HYPOGLYCEMIC, HYPOLIPIDEMIC AND BIOCHEMICAL EFFECTS OF *TITHONIA DIVERSIFOLIA* AQUEOUS ROOT EXTRACT IN WESTERN DIET FED WISTAR ALBINO RATS.

BY

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE DEGREE OF THE DEPARTMENT OF MEDICAL BIOCHEMISTRY, MOI UNIVERSITY.

DECLARATION

Declaration by the Candidate

This thesis is my original work and has not been submitted for any academic award in any other University. No part of this thesis may be reproduced without the prior written permission of the author/or Moi University.

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DEDICATION

This thesis is dedicated to my loving husband Edwin and our lovely children Patience, Praston and Powell.

ABSTRACT

Background: Diabetes and obesity pose risks of severe complications, including cardiovascular diseases and cancer. The Luo community in Kenya uses Tithonia diversifolia root preparations for hypoglycemic and hypolipidemic effects, necessitating scientific validation.

Objectives: To determine the hypoglycemic and hypolipidemic effects of aqueous root extract of *Tithonia diversifolia* and its biochemical effects on the liver and kidney of western diet-fed Wistar albino rats.

Methods: This was a laboratory-based study in wistar albino rats with elevated fasting blood glucose and lipids. The rats were put on a western diet composed of rodent chow enriched with 21% animal lard and 0.15% cholesterol for 35days. Thirty-five male rats weighing 180-200g were selected, acclimatized for one week, and randomly grouped into 7 groups of normal control(G1), those fed on western diet for 35 days(G2), the ones fed on western diet for 35days and given 10mg/kg atorvastatin in the last 7 days(G3), those fed on western diet for 35days and given 0.5mg/kg glibenclamide in the last 7 days(G4), the ones fed on western diet for 35days and given 200mg/kg(G5), and 400mg/kg of the extract (G6) respectively in the last 7 days and the ones fed on western diet for 28 days and reverted to normal diet in the last seven days(G7). Blood fasting glucose levels were determined weekly by obtaining blood from the tail.

In contrast, lipid profile, kidney and liver function were determined using blood obtained by cardiac puncture at the end of the experiment. Data was stored in SPSS version 20 and analyzed for means, post-hoc Least Significance Difference, and Duncan's tests to compare the pairs of groups. A p-value ≤ 0.05 was considered statistically significant.

Result: The fasting blood glucose levels gradually increased in all the groups between weeks one to four though maintained normal range for wistar albino rats (3.95±1.31 mmol/L). There was a significant reduction (p=0.000) in serum cholesterol (normal 1.06-3.25mmol/L) when the negative control group(G2) was compared to the groups that received 200mg/kg(G5) mean 2.0mmol/L, 400mg/kg of the extract(G6) mean1.2mmol/L and 10mg/kg Atorvastatin(G3) mean 2.0mmol/L. For triglycerides (0.5-2.9mmol/L) p=0.036 the mean values in G5, G6 and G3 were 1.0, 1.0 and 0.4mmol/L respectively. There was a significant increase (p=0.000) in urea levels (normal levels 3.9-8.9mmol/L) and a significant reduction (p=0.011) in creatinine (17.68-61.88umol/L) among groups given 200mg/kg and 400mg/kg extract compared to positive control. There was no significant increase in levels of aspartate aminotransferase (p=0.264) and alanine aminotransferase (p=0.264), whose normal levels are 34-109U/L and 198.68 ±15.66U/L respectively, but there was significant (p=0.000) difference in alkaline phosphatase(95-611U/L) after administration of 200mg/kg of extract daily for seven days. Reverting to rodent chow for seven days(G7) did not significantly change all the parameters except creatinine and urea, where the changes were significant compared to the positive control group.

Conclusion: Aqueous root extract of *Tithonia diversifolia* administered at 200mg/kg and 400mg/kg is safe for the liver and demonstrated hypoglycemic and hypolipidemic activity similar to standard drugs glibenclamide and atorvastatin, respectively. However, it seems to be associated with glomerular damage, as evidenced by the elevated levels of urea.

Recommendation: Further studies are recommended in order to establish proper dosage and kidney toxicity.

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LIST OF ACCRONYMS

ANOVA	Analysis of variance
ALT	Alanine aminotransferase
AST	Aspartate aminotransferase
ALP	Alkaline phosphatase
b.w	body weight
CHD	Coronary heart disease
CHO	Cholesterol
CVD	Cardiovascular diseases
HDL	High-density lipoprotein
REC	Research Ethics Committee
LD	Light-darkness
LDL	Low-density lipoprotein
LSD	Least Significance Difference
SPSS	Statistical Package of Social Sciences
TD	*Tithonia diversifolia*
TGs	Triglycerides
T2DM	Type-2 diabetes
WHO	World Health Organization

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Diabetes mellitus (DM) is characterized by abnormally elevated blood glucose concentrations that are associated with increased mortality, microvascular and macrovascular complications (Nathan, 1993). It is defined by increased glucose levels and glycosuria resulting from impaired pancreatic β-cell function and insulin resistance (Liu *et al.,* 2021). In contrast, obesity is characterized by elevated levels of very low-density lipoprotein, low-density lipoprotein, and total serum cholesterol. Hyperlipidemia is associated with lipid disorders and is a well-known contributor to atherosclerosis, serving as a primary risk factor for cardiovascular diseases (DeFronzo *et al.,* 2015). Both elevated blood glucose concentrations and lipid levels have long-term consequences, leading to organ damage, dysfunction, and failure (Daryabor *et al*., 2020).

Diabetes mellitus and obesity have shown an alarming increase worldwide and are considered the fourth or fifth most important cause of death globally. These two conditions are linked to severe complications such as peripheral vascular diseases, coronary artery problems, stroke, diabetic neuropathy, blindness, and kidney failure. The predisposing factors to the rapid rise of these conditions are sedentary lifestyles, nutrition transitions, urbanization, and aging (Tuso, 2014).

It is projected that by 2045, the global diabetic population will exceed 693 million individuals (Reddy & Mahesh, 2018). The global burden caused by obesity and overweight is on the rise, leading to significant economic, social, and health consequences. Approximately 2.8 million

people worldwide perish annually due to obesity-related illnesses. Excess weight increases triglycerides, total cholesterol, low-density lipoprotein (LDL), or "bad cholesterol," and reduces high-density lipoprotein (HDL), known as "good cholesterol," increasing the risk of type 2 diabetes and cardiovascular diseases (CVDs). This happens because increased body fat hinders insulin from effectively incorporating glucose into cells, leading to elevated blood glucose levels (Okube & Omandi, 2019). Approximately 80% of fatalities related to diabetes mellitus can be attributed to cardiovascular diseases, mainly as a result of coronary artery disease (Hayat *et al.,* 2004).

Diabetes mellitus has remained one of the most expensive and burdensome chronic illnesses, increasing public health concerns. Among individuals above 60, stroke and coronary/ ischemic heart disease (CHD) are emerging as the number one cause of more than a quarter of deaths in this age group (Zhou *et al.,* 2020). In Africa, this represents a remarkable shift as coronary heart disease and stroke, which were not known until recently, have presented mortality rates and prevalence comparable to high-income countries. African countries are thus undergoing a shift in the epidemiological change in lifestyle diseases while retaining a high burden of infectious diseases (Boutayeb, 2006).

In Africa, particularly sub-Saharan Africa, Diabetes mellitus and obesity are the leading causes of mortality among persons aged 30 years and above. Moreover, the epidemiologic burden of these two conditions threatens to impose a significant economic burden on middle and low-income countries. Common risk factors for Diabetes mellitus and obesity in Africa include obesity, sedentary lifestyles, unhealthy diets high in sugar and saturated fats, genetic predisposition, and socioeconomic factors. Diabetes mellitus and obesity can lead to atherosclerosis, especially stroke and cardiovascular disease risk factors, notably

hypertension (Jagannathan *et al*., 2019). Risk factors for cardiovascular diseases associated with these conditions are reportedly rising in Kenya (Watetu *et al*., 2019). Urbanization, which has been rapidly advancing in Kenya, may adversely affect physical health due to dietary shifts in urban areas. Consequently, the rural-to-urban transition may increase obesity and overweight levels nationwide, although Kenya is expected to face a dual burden of malnutrition in the near future (Peters *et al*., 2019).

According to the STEP-wise survey in Kenya, the prevalence of Diabetes mellitus in adults is estimated at around 4.56%, affecting approximately 750,000 individuals and resulting in 20,000 annual deaths. Generally, 87.8% of Kenyans have never been screened for Diabetes mellitus, and fewer than half (40.1%) are receiving treatment among those diagnosed. The disease significantly impacts healthcare expenditures and has become a significant medical and economic burden in Kenya (Kweyu *et al.*, 2022).

Data on the prevalence of dyslipidemia and its association with poor blood pressure control among obese patients in Kenya are scarce (Nderitu, 2020). A recent household survey in Kenya revealed that 27% of the adult population is affected by obesity (Wamai *et al*., 2018). A "hyperlipidemia transition" is taking shape in Kenya, forming part of a double burden of diseases as the country grapples with infectious diseases that, although in decline, still dominate Kenya's disease burden (Roth, 2018).

Commonly used remedies for managing Diabetes mellitus include oral hypoglycemic medications and insulin administration. Studies have identified several side effects of these oral hypoglycemic drugs, such as hemolytic anemia, weight gain, fluid retention, peripheral

edema, central nervous system disorders, dermatological reactions, nausea, and bloating (Isitua *et al*., 2018).

Furthermore, the cost of insulin and other medications used to manage this condition is considered high, especially for low-income communities. Consequently, many patients in third-world countries are compelled to turn to traditional medicines suspected of having some therapeutic value (Inteso & Isaacs, 2021). Throughout history, humanity has relied on phytomedicine to manage hyperglycemic and hyperlipidemic conditions (Amirehsani *et al.*, 2021) and hypertension (Huan *et al.,* 2021) because medicinal plants are known to be cost-effective, readily available, safer, and better tolerated, less likely to produce side effects, and have therapeutic potency and effectiveness (Erion *et al.*, 2016).

The goal of the present study was to evaluate the hypoglycemic and hypolipidemic activity of the aqueous root extract of *Tithonia diversifolia* in Western diet-fed Wistar albino rats, comparing them with glibenclamide and atorvastatin, which are the standard drugs for Diabetes mellitus and obesity, respectively.

The plant's safety and toxicity have been confirmed in its leaf extracts. Higher doses of more than 400 mg/kg of the aqueous leaf extract of *Tithonia diversifolia* caused significant changes in biochemical, histopathological, and hematological parameters in Wistar rats after 14 days of treatment (Fakunle & Abatan, 2007). In contrast, a 100 mg/kg dose was well-tolerated in rats after seven days of treatment (Adebayo *et al*., 2009). However, a 200 mg/kg dose led to heart and liver damage, as indicated by elevated alkaline phosphatase levels in these tissues (Mabou *et al.*, 2018). Additionally, continuous administration of 10 mg/kg of the same

extract for 90 days increased alkaline phosphatase levels and reduced white blood cell counts in rats (Passoni *et al.*, 2013).

In summary, these findings suggest that *Tithonia diversifolia* is relatively well-tolerated in Wistar rats when administered orally at lower doses (<100 mg/kg) for a short-term period (less than seven days). However, higher-than-required doses can cause adverse side effects, such as kidney damage and hepatic dysfunction. *Tithonia diversifolia* is widespread in tropical and subtropical climates, and its leaves have traditionally been used by indigenous people to treat various ailments and diseases (Mabou *et al*., 2018). In Kenya, the Luo communities traditionally use boiled roots to maintain normal blood sugar and lipid levels. The claim regarding the hypoglycemic and hypolipidemic activity of this plant's roots formed the basis of this study, as it has not been scientifically tested, proven, or documented. Therefore, this study aimed to investigate the hypoglycemic and hypolipidemic effects of the aqueous root extract of *Tithonia diversifolia* in Western diet-fed Wistar albino rats, along with its impact on the liver and kidney.

1.2 Statement of the problem

Approximately 200 million persons worldwide suffer from Diabetes mellitus, which is expected to reach 300 million by 2025. The major reason for this global increase in Diabetes mellitus is primarily associated with obesity. The International Diabetes Federation (IDF) has reported that the prevalence of diabetes mellitus has reached epidemic levels globally. The IDF estimates that in 2010, 285 million adults had diabetes, an increase of 39 million people from 2007. The projection for 2030 is 439 million (Waly *et al.*, 2010)

In sub-Saharan Africa, Diabetes mellitus is estimated to affect 40.7 million people by 2045, up from 15.9 million in 2017. This burden is exacerbated by estimates showing that more than two-thirds of individuals in sub-Saharan Africa with diabetes go undiagnosed. Due to the increasing demand and insufficient funding for diabetes care, the quality of diabetes care in sub-Saharan Africa is below average. Additionally, diabetes mellitus and obesity represent a significant "double burden" of infectious and chronic diseases (Mercer *et al.,* 2019).

The World Health Organization estimates that the prevalence of Diabetes mellitus in Kenya is at 3.3% (Chege, 2010), and this figure is predicted to increase to 4.5% by 2025 (Mcferran *et al*., 2008). Studies have shown that Kenya has a prevalence of 14.2% in the general population, 2.2% in rural areas, and 12.2% in urban residents (Christensen *et al*., 2009), partly due to sedentary lifestyles.

The number of individuals with Diabetes mellitus and obesity continues to rise due to population growth, urbanization, aging, and the increasing prevalence of obesity and physical inactivity (Kiptisia *et al*., 2020).

The impact of hyperglycemic and hyperlipidemic treatment on patients, economies, and societies, particularly in less developed and developing countries cannot be overstated. For many patients in Kenya, the cost of treatment for the mentioned conditions is prohibitively high, posing financial challenges for their families. As a result, many of these patients fail to adhere to treatment measures, putting them at a higher risk of developing end-organ damage. If the cost of prevention can be kept sufficiently low, it can lead to a long-term reduction in medication costs. A research study estimates that a hyperglycemic patient spends an average of 349,000 shillings on medications per year (Hall *et al*., 2011). Due to inflation over time,

this cost is likely even higher now. The management of Diabetes mellitus and obesity remains a global crisis, and to date, a fully effective and successful medication has not been discovered (Henry *et al.*, 2020).

Available remedies for diabetic conditions include various oral hypoglycemic agents like metformin, sulfonylureas, glucosidase inhibitors, troglitazone, and insulin, among others. However, these modern remedies are known to cause adverse side effects such as lactic acidosis, diarrhea, and liver problems (Rashid & Abdelgadir, 2019).

Phytomedicine has become increasingly common in primary healthcare, especially in developing countries, with many people assuming that they are safe simply because they are natural, even though there is a lack of scientific evidence to confirm their safety for consumption (Chan, 2003). For instance, bitter melon (*Momordica charantia L*.) is used to treat fever and malaria (Adoum, 2009), but its green seeds are known to be very toxic, leading to a rapid drop in blood glucose and potentially inducing hypoglycemic coma (Li *et al*., 2004) due to structural similarities to animal insulin in bitter melon extract components (Basch *et al*., 2003).

While several published studies have investigated the hypoglycemic and hypolipidemic effects of the leaf and stem extracts of *Tithonia diversifolia*, more studies need to be done on the root extract's effects. However, some Luo communities in Kamagambo Sub-location, Rongo District, Migori County, Kenya, believe that the aqueous root extract of *Tithonia diversifolia* has the potential to reduce blood sugar levels in hyperglycemic individuals and lower fat content in obese individuals. This study aims to scientifically validate this claim

and assess whether it may cause any harm to organs such as the liver and kidney through the analysis of liver enzymes and some kidney biomarkers.

Due to the financial burden of managing diabetes mellitus and obesity, especially in developing countries, it can be challenging for communities to maintain a steady supply of drugs. Consequently, many diabetic and hyperlipidemic patients may not adhere to treatment measures, putting them at a higher risk of developing end-organ damage.

Furthermore, due to the high cost and unwanted side effects associated with current hypoglycemic and hypolipidemic therapies, there is an increasing consumption of herbal remedies by communities who believe these products are safe for treating and managing diseases simply because they are natural. However, herbal formulations, which may be assumed to be safe, can contain toxins, and their long-term use may lead to hepatotoxicity, nephrotoxicity, neurotoxicity, cardiotoxicity, and skin toxicity (Fatima & Nayeem, 2016). For example, the aqueous leaf extract of *Tithonia diversifolia* is reported to cause significant changes in biochemical, histopathological, and hematological parameters in Wistar rats after 14 days of treatment at doses higher than 400 mg/kg, indicating its toxicity with prolonged use at this concentration (Fankule & Abatan, 2007).

1.3 Justification of the study

Herbal remedies are favored for their ready availability, cost-effectiveness, efficiency, potency, low cost, improved tolerance, perceived minimal side effects, accessibility, and recyclability (Maiti & Kesari, 2011). The use of *Tithonia diversifolia* aqueous root extract in this study is based on the traditional practice among the Luo community, where it is used to manage diabetes mellitus and obesity. However, there is no scientific documentation

supporting these claims of hypoglycemic and hypolipidemic activity and their safety, which underscores the rationale for the present study. The entire plant, crude extracts, or purified constituents are used in the native system of medicines, which have eventually evolved into contemporary therapeutic sciences (Rehman *et al*., 2017). The crude root extract was employed in this study because the communities predominantly use boiled preparations for disease treatment and management. Experimental assessment of the toxicity of herbal plants is vital to ensure safety before human exposure. Historically, oral administration is the most suitable and commonly used route for studying toxicity. The oral route of administration aligns with the traditional use of herbal plant roots. Diabetes mellitus and obesity are affecting an increasing number of patients and significantly diminishing their quality of life (Ciulla *et al*., 2003). Modern medications for managing these conditions are prohibitively expensive for many patients, and most of these medications are associated with adverse side effects (Schattner, 2022). Incorporating herbal medicine into the modern healthcare system may significantly enhance overall healthcare. This study assessed key parameters mainly affected during hyperlipidemic and hyperglycemic states, including body weight and blood sugar levels. Additionally, the biochemical changes in the liver and kidney were examined in Western diet-fed Wistar rats following treatment with the aqueous root extract of *Tithonia diversifolia*.

While many studies have been published focusing primarily on the leaf extract of *Tithonia diversifolia* to demonstrate its hypoglycemic and hypolipidemic properties, a segment of the Luo Nyanza community in Kamagambo sub-location, Rongo district, Migori County, Kenya, believes that the aqueous root extract of *Tithonia diversifolia* has the potential to reduce blood sugar levels in diabetic individuals and lower fat content in obese individuals. The current

study aimed to scientifically validate these claims and assess whether the extract may cause harm to the liver and kidney by analyzing liver enzymes and selected kidney biomarkers.

1.4 Research Questions

1. Does *Tithonia diversifolia* aqueous root extract possess hypoglycemic effects?
2. Does *Tithonia diversifolia* aqueous root extract possess hypolipidemic effects?
3. How does ingesting aqueous root extract of *Tithonia diversifolia* affect biochemical markers of kidney and liver functions?

1.5 Objectives

1.5.1 Broad objective

To evaluate the hypoglycemic, hypolipidemic effects of *Tithonia diversifolia* aqueous root extract, and kidney and liver functions on western diet-fed Wistar albino rats.

1.5.2 Specific objectives

1. To qualitatively determine the phytochemical composition of the aqueous root extract of *Tithonia diversifolia.*
2. To determine the hypoglycemic effect of *Tithonia diversifolia* aqueous root extract on western diet-fed Wistar albino rats.
3. To determine the hypolipidemic effect of *Tithonia diversifolia* aqueous root extract on western diet-fed Wistar albino rats.
4. To determine the biochemical effects of *Tithonia diversifolia* aqueous root extract on kidney and liver functions in Western diet-fed Wistar albino rats.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 The biochemical basis of obesity due to diabetes mellitus

The association between hyperglycemic and hyperlipidemic conditions is a well-known occurrence. High blood glucose directly has a significant effect on blood lipid levels, thus leading to lipid imbalance among people with diabetes (Belayneh *et al.,* 2019). Those who are hyperglycemic are more prone to have increased levels of serum triglycerides (TG), elevated levels of serum low-density lipoprotein cholesterol (LDL-C), and reduced levels of serum high-density lipoprotein cholesterol (HDL-C), in comparison to those whose blood sugar levels are normal (not diabetic) (Belayneh *et al.,* 2019)

The most common lipid abnormalities in diabetic patients include reduced high-density lipoprotein (HDL) and hyper-triglyceridemia (Hirano, 2018). Even though lipid abnormalities improve with glycemic control, normalization does not occur because there is a close connection between diabetic patients, particularly type-2 diabetes and obesity. Therefore, the management of obesity should begin with glycemic control (Garber *et al.,* 2020).

The elevated concentration of lipids (fats) in the bloodstream often occurs in Diabetes mellitus, where the levels of blood glucose are abnormally high (Ahmed, 2022). This biochemical relationship is particularly relevant in the context of diabetes, where both conditions frequently coexist. The interplay between diabetes mellitus and obesity involves several intricate processes at the cellular and molecular levels.

One of the fundamental mechanisms linking diabetes mellitus to obesity is insulin resistance. In type 2 diabetes and insulin-resistant states, the body's cells become less responsive to insulin (Schofield *et al*., 2012), a hormone that plays a central role in glucose metabolism and lipid regulation. This resistance impairs glucose uptake by cells, leading to an accumulation of glucose in the bloodstream. In response to diabetes mellitus, the body adapts by increasing insulin release. However, this can trigger changes in lipid metabolism, including increased synthesis and release of triglycerides and other lipids into the blood.

Diabetes mellitus can also stimulate the liver to engage in gluconeogenesis, which synthesizes glucose from non-carbohydrate precursors like amino acids and glycerol (Cătoi *et al*., 2015). The increased production and release of glucose from the liver contribute to higher levels of glucose in the bloodstream. These elevated glucose levels can, in turn, promote the release of free fatty acids (FFAs) from adipose tissue (Bays *et al*., 2004). Increased FFAs in the bloodstream provide a substrate for triglyceride synthesis and contribute to the elevated lipid levels in obesity associated with increased blood glucose levels (Choi *et al.,* 2011).

The implications of obesity due to diabetes mellitus are profound, particularly in the context of diabetes. This combination of conditions significantly increases the risk of atherosclerosis, a condition characterized by the buildup of fatty deposits in the arterial walls. Elevated levels of triglycerides and low-density lipoproteins (LDL) contribute to the formation of atherosclerotic plaques. Over time, these plaques can narrow and harden the arteries, leading to an increased risk of cardiovascular complications such as heart disease and stroke (Saçlı *et al*., 2018).

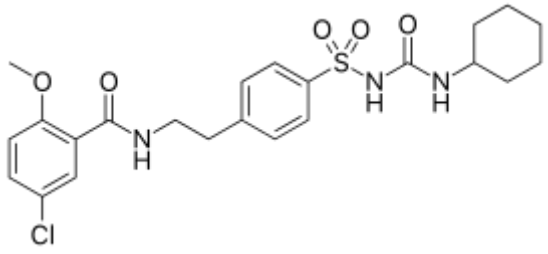
Furthermore, the presence of both diabetes mellitus and obesity can adversely affect pancreatic beta-cell function. Persistent high glucose and lipid levels can damage the cells that are responsible for producing insulin (Cerf, 2013). This dual metabolic stress further promotes insulin resistance, creating a challenging cycle in diabetes management. The risk of cardiovascular disease is significantly heightened due to endothelial dysfunction, inflammation, and oxidative stress induced by this combination of conditions (Incalza *et al*., 2018). Abnormal lipid profiles characterized by high triglycerides, low high-density lipoproteins (HDL), and elevated LDL cholesterol levels, further increase the cardiovascular risk for persons with diabetes mellitus (Jain *et al*., 2016).

2.2 Glibenclamide

2.2.1 Hypoglycemic Activity of Glibenclamide

Glibenclamide (1) belongs to a group of drugs referred to as sulfonylureas. It is an antidiabetic drug that is used in the management of type-2 diabetes.

It is an effective sulfonylurea medication that promotes the control of glucose levels by acting on insulin action and insulin secretion (Monami *et al.*, 2006)



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2.2.2 Glibenclamide's Mode of Action

This drug functions by closing the channels of potassium ATP-sensitive on the beta cells of the pancreas. These potassium ATP-sensitive channels found on the beta cells are called sulfonylurea receptor 1 (SUR1) (Gribble & Reimann, 2003).

Glibenclamide functions by binding to and then inhibiting the channels of potassium ATP-sensitive (K_{ATP}) (Esmaeili *et al.,* 2018), the regulatory subunit sulfonylurea receptor 1 (SUR1) (Xu *et al.,* 2019) in beta cells of the pancreas.

This drug acts on the pancreatic beta-cells in order to stimulate the secretion of insulin. Under physiological conditions, the secretion of insulin from pancreatic beta-cells is mediated by increased concentration of blood glucose levels. Glucose then enters the cell through GLUT2 (SLC2A2) transporters (Berger, 2020). Once glucose is inside the cell, it is metabolized to generate adenosyl triphosphate (ATP). Increased concentration of ATP will slow down or inhibit ATP-dependent potassium channels (ABCC8), which will depolarize the cell. Depolarization leads to an opening of channels of calcium voltage-gated, this allows calcium to go into the cell. An increase in the intracellular calcium then stimulates exocytosis of the vesicle and insulin secretion. Glibenclamide stimulates insulin secretion by inhibiting ATP-dependent potassium channels (Gravielle, 2021).

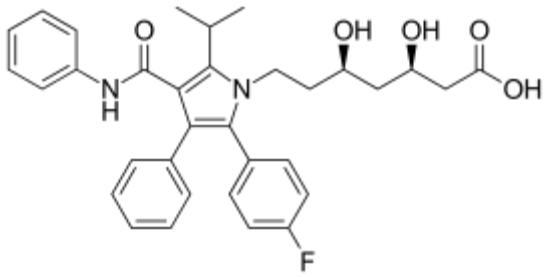
In a situation with a reduced glucose concentration level, sulfonylurea receptor 1(SUR1) remains open; this allows the efflux of potassium ions to form a -70mV potential membrane. Usually, sulfonylurea receptor one remains closed in response to increased concentration of glucose, the cell's membrane potential becomes less negative, there is a depolarization of the cell, the channels of calcium voltage-gated become open, calcium ions then go into the cell,

the raised concentration of intracellular calcium stimulates the insulin release containing granules. Glibenclamide overdoes this procedure by forcing sulfonylurea receptor 1 to close and stimulates insulin secretion, which lowers blood sugar levels to normal (Gribble & Reimann, 2003).

2.3 Atorvastatin

2.3.1 Hypolipidemic Activities of Atorvastatin

Atorvastatin (**2**) and other statins are regarded as the first option for treating and managing diabetes mellitus (Grundy & Stone, 2019).



(2)

The increase in the utilization of this class of medication has been mainly attributed to the increase in cardiovascular diseases (CVD) (like atherosclerosis, peripheral artery disease, heart attack, stroke, and angina) in several countries (Einarson *et al.*, 2018). Increased levels of cholesterol (raised levels of low-density lipoprotein (LDL) specifically) are a significant risk factor for the genesis of cardiovascular diseases (Anderson *et al.*, 2016). Several studies have shown that proper use of Atorvastatin is connected to reduced levels of low-density lipoprotein and cardiovascular disease risk.

2.3.2 Atorvastatin's Mode of Action

Atorvastatin is a medication that reduces lipid levels incorporated in the statin group of drugs. Statins reduce unusual cholesterol and lipid levels by preventing the production of endogenous cholesterol in the liver, thus lowering the danger of developing cardiovascular disease. Specifically, statin medications compete to inhibit the activity of an enzyme called hydroxymethylglutaryl-coenzyme A (HMG-CoA) Reductase (Ahmadi, 2020). The conversion of HMG-CoA to mevalonic acid, which is a very early rate-limiting step in the biosynthesis of cholesterol, is catalyzed by hydroxymethylglutaryl-coenzyme A reductase (Johnson & DeBose-Boyd, 2018). This conversion is a very important metabolic reaction that is involved in the creation of various compounds that are used in the metabolism of lipids and their transport like the low-density lipoprotein (LDL) also called "bad cholesterol" due to the fact that it operates as a basis of cholesterol that builds up in arteriosclerotic plagues.), very-low-density lipoprotein (VLDL) and total cholesterol (Davies *et al.,* 2016).

Atorvastatin functions mainly in the liver, where reduced concentration levels of hepatic cholesterol stimulate the up-regulation of the hepatic low-density lipoprotein (LDL) receptors, which elevates the uptake of hepatic low-density lipoprotein. Atorvastatin too reduces the levels of serum triglycerides (TG), Very-Low-Density Lipoprotein-Cholesterol (VLDL-C) and Intermediate Density Lipoproteins (IDL) together with the amount of apolipoprotein B (apo B) containing particles, yet increases the levels of High-Density Lipoprotein Cholesterol (HDL-C) (Chowdhury & Chowdhury, 2015).

In vivo and *In vitro* studies that have been conducted in animal studies also demonstrated that Atorvastatin offers vasculoprotective activities apart from its properties of lowering lipids,

which is referred to as the pleiotropic activities of statins (Rohilla *et al.,* 2016). These effects include enhanced atherosclerotic plaque stability, endothelial function improvement, inflammation, inhibition of the thrombogenic response, and reduced oxidative stress. Studies have also reported that statins allosterically bind to β2 integrin function-associated antigen-1 (LFA-1), which plays a critical role in T-cell activation and leukocyte trafficking (Rohilla *et al.,* 2016).

Management of diabetes mellitus and high blood pressure management using traditional therapies is widespread in African urban and rural communities. A growing population of diabetic patients who prefer herbal therapies are motivated to do so because of several factors that are not limited to financial problems, the fact that traditional medicine is easily accessible, geographical accessibility to health facilities, indigenous knowledge of community members, inadequate healthcare systems together with the role of traditional therapists in the treatment of illnesses (Mushagalusa *et al.,* 2021).

2.4 Herbal medicines and disease management

Herbal medicine originated from ancient cultures where plants or their extracts were used to treat illnesses and assist bodily functions **(**Kooti *et al.,* 2016). About 75% of people in the world, particularly in developing and underdeveloped countries, consider herbal medicine the primary way of treating illnesses since it has better tolerability with the human body, lesser side effects, and better cultural acceptability (Rahman, 2022). For example, herbal extracts have been introduced as prescription drugs (Gunjan *et al.,* 2015).

The discovery of conventional drugs has outdone the traditional remedies, more specifically in developed countries. In resource-poor communities, particularly in Africa, herbal

medicine has been considered the most crucial part of the traditional remedy, the alternative medication (Odhiambo *et al.,* 2011). The popularity of green medicine in treating and managing diseases in African populations is due to the fact that it is easily accessible and at a reduced/affordable cost compared to conventional medicine (Sam, 2019). In traditional therapy, patients get social treatment from relatives, traditional healers, and friends with good experiences. The positive outcomes of herbal therapy are because of the placebo and sometimes due to the actual efficacy of the plant. It is also worth mentioning that there is presently a renewal of herbal therapy in developed communities (Gurib, 2006). The rationale for using traditional medicine comes as no shock since it possesses numerous bioactive compounds of known therapeutic usage (Rehman *et al.,* 2022). A range of herbal extracts, together with their metabolites, can amend signaling cascades that are implicated in cardiovascular physiology. Several plants have been reported to provide a starting point in synthesizing more than fifty percent of the pharmaceutical medicines presently in use (Mushagalusa *et al.*, 2021).

2.4.1 Hypoglycemic Medicinal Plants

Existing medications for hyperglycemic conditions are generally limited in value, bear the danger of undesirable effects, and are too expensive, particularly for developing countries. Consequently, a search for plant-derived hypoglycemic remedies that can be readily available and do not involve demand for expensive pharmaceutical processing becomes a very attractive area of research (Belayneh *et al.,* 2019). Approximately eight hundred and eighty plants are thought to have hypoglycemic activity, and around three hundred and forty-three plants have been reported in scientific studies (Maher *et al.,* 2021). Plants do not only contain hypoglycemic activities, but they also lead to a decline in triglyceride, alkaline phosphatase,

and cholesterol levels while increasing the content of total protein (Gopalakrishnan & Dhanapal, 2014). All these medicinal properties are quite advantageous to those who have diabetes. However, the plants believed to have hypoglycemic activities have yet to be evaluated on their mode of action, potency, and safety.

In recent times, herbal therapies have been evaluated as very important in managing diabetes mellitus globally and are used as hypoglycemic and hypolipidemic drugs. Despite the availability of hypoglycemic remedies in the pharmaceutical market, diabetes mellitus and related problems remain the leading medical crisis. Hypoglycemic activities of most of the plants are due to their potential to restore the role of the tissues of the pancreas by increasing insulin production and inhibiting glucose absorption in the intestine. Most medicinal plants possess alkaloids, carotenoids, glycosides, flavonoids, and terpenoids, among others, commonly incorporated as containing hypoglycaemic activity (Srivastava *et al.,* 2019). Several herbal medicines are used in different communities worldwide to cure numerous diseases, including diabetes (Andargie *et al.,* 2022). Some plants like *Avicennia marina,* an ethanolic extract of its leaf, have been used to minimize high blood sugar levels and oxidative stress, improve the neurobehavioral changes linked to diabetes, and protect the liver in mice (Okla *et al.,* 2019).

Studies have shown that approximately more than one thousand species of flora have been traditionally applied for managing diabetes mellitus. Some species of plants that have been reported to have hypoglycemic effects include *Asteraceae, Leguminosae (Fabaceae), Liliaceae, Moraceae, Cucurbitaceae, Lamiaceae, Euphorbiaceae, Araliaceae Calpurnia aurea and Rosaceael Acacia Arabica* (Hegazy *et al.,* 2013). *Acosmium panamense* (Andrade-Cetto *et al.,* 2004). *Allium sativum (garlic), Hibiscus sabdariffa L (*Su *et al.,* 2018).

Coriandrum sativum (Kooti *et al.,* 2016). *Securinegra virosa* (Tanko *et al.,* 2018). *Mangifera indica, Ocimum sanctu* (Vats *et al.,* 2002). *Opium graveolens* (Mans *et al.,* 2019). *Aegle marmelose,* among others. The hypoglycemic effects of these botanical remedies are due to the existence of terpenoids, phenolic, alkaloid compounds, and flavonoids.

2.4.2 Hypolipidemic Medicinal Plants

In the past few years, a progressive development in the field of herbal medication has been seen, and most of these medicines are becoming more popular both in developed and developing communities because of their reduced adverse effects and natural availability. A rising number of research findings have reported antihyperlipidemic activities with herbal medicines. Attempts have been made so as to reduce body weight by the use of a pharmacological intervention that possesses minimum side effects. Plants have been utilized for healing various diseases; in particular, several oriental medicinal plants have been demonstrated to have biological activity. These medicinal plants are rich sources of bioactive compounds (Alagumanivasagam & Veeramani, 2015). Therefore, they have been utilized as essential raw materials for producing conventional drugs.

Some of the hypolipidemic medicinal plants include the following: *Amaranthus Spinosus* Amaranthaceae, *Glycyrrhiza Glabra* Fabaceae, *Withania Somnifera* Solanaceae, *Chlorophytum Borivilianum* Liliaceae, *Moringa oleifera* Moringaceae, *Sphaeranthus indicus,* Asteraceae, *Rhinacanthus nasutus* Acanthaceae, *Pithecellobium Dulce benth* Leguminosae, *Hibiscus cannabinus* Malvaceae, *Eclipta prostrate* Asteraceae, *Sesbania grandiflora* Fabaceae, *Lycium barbarum* Solanaceae and *Ougeinia oojeinensis* Fabaceae (Sham *et al.,* 2014). Given that currently accessible hypolipidemic therapies do not have the

desired ultimate remedy characteristics; research is expected to look for safe, effective, and inexpensive remedies. Herbal medicine is helpful in diabetes globally and has been used as hypoglycaemic and hypolipidemic drugs (Sajadimajd *et al.,* 2023). Medicinal plants for hypercholesterolemia have been shown to have no or fewer adverse effects and are economically efficient in managing obesity (Aziz *et al.*,2023).

Several research work has recorded that dyslipidemia linked to non-communicable illnesses such as obesity and diabetes have shown to be on the rise, especially in developing countries, and steady studies are needed in order to discover native medicinal plants that can be able to alleviate, or maybe helpful in managing dyslipidemia (Tsenum, 2018). Hence, the need to conduct the present study to assess the hypolipidemic and hypoglycemic effects of the aqueous root extract of *Tithonia diversifolia* compared to the standard drugs, atorvastatin, and glibenclamide.

2.5 *Tithonia diverfolia* (Hemsley) A. Gray

2.5.1 The Plant

Tithonia diversifolia belongs to the Asteraceae family, genus *Tithonia* and species *T. diversifolia*. Vernacular/common names: (English): Mexican sunflower, Tithonia, tree marigold; (Kikuyu): Maruru; (Luo): *Maua makech, akech*; (Kamba): *Ilaa*; (Kisii): *Amaua maroro*; (Luhya): *Maua amalulu* (Mabou *et al.,* 2018).

Tithonia diversifolia (Figure 1) is a bushy perennial herb that grows approximately three meters high. The stems of this plant are slightly ridged, hairy, and hollow when young. Its leaves are arranged alternately and are borne on its stalks, which are about 2-10 cm long.

The colour of its leaves is dark-green and finely hairy. Its flowers are large and yellow and resemble that of the sunflower plant. The heads of these flowers are borne at the tops of the leafy branches, which are about 7-30 cm long. Flowering mainly occurs during the rainy seasons in East Africa (Mabou *et al.,* 2018).

Figure 1: *Tithonia diversifolia* shoot

Tithonia diversifolia is/was indigenous in Mexico but has spread around all over the world. It was introduced as an ornament and green manure in Africa and Asia. The plant grows wild in tropical and subtropical areas and has also become naturalized (Mabou *et al.,* 2018).

A study by Masood *et al.,* 2017 revealed that *Tithonia diversifolia* exhibits exciting health-promoting properties that result from stimulation of its defensive cellular mechanisms that are engaged in the stress defenses at the cell and its capacity of free radical scavenger (Meshuneke *et al.,* 2020) and also in mesenchymal cells adipogenesis (Roopa *et al.,* 2021).

The phytochemicals extracted from the stem and leaf of *Tithonia diversifolia* have been traditionally applied in the treatment and management of diabetes (Yazid *et al.,* 2021), diarrhea (Gahamanyi *et al.,* 2021), menstrual pain (Obayomi *et al.,* 2021), malaria

(Ngarivhume *et al.*, 2021), hepatitis (Silva *et al.*, 2020), hepatomas (Maher *et al.*, 2021). This has been attributed to the flavonoids and terpenoids contained in this plant's aerial areas. In addition, it is established that *Tithonia diversifolia* has antimalarial, antimicrobial, analgesic, and anti-inflammatory repair activities. Herbal remedies have been culturally applied in managing several conditions and sicknesses. A study (Olukunle, 2014) reported that *T. diversifolia* aqueous leaf extract improves insulin at the cellular level since it can attenuate blood glucose concentrations in hyperglycaemic rats.

A study on ethanolic root extract of *Tithonia diversifolia* contains the following phytochemical compounds: alkaloids, tannins, phenolic compounds, flavonoids, and terpenoids (Tagne *et al.*, 2018).

Although the mechanism of action of various hypoglycemic plants is not precisely known, it is assumed that these plants have specific hypoglycemic values, which slow down the activities of some of the enzymes that are drawn in the glucose production pathway, stimulate the production of insulin and also make the target cells receptors susceptible to insulin (Olukunle, 2014).

Together with this, the hypoglycemic activities of several plants might be credited to the occurrence of trace elements like potassium, iron, zinc, copper, sodium, vanadium, nickel, and chromium, which are believed to activate the cells of the pancreas and take part in a vital role in maintaining normoglycemia (Parasuraman *et al.*, 2015). The claim on antidiabetic and hypolipidemic properties of this plant formed the basis of establishing the outcome effect of the aqueous root extract on these parameters since it has not been validated scientifically.

2.5.2 The traditional usage of *Tithonia diversifolia*

Scientific studies have validated *Tithonia diversifolia* medicinal properties as attributed to the presence of phytochemicals like the triterpenes, sesquiterpene lactone, and monoterpene, particularly tagitinins, which have a broad range of pharmacological effects such as anti-inflammatory, antioxidant, insecticidal, antidiabetic as well as anticancer property. Therefore, *Tithonia diversifolia* is seen to have a potential source of phytochemical compounds and antioxidant activity. The flavonoid and phenolic phytochemical compounds are secondary metabolites of plants that display outstanding antioxidant activity (Roopa *et al.,* 2021).

Through the decades, *Tithonia diversifolia* has been extensively used in diverse forms in traditional remedies for the management and treatment of numerous diseases—for example, wound treatment through administering a paste-like form made from unrefined leaves. The administration can also treat malaria of *Tithonia diversifolia* root extract. Elevated blood glucose levels is reported to be managed well using dried leaf extract (Silva *et al.*, 2020). Based on these uses, pharmacological investigations made from the earlier years have revealed that the extracts made from several parts of *Tithonia diversifolia*, like the leaves, roots, stems, and flowers, have broad pharmacological attributes, including antidiabetic, anti-inflammatory, antitumoral, immunomodulatory, antibacterial and antifungal properties (Gahamanyi *et al.,* 2021). Some of the traditional use of *Tithonia diversifolia* is presented in the table below.

Table 1. The traditional usage of *Tithonia diversifolia*.

SNo.	Category of use	Description of traditional usage
1.	Abscesses	The juice from the leaves and stems cleans the affected parts.
2.	Diabetes mellitus	Leaf concoction is taken orally.
3.	Malaria	Cold/hot water leaf infusion from aerial parts is administered orally.
4.	Snakebite	Leaf concoction orally administered.
5.	Bruises, wounds, and skin infections	A powdered form from the toasted leaves or powdered creams is applied on the affected parts.
6.	Gastrointestinal diseases and worms in poultry	Leaf concoction of the plant called (*Likong*) in Kenya is orally administered to the livestock
7.	Measles	A concoction made from the leaves (method of administration is not affirmed)
8.	Bleeding	The leaves are crushed and applied to the cuts and wounds.
9.	Infections in sexual organs	Cold/hot water leaf infusions are orally taken and for bathing.
10.	Gastric ulcer	Leaf concoction is orally taken.
11.	Diarrhea	Aqueous decoction orally administered.
12.	Menstrual pain	Leaf concoction in water is orally taken.
13.	Hepatitis	Orally, the decoction of stem and leaf is administered.
14.	Disease of the nose, throat, and ear	The roots and leaves are boiled and taken orally

(Ajao & Moteetee, 2017).

Tithonia diversifolia aqueous root extract is believed to have hypoglycemic and hypolipidemic activities among the Luos of South Nyanza, though this claim is not scientifically proven. This research work aimed at validating this claim scientifically.

2.5.3 Hypoglycemic activity of *Tithonia diversifolia*

Aqueous leaf extract of *Tithonia diversifolia* orally administered at 400 mg/kg body weight led to a timely reduction of blood sugar levels in alloxan-induced diabetic rats. This effect is similar to the one yielded by glibenclamide (10 mg/kg body weight), used as a positive control. This result suggests that *Tithonia diversifolia* aqueous leaf extract promotes insulin secretion by the remnant β-cells of the pancreas of diabetic rats (Olukunle *et al.,* 2014).

Tithonia diversifolia aqueous leaf extract shows an important hypoglycemic activity on glucose tolerance (OGTT). The same extract of this plant has also been shown to contain significant antidiabetic and hypolipidemic activity in mice that have induced diabetes using alloxan by reducing lipid peroxide concentration in diabetic mice. Peroxidation of lipid products indicates oxidative damage to the pancreas and liver tissues. High blood sugar levels can increase the production of reactive oxygen species (ROS) in all tissues from protein glycosylation and glucose auto-oxidation. Diabetes mellitus causes interference in the lipid profile, particularly an increased lipid peroxide susceptibility, which is the primary cause of the occurrence of atherosclerotic state (Thongsom *et al.,* 2013). The hypoglycemic effect of *Tithonia diversifolia* is due to the presence of chemical compounds like the phenols, flavonoids, and lactones sesquiterpenes that can raise the sensitivity of insulin, which helps in the reduction of high blood sugar, reducing the intake of food and raising the body weight of hyperglycemic Wistar rats (Sari *et al.,* 2018). The average blood sugar levels in Wistar albino rats range between 3.95±1.31mmol/L (Wang *et al.,* 2010).

2.5.4 Hypolipidemic activity of *Tithonia diversifolia*

The aqueous leaf extract of *Tithonia diversifolia* given at 400 mg/kg per day considerably reduces total serum cholesterol and low-density lipoprotein (LDL) in diabetes-induced rats after treating them for 21 days. However, the serum high-density lipoprotein (HDL) significantly increases under the same conditions (Olukunle *et al.,* 2014). Saponins that are isolated from *Tithonia diversifolia* leaves significantly reduced the triglyceride levels, total cholesterol, and serum low-density lipoprotein (LDL) in normal rats at dose ranges of 60-100, 40-100, and 20-100 mg/kg body weight respectively. On the other hand, at doses of 20-100 mg/kg body weight, the serum high-density lipoprotein is also significantly lowered. These results suggest that *Tithonia diversifolia* (TD) aqueous leaf extracts, precisely the fraction that is rich in saponins, can be helpful in the management of dyslipidemia (Ejelonu *et al.,* 2017).

A study by Thongsom and his colleagues in 2013 reported that the oral administration of *Tithonia diversifolia* aqueous leaf extract in mice with diabetes for 30 days resulted in a decrease in the levels of triglyceride, LDL-cholesterol, total cholesterol, and HDL-cholesterol is reported to increase when compared diabetic control rats. The levels of lipid peroxidation, as well as reactive oxygen species, hydroxyl radical, hydrogen peroxide, and superoxide anion, are typical markers of oxidative stress in diabetes. The normal levels of serum cholesterol in Wistar albino rats range from 1.1-2.0 mmol/L, that of serum triglycerides is between 0.4-2.1 mmol/L, and normal ranges for high-density lipoprotein in Wistar rats is between 2.2-2.8 mmol/L (Boehm *et al*., 2007).

From the above studies on the hypoglycemic and hypolipidemic activities of *Tithonia diversifolia,* the aqueous leaf extract has been evaluated. The root of this plant, claimed by the Luo community to have hypoglycemic and hypolipidemic properties, has not been evaluated scientifically. Therefore, the proposed research work targeted the roots of this plant in order to validate this claim scientifically.

2.5.5 Biochemical effects of *Tithonia diversifolia* in the liver and kidney

The changes made on the major organs like the kidney and the liver by the plant extract help design the therapeutic dosage required during the development of new medicines to reduce its adverse side effects on these organs. The kidneys and liver are usually the primary targets of toxicity by the plant extract because they are the ones that are associated with the degradation and excretion of many chemical substances (de Oliveira *et al.*, 2011).

The adverse effects of the aqueous leaf extract of *Tithonia diversifolia* on the kidney and liver have been investigated on Wistar albino rats after its oral administration for 14 days at a dose of 100 mg/kg and 200 mg/ kg per body weight. The observation that was made was that the graded doses of the extract caused noticeable changes to blood biochemistry by increasing the levels of alanine amino transaminase (ALT), alkaline phosphatase (ALP), and aspartate aminotransaminase (AST) which is equivalent to damage in the hepatocytes (Ajao & Moteetee, 2017). However, doses below 100 mg/kg were reported to be moderately safe in the toxicological study that was conducted by (Passoni *et al.*, 2013) after repeated oral administration of *Tithonia diversifolia* aqueous leaf extract for 90 days. Additionally, the aqueous leaf extract of *Tithonia diversifolia* contains sesquiterpene and chlorogenic acids, which can lead to severe kidney and liver damage (Passoni *et al.*, 2013).

Biochemical analysis of the blood liver enzymes helps evaluate the extent of damage to the liver caused by the extract (Elufioye *et al.,* 2009). The damaging attack on the liver by the components of the extract might be because the liver plays a vital role in the metabolism of drugs and, therefore, usually is the site for the initial pass effect for the majority of the bioactive substances (Elufioye *et al.*, 2009).

The investigation made on the biochemical effects of *Tithonia diversifolia* leaf extract on the kidney revealed a significant decrease in serum creatinine level in mice at a dosage of 300 mg/kg body weight (Dada & Oloruntola, 2016) at a dose of 600 mg/kg body weight of *Tithonia diversifolia* aqueous leaf extract, a significant increase in serum creatinine levels was revealed which implies kidney dysfunction (Ajao & Moteetee, 2017).

The biochemical changes that occurred in the liver and the kidney, as can be seen, were produced by the aqueous leaf extract of *Tithonia diversifolia*. Many studies have been published on *Tithonia diversifolia* leaf extracts only and no scientific reports on the roots; therefore, there was a need to investigate the biochemical changes in the kidney and liver that the aqueous root extract of *Tithonia diversifolia* may bring about.

2.6 Liver biochemical parameters

The current study investigated the biochemical changes that would have occurred in the liver and kidney via the liver and renal function tests, respectively. Clinically, liver health indicators are primarily based on the concentration of liver enzymes like alkaline phosphatase (ALP), aspartate aminotransferase (AST), and alanine aminotransferase (ALT), which are being used in the screening of diseases of the liver (Denova-Gutiérrez *et al.*, 2021). When there is damage in the tissues of the liver, the concentrations of liver enzymes like the ALT,

ALP, and AST go high in the bloodstream as they are released into the blood. Therefore, a dysfunction in the liver can be evaluated by checking the levels of these liver enzymes. Tissue damage leads to the extra release of ALT and AST in the blood circulation; hence, the levels of such enzymes are increased in the bloodstream, which are vital biomarkers of liver dysfunction.

Research has shown that when the liver is damaged, or there is a dysfunction in the liver, additional amounts of ALT and AST are released into the bloodstream, thus raising the concentration levels of serum liver enzymes. Therefore, the amount of AST and ALT in the bloodstream is directly linked to liver damage (Hasan *et al.,* 2018). ALT is the most specific and sensitive indicator in liver damage since it is predominantly produced in the liver compared to AST, which can be high in other diseases like heart disease, kidneys, and muscles. The normal levels of ALTs in adult human circulation range from 30–50 units per liter (U/L) (Ali *et al.,* 2021). In Wistar albino rats, the normal values of serum ALT range between 24-49U/L while the usual levels of AST range between 50-96U/L and that of ALP ranges from 65-193U/L (Boehm *et al*., 2007).

2.7 Renal biochemical parameters

Creatinine and Urea are kidney function biomarkers that show the glomerular filtration rate (Ascher *et al.,* 2021). The main metabolic breakdown of protein in a human's nitrogenous end product is Urea. After Urea has been dissolved in the blood, it is transported and then excreted as a component of urine by the kidney. Creatinine refers to the product of the breakdown of creatine phosphate released from the skeletal muscle. Creatinine is filtered through the glomerulus, and a small amount is secreted into the glomerulus filtrate through the proximal tubules. Blood urea nitrogen and serum creatinine levels are the best guiding

principles for estimating prognosis and progression that institute nutritional limits in the kidney disease in type 2 diabetes mellitus (Kene *et al.,* 2021).

A rise in the levels of these markers shows kidney dysfunction. Serum creatinine is a substitute for general renal function by helping evaluate the glomerular filtration rate. However, it lacks the sensitivity for detecting reductions in kidney function at an early stage (Ascher *et al.,* 2021).

Serum creatinine speedily reduces to a level of about 0.25 mg/dL in the earliest month of life and again rises as one continues to grow. Healthy subjects of the ages between 20 and 70 years, on average, have normal constant serum creatinine levels of (0.63–1.16 mg/dL) for gents and (0.48–0.93 mg/dL) as the normal reference interval for ladies. In ages over 70 years, serum creatinine begins to rise once more in both genders gradually. These increases could be the first indicators to caution on the existence of probable kidney damage. Nonetheless, research has shown that these increases in serum creatinine levels may not be beneficial in detecting renal damage or impairment caused by the nephrotoxic medication (Delanaye *et al.,* 2017)**.** In male Wistar albino rats, the expected levels of serum creatinine range between (31-48mmol/L) while that of serum urea in male Wistar rats range from 4.0-9.3 mmol/L (Boehm *et al*., 2007).

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Methods

3.1.1 Study design

The study was a prospective laboratory-based study.

3.1.2 Study setting

This research study was conducted between September 2021 and December 2021. It involved a collaborative effort between the Department of Biological Sciences at the University of Eldoret and the School of Pharmacy at Kabarak University. The plant root underwent shade drying and grinding procedures within the Department of Biological Sciences, University of Eldoret facilities. Subsequently, the resulting powdered material was transported to the School of Pharmacy, Kabarak University, for further processing. The preparation of the aqueous root extract, the maintenance and handling of experimental animals, and the execution of various experimental procedures were all carried out within the premises of the School of Pharmacy, Kabarak University.

3.2 Materials

3.2.1. Western diet

A Western diet is characterized by elevated levels of fat, cholesterol, and fructose, resembling the dietary patterns commonly observed in human consumption of fast food. Consequently, when experimental animals are subjected to this diet, they replicate the pathogenesis of Nonalcoholic Steatohepatitis (NASH) observed in humans. It remains unclear how the various fat sources in Western diets (WD) impact the progression of non-alcoholic

steatohepatitis (NASH) (Drescher *et al.,* 2019). The administration of a Western diet to laboratory animals leads to the development of insulin resistance, obesity, and NASH histological features, as demonstrated in prior research (Asgharpour *et al.,* 2016). This specific diet can increase both blood glucose and lipid levels in the experimental rats. The western diet used in this research was prepared via the guidelines of Nguyen *et al.,* (2017) on improving the rodent chow into the western diet. The rodent chow was procured from Unga Limited, Nairobi-Kenya, the composition of which is detailed in Table 2 below.

Table 2. Comparison between the composition of rodent chow and the Western diet

Component	**% composition in rodent chow** (Unga limited-Kenya)	**Reconstituted composition in Western diet** (Nguyen *et al.,* 2017) expressed in %
Carbohydrates	49	60.85
Animal fat	3	21
Protein	21	18
Cholesterol	0	0.15
Calcium	0.8	-
Phosphorus	0.4	-
Fibre	5	-
Moisture	13	-
Ash	8	-

3.2.2. Preparation of the western diet

According to (Franco *et al.,* 2022), one Wistar albino rat weighing between 150-200g feeds on 24g of rodent chow daily. Therefore, a total of 120g of western diet was required for every cage of five rats daily. To make 25.2 kg of western diet, 4.53 kg of animal fat was first mixed with 20.68 kg of commercial rodent chow. Then 25.16 kg of this mixture was mixed with 37.8g of cholesterol to give 25.2 kg of western diet. About 120g of this western diet was fed to the five rats in the cage daily.

3.2.3. Wistar rats

A total of thirty-five male Wistar albino rats (*Rattus norvegicus*), aged two months and weighing between 180-200g, were procured from the small animal facility at Chiromo Campus, University of Nairobi, Kenya. The rats were transported in cages to Kabarak University, where they were accommodated in stainless steel cages furnished with sawdust and soft grass serving as bedding material. These animals were then categorized into seven groups of five rats. They were maintained under standard laboratory conditions, with a temperature set at 25±2ºC. They were subjected to a 12-hour light and 12-hour dark cycle within the animal housing facility at the School of Pharmacy, Kabarak University.

Throughout the acclimatization period, which spanned one week, all the rats were provided unrestricted access to standard rodent chow (Unga Limited-Kenya) and drinking water. Their cages were routinely cleaned to remove waste, and the rats' health status was regularly monitored.

3.2.4. *Tithonia diversifolia* (The material)

3.2.4.1 Collection and Identification of Plant Material

In September 2021, fresh and healthy roots of *Tithonia diversifolia* were collected from the Kamagambo sub-location, located within the Olando shrubs near the Kanga market in Migori County, Kenya. The identification of the plant in its natural habitat was conducted by a local herbalist, and subsequently, the roots were carefully excavated, placed in polyethylene bags, securely sealed, and transported to the University of Eldoret, Kenya together with a sample shoot. At the University of Eldoret, the plant specimen was further identified by a taxonomist from the Department of Biological Sciences, and a voucher number, M.U.H/MD/0020/21, was assigned to this particular plant specimen. This specimen was duly deposited in the herbarium of the University of Eldoret for documentation and reference.

3.2.4.2 Preparation of the aqueous root extract

The roots of *Tithonia diversifolia* were initially subjected to a washing process to eliminate extraneous debris. Subsequently, they were cut into small pieces and subjected to a three-week shade drying period within a well-ventilated room. The roots were finely ground into a homogeneous powder utilizing an electric mill after the drying process. This powdered material was then transferred to Kabarak University, where it was utilized to prepare the aqueous root extract. The preparation of the aqueous root extract followed a method by Alli *et al.,* 2011.

This procedure involved soaking 100 grams of the *Tithonia diversifolia* root powder in 1000 ml of distilled water. The resulting mixture was placed in an electric shaker and agitated for 12 hours at room temperature. Subsequently, the mixture was filtered through muslin cloth

and Whatman No 1 filter paper. The filtrate was subjected to drying using a rotary evaporator in a water bath maintained at 50°C until dark green syrup of the crude extract was obtained. The crude extract was then transferred into a pre-weighed crucible and left exposed to air overnight to facilitate the evaporation of any remaining water, thereby yielding the final concentrate. This concentrate was stored in an airtight container at 4ºC until its use. The percentage yield of the aqueous extract was determined to be 19.4%.

This yield was calculated as follows;

$$\%\ yield = \frac{the\ weight\ of\ extract\ in\ gram}{weight\ of\ powder\ plant\ material}\ x\ 100$$

3.2.4.3 Preparation of *Tithonia diversifolia* extract concentration

The concentration of the doses given to the rats was calculated using the formula below:

$$M_e = \frac{dM_R}{1Kg}$$

Derived from Olukunle, 2014

Where: M_e = Mass of extract given daily to the experimental rats in mg

d = desired extract dosage in mg/kg body weight

M_R= Group average mass of rats in g

Table 3. Daily Mass of plant extract given to each rat in G5 and G6

Rat Groups	Average Mass of the rat	Dosage of extract Required	Daily Mass of plant extract given to each rat
G5	192.06 g	200mg/kg bw of extract	7.68 mg
G6	191.34 g	400mg/kg bw of extract	15.31 mg

3.2.5 Determination of Standard Drug Dosage

The dosages of drugs used in these experiments was prepared based on the published works of (Nasri *et al*., 2016) for artovastatin and (Samuel *et al*., 2014) for glibenclamide Mass of standard drug orally administered to each rat daily (D) was calculated as follows;

$$\boldsymbol{D} = \frac{Average\ weight\ of\ rats\ in\ a\ group\ x\ Drug\ dosage}{1000g}$$

Mass of tablet dissolved to make 2.5mL of solution for 5 rats in a group (M_T) was calculated as follows;

$$\boldsymbol{M_T} = \frac{D\ x\ Average\ mass\ of\ tablet}{Concentration\ of\ the\ drug\ component\ in\ each\ tablet}$$

Where:

D: The mass of standard drug orally administered to each rat daily

M_T: The mass of tablet dissolved to make 2.5mL of solution for 5 rats in a group

Table 4. Standard Drug Dosage

Groups	**Dosage of the standard drugs**	**Average mass of rat in a group**	**D**	**Average Mass of a tablet**	**drug concentration in a tablet**	**M_T**
G3	10mg/kg Atorvastatin	191.86g	1.92mg	308mg	20mg	147.8mg
G4	0.5mg/kg Glibenclamide	191.76g	0.096mg	155mg	5mg	14.88mg

147.8mg of Atorvastatin powder was dissolved in distilled water to make 2.5mL of the solution daily. From this, 0.5mL (29.56mg) was orally administered to each rat in G4 daily from days 29 to 35 of the experiment.

14.88mg of glibenclamide powder was dissolved in distilled water to make 2.5mL of the solution daily. From this, 0.5mL (2.976mg) was orally administered to each rat in G4 daily from days 29 to 35 of the experiment.

3.3 Procedures

3.3.1. Phytochemical Screening of the aqueous root extract

The stock solution for conducting phytochemical tests was prepared by dissolving 1 gram of the *Tithonia diversifolia* crude extract in distilled water, resulting in a 200 ml solution. Special care was taken to ensure that the concentration of the extract solution was suitable for facilitating the qualitative tests. The qualitative analysis of the different phytochemical components was carried out following the respective standard procedures within a fume hood for safety.

1. **Test for Alkaloids.**

Preparation of Dragendorff's reagent

In a test tube, 5.2 grams of Bismuth carbonate were introduced, followed by the addition of 4 grams of sodium iodide and 50 mL of glacial acetic acid. The resulting solution was brought to a boil for duration of 3 minutes and then allowed to stand undisturbed for 12 hours, leading to the formation of a precipitate. Subsequently, the precipitated sodium acetate crystals were filtrated using a sintered glass funnel. A 40 mL portion of the filtrate was mixed with 160

mL of ethyl acetate, followed by adding 1 mL of distilled water, thus creating Dragendorff's reagent. This reagent was then stored in an amber-colored glass bottle.

Three drops of reagent were combined with 3 mL of the plant extract for the test. The resulting solution was carefully observed for the appearance of an orange-red or reddish-brown precipitate, which indicates the presence of alkaloids (Dragendorff, 1879).

2. Test for Flavonoids

Shinoda Test: Three drops of concentrated HCl were added to the extract, followed by a small magnesium ribbon. The solution was observed in the formation of a pink or red colour as an indication of the presence of flavonoids (Trease and Evans, 2002).

3. Test for Tannins

Ferric Chloride Test: In a test tube, three drops of 1% ferric chloride ($FeCl_3$) solution were added to 5 ml pre-boiled and filtered extract. The solution was observed for the formation of a blue-black or greenish-black colour; this colour formation indicated the presence of tannins (Harborne, 1973).

4. Test for Saponins:

Froth Test: 5 ml of the extract was put in a test tube and vigorously shaken and observed for the formation of stable froth that persisted for a few minutes as an indication of saponins' presence (Sofowora, 1993).

5. Test for Glycosides

Keller-Killiani Test: In a test tube containing 5 ml of Glacial acetic acid, a drop of 5% ferric chloride solution, 5 ml plant extract, and 3 drops of concentrated sulfuric acid were added. The solution was observed for the formation of a reddish-brown ring at the interface of the two layers as an indication of the presence of glycosides (Trease & Evans, 1989).

6. Test for Terpenoids

Salkowski Test: 5 ml of the plant extract was mixed with 5 ml of chloroform followed by addition of of concentrated sulfuric acid carefully along the sides of the test tube. The solution was observed for the formation of a reddish-brown coloration at the interface indicating the presence of terpenoids, (Harborne, 1973).

7. Test for Phenols

Ferric Chloride Test (for phenolic compounds): in a test tube, three drops of 1% ferric chloride ($FeCl_3$) solution was added to 5 ml extract. The solution was observed for the formation of shades of green, blue, or violet, as an indication for the presence of phenolic compounds, (Harborne, 1973).

8. Test for Carbohydrates

Molisch's Test: in a test tube, three drops of 1% alcoholic α-naphthol solution was added to 5 ml extract, followed by slow addition of concentrated sulfuric acid along the sides of the test tube. The formation of a violet ring at the interface indicated the presence of carbohydrates, particularly sugars, (Molisch, 1937).

9. Test for Steroids and Sterols

Liebermann-Burchard Test: in a teste tube containing 5 ml of the extract, three drops acetic anhydride was added, followed by slow addition of 3 drops of concentrated sulfuric acid. The solution was observed for the formation of a green color, which changes to blue and then to red, indicated the presence of steroids and sterols, (Nath *et al*., 1946).

10. Test for Cardiac Glycosides:

Legal's Test: in a test tube, 5 ml of glacial acetic acid was added to 5 ml of the extract followed by three drops of ferric chloride solution. The solution was observed for the formation of a brown ring at the interface as an indication of the presence of cardiac glycosides, (Trease & Evans, 1989).

11. Test for Proteins and Amino Acids

Biuret Test: Three drops of 2% copper sulfate solution was added in a test tube containing 5 ml plant extract, followed by three drops of 10% sodium hydroxide solution. The solution was observed for the formation of a violet or lavender colour as an indication for the presence of proteins/amino acids, (Gornall *et al.,* 1949).

12. Test for Anthocyanins

Acid Test: In a test tube, containing 5 ml of the extract, three drops of dilute hydrochloric acid (HCl) was added and the solution observed for the formation of a red to violet colour change as an indication for the presence of anthocyanins, (Fossen & Andersen, 2003).

13. Test for Lignin

Preparation of Phloroglucinol reagent

0.5g of phloroglucinol was dissolved in distilled water to make 100 ml solution. This solution was gently warmed accompanied by continuous stirring to completely dissolve then mixed with with three drops freshly prepared 6M HCl accompanied with continuous stirring.

Phloroglucinol Test: In a test tube, three drops of phloroglucinol reagent was added to 5 ml plant extract followed by three drops concentrated hydrochloric acid. The solution was observed for the formation of a red colour as an indication for the presence of lignin, (Lin & Dence, 1992).

14. Test for Coumarins

NaOH Test: In a test tube containing 5 ml plant extract, three drops of 1M sodium hydroxide (NaOH) solution was added and the solution observed for the formation of a yellow colour as an indication for the presence of coumarins, (Harborne, 1973).

3.3.2 Groupings of the Animals

The formular used for the calculation of the sample size for all the rat groups was according to Charan & Kantharia, 2013. The male Wistar albino rats were put in cages and labeled as follows:

Group I: This was the normal control group that received drinking water in addition to the standard rat diet (rodent chow), given orally for the entire experimental period of 35 days.

Group II: This group was the negative control that received drinking water and the Western diet throughout the experimental period (35 days).

Group III: Fed on a Western diet for five weeks with drinking water and received 10 mg/kg of Atorvastatin (Nasri *et al*., 2016) once a day in the fifth week.

Group IV: Fed on western diet for five weeks with drinking water and received 0.5 mg/kg glibenclamide (Samuel *et al*., 2014) in the fifth week.

Group V: Fed on western diet for five weeks with drinking water and received 200 mg/kg aqueous root extract of *Tithonia diversifolia* once a day in the fifth week.

Group VI: Fed on western diet for five weeks with drinking water and received 400 mg/kg aqueous root extract of *Tithonia diversifolia* once a day in the fifth week

Group VII: Fed on a Western diet for four weeks with drinking water and reverted to rodent chow in the last week of the experiment.

3.3.3 Drug Administration

Stock solution of 2.5ml of the *Tithonia diversifolia* aqueous root extract (200 mg/kg and 400 mg/kg), was prepared daily and 0.5ml of this solution was given to each rat in group five and six between days 29-35. 2.5 ml Glibenclamide solution was also prepared on a daily basis and from it, 0.5ml was given to each rat in group four between days 29-35, and 2.5 ml Atorvastatin solution prepared every day and 0.5ml of this solution given to each rat in group

three between days 29-35. All the drug and extract solutions were administered orally to the rats using a 5ml syringe in their respective groups.

3.4 Data collection

3.4.1 Determination of rat weights

The rat weights were monitored weekly throughout the experimental period. This was done by first resetting the weighing scale and weighing an empty closed container. This was followed by putting one rat at a time in a closed container, weighing the container together with the rat, and recording the readings. This procedure was repeated severally until all the rats were weighed.

The weight of the rat was calculated as follows:

Rat weight = (Mass of the container together with the rat) – (mass of the empty container).

3.4.2 Determination of fasting blood glucose level

At the commencement of the experiment, the blood glucose levels for each of the experimental rats were determined by initiating a small incision at the tip of the tail and collecting a drop of blood onto a One Touch Horizon digital glucometer test strip. This measurement process involved activating the glucometer and inserting a test strip. Once the machine was prepared, a tiny droplet of blood was applied to the strip, and the glucometer was allowed to register the blood sugar level reading. This reading was duly recorded before subsequent tests were performed using fresh test strips. Prior to blood glucose tests, the feed was withdrawn from the rats for 12 hours. Fasting blood glucose levels were assessed weekly using the One Touch Horizon digital glucometer (Parasuraman *et al.,* 2015).

3.4.3 Biochemical assays

At the end of the thirty-five-day study period, all thirty-five Wistar albino rats underwent overnight fasting. Subsequently, they were, in turn, placed within a desiccator containing cotton wool soaked in chloroform, allowing them to become unconscious. Once unconscious, approximately five to six milliliters of blood samples were collected from each rat via cardiac puncture and deposited into plain test tubes. The collected blood samples were undisturbed for approximately 30 minutes to induce clotting. The serum separation from the clotted blood was carried through centrifugation at 3000 RPM for about 20 minutes (Abebe *et al.*, 2021). The serum samples were carefully separated from the blood using a micropipette and transferred into vials. The serum lipid profile, Renal function tests (RFTs), and Liver function tests (LFTs) were subsequently analyzed using the Biobase Auto Chemistry Analyzer BK-200. The analysis encompassed various biochemical markers, including the evaluation of liver enzyme levels through measurements of aspartate aminotransferase (AST), alanine aminotransferase (ALT), and alkaline phosphatase (ALP), as well as the assessment of RFTs, which involved the analysis of creatinine and urea levels (Shukla *et al.*, 2015). Furthermore, the analysis of the lipid profile included the measurement of total cholesterol (TC), triglyceride (TG), and high-density lipoprotein (HDL) levels (Cai *et al.*, 2021). All the biochemical analyses were conducted at the Kabarak University Medical Centre laboratory.

3.5 Data management plan

3.5.1 Data entry and storage

The numerical data from biochemical measurements obtained during the experiment were meticulously entered into a Microsoft Excel spreadsheet. Subsequently, the data underwent

a thorough cleaning process involving identifying and correcting any typographical or entry errors. Finally, the cleaned data were securely stored for further analysis.

3.5.2 Data Analysis

The data entered was exported for analysis to the Statistical Package for Social Sciences (SPSS) Software, specifically version 20. Statistical analysis encompassing all seven groups was conducted employing one-way Analysis of Variance (ANOVA), subsequently followed by the application of the Least Significant Differences (LSD) method, where statistical significance was established at $P \leq 0.05$. Additionally, Duncan's test was employed to assess the homogeneity of the various treatment groups. Each group consisted of 5 rats, and the outcomes were expressed as mean values along with their respective standard deviations, following the format described by Jayaraman *et al.* in 2018. The resulting data was effectively presented through the use of graphs and tables.

3.5.3 Selection of Least Significant Difference (LSD) post hoc analysis

Opting for the Least Significant Difference (LSD) post hoc analysis is the ideal choice for this research, primarily due to its alignment with the research objectives and questions. The research focuses on customized comparisons that directly address specific research inquiries, and LSD's flexibility allows for precise refinements of treatment group comparisons. In contrast, other post hoc methods, such as Tukey's HSD or Bonferroni, may involve overly inclusive pairwise comparisons that lack the specificity required. Furthermore, given the research's emphasis on simplicity, interpretability, and effective communication, LSD offers a straightforward approach to comparing group means. Its adaptability to situations where the assumption of equal variances might not hold makes it even more favorable when compared to methods reliant on this assumption.

3.5.4 The selection of Duncan's test analysis

The selection of Duncan's test analysis over other methods is particularly appropriate for this research, given its direct alignment with the research objectives and questions. One of the primary research goals in this research is to discern homogeneous subsets among treatment groups and conduct customized comparisons to address specific research questions. This test excels in categorizing treatment groups into subsets with similar means, enabling a clear understanding of which groups exhibit statistically significant differences and which do not. This alignment with the research's central focus on specific treatment differences distinguishes it from other, more rigid post hoc tests. Furthermore, the Duncan's test's simplicity, ease of interpretation, and precise results make it relevant to this work.

3.6 Ethical Considerations

The experimental procedures employed in this study were submitted for review. They obtained approval from the Research Ethics Committee (REC) at the University of Eastern Africa, Baraton, prior to the initiation of the experiment. The study was conducted under the ethical approval number UEAB/REC/16/03/2020.

CHAPTER FOUR

4.0 RESULTS

4.1 Phytochemical screening on the aqueous root extract of *Tithonia diversifolia*

The qualitative phytochemical analysis of the aqueous root extract of *Tithonia diversifolia* revealed the presence of alkaloids, flavonoids, tannins, saponins, terpenoids, phenols, carbohydrates, anthocyanins, and coumarins, as depicted in Table 5 below. Conversely, glycosides, steroids and sterols, proteins and amino acids, and lignin were undetected.

Table 5. Phytochemical constituents of the aqueous root extract of *Tithonia diversifolia*

	Phytochemical	**Test**	**Observation**	**Indication (+:Presence), (-: Absence)**
1	Alkaloids	Dragendorff's Test	Orange-red colouration	+
2	Flavonoids	Shinoda Test	Reddish colouration	+
3	Tannins	Ferric Chloride Test	Blue-black colouration	+
4	Saponins	Froth Test	Froth that persists for a few minutes	+
5	Terpenoids	Salkowski Test	Reddish-brown coloration at the interface	+
6	Glycosides	Keller-Killiani Test	Darkening of the solution	-
7	Phenols	Ferric Chloride Test	Blue-green coloration	+
8	Carbohydrates	Molisch's Test	Dark Violet ring at the interface	+
9	Steroids and Sterols	Liebermann-Burchard Test	The solution turned dark brown	-
10	Cyanogenic Glycosides	Picric Acid Test	No observable change	-
11	Proteins and Amino Acids	Biuret Test	Bluish colouration	-
12	Anthocyanins	Acid Test	Reddish colouration	+

13	Lignin	Phloroglucinol Test	Browning of the solution	-
14	Coumarins	NaOH Test	Yellowing of the solution	+

4.2 Effects of aqueous root extract of *T. diversifolia* on body weights of Western diet-fed Wistar albino rats

The rats underwent a one-week acclimatization period. After this week, each rat was weighed and assigned to their treatment groups G1-G7. All groups, except the normal control group (G1) and G7, were fed a Western diet for five weeks (throughout the experimental period). The rats' weights were recorded weekly for five weeks. The feeding of the western diet was replaced with normal rat chow at the end of the fourth week for G7. Starting from week five, the treatments were administered to the corresponding groups for seven days, and the rats' weights were measured again at the end of week five. The results are detailed in Table 6 below.

Table 6: Effects of aqueous root extract of *T. diversifolia* on mean weights of Western diet-fed Wistar albino rats within the five weeks

Week	**Normal Control (G1)**	**Negative Control (G2)**	**10mg/kg b.w Atorvastatin (G3)**	**0.5mg/kg b.w Glibenclamide (G4)**	**200mg/kg b.w extract (G5)**	**400mg/kg b.w extract (G6)**	**(G7)**
1	187.52	186.34	187.74	187.74	188.14	187.14	188.86
2	189.46	188.72	188.94	189.25	189.2	189.18	190.1
3	190.22	191.38	190.12	190.46	190.38	190.64	191.7
4	191.2	194.84	191.86	191.76	192.06	191.34	193.8
5	192.46	197.12	189.52	191.38	191.94	190.7	193.98

The table above showed a gradual increase in rat weights for all groups between weeks one and four. By the end of week 5, the mean weights of rats decreased for those receiving 10 mg/kg atorvastatin (G3), 0.5 mg/kg glibenclamide (G4), 200 mg/kg (G5), and 400 mg/kg aqueous root extract (G6) of *Tithonia diversifolia*, compared to the normal control (G1), negative control (G2), and the rats fed a Western diet for four weeks and then switched to rodent chow in the fifth week (G7).

In the post hoc LSD analysis used to compare mean differences in rat weights between the groups, with the normal control group (G1) as the baseline, a significant reduction in average rat weights was observed (p=0.000) among the groups that received 10 mg/kg atorvastatin (G3), 0.5 mg/kg glibenclamide (G4), 200 mg/kg *Tithonia diversifolia* aqueous root extract (G5), 400 mg/kg *Tithonia diversifolia* aqueous root extract (G6), and those fed a Western diet for four weeks and switched to normal rodent chow in the fifth week (G7) (p=0.013). There was a significant decrease in rat weight in all the treatment groups compared to the negative control (G2) (p=0.00).

Table 7: Post-hoc results on the effects of aqueous root extract of *T. diversifolia* on body weights of Western diet-fed Wistar albino rats on the fifth week

Multiple Comparisons								
Dependent Variable: Average body weight at WK5								
	(I) GROUPS	**(J) GROUPS**	**Mean**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
							Lower Bound	**Upper Bound**
LSD	NORMAL CONTROL(G1)	NEGATIVE CONTROL (G2)	2.28	1.020	.399	.016	-1.838	-.201
		10 mg/kg b.w ATORVASTATIN(G3)	-2.34	-3.600	.399	.000	2.781	4.418
		0.5 mg/kg b.w GLIBENCLAMIDE(G4)	-0.38	-1.640	.399	.000	.821	2.458
		200 mg/kg b.w extract (G5)	-0.12	-1.380	.399	.002	.561	2.198
		400 mg/kg b.w extract (G6)	-0.64	-1.900	.399	.000	1.081	2.718
		(G7)	-0.18	-1.080	.399	.013	.241	1.878
	NEGATIVE (G2)	NORMAL CONTROL(G1)	1.26	-1.020	.399	.016	.201	1.838
		10 mg/kg b.w ATORVASTATIN(G3)	-2.34	-4.620	.399	.000	3.801	5.438
		0.5 mg/kg b.w GLIBENCLAMIDE(G4)	-0.38	-2.660	.399	.000	1.841	3.478
		200 mg/kg b.w extract (G5)	-0.12	-2.400	.399	.000	1.581	3.218
		400 mg/kg b.w extract (G6)	-0.64	-2.920	.399	.000	2.101	3.738
		(G7)	0.18	-2.100	.399	.000	1.261	2.898

Based on observed means.
*The mean difference is significant at 0.05 level.

In Table 7, the second column is the baseline from which all the other treatment groups in column three are compared. The level of significance is shown in column 7.

4.3 Effects of aqueous root extract of *T. diversifolia* on blood glucose in Western diet-fed Wistar albino rats.

The normal range for fasting blood glucose levels in Wistar rats is 3.95±1.31mmol/L (Wang *et al*., 2010).

The fasting blood sugar levels of the rats were measured using a digital glucometer every week, and the result is shown in Table 8 below.

Table 8: Effects of aqueous root extract of *T. diversifolia* on blood glucosde in Western diet-fed Wistar albino rats.

Treatment Groups	**Fasting Blood glucose in mmol/L**				
	Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5**
Normal Control (G1)	4.06	4.14	4.18	4.2	4.32
Negative Control (G2)	4	4.22	4.36	4.52	4.82
10mg/kg b.w Atorvastatin (G3)	3.9	4.26	4.27	4.28	4.18
0.5mg/kg b.w Glibenclamide (G4)	3.94	4.04	4.12	4.22	4.12
200mg/kg b.w extract (G5)	3.94	4	4.12	4.24	4.18
400mg/kg b.w extract (G6)	3.94	4.18	4.24	4.25	4.08
Rodent chow (G7)	4.02	4.04	4.16	4.62	4.84

In Table 8 above, fasting blood sugar levels gradually increased in all rat groups from week one to week four. At the start of week 5, G3 received 10 mg/kg atorvastatin, G4 got 0.5 mg/kg glibenclamide, G5 was given 200 mg/kg *Tithonia diversifolia* root extract, and G6 received 400 mg/kg *Tithonia diversifolia* root extract, while G7 returned to rodent chow. Generally, there was a decrease in fasting blood sugar levels in the rat groups that received 10 mg/kg atorvastatin (G3), 0.5 mg/kg glibenclamide (G4), those given 200 mg/kg *Tithonia diversifolia* root extract (G5), and the ones given 400 mg/kg *Tithonia diversifolia* root extract (G6). In contrast, the normal control (G1), negative control (G2), and the rats fed a Western diet for four weeks and reverted to rodent chow in the fifth week (G7) showed an increase in their mean sugar levels at the end of week five when the experiment concluded.

A post hoc LSD result compared the mean difference in fasting blood sugar levels in the rat groups. When the normal control was used as the baseline, there was an insignificant decrease in fasting blood sugar levels in the rats given 10 mg/kg atorvastatin (G3), 0.5 mg/kg glibenclamide (G4), and 200 mg/kg *Tithonia diversifolia* root extract (G5) ($p=0.190$, $p=0.065$, $p=0.190$, respectively), while the rats fed a Western diet for four weeks and reverted to rodent chow in the last week of the experiment (G7) recorded a significant increase in fasting blood sugar levels ($p=0.000$). The rats given 400 mg/kg *Tithonia diversifolia* root extract showed a significant decrease in fasting blood sugar levels ($p=0.029$). When negative control (G2) was used as the baseline, there was a significant decrease in fasting blood sugar levels in the rats that received 0.5 mg/kg glibenclamide (G4), 10 mg/kg atorvastatin (G3), 200 mg/kg *Tithonia diversifolia* root extract (G5), and 400 mg/kg *Tithonia diversifolia* root extract (G6) ($p=0.000$), while an insignificant decrease was shown in the rats fed a Western

diet for four weeks and reverted to rodent chow in the last week of the experiment (G7) (p=0.849).

Table 9: Post-hoc results on the effects of aqueous root extract of *T. diversifoila* on blood sugar in Western diet-fed Wistar albino rats

Multiple Comparisons								
Dependent Variable: Blood sugar in Western diet-fed Wistar albino rats at week 5								
	(I) GROUPS	**(J) GROUPS/ TREATMENTS**	**Mean**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
							Lower Bound	**Upper Bound**
LSD	NORMAL CONTROL (G1)	NEGATIVE CONTROL(G2)	4.82	-.500000*	.1041976	.000	-.713439	-.286561
		10 mg/kg b.w ATORVASTATIN (G3)	4.18	.140000	.1041976	.190	-.073439	.353439
		0.5 mg/kg b.w GLIBENCLAMIDE (G4)	4.12	.200000	.1041976	.065	-.013439	.413439
		200 mg/kg b.w extract (G5)	4.18	.140000	.1041976	.190	-.073439	.353439
		400 mg/kg b.w extract (G6)	4.08	.240000*	.1041976	.029	.026561	.453439
		(G7)	4.84	-.520000*	.1041976	.000	-.733439	-.306561
	NEGATIVE CONTROL (G2)	NORMAL CONTROL(G1)	4.32	.500000*	.1041976	.000	.286561	.713439
		10 mg/kg b.w ATORVASTATIN(G3)	4.18	.640000*	.1041976	.000	.426561	.853439
		0.5 mg/kg b.w GLIBENCLAMIDE (G4)	4.12	.700000*	.1041976	.000	.486561	.913439
		200 mg/kg b.w extract (G5)	4.18	.640000*	.1041976	.000	.426561	.853439
		400 mg/kg b.w extract (G6)	4.08	.740000*	.1041976	.000	.526561	.953439
		(G7)	4.84	-.020000	.1041976	.849	-.233439	.193439

In Table 9 above, the second column is used as the baseline to which all the other treatment groups in column three are compared. The level of significance is shown in column 7.

4.4 Lipid Profile

In male Wistar albino rats, the normal reference values for serum cholesterol (2.0-1.1 mmol/l), serum triglycerides (2.1-0.4 mmol/l), and serum high-density lipoprotein according to Boehm *et al.* (2007).

4.4.1 Effects of aqueous root extract of *T. diversifolia* on mean serum cholesterol levels

The blood for the cholesterol estimation was collected at the end of the experiment via cardiac puncture and estimated using Biobase BK 200. The mean serum cholesterol levels for each group are shown in Figure 2 below.

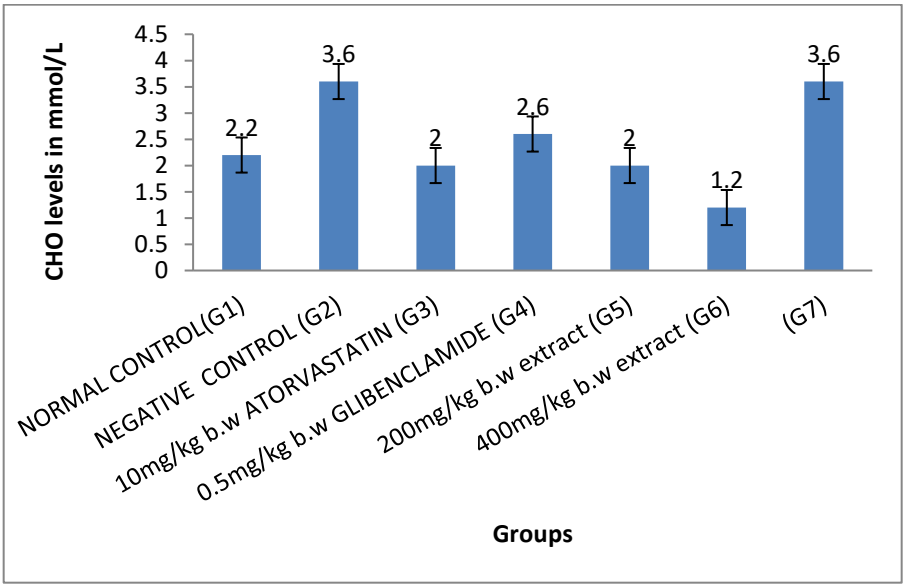


Figure 2: Effects of aqueous root extract of *T. diversifolia* on mean serum cholesterol levels in Western diet-fed Wistar albino rats.

From Figure 2, there was a decrease in serum cholesterol levels in rats that received 10 mg/kg atorvastatin (G3), 200 mg/kg *Tithonia diversifolia* aqueous root extract (G5), and 400 mg/kg *Tithonia diversifolia* aqueous root extract (G6) when compared to the normal control (G1). Conversely, increased cholesterol levels were observed in rats given 0.5 mg/kg glibenclamide (G4). The rats were initially fed a Western diet for four weeks and then switched to rodent chow in the last week of the experiment (G7).

There was a decrease in serum cholesterol levels in rats given 10 mg/kg atorvastatin (G3), 200 mg/kg *Tithonia diversifolia* root aqueous extract (G5), and 400 mg/kg *Tithonia diversifolia* root aqueous extract (G6). However, the rats initially fed on a Western diet for four weeks and then reverted to a normal rat diet in the fifth week (G7) did not change in cholesterol levels compared to the negative control (G2).

In the post hoc LSD analysis, which compared the mean difference in serum cholesterol levels among the groups with the normal control (G1) as the baseline, there was an insignificant decrease in cholesterol levels in the rats treated with 10 mg/kg atorvastatin (G3) and 200 mg/kg *Tithonia diversifolia* root aqueous extract (G5) ($p=0.538$). However, rats given 400 mg/kg *Tithonia diversifolia* root aqueous extract (G6) recorded significantly decreased cholesterol levels ($p=0.004$). In contrast, the rats fed a Western diet for four weeks and switched to normal rat diet in the fifth week (G7) showed a significant increase in serum cholesterol levels ($p=0.000$).

When the negative control (G2) was used as the baseline, the post hoc analysis indicated a significant decrease in mean serum cholesterol levels in the rat groups that received 10 mg/kg atorvastatin (G3), 200 mg/kg *Tithonia diversifolia* root aqueous extract (G5), and 400 mg/kg

Tithonia diversifolia root aqueous extract (G6) (p=0.000). Meanwhile, the group of rats fed a Western diet for four weeks and switched to rodent chow in the fifth week (G7) exhibited cholesterol levels identical to the control group.

Table 10: Post hoc LSD analysis on the effects of aqueous root extract of *T. diversifolia* on serum cholesterol levels in Western diet-fed Wistar albino rats.

Multiple Comparisons								
Dependent Variable: Cholesterol								
	(I) GROUPS	**(J) Groups/Treatments**	**Mean**	**Mean Diff (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
							Lower Bound	**Upper Bound**
LSD	NORMAL CONTROL (G1)	NEGATIVE CONTROL (G2)	3.60	-1.40*	.321	.000	-2.06	-.74
		10 mg/kg b.w ATORVASTATIN (G3)	2.00	.20	.321	.538	-.46	.86
		0.5 mg/kg b.w GLIBENCLAMIDE (G4)	2.60	-.40	.321	.223	-1.06	.26
		200 mg/kg b.w extract (G5)	2.00	.20	.321	.538	-.46	.86
		400 mg/kg b.w extract (G6)	1.20	1.00*	.321	.004	.34	1.66
		(G7)	3.60	-1.40*	.321	.000	-2.06	-.74
	NEGATIVE CONTROL (G2)	NORMAL CONTROL (G1)	2.20	1.40*	.321	.000	.74	2.06
		10 mg/kg b.w ATORVASTATIN (G3)	2.00	1.60*	.321	.000	.94	2.26

		0.5 mg/kg b.w GLIBENCLAMIDE (G4)	2.60	1.00*	.321	.004	.34	1.66
		200 mg/kg b.w extract (G5)	2.00	1.60*	.321	.000	.94	2.26
		400 mg/kg b.w extract (G6)	1.20	2.40*	.321	.000	1.74	3.06
		(G7)	3.60	.00	.321	1.000	-.66	.66
	Based on observed means.							
	* The mean difference is significant at 0.05 level.							

The second column is used as the baseline that compares other treatment groups in column three, and the significance level is shown in column 7.

A Duncan's test was employed to assess the homogeneity of the groups concerning the mean serum cholesterol levels. Duncan's multiple range tests, as a post hoc analysis, were used to discern specific distinctions between pairs of means.

The results of this test revealed that mean cholesterol values were homogeneous among the groups administered 10 mg/kg Atorvastatin (G3), 0.5 mg/kg Glibenclamide (G4), 200 mg/kg *Tithonia diversifolia* aqueous root extract (G5), and the normal control group (G1). Similarly, the negative control group (G2) and the rats exposed to a Western diet for four weeks followed by a switch to rodent chow in the fifth week (G7), also displayed consistency in cholesterol mean levels. In contrast, these groups exhibited distinctions from the rats that received 400 mg/kg aqueous root extract of *Tithonia diversifolia* (G6) and the remaining groups.

Table 11: Showing the level of homogeneity in the mean serum cholesterol levels between the groups

Variable : Cholesterol					
	TREATMENT GROUPS	**N**	**Subset**		
			1	**2**	**3**
Duncan[a,b]	400 mg/kg b.w extract (G6)	5	1.20		
	10 mg/kg b.w ATORVASTATIN (G3)	5		2.00	
	200 mg/kg b.w extract (G5)	5		2.00	
	NORMAL CONTROL(G1)	5		2.20	
	0.5 mg/kg b.w GLIBENCLAMIDE (G4)	5		2.60	
	NEGATIVE CONTROL(G2)	5			3.60
	(G7)	5			3.60
Means for groups in homogeneous subsets are displayed. Based on observed means.					
a. Uses Harmonic Mean Sample Size = 5.000.					

A Duncan's test for assessing homogeneity categorized the treatment groups into three distinct subsets, as presented in Table 11. Rats administered 10 mg/kg Atorvastatin (G3), 200 mg/kg *Tithonia diversifolia* aqueous root extract (G5), the normal control (G1), and 0.5 mg/kg Glibenclamide (G4) did not exhibit statistically significant differences among themselves.

However, they were distinguishable from the groups of rats that were administered 400 mg/kg aqueous root extract of *Tithonia diversifolia* (G6), the rats subjected to a Western diet for four weeks followed by a switch to rodent chow in the fifth week (G7), and the negative control (G2).

4.4.2 Effects of aqueous root extract of *T. diversifolia* on serum High-Density Lipoprotein (HDL-C) levels in Western diet-fed Wistar albino rats.

The Serum HDL-C levels were analyzed using Biobase BK 200, and their mean levels for each rat group are shown in Figure 7 below.

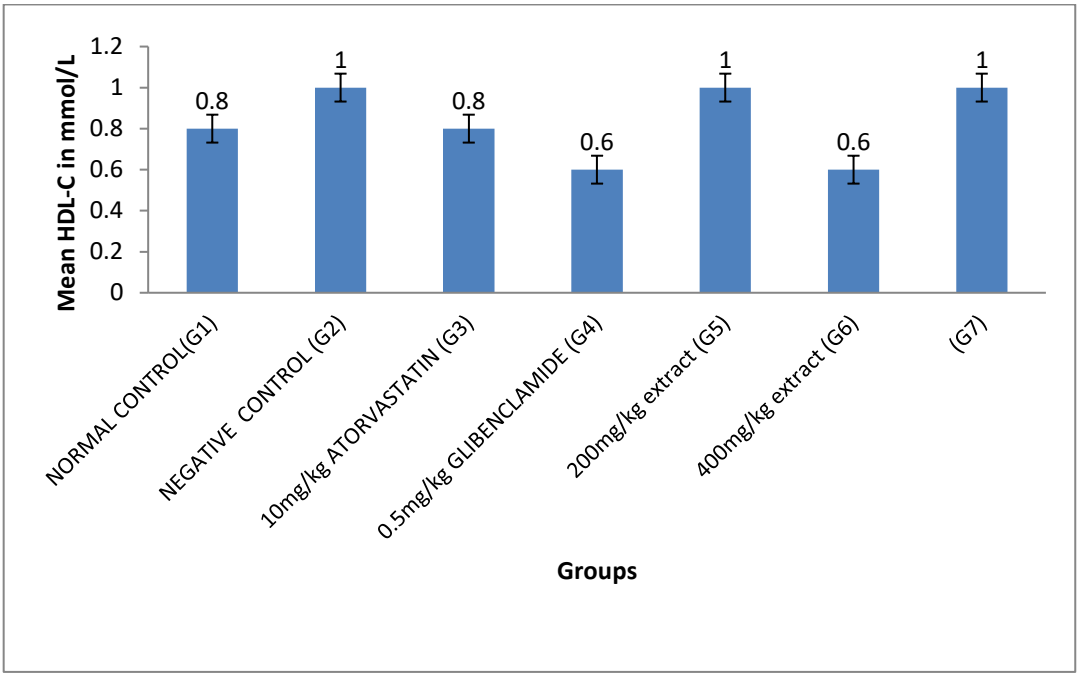


Figure 3: Effects of aqueous root extract of *T. diversifolia* on mean serum High high-density lipoprotein (HDL-C) levels in Western diet-fed Wistar albino rats.

In Figure 3, a comparison was made between the normal control (G1) and the other treatment groups. It was observed that rats administered 0.5 mg/kg glibenclamide (G4) and 400 mg/kg aqueous root extract (G6) displayed a reduction in mean HDL-C levels, while rats that received 200 mg/kg aqueous root extract of *Tithonia diversifolia* (G5) and rats subjected to a Western diet for four weeks followed by a switch to rodent chow (G7) exhibited an increase in HDL-C levels.

When the negative control (G2) was used as the reference for comparison, it was noted that there was a decline in mean HDL-C levels in rats administered 10 mg/kg atorvastatin (G3), 0.5 mg/kg glibenclamide (G4), and 400 mg/kg aqueous root extract (G6). However, rats receiving 200 mg/kg aqueous root extract of *Tithonia diversifolia* (G5) and those subjected to a Western diet for four weeks followed by a switch to rodent chow (G7) did not exhibit any significant change in HDL-C levels.

Upon conducting a post hoc LSD analysis to compare the mean differences in serum HDL-C levels between the groups and using both the normal control (G1) and the negative control (G2) as baselines, it was evident that there were no significant alterations in HDL-C levels across all the treatment groups, as indicated by their respective p-values (Table 12).

Table 12: Post-hoc results on the effects of aqueous root extract of *T. diversifolia* on mean serum HDL-C in Western diet-fed Wistar albino rats.

Multiple Comparisons								
Dependent Variable: HDL-C								
	(I) GROUPS	**(J) Groups/Treatments**	**Mean**	**Mean Diff (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
							Lower Bound	**Upper Bound**
LSD	NORMAL CONTROL (G1)	NEGATIVE CONTROL(G2)	1.000	-.20	.239	.410	-.69	.29
		10 mg/kg b.w ATORVASTATIN (G3)	.800	.00	.239	1.000	-.49	.49
		0.5 mg/kg b.w GLIBENCLAMIDE (G4)	.600	.20	.239	.410	-.29	.69
		200 mg/kg b.w extract (G5)	1.000	-.20	.239	.410	-.69	.29

		400 mg/kg b.w extract (G6)	.600	.20	.239	.410	-.29	.69
		(G7)	1.000	-.20	.239	.410	-.69	.29
	NEGATIVE (G2)	NORMAL CONTROL (G1)	.800	.20	.239	.410	-.29	.69
		10 mg/kg b.w ATORVASTATIN (G3)	.800	.20	.239	.410	-.29	.69
		0.5 mg/kg b.w GLIBENCLAMIDE (G4)	.600	.40	.239	.105	-.09	.89
		200 mg/kg b.w extract (G5)	1.000	.00	.239	1.000	-.49	.49
		400 mg/kg b.w extract (G6)	.600	.40	.239	.105	-.09	.89
		(G7)	1.000	.00	.239	1.000	-.49	.49
Based on observed means. *The mean difference is significant at the 0.05 level.								

The baseline, column two, is used to compare other treatment groups in column three, and the significance level is shown in column 7.

When a Duncan's test was conducted to assess the homogeneity of the groups in terms of HDL-C mean levels, it revealed uniformity in HDL-C mean values across all the rat groups, as presented in Table 13.

Table 13: Level of homogeneity in the mean serum HDL-C levels between the groups

Dependent Variable: HDL-C			
	GROUPS/TREATMENTS	**N**	**Subset**
			1
Duncan[a,b]	0.5 mg/kg b.w GLIBENCLAMIDE (G4)	5	.60
	400 mg/kg b.w extract (G6)	5	.60
	NORMAL CONTROL (G1)	5	.80
	10 mg/kg b.w ATORVASTATIN (G3)	5	.80
	NEGATIVE CONTROL (G2)	5	1.00
	200 mg/kg b.w extract (G5)	5	1.00
	(G7)	5	1.00
Means for groups in homogeneous subsets are displayed. Based on observed means.			
a. Uses Harmonic Mean Sample Size = 5.000.			
b. Alpha = .05.			

4.4.3 Effects of aqueous root extract of *T. diversifolia* on serum Triglycerides (TG) levels in Western diet-fed Wistar albino rats

The analysis of serum triglyceride levels was done using Biobase BK 200. The mean serum triglyceride levels for each group were as shown in Figure 4 below.

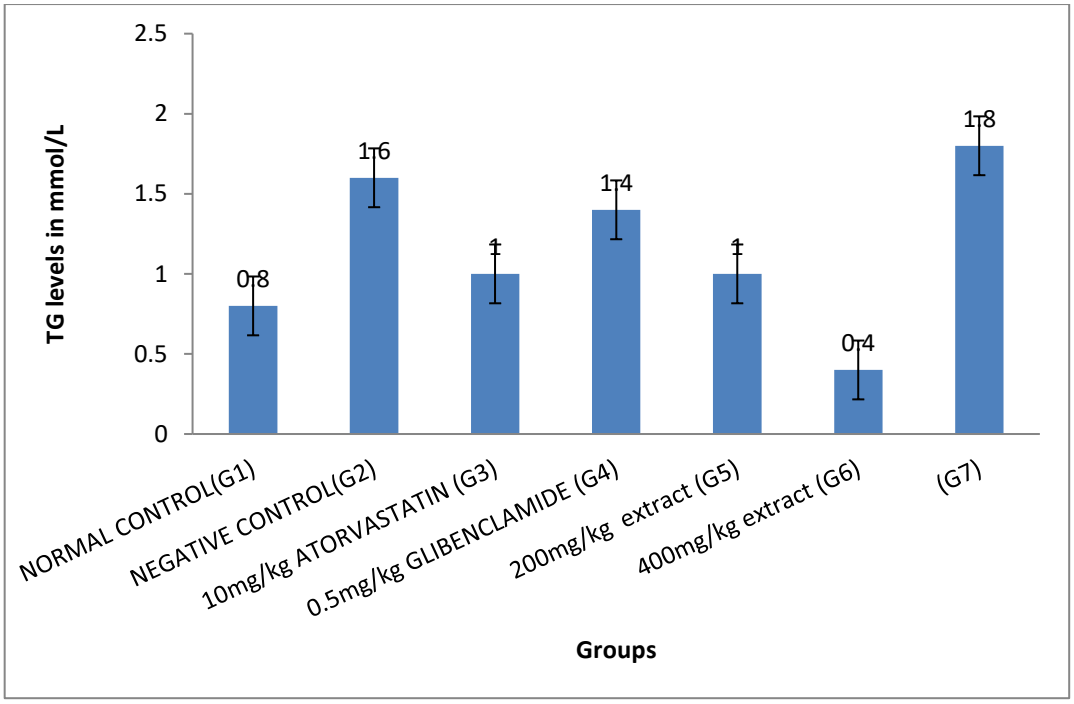


Figure 4: Effects of aqueous root extract of *T. diversifolia* on mean serum Triglycerides (TG) levels in Western diet-fed Wistar albino rats.

In Figure 4, it was observed that rats administered 10 mg/kg atorvastatin (G3), 0.5 mg/kg glibenclamide (G4), 200 mg/kg *Tithonia diversifolia* aqueous root extract (G5), and rats subjected to a Western diet for four weeks followed by a switch to rodent chow after week four (G7) exhibited an increase in mean serum triglyceride levels, in comparison to the normal control (G1). Conversely, rats that received 400 mg/kg *Tithonia diversifolia* aqueous root extract (G6) demonstrated decreased serum triglyceride levels.

When the negative control (G2) was used for comparison with the other treatment groups, it was noted that there was a decrease in mean serum triglyceride levels in all the treatment

groups except for the rats exposed to a Western diet for four weeks and subsequently switched to rodent chow (G7), which exhibited an increase in mean serum triglyceride levels.

Upon conducting a post hoc LSD analysis to compare the mean differences in serum triglyceride levels among the rat groups and employing the normal control (G1) as the reference point, it was revealed that there was a significant decrease in mean serum triglyceride levels in the group administered with 0.5 mg/kg body weight glibenclamide ($p=0.034$). Conversely, the group of rats subjected to a Western diet for four weeks and switched to rodent chow in the fifth week (G7) showed a significant increase in triglyceride levels ($p=0.001$). However, the other groups, including those administered with 10 mg/kg atorvastatin (G3) and 200 mg/kg *Tithonia diversifolia* aqueous root extract (G5) ($p=0.469$), and 400 mg/kg *Tithonia diversifolia* aqueous root extract (G6) ($p=0.153$), did not exhibit any significant differences.

When the negative control (G2) was used as the reference point, it was evident that there was a significant decrease in mean serum triglyceride levels in the groups that received 10 mg/kg atorvastatin (G3) ($p=0.036$) and 200 mg/kg *Tithonia diversifolia* aqueous root extract (G5) ($p=0.036$). Furthermore, the group exposed to a higher extract concentration at 400 mg/kg (G6) displayed a more substantial reduction in triglyceride levels ($p=0.000$), as indicated in Table 14.

Table 14: Post-hoc LSD results on the effects of aqueous root extract of *T. diversifolia* on serum triglycerides in Western die-fed Wistar albino rats

Multiple Comparisons								
Dependent Variable: TG								
	(I) GROUPS	**(J) Groups/Treatments**	**Mean**	**Mean Diff (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
							Lower Bound	**Upper Bound**
LSD	NORMAL CONTROL G1	NEGATIVE CONTROL (G2)	1.60	-.80*	.273	.007	-1.36	-.24
		10 mg/kg b.w ATORVASTATIN (G3)	1.00	-.20	.273	.469	-.76	.36
		0.5 mg/kg b.w GLIBENCLAMIDE (G4)	1.40	-.60*	.273	.036	-1.16	-.04
		200 mg/kg b.w extract (G5)	1.00	-.20	.273	.469	-.76	.36
		400 mg/kg b.w extract (G6)	.40	.40	.273	.153	-.16	.96
		(G7)	1.80	-1.00*	.273	.001	-1.56	-.44
	NEGATIVE G2	NORMAL CONTROL(G1)	.80	.80*	.273	.007	.24	1.36
		10 mg/kg b.w ATORVASTATIN (G3)	1.00	.60*	.273	.036	.04	1.16
		0.5 mg/kg b.w GLIBENCLAMIDE (G4)	1.40	.20	.273	.469	-.36	.76
		200 mg/kg b.w extract (G5)	1.00	.60*	.273	.036	.04	1.16

		400 mg/kg b.w extract (G6)	.40	1.20*	.273	.000	.64	1.76
		(G7)	1.80	-.20	.273	.469	-.76	.36

In Table 14, column two serves as the reference point against which all the other treatment groups in column three are compared, and column 7 indicates the level of statistical significance.

Duncan's test has organized the treatment groups into four subsets (table 15), providing a basis for understanding the statistical similarity or dissimilarity of their mean values for the dependent variable (TG). Subset 1; normal control (G1), 10 mg/kg atorvastatin (G3), 200 mg/kg *Tithonia diversifolia* aqueous root extracts (G5), 400 mg/kg *Tithonia diversifolia* aqueous root extract (G6) contains treatments with statistically similar TG levels, highlighting that these groups share commonalities in terms of TG. In Subset 2, normal control (G1), 10 mg/kg atorvastatin (G3), 200 mg/kg *Tithonia diversifolia* aqueous root extracts (G5), 0.5 mg/kg glibenclamide (G4), treatments exhibit similar TG levels, but they differ significantly from Subset 1, indicating that 0.5 mg/kg glibenclamide (G4) has distinct TG levels compared to 400 mg/kg *Tithonia diversifolia* aqueous root extract (G6). Subset 3: The negative control group (G2), 10 mg/kg atorvastatin (G3), 200 mg/kg *Tithonia diversifolia* aqueous root extracts (G5), 0.5 mg/kg glibenclamide (G4) showcases treatments with similar TG levels within the subset, differing significantly from Subset 1, illustrating differences between the negative control group (G2) and 400 mg/kg *Tithonia diversifolia* aqueous root extract (G6). Subset 4; 0.5 mg/kg glibenclamide (G4), the negative control group (G2), the rats subjected to a Western diet for four weeks followed by a switch to rodent

chow in the fifth week (G7) includes treatments with statistically similar TG levels within this subset but significantly different from groups in Subsets 1, 2, and 3.

Table 15: showing the level of homogeneity in the mean serum triglyceride levels between the groups

Dependent Variable: TG						
	GROUPS/TREATMENTS	**N**	**Subset**			
			1	**2**	**3**	**4**
Duncan[a,b]	400 mg/kg b.w extract (G6)	5	.40			
	NORMAL CONTROL (G1)	5	.80	.80		
	10 mg/kg b.w ATORVASTATIN (G3)	5	1.00	1.00	1.00	
	200 mg/kg b.w extract (G5)	5	1.00	1.00	1.00	
	0.5 mg/kg b.w GLIBENCLAMIDE (G4)	5		1.40	1.40	1.40
	NEGATIVE CONTROL (G2)	5			1.60	1.60
	(G7)	5				1.80
Means for groups in homogeneous subsets are displayed. Based on observed means.						
a. Uses Harmonic Mean Sample Size = 5.000.						
b. Alpha = .05.						

Therefore, Duncan's test on homogeneity produced four different subsets for the rat groups, as shown in table above.

4.5 Liver Function Tests

4.5.1 Effects of aqueous root extract of *T. diversifolia* on serum alkaline phosphatase (ALP) levels in Western diet-fed Wistar albino rats

The refence values for ALP (U/L) in Wistar albino rats range between 95-611 (Loeb & Quimby, 1999).

Biobase BK 200 serum analysis on ALP levels was done, and the mean serum ALP levels for each treatment group are shown in Figure 5 below.

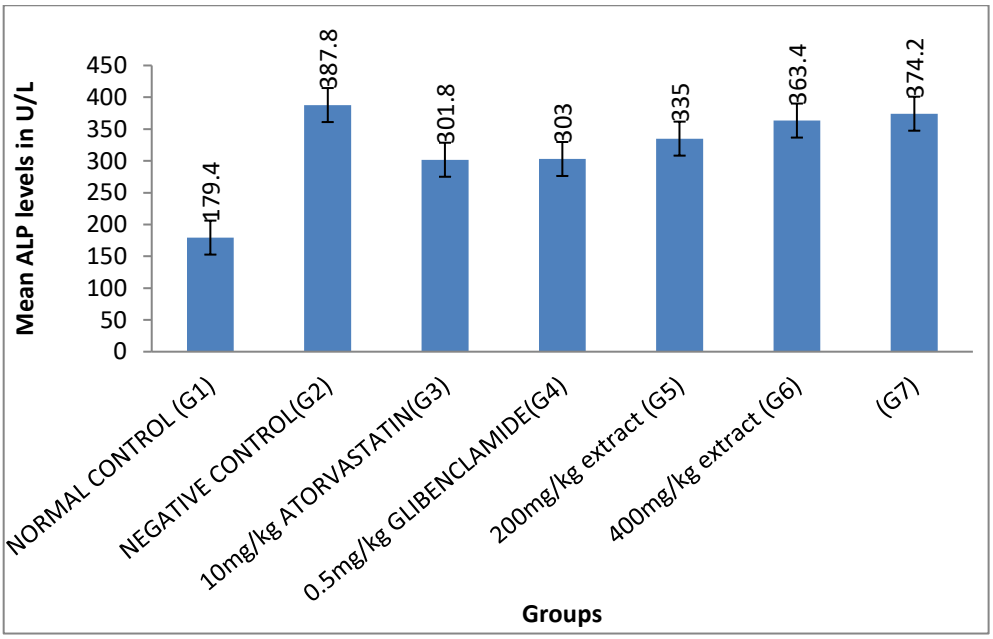


Figure 5: Effects of aqueous root extract of *T. diversifolia* on serum alkaline phosphatase (ALP) levels in Western diet-fed Wistar albino rats.

From figure 5 above, From Figure 5 above, when comparing the normal control (G1) to the other rat groups, there was a notable increase in mean serum ALP levels across all the rat groups. In contrast, when comparing these groups to the negative control (G2), a decrease in mean serum ALP levels was observed in all the rat groups, as depicted in Figure 5.

Upon employing post hoc LSD analysis to assess the mean differences in serum ALP levels among the rat groups, and with the normal control (G1) as the reference point, a significant increase in mean serum ALP levels was noted among all the rat groups, indicated by their

respective p-value (p=0.000). This suggests that consuming a Western diet had a discernible impact on liver integrity.

Conversely, when the negative control (G2) was used as the baseline for comparison, all the rat groups exhibited a significant decrease in mean serum ALP levels, as detailed in Table 16 for the corresponding p-values. This implies that the interventions implemented had a beneficial hepato-restorative effect. Notably, the group of rats fed a Western diet for four weeks and then switched to rodent chow in the fifth week (G7) showed a non-significant reduction in ALP levels (p=0.184).

Table 16: Post-hoc results on the effects of aqueous root extract of *T. diversifolia* on serum ALP levels in Western diet-fed Wistar albino rats

Multiple Comparisons								
Dependent Variable: ALP								
	(I) GROUPS	**(J) Treatments**	**Mean**	**Mean Diff (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
							Lower Bound	**Upper Bound**
LSD	NORMAL CONTROL (G1)	NEGATIVE CONTROL(G2)	387.800	-208.40*	9.988	.000	-228.86	-187.94
		10 mg/kg b.w ATORVASTATIN (G3)	301.800	-122.40*	9.988	.000	-142.86	-101.94
		0.5 mg/kg b.w GLIBENCLAMIDE (G4)	303.000	-123.60*	9.988	.000	-144.06	-103.14
		200 mg/kg b.w extract (G5)	335.000	-155.60*	9.988	.000	-176.06	-135.14

		400 mg/kg b.w extract (G6)	363.400	-184.00*	9.988	.000	-204.46	-163.54
		(G7)	374.200	-194.80*	9.988	.000	-215.26	-174.34
	NEGATIVE CONTROL (G2)	NORMALCONTROL (G1)	179.400	208.40*	9.988	.000	187.94	228.86
		10 mg/kg b.w ATORVASTATIN (G3)	301.800	86.00*	9.988	.000	65.54	106.46
		0.5 mg/kg b.w GLIBENCLAMIDE (G4)	303.000	84.80*	9.988	.000	64.34	105.26
		200 mg/kg b.w extract (G5)	335.000	52.80*	9.988	.000	32.34	73.26
		400 mg/kg b.w extract (G6)	363.400	24.40*	9.988	.021	3.94	44.86
		(G7)	374.200	13.60	9.988	.184	-6.86	34.06

In the table above, column two serves as the reference against which all other treatment groups in column three are compared, and column 7 indicates the level of statistical significance.

When Duncan's test was conducted to evaluate the homogeneity of the groups concerning mean ALP levels, it revealed a similarity in ALP mean values between the groups administered 10 mg/kg atorvastatin (G3) and 0.5 mg/kg glibenclamide (G4). Additionally, rats given 400 mg/kg aqueous root extract of *Tithonia diversifolia* (G6) and those subjected to a Western diet for four weeks and reverted to rodent chow in the last seven days (G7) exhibited comparable outcomes. In contrast, the normal control (G1) and the group receiving

200 mg/kg aqueous root extract of *Tithonia diversifolia* (G5) differed from all other groups, as illustrated in Table 17.

Table 17: showing level of homogeneity in the mean serum ALP levels between the groups

Dependent Variable: ALP							
	GROUPS	**N**	**Subset**				
			1	**2**	**3**	**4**	**5**
Duncan[a,b]	NORMAL CONTROL(G1)	5	179.4				
	10 mg/kg b.w ATORVASTATIN (G3)	5		301.8			
	0.5 mg/kg b.w GLIBENCLAMIDE (G4)	5		303.0			
	200 mg/kg b.w extract (G5)	5			335.0		
	400 mg/kg b.w extract (G6)	5				363.4	
	(G7)	5				374.2	374.2
	NEGATIVE CONTROL (G2)	5					387.8
Means for groups in homogeneous subsets are displayed. Based on observed means.							
a. Uses Harmonic Mean Sample Size = 5.							
b c. Alpha = .05.							

The Dancun's test on homogeneity was, therefore, able to group the rat groups into five different subsets, as shown in Table 17 above.

4.5.2 Effects of aqueous root extract of *T. diversifolia* on serum Alanine aminotransferase (ALT) levels in Western diet-fed Wistar albino rats

The refence values for ALT (U/mL) in Wistar albino rats range between 80.08±7.49 (Marzouk *et al.*, 2011).

The mean serum ALT levels were estimated, and the result for each rat group is shown in Figure 6 below.

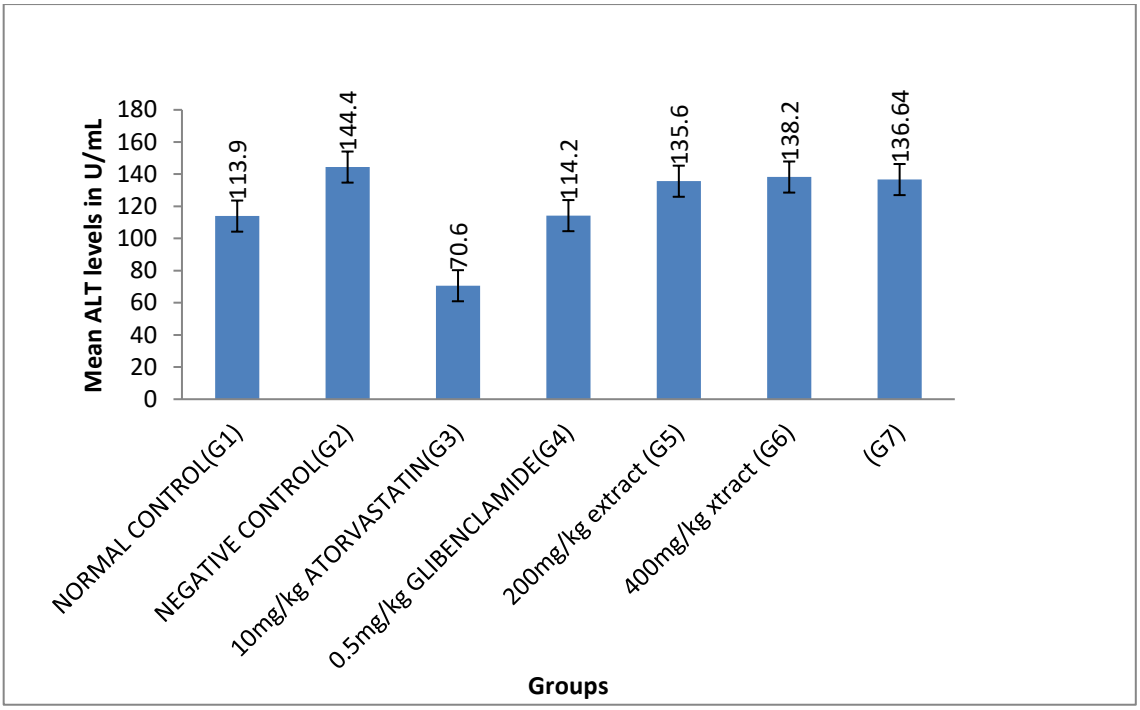


Figure 6: Effects of aqueous root extract of *T. diversifolia* on mean serum Alanine aminotransferase (ALT) levels in Western diet-fed Wistar albino rats.

When comparing the normal control (G1) to the other rat groups, there was an increase in mean serum ALT levels in all the rat groups, except for the rats that received 10 mg/kg atorvastatin (G3), which exhibited a decrease in mean serum ALT levels. Conversely, when employing the negative control (G2) as the basis for comparison, there was a reduction in mean serum ALT levels across all rat groups, as illustrated in Figure 6.

Upon conducting post hoc LSD analysis to evaluate the mean differences in serum ALT levels between the rat groups and utilizing the normal control (G1) as the reference point, it was evident that there was a significant increase in mean serum ALT levels in the rats that received 200 mg/kg aqueous root extract of *Tithonia diversifolia* (G5), 400 mg/kg aqueous root extract of *Tithonia diversifolia* (G6), and the rats exposed to a Western diet for four weeks and then reverted to rodent chow in the last week of the experiment (G7), as indicated

by their respective p-values (p=0.009), (p=0.004), (p=0.006). In contrast, the rats administered 0.5 mg/kg glibenclamide (G4) did not exhibit a significant increase in mean serum ALT levels (p=0.969). The rats that received 10 mg/kg atorvastatin (G3) recorded a significant decrease in mean serum ALT levels (p=0.000).

When the negative control (G2) was used as the baseline for comparison, there was an insignificant reduction in mean serum ALT levels in the groups of rats administered 200 mg/kg aqueous root extract of *Tithonia diversifolia* (G5), 400 mg/kg aqueous root extract of *Tithonia diversifolia* (G6), and the rats subjected to a Western diet for four weeks and then reverted to rodent chow in the last week of the experiment (G7), as denoted by their respective p-values (p=0.264), (p=0.428), (p=0.323). Conversely, the group of rats that received 10 mg/kg atorvastatin (G3) showed a significant decrease in mean serum ALT levels (p=0.000).

Table 18: Post-hoc results on the effects of aqueous root extract of *T. diversifolia* on serum ALT levels in Western diet-fed Wistar rats.

Multiple Comparisons								
Dependent Variable:ALT								
	(I) GROUPS	**(J) Treatments**	**Mean**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
							Lower Bound	Upper Bound
LSD	NORMAL CONTROL (G1)	NEGATIVE CONTROL (G2)	144.400	-30.500*	7.713	.000	-46.301	-14.698
		10 mg/kg b.w ATORVASTATIN (G3)	70.600	43.300*	7.713	.000	27.498	59.101
		0.5 mg/kg b.w GLIBENCLAMIDE (G4)	114.200	-.300	7.713	.969	-16.101	15.5011
		200 mg/kg b.w extract (G5)	135.600	-21.700*	7.713	.009	-37.501	-5.898
		400 mg/kg b.w extract (G6)	138.200	-24.300*	7.713	.004	-40.101	-8.498
		(G7)	136.640	-22.740*	7.713	.006	-38.541	-6.938
	NEGATIVE CONTROL (G2)	NORMAL CONTROL(G1)	133.900	30.500*	7.713	.000	14.698	46.301
		10 mg/kg b.w ATORVASTATIN (G3)	70.600	73.800*	7.713	.000	57.998	89.601
		0.5 mg/kg b.w GLIBENCLAMIDE (G4)	114.200	30.200*	7.713	.001	14.398	46.001

		200 mg/kg b.w extract (G5)	135.600	8.800	7.713	.264	-7.001	24.601
		400 mg/kg b.w extract (G6)	138.200	6.200	7.713	.428	-9.601	22.001
		NEGATIVE CONTROL -2 (G7)	136.640	7.760	7.713	.323	-8.041	23.561
	Based on observed means.							
	*. The mean difference is significant at the .05 level.							

In Table 18, presented above, the baseline in the second column served as the reference against which all other treatment groups in column three were compared, and the significance level is indicated in column 7.

A Duncan's test was conducted to evaluate the homogeneity among the groups. It revealed similarity in ALT mean values between the negative control (G2), those administered 200 mg/kg extract (G5), 400 mg/kg extract (G6), and the rats exposed to a Western diet for four weeks, followed by a switch to rodent chow in the fifth week (G7). These groups exhibited uniformity in their outcomes but differed from all other groups.

Conversely, the normal control (G1) and the group administered 0.5 mg/kg glibenclamide (G4) displayed similarity in outcomes but were distinct from those given 10 mg/kg atorvastatin (G3). The Dancun’s test on homogeneity recorded three different subsets of the rat groups, as detailed in Table 19.

Table 19: The level of homogeneity in the mean serum ALT levels between the groups.

Dependent variable: ALT					
	GROUPS/Treatments	**N**	**Subset**		
			1	**2**	**3**
Duncan[a,b]	10 mg/kg ATORVASTATIN (G3)	5	70.6000		
	NORMAL CONTROL(G1)	5		113.9000	
	0.5 mg/kg b.w GLIBENCLAMIDE (G4)	5		114.2000	
	200 mg/kg b.w extract (G5)	5			135.6000
	(G7)	5			136.6400
	400 mg/kg b.w extract (G6)	5			138.2000
	NEGATIVE CONTROL (G2)	5			144.4000
Means for groups in homogeneous subsets are displayed. Based on observed means.					
a. Uses Harmonic Mean Sample Size = 5.					
b. Alpha = .05.					

4.5.3 Effects of aqueous root extract of *T. diversifolia* on serum aspartate aminotranferase (AST) levels in Western diet-fed Wistar albino rats

The refence values for AST (U/ml) in rats range between 198.68 ±15.66 (Marzouk *et al.*, 2011). The mean serum AST levels for each rat groups at the end of week five are as shown in figure 7 below.

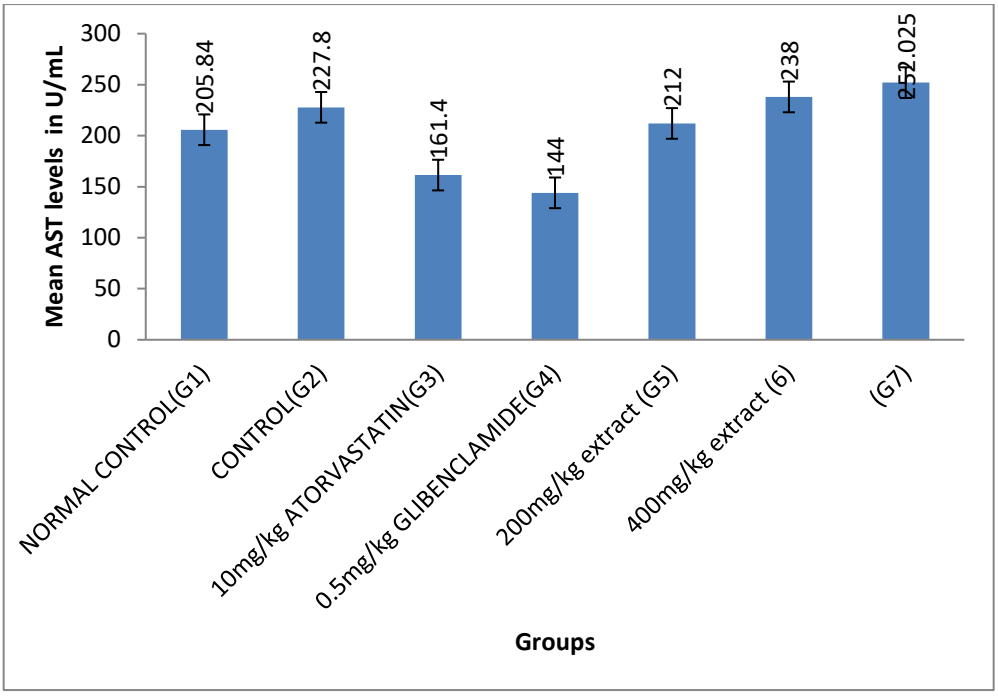


Figure 7: Effects of aqueous root extract of *T. diversifolia* on serum aspartate aminotransferase (AST) levels in Western diet-fed Wistar albino rats.

Figure 7 shows a decrease in mean serum AST levels in the rat groups that received 10 mg/kg atorvastatin (G3) and 0.5 mg/kg glibenclamide (G4). Contrariwise, the groups that received 200 mg/kg aqueous root extract of *Tithonia diversifolia* (G5), 400 mg/kg aqueous root extract of *Tithonia diversifolia* (G6), and those fed a Western diet for four weeks followed by a reverse to rodent chow for the last seven days (G7) exhibited an increase in mean serum AST levels when compared to the normal control (G1). When employing the negative control (G2) as the reference point for comparison, rats given 10 mg/kg atorvastatin (G3), 0.5 mg/kg glibenclamide (G4), and 200 mg/kg aqueous root extract of *Tithonia diversifolia* (G5) displayed a decrease in mean serum AST levels, while those given 400 mg/kg aqueous root extract of *Tithonia diversifolia* (G6) and rats subjected to a Western diet for four weeks, with

a subsequent switch to rodent chow in the last seven days (G7), demonstrated an increase in serum AST levels.

Subsequent post hoc LSD analysis was conducted to evaluate the mean differences in serum AST levels among the rat groups. When utilizing the normal control (G1) as the baseline, it was evident that rats administered 10 mg/kg atorvastatin (G3) and 0.5 mg/kg glibenclamide (G4) exhibited a significant decrease in mean serum AST levels ($p=0.018$ and $p=0.002$, respectively). In contrast, the group of rats subjected to a Western diet for four weeks, followed by a switch to rodent chow in the fifth week (G7), recorded a significant increase in mean serum AST levels ($p=0.020$). Those given 200 mg/kg aqueous root extract of *Tithonia diversifolia* (G5) and 400 mg/kg aqueous root extract of *Tithonia diversifolia* (G6) displayed an insignificant increase in AST levels ($p=0.729$ and $p=0.078$, respectively).

When the negative control was used as the baseline (G2), a significant decrease was observed in the rats administered 10 mg/kg atorvastatin (G3) ($p=0.018$), while an insignificant decrease was noted in the mean serum AST levels of the rats given 200 mg/kg aqueous root extract of *Tithonia diversifolia* (G5) ($p=0.377$). Conversely, those administered 400 mg/kg aqueous root extract of *Tithonia diversifolia* (G6) and the rats subjected to a Western diet for four weeks, followed by a switch to rodent chow in the last 7 days (G7), displayed insignificant increases in the levels of mean serum AST ($p=0.567$ and $p=0.205$, respectively).

Table 20: Post-hoc results on the effects of aqueous root extract of *T. diversifolia* on serum aspartate aminotranferase (AST) levels in Western diet-fed Wistar albino rats.

Multiple Comparisons								
Dependent Variable: AST								
	(I) GROUPS	**(J)Treatments**	**Mean**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
							Lower Bound	**Upper Bound**
LSD	NORMAL CONTROL (G1)	NEGATIVE CONTROL (G2)	227.80	-21.960	17.5853	.222	-58.042	14.122
		10 mg/kg b.w ATORVASTATIN (G3)	161.40	44.440*	17.5853	.018	8.358	80.522
		0.5 mg/kg b.w GLIBENCLAMIDE (G4)	144.00	61.840*	17.5853	.002	25.758	97.922
		200 mg/kg b.w extract (G5)	212.00	-6.160	17.5853	.729	-42.242	29.922
		400 mg/kg b.w extract (G6)	238.00	-32.160	17.5853	.078	-68.242	3.922
		(G7)	252.02	-46.185*	18.6520	.020	-84.456	-7.914
	NEGATIVE CONTROL (G2)	NORMAL CONTROL(G1)	205.84	21.960	17.5853	.222	-14.122	58.042
		10 mg/kg b.w ATORVASTATIN(G3)	161.40	66.400*	17.5853	.001	30.318	102.482
		0.5 mg/kg b.w GLIBENCLAMIDE (G4)	144.00	83.800*	17.5853	.000	47.718	119.882
		200 mg/kg b.w extract (G5)	212.00	15.800	17.5853	.377	-20.282	51.882
		400 mg/kg b.w extract (G6)	238.00	-10.200	17.5853	.567	-46.282	25.882
		(G7)	252.02	-24.225	18.6520	.205	-62.496	14.046

Based on observed means.
*. The mean difference is significant at the .05 level.

In Table 20, the second column serves as the baseline against which all other treatment groups in column three are compared, and column 7 indicates the level of statistical significance.

Upon conducting Duncan's test to assess the homogeneity of the groups in terms of AST mean levels, it was observed that there was similarity in AST mean values among the following groups: normal control (G1), negative control (G2), those administered 200 mg/kg of the extract (G5), and those given 400 mg/kg of the extract (G6). These groups exhibited no statistically significant differences among them. However, they differed from the groups of rats that received 10 mg/kg atorvastatin (G3), 0.5 mg/kg glibenclamide (G4), and the rats subjected to a Western diet for four weeks, with a subsequent switch to rodent chow in the fifth week (G7).

Table 21: Showing the level of homogeneity in the mean serum AST levels between the groups

Dependent variable: AST					
	GROUPS	**N**	**Subset**		
			1	**2**	**3**
Duncan[a,b,c]	0.5 mg/kg b.w GLIBENCLAMIDE (G4)	5	144.000		
	10 mg/kg b.w ATORVASTATIN (G3)	5	161.400		
	NORMAL CONTROL(G1)	5		205.840	
	200 mg/kg b.w extract (G5)	5		212.000	
	NEGATIVE CONTROL(G2)	5		227.800	227.800
	400 mg/kg b.w extract (G6)	5		238.000	238.000
	(G7)	5			252.025
Means for groups in homogeneous subsets are displayed. Based on observed means.					
a. Uses Harmonic Mean Sample Size = 5.					
b. The harmonic mean of the group sizes is used.					
c. Alpha = .05.					

Therefore, Dancun's test on homogeneity grouped the rat groups into three different subsets, as shown in Table 21 above.

4.6 Kidney profile

4.6.1 Effects of aqueous root extract of *T. diversifolia* on serum creatinine levels

Figure 8 below shows the mean serum creatinine levels for each rat group.

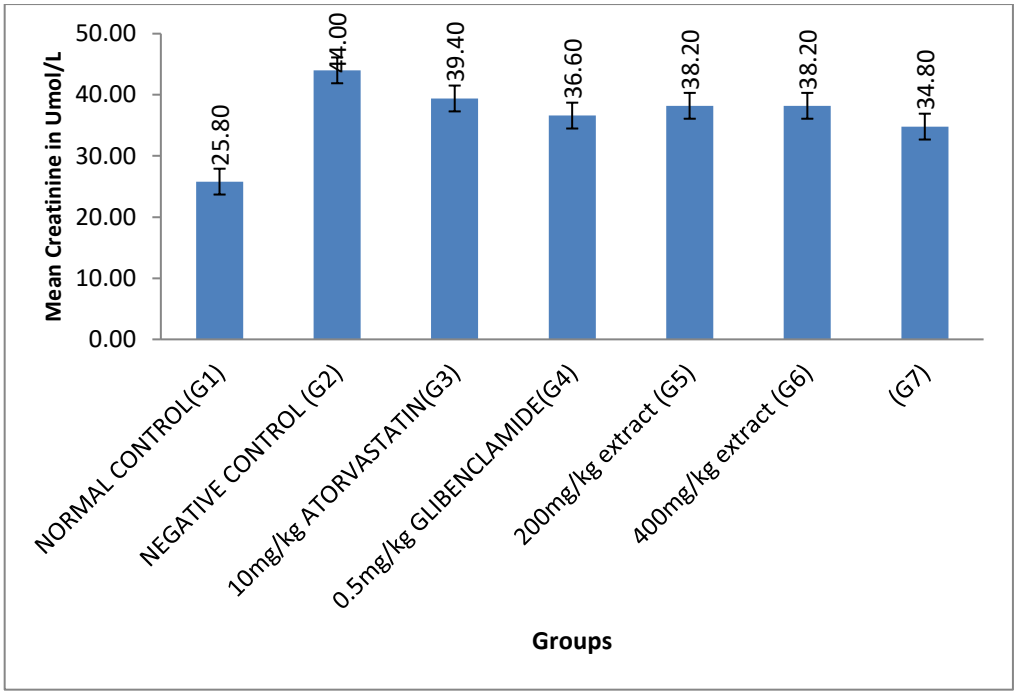


Figure 8: Effects of aqueous root extract of *T. diversifolia* on serum creatinine levels in Western diet-fed Wistar albino rats

In Figure 12, a comparison between the normal control (G1) and the other groups revealed an increase in mean serum creatinine levels in all the rat groups. Conversely, when the negative control (G2) was used to compare to the other groups, all groups exhibited a decrease in mean serum creatinine levels.

Subsequently, a post hoc LSD analysis was conducted to evaluate the differences in mean serum creatinine levels among the groups. Using normal control (G1) as the baseline, a significant increase in creatinine levels was observed across all treatment groups, as indicated by the p-value (p=0.000).

Furthermore, when the negative control (G2) was utilized as the baseline, a significant decrease in serum creatinine levels was noted in the rat groups given 10 mg/kg atorvastatin

(G3), 0.5 mg/kg glibenclamide (G4), 200 mg/kg extract (G5), 400 mg/kg extract (G6), and the rats subjected to a Western diet for four weeks, with a subsequent switch to rodent chow in the fifth week (G7). The corresponding p-values were as follows: (P=0.040), (P=0.002), (P=0.011), (P=0.011), and (P=0.000), respectively, as presented in Table 22.

Table 22: Post-hoc results on the effects of aqueous root extract of *T. diversifolia* on serum creatinine levels in Western diet-fed Wistar albino rats.

Multiple Comparisons								
Dependent Variable: CREATININE								
	(I) GROUPS	**(J) Treatments**	**Mean**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
							Lower Bound	**Upper Bound**
LSD	NORMAL CONTROL (G1)	NEGATIVE CONTROL (G2)	44.00	-18.20*	2.137	.000	-22.58	-13.82
		10 mg/kg b.w ATORVASTATIN (G3)	39.40	-13.60*	2.137	.000	-17.98	-9.22
		0.5 mg/kg b.w GLIBENCLAMIDE (G4)	36.60	-10.80*	2.137	.000	-15.18	-6.42
		200 mg/kg b.w extract (G5)	38.20	-12.40*	2.137	.000	-16.78	-8.02
		400 mg/kg b.w extract (G6)	38.20	-12.40*	2.137	.000	-16.78	-8.02
		(G7)	34.80	-9.00*	2.137	.000	-13.38	-4.62
	NEGATIVECONTROL (G2)	NORMAL CONTROL (G1)	25.80	18.20*	2.137	.000	13.82	22.58
		10 mg/kg b.w ATORVASTATIN (G3)	39.40	4.60*	2.137	.040	.22	8.98

		0.5 mg/kg b.w GLIBENCLAMIDE (G4)	36.60	7.40*	2.137	.002	3.02	11.78
		200 mg/kg b.w extract (G5)	38.20	5.80*	2.137	.011	1.42	10.18
		400 mg/kg b.w extract (G6)	38.20	5.80*	2.137	.011	1.42	10.18
		(G7)	34.80	9.20*	2.137	.000	4.82	13.58
Based on observed means. *. The mean difference is significant at the .05 level.								

In Table 22 provided above, the second column serves as the reference against which all other treatment groups in column three are compared, and column 7 denotes the significance level.

Upon conducting Duncan's test to assess the homogeneity of the groups concerning serum creatinine mean levels, it was observed that there was a similarity in creatinine mean values among the following groups: rats administered 10 mg/kg atorvastatin (G3), 0.5 mg/kg glibenclamide (G4), 200 mg/kg aqueous root extract of *Tithonia diversifolia* (G5), 400 mg/kg aqueous root extract of *Tithonia diversifolia* (G6), and the group of rats that were subjected to a Western diet for four weeks and then switched to rodent chow in the fifth week (G7). These groups exhibited no statistically significant differences but differed from the normal control (G1) and the negative control (G2).

Table 23: Showing the level of homogeneity in the mean serum creatinine levels between the groups

CREATININE					
	GROUPS	**N**	**Subset**		
			1	**2**	**3**
Duncan[a, b]	NORMAL CONTROL (G1)	5	25.80		
	(G7)	5		34.80	
	0.5 mg/kg b.w GLIBENCLAMIDE (G4)	5		36.60	
	200 mg/kg b.w extract (G5)	5		38.20	
	400 mg/kg b.w extract (G6)	5		38.20	
	10 mg/kg b.w ATORVASTATIN (G3)	5		39.40	
	NEGATIVE CONTROL (G2)	5			44.00
Means for groups in homogeneous subsets are displayed. Based on observed means.					
a. Uses Harmonic Mean Sample Size = 5.000.					
b. Alpha = .05.					

A Duncan's test for assessing homogeneity categorized the treatment groups into three distinct subsets, as presented in Table 23. The rats that were given 10 mg/kg atorvastatin (G3), 0.5 mg/kg glibenclamide (G4), 200 mg/kg aqueous root extract of *Tithonia diversifolia* (G5), 400 mg/kg aqueous root extract of *Tithonia diversifolia* (G6), and those subjected to a Western diet for four weeks, followed by a transition to rodent chow in the final seven days of the experiment (G7), exhibited similarity in their outcomes. However, they differed from the normal control (G1) and the negative control (G2).

4.6.2 Effects of aqueous root extract of *T. diversifolia* on serum urea levels in Western diet-fed Wistar albino rats.

At the end of week five, analysis of serum urea levels was done by Biobase BK 200, and the mean serum urea levels for each rat group were shown in Figure 9 below.

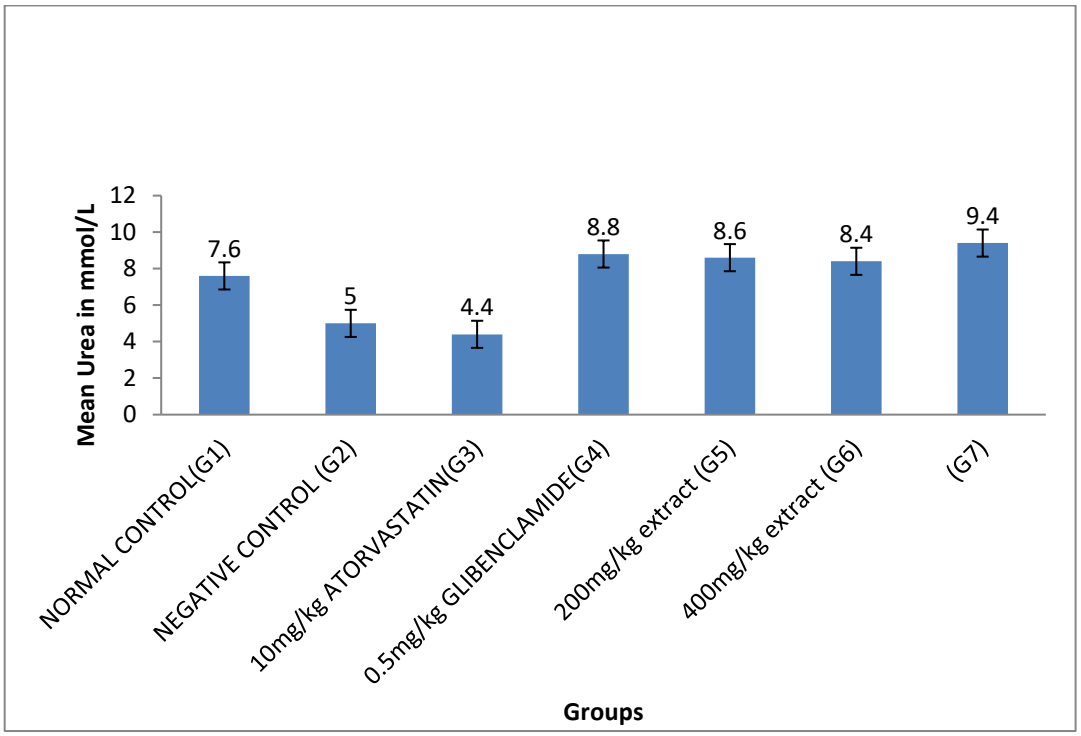


Figure 9: Effects of aqueous root extract of *T. diversifolia* on serum urea levels in Western diet-fed Wistar albino rats.

When normal control (G1) served as the reference for comparison with other rat groups, there was an increase in mean serum urea levels in all the rat groups, except for those administered 10 mg/kg atorvastatin (G3), which exhibited a decrease in mean serum urea levels.

Conversely, when compared to the negative control (G2), all the other rat groups displayed an increase in mean serum urea levels, except for those receiving 10 mg/kg atorvastatin (G3), which demonstrated a decrease in mean serum urea levels.

Upon conducting a post hoc LSD analysis to examine the mean differences in serum urea levels among the rat groups and using the normal control (G1) as the reference, there was an insignificant increase in mean serum urea levels in the rats administered 0.5 mg/kg glibenclamide (G4), 200 mg/kg extract (G5), and 400 mg/kg extract (G6) with p-values of ($p=0.153$), ($p=0.232$), and ($p=0.336$), respectively. Rats given 10 mg/kg atorvastatin (G3) significantly decreased ($p=0.001$). At the same time, those fed a Western diet for four weeks and then reverted to a normal rodent chow in the fifth week (G7) exhibited a significant increase in urea levels ($p=0.036$).

Using the negative control (G2) as the baseline, a significant increase in serum urea levels was observed in the rats administered 0.5 mg/kg glibenclamide (G4), 200 mg/kg extract (G5), 400 mg/kg extract (G6), and those fed a Western diet for four weeks and reverted to rodent chow in the fifth week (G7) ($p=0.000$). Rats given 10 mg/kg atorvastatin (G3) showed an insignificant decrease in mean urea levels ($p=0.469$).

Table 24: Post-hoc results on the effects of aqueous root extract of *T. diversifolia* on serum urea levels in Western diet-fed Wistar albino rats.

Multiple Comparisons								
Dependent Variable: UREA								
	(I) GROUPS	**(J) Treatments**	**Mean**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
							Lower Bound	**Upper Bound**
LSD	NORMAL CONTROL (G1)	NEGATIVE CONTROL (G2)	5.00	2.60*	.818	.004	.93	4.27
		10 mg/kg b.w ATORVASTATIN (G3)	4.40	3.20*	.818	.001	1.53	4.87
		0.5 mg/kg b.w GLIBENCLAMIDE (G4)	8.80	-1.20	.818	.153	-2.87	.47
		200 mg/kg b.w extract (G5)	8.60	-1.00	.818	.232	-2.67	.67
		400 mg/kg b.w extract (G6)	8.40	-.80	.818	.336	-2.47	.87
		(G7)	9.40	-1.80*	.818	.036	-3.47	-.13
	NEGATIVE CONTROL (G2)	NORMAL CONTROL (G1)	7.60	-2.60*	.818	.004	-4.27	-.93
		10 mg/kg b.w ATORVASTATIN (G3)	4.40	.60	.818	.469	-1.07	2.27
		0.5 mg/kg b.w GLIBENCLAMIDE (G4)	8.80	-3.80*	.818	.000	-5.47	-2.13
		200 mg/kg b.w extract (G5)	8.60	-3.60*	.818	.000	-5.27	-1.93
		400 mg/kg b.w extract (G6)	8.40	-3.40*	.818	.000	-5.07	-1.73
		(G7)	9.40	-4.40*	.818	.000	-6.07	-2.73
	Based on observed means.							
	*. The mean difference is significant at the .05 level.							

The second column in the table above is the reference against which all the other rat groups in column three are compared. Column 7 indicates the level of significance.

A Duncan's test was conducted to assess the homogeneity of the groups concerning serum urea mean levels, revealing similarity in urea mean values among the rats used as the normal control (G1), those administered 0.5 mg/kg glibenclamide (G4), 200 mg/kg aqueous root extract of *Tithonia diversifolia* (G5), 400 mg/kg aqueous root extract of *Tithonia diversifolia* (G6), and those that were fed a Western diet for four weeks and then reverted to a rodent chow in the last week of the experiment (G7). These groups were not different from each other but differed from the negative control (G2) and rats given 10 mg/kg atorvastatin (G3). This homogeneity test, therefore, grouped the rat groups into two different subsets, as shown in Table 25 below.

Table 25: showing the level of homogeneity in the mean serum urea levels between the groups

UREA				
	GROUPS	**N**	**Subset**	
			1	**2**
Duncan[a,b]	10 mg/kg b.w ATORVASTATIN (G3)	5	4.40	
	NEGATIVE CONTROL (G2)	5	5.00	
	NORMAL CONTROL (G1)	5		7.60
	400 mg/kg b.w extract (G6)	5		8.40
	200 mg/kg b.w extract (G5)	5		8.60
	0.5 mg/kg b.w GLIBENCLAMIDE (G4)	5		8.80
	(G7)	5		9.40
Means for groups in homogeneous subsets are displayed. Based on observed mean.				
a. Uses Harmonic Mean Sample Size = 5.000.				
b. Alpha = .05.				

CHAPTER FIVE

5.0 DISCUSSION

5.1 Phytochemical of the aqueous root extract of *Tithonia diversifolia*

In the present study, a qualitative phytochemical analysis of the aqueous root extract of *Tithonia diversifolia* revealed the presence of alkaloids, flavonoids, tannins, saponins, terpenoids, phenols, carbohydrates, coumarins, and anthocyanins. Interestingly, this differs from the findings of previous studies conducted by Obayomi *et al*. (2021) and Omolola (2020) on the leaf extract, which did not report the presence of anthocyanins, coumarins, and carbohydrates. It is worth noting that differences in the phytochemical composition between the leaf and root of *Tithonia diversifolia* may contribute to variations in the effects of these extracts. The aqueous root extract contains a broader spectrum of bioactive compounds than the aqueous leaf extract. In contrast, Olayinka *et al*. (2015) reported the presence of alkaloids, flavonoids, tannins, saponins, terpenoids, and phenols in the aqueous stem extract of *Tithonia diversifolia,* which differs from the current findings as it was reported not to contain carbohydrates, coumarins, and anthocyanins. These disparities highlight the potential variations in medicinal use and effectiveness between the leaf and root extracts.

Phytochemicals exhibit diverse pharmacological and biochemical actions, playing a crucial role in treating and managing various illnesses. They are responsible for plants' characteristic odor and color and can contribute to their toxicity and medicinal properties. The availability of these bioactive compounds, which may exhibit activities akin to conventional synthetic drugs, can be employed to predict the potential toxicity and side effects associated with medicinal plants. Furthermore, studying these phytochemicals holds promise for developing novel medicinal agents. Many herbs contain potent phytochemical compounds that can

enhance overall health and protect against various diseases. Phytochemicals, being bioactive natural plant compounds, are predominantly employed for their medicinal properties due to their therapeutic potency (Juliani *et al*., 2017). These phytochemicals warrant in-depth investigation for the potential development of novel therapeutic agents (Dasgupta *et al.*, 2021). Various herbal sources have demonstrated the presence of potent phytochemical compounds capable of enhancing overall health and conferring protection against a spectrum of diseases. Phytochemicals, as bioactive constituents derived from plants, are primarily harnessed for their therapeutic efficacy due to their medicinal potential, (Okarter *et al.,* 2010).

5.2 *Tithonia diversifolia* extract and blood glucose levels

The results of the present study indicated that the consumption of a Western diet for a four-week duration resulted in a significant elevation of fasting blood glucose levels in all rat groups fed on the Western diet. This observation underscores the capacity of the Western diet to increase blood glucose levels in Wistar rats. In the fourth week of the study, the negative control group (G2) displayed higher weight and blood glucose levels compared to the other groups, despite the uniform diet and equivalent food quantities administered to all groups. Notably, all rat groups adhered to a consistent feeding schedule and regular intervals. Given the uniformity in feeding patterns, other factors might contribute to the distinctive outcomes observed in G2. Possible explanations could include inherent physiological variations, genetic factors, or individual responses to the diet that could manifest differently in each group.

However, a marked reduction in blood glucose levels was noted upon administering the aqueous root extract of *Tithonia diversifolia* at 200 mg/kg to Wistar rats subjected to the

Western diet for seven days (p=0.000). This reduction was comparable to the effects observed with glibenclamide administration at 0.5mg/kg for seven days (p=0.000).

These findings are in line with studies conducted by Yazid *et al.* (2021) and Chunudom *et al.* (2020), which reported a significant decrease in fasting blood glucose levels in diabetic rats following daily administration of *Tithonia diversifolia* aqueous leaf extract at 200 mg/kg for 16 days ($p<0.05$). These findings suggest that compounds such as coumarin, anthocyanins, and carbohydrates in the aqueous leaf extract may not significantly influence the hypoglycemic effects. However, further research in this area is warranted for clarification.

The administration of 400 mg/kg of aqueous root extract after the fourth week significantly reduced fasting blood glucose levels (p=0.000). These findings align with previous research conducted by Olukunle and (2014) Mabou *et al*. (2018), who reported a significant reduction in fasting blood sugar levels in diabetic Wistar rats after administering a similar dose of the aqueous leaf extract. It is worth noting that both (Olukunle, 2014; Mabou *et al*., 2018) administered the extract for 21 days, in contrast to the current study, which employed a 7-day administration period. Considering the nephrotoxic effects associated with these extracts, it raises the question of the optimal duration for administering these extracts to animals.

Furthermore, other studies have reported similar reductions in blood sugar levels, albeit at varying dosages. For instance, a study by Sari *et al.* (2018) demonstrated that the administration of 150 mg/kg of leaf aqueous extract of *Tithonia diversifolia* once a day for 28 days led to a reduction in blood glucose levels comparable to that achieved with glibenclamide in hyperglycemic rats.

Similarly, another study by (Yazid *et al.*, 2021) involved the administration of 600 mg/kg of body weight for 16 days, concluding that the *Tithonia diversifolia* leaf extract significantly reduced fasting blood glucose.

Based on the preceding analysis, it is evident that the aqueous root extract, administered at both 200 mg/kg and 400 mg/kg doses, exhibits a more efficient reduction in blood glucose levels over a shorter treatment duration compared to the leaf extracts, which achieved similar results but required a more protracted administration period. These variances in effectiveness can likely be attributed to differences in the phytochemical compositions between the leaf and root extracts of *Tithonia diversifolia*.

Diverse phytochemicals in a plant extract can substantially influence its pharmacological activities, particularly its hypoglycemic effects. The enhanced hypoglycemic activity observed in the aqueous root extract of *Tithonia diversifolia* may be attributed to the presence of specific bioactive compounds, including alkaloids, tannins, and anthocyanins. In previous research, alkaloids, a class of naturally occurring compounds found in various plants, have been linked to hypoglycemic effects. The mechanisms underlying alkaloid-induced hypoglycemic effects can vary, contingent upon the specific alkaloid and its plant source. These mechanisms include insulin secretion stimulation (López *et al.*, 2004), enhanced insulin sensitivity, gluconeogenesis inhibition, inhibition of gluconeogenesis by boldine (Silva *et al.*, 2023), and AMP-Activated Protein Kinase (AMPK) activation, with berberine, one of the principal alkaloids in *Rhizoma coptidis* (Shen *et al*., 2012), being a notable example. Notably, alkaloids' hypoglycemic effects can vary widely depending on the specific alkaloid, its concentration, and the individual's overall health and metabolic profile (Derosa *et al*., 2014).

Additionally, the presence of tannins in the roots of *Tithonia diversifolia* also contributes to its hypoglycemic activity. Tannins, a group of polyphenolic compounds found in various plant sources, primarily exert hypoglycemic effects by inhibiting carbohydrate absorption and modulating glucose metabolism (Tsujita, 2016). Moreover, tannins possess antioxidant properties capable of reducing oxidative stress and inflammation (Kumari & Jain, 2012), contributing to insulin resistance. This property is also shared with anthocyanins, which are absent in the leaf extract of *Tithonia diversifolia* (Garcia & Blesso, 2021). The presence of anthocyanins in the root extract is likely responsible for the improved hypoglycemic activity observed, as they aid in reducing oxidative damage to insulin-sensitive tissues and enhancing insulin signaling. This ultimately facilitates more efficient glucose uptake by cells and improves glycemic control (Oliveira *et al.,* 2020).

Notably, despite experiencing elevated fasting blood glucose levels, the rats did not progress to a diabetic state, maintaining an average blood glucose levels of within the normal range of 2.64-5.26 mmol/L (Wang *et al*., 2010). The observed elevated fasting blood glucose levels in the rats may suggest a state of insulin resistance (Leibowitz *et al*., 2018). This phenomenon can lead to higher fasting blood glucose levels without an immediate transition to full-blown diabetes. Several factors could contribute to the observed results.

Firstly, the study was conducted over a relatively short duration, and the rats may have been in an adaptation phase. It's plausible that, given more time, the insulin resistance could progress, potentially leading to diabetes. Compensatory mechanisms (Wei *et* al., 2020) could also be at play. The rats may have initiated adaptive responses (Zhou *et al.,* 2014), such as increased insulin production, to counteract the detrimental effects of the Western diet. While

these mechanisms may temporarily prevent the onset of diabetes, their sustainability over an extended period is uncertain. Moreover, the study may not have thoroughly explored all relevant metabolic factors. Assessing additional markers, such as inflammation, lipid metabolism, or oxidative stress, could provide a more comprehensive understanding of the rats' metabolic state.

It's crucial to acknowledge the limitations of using rats as models for human physiology. Rats may not fully replicate the intricacies of human metabolism, and the progression from insulin resistance to diabetes (Kucera & Cervinkova, 2014) might differ between the two species. While the elevated fasting blood glucose levels in rats subjected to a Western diet indicate metabolic changes, the absence of diabetes may be attributed to various factors, including the study's duration and compensatory mechanisms (Hannon & Arslanian, 2015). These findings emphasize the complexity of diet-induced metabolic changes and underscore the need for further research to unravel the underlying mechanisms.

In summary, the data suggest that the aqueous root extract of *Tithonia diversifolia*, administered at doses of 200 mg/kg and 400 mg/kg daily for seven days in Western diet-fed Wistar albino rats, is more effective in reducing blood glucose levels. Consequently, it may be a valuable hypoglycemic agent for managing hyperglycemic conditions.

5.3 *Tithonia diversifolia* extract and lipid profiles

The current investigation has ascertained a significant elevation in the levels of serum triglycerides and cholesterol when compared to negative control. This increase was particularly pronounced in rats subjected to a Western diet for four weeks and subsequently

switched back to a standard rodent diet in the fifth week, highlighting the Western diet's potential to induce obesity. However, there were no notable alterations in HDL-C levels in Wistar rats after the five weeks when contrasted with the negative control group.

The daily administration of an aqueous root extract of *Tithonia diversifolia* at a dose of 200 mg/kg to Wistar albino rats fed a Western diet for seven days during the fifth week resulted in a significant reduction in serum cholesterol ($p=0.000$) and triglyceride levels ($p=0.036$). These outcomes were comparable to the effects observed with the standard drug atorvastatin ($p=0.000$). These findings align with those of Nguepi *et al.* (2021), who reported a significant decrease in serum cholesterol and triglyceride levels after administering a lower dose of 120 mg/kg of leaf aqueous extract for a more extended period of 14 days.

Upon increasing the dose of the aqueous root extract of *Tithonia diversifolia* to 400 mg/kg, this study discovered a significant decrease in serum cholesterol and triglyceride levels ($p=0.000$). These results are in line with the earlier work by Mabou *et al.* (2018), who demonstrated a significant reduction in serum cholesterol and triglycerides ($p<0.05$) following the administration of 400 mg/kg of aqueous leaf extract, as well as the study by Ajao & Moteetee (2017), which used 500 mg of *Tithonia diversifolia* daily for 21 days.

Ejelonu *et al.* (2017) also significantly reduced serum cholesterol and triglyceride levels following the administration of 100 mg/kg of leaf aqueous extract of *Tithonia diversifolia* to Wistar rats once a day for 21 days. It is noteworthy that while the current study administered the extract for a shorter duration, these previous studies also obtained similar effects on cholesterol and triglycerides, indicating the effectiveness of shorter-term administration and

potentially avoiding the risk of plant extract toxicity, as suggested by the present study's findings.

The differences in the hypolipidemic effects of the aqueous leaf and root extracts of *Tithonia diversifolia* may be attributed to variations in the concentrations of phytochemicals present in the root and leaf of the plant.

The observed hypolipidemic effects of this extract may be attributed to various phytochemicals found in its roots, such as saponins, terpenoids, and phenolic compounds. To begin with, saponins, naturally occurring compounds found in various plant sources, including *Tithonia diversifolia*'s aqueous root extract, have exhibited hypolipidemic activity. They achieve this by influencing lipid absorption and metabolism due to their amphiphilic nature (Marrelli *et al.,* 2016).

This unique property allows saponins to bind to dietary fats and cholesterol in the intestinal tract, forming micelles that encapsulate fats and cholesterol. As a result, the efficient absorption of these lipids into the bloodstream is prevented, leading to reduced levels of circulating cholesterol and triglycerides. Furthermore, saponins have been shown to interfere with the activity of enzymes involved in cholesterol synthesis and absorption (del Hierro *et al.,* 2018), further contributing to lowered cholesterol levels. Conversely, terpenoids primarily modulate lipid metabolism and cholesterol levels (Ludwiczuk *et al*., 2017).

In conclusion, the administration of *Tithonia diversifolia*'s aqueous root extract to Wistar albino rats fed a Western diet at doses of 200 mg/kg and 400 mg/kg daily for seven days demonstrated the potential to reduce serum cholesterol and triglyceride levels in a shorter

time frame. However, further in-depth studies are warranted to substantiate these findings adequately.

5.4 *Tithonia diversifolia* and liver function.

The present study's results demonstrate that a four-week consumption of a Western diet by Wistar rats led to elevated levels of ALP, AST, and ALT, indicating the hepatotoxic effects of the diet. Subsequently, upon daily administration of an aqueous root extract of *Tithonia diversifolia* at 200 mg/kg for seven days, a significant reduction in serum alkaline phosphatase (ALP) levels ($p=0.000$) was observed. Meanwhile, there were insignificant reductions in serum alanine aminotransferase (ALT) levels ($p=0.264$) and aspartate aminotransferase (AST) levels ($p=0.377$).

These current findings diverge from the previous study by Adebayo *et al*. (2009), which employed a similar dosage and duration but utilized leaf extract. Their study showed an insignificant decrease in serum ALP levels, while the results for ALT and AST levels align with the present study. Similar outcomes have also been reported by Ejelonu *et al*. (2017).

In a separate experiment involving a dosage of 400 mg/kg of aqueous root extract of *Tithonia diversifolia* administered daily for seven days to Wistar albino rats fed a Western diet, our study revealed a significant reduction in serum ALP levels ($p=0.021$), with insignificant changes in serum ALT ($p=0.428$) and AST ($p=0.567$) levels.

The current study findings align with prior research conducted by Nguepi *et al*. (2021) and Oyewusi *et al*. (2019) concerning ALP levels. However, they diverge regarding serum ALT and AST levels, where their results demonstrated a significant decrease in contrast to the outcomes established by the current study. The absence of significant changes in ALT and

AST levels in rats treated with the *Tithonia diversifolia* aqueous root extract in the present study suggests that the extract did not impact hepatocyte function in Wistar rats.

These findings indicate a hepatoprotective potential of the extract, possibly attributable to the phytochemicals contained within the plant's roots. The liver plays a pivotal role in numerous biochemical pathways related to growth, energy supply, immune response, reproduction, nutrient regulation, and overall homeostasis within the body. Its capacity to perform these functions can be compromised by exposure to various substances such as foods, herbs, and drugs, as indicated by Ejelonu *et al*. (2017).

In contrast to certain alkaloids, such as pyrrolizidines, which have the potential to be hepatotoxic and can disrupt liver enzyme systems responsible for detoxification (Neuman *et al*., 2015), the current study on *Tithonia diversifolia* aqueous root extract yielded distinct results. In this investigation, the extract consumption reduced ALP, AST, and ALT levels. Typically, an elevation in these liver enzymes signifies liver cell damage. The cumulative evidence suggests that the phytochemicals within the aqueous root extract of *Tithonia diversifolia* may possess a hepatoprotective effect, counteracting the potential hepatotoxicity often associated with alkaloids (Mabou *et al*., 2018). This unique outcome implies that the extract may positively influence liver health by decreasing ALP, AST, and ALT levels, indicative of enhanced liver function rather than damage.

In conclusion, the administration of *Tithonia diversifolia* aqueous root extract at dosages of 200 mg/kg and 400 mg/kg for seven days to Wistar albino rats fed a Western diet appears to be safe for the liver and may find utility in the management of liver diseases, as it did not result in an elevation of liver enzymes.

5.5 *Tithonia diversifolia* and kidney function

The present study observed that feeding Wistar albino rats a Western diet increased serum creatinine levels in the negative control group. Typically, elevated creatinine levels indicate compromised kidney function, as creatinine is a waste product excreted by the kidneys (Kamal, 2014). These findings suggest that the diet had a nephrotoxic effect on Wistar rats. However, when the aqueous root extract of *Tithonia diversifolia* was administered to the rats at doses of 200 mg/kg and 400 mg/kg daily for seven days, a significant reduction in serum creatinine levels ($p=0.011$) was established, implying potential kidney restorative effects of the extract.

These findings contrast with Adebayo *et al*. (2009), who reported that the daily administration of 200 mg/kg of aqueous leaf extract of *Tithonia diversifolia* for seven days produced an insignificant change in serum creatinine levels. These discrepancies between Adebayo's findings and the present study could be attributed to the metabolites present in the root extract, particularly coumarins and anthocyanins, which may influence creatinine levels. Notably, these phytochemicals are absent in the leaf extract, as indicated by previous studies such as Obayomi *et al.* (2021) and Omolola (2020).

Furthermore, this study established a significant increase in serum urea levels following daily administration of aqueous root extract of *Tithonia diversifolia* for seven days at 200 mg/kg and 400 mg/kg to Western diet-fed Wistar rats ($p=0.000$). This result differs from Passoni *et al*. (2013), who did not observe any change in serum urea levels after administering aqueous leaf extract of *Tithonia diversifolia* at 200 mg/kg for 14 days. This study's significant increase in serum urea levels may suggest early-stage kidney dysfunction.

Simultaneously, the significant reductions in creatinine levels indicate that the interventions reduced the circulating levels of creatinine, akin to the effects of established antidiabetic and antihypertensive drugs that improve kidney function. This could suggest that the extract, much like standard drugs, possesses antioxidant properties (Wang *et al*., 2019) and anti-inflammatory properties, such as flavonoids (Abdallah *et al.*, 2015) and phenols (Zhang & Tsao, 2016), which may protect kidney tissues from oxidative damage and inflammation.

However, the elevation in urea levels, despite the root extract interventions, may imply kidney cell damage. Comparatively, the standard drug atorvastatin administered at a dose of 10 mg/kg, as shown by Hamid *et al*. (2016) for seven days, was found to be kidney-safe, as it did not lead to increased urea levels. The rise in urea levels may be a consequence of enhanced metabolism or altered renal function, possibly influenced by the presence of other phytochemicals like alkaloids (Adamse & van Egmond, 2010) or saponins (Adeoye & Oyedapo, 2004). Further investigations must be carried out to elucidate the reasons behind these effects.

In conclusion, the administration of aqueous root extract of *Tithonia diversifolia* at doses of 200 mg/kg and 400 mg/kg for seven days to Western diet-fed Wistar albino rats led to an elevation of urea levels while seemingly reducing the levels of serum creatinine. This observation suggests some aspects of kidney damage that warrant further investigation beyond the scope of this study.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

This hypoglycemic study established that the aqueous root extracts of *Tithonia diversifolia* at doses of 200 mg/kg and 400 mg/kg possess hypoglycemic activity in Wistar albino rats fed a Western diet, comparable to the effects of glibenclamide at 0.5 mg/kg. Furthermore, this study demonstrated that the administration of aqueous root extract at doses of 200 mg/kg and 400 mg/kg to Wistar albino rats fed a Western diet for seven days resulted in hypolipidemic activities similar to those of atorvastatin at 10 mg/kg. The results of the current study have revealed that *Tithonia diversifolia* at doses of 200 mg/kg and 400 mg/kg led to an increase in urea levels, indicating potential kidney cell damage. However, these doses were associated with reduced serum creatinine levels, suggesting that the extract is safe for short-term kidney use, as creatinine is highly specific to kidney function.

6.2 RECOMMENDATIONS

Based on the findings of the present study concerning the hypoglycemic and hypolipidemic effects of the aqueous root extract of *Tithonia diversifolia* in Wistar albino rats subjected to a Western diet, the following recommendations are put forth:

1. Further investigations should be undertaken to identify the specific active constituents responsible for the plant extract's observed hypoglycemic and hypolipidemic activities.
2. Safety assessments focusing on organ health, particularly the liver and kidneys should be conducted to ascertain the potential impacts of the *T. diversifolia* aqueous root extract.

3. Additional research endeavors are warranted to understand better the precise active compounds within the *T. diversifolia* aqueous root extract.

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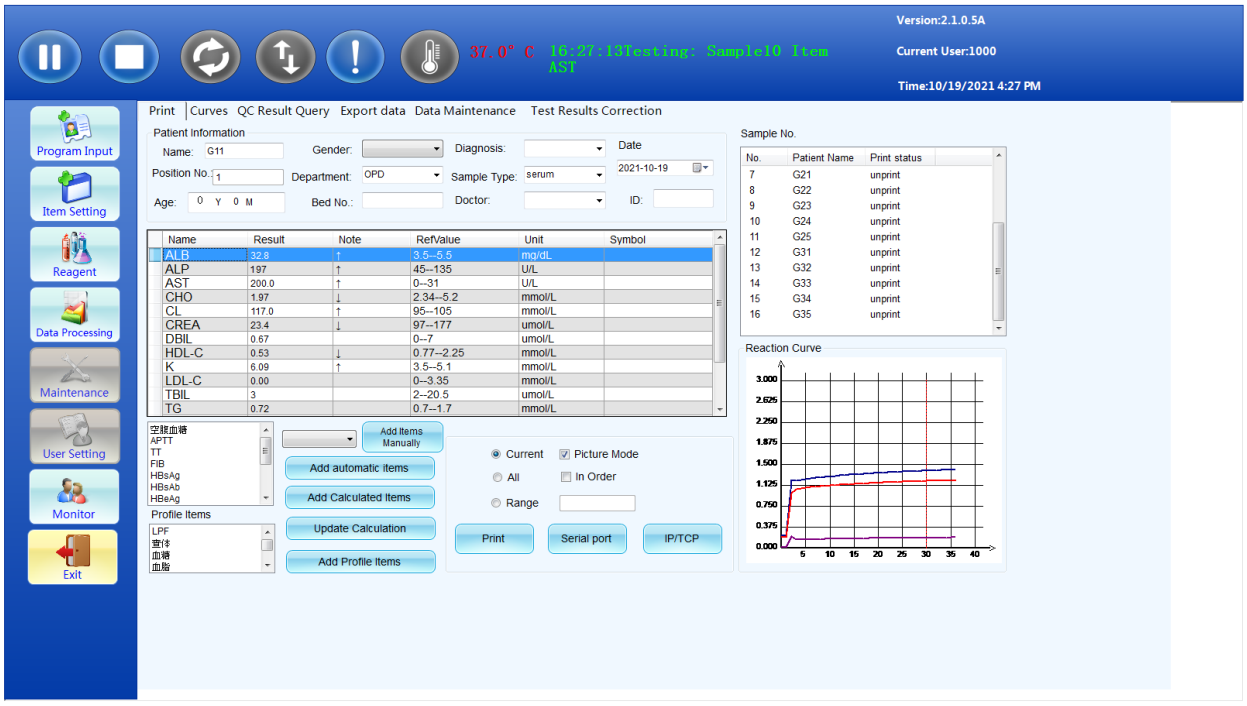
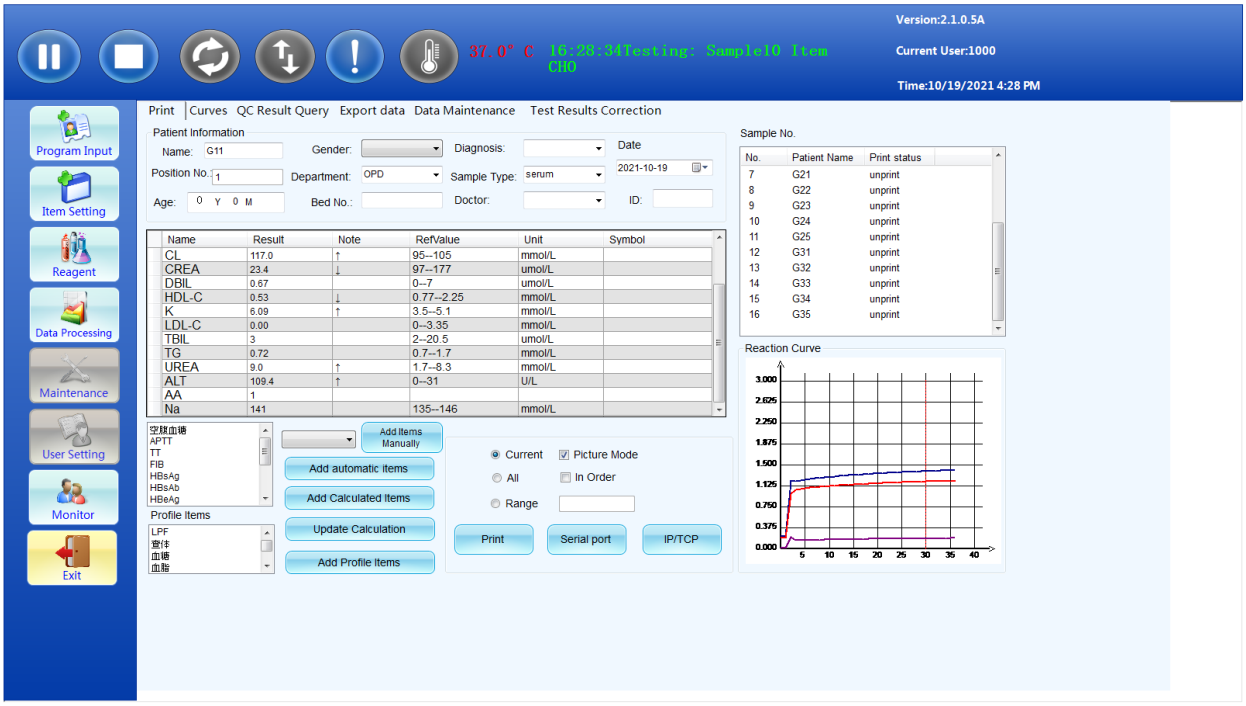
APPENDICES

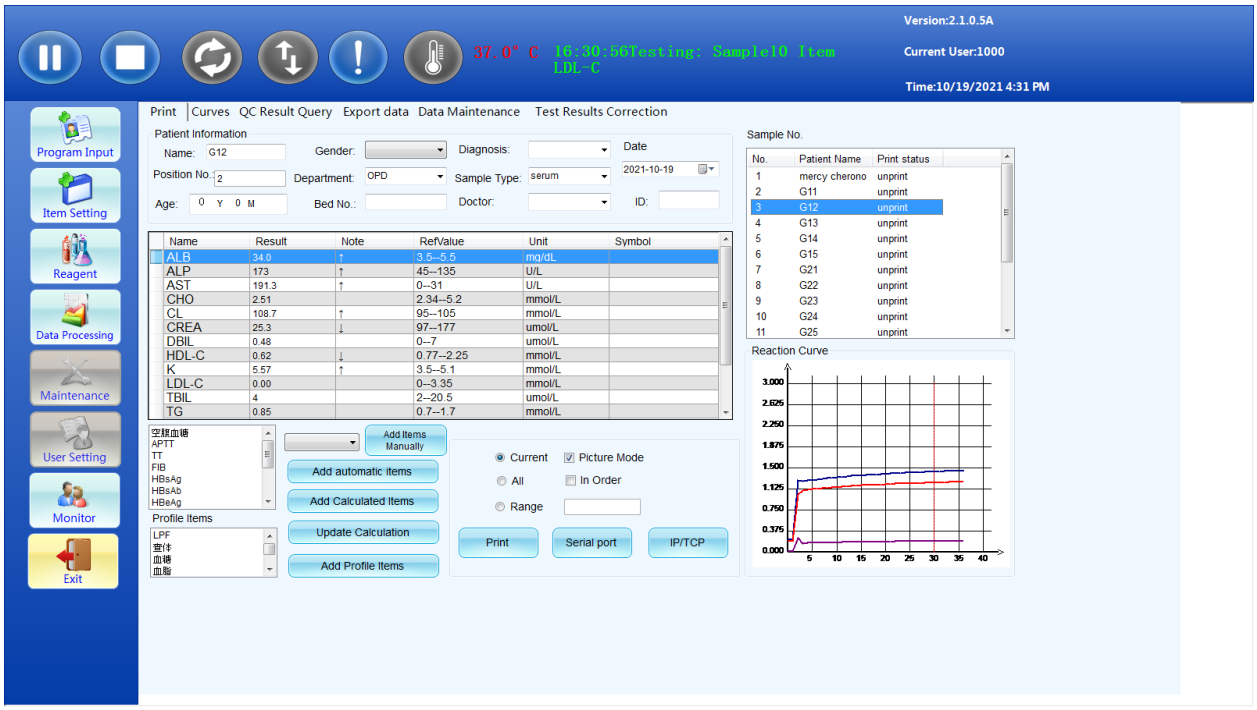
APPENDIX I: SERUM ANALYSIS RESULTS

G11





G12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Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print Curves QC Result Query Export data Data Maintenance Test Results Correction
Patient Information
Name: G12
Gender:
Diagnosis:
Date
Position No.: 2
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
ALB 34.0 ↑ 3.5--5.5 mg/dL
ALP 173 ↑ 45--135 U/L
AST 191.3 ↑ 0--31 U/L
CHO 2.51 2.34--5.2 mmol/L
CL 108.7 ↑ 95--105 mmol/L
CREA 25.3 ↓ 97--177 umol/L
DBIL 0.48 0--7 umol/L
HDL-C 0.62 ↓ 0.77--2.25 mmol/L
K 5.57 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 4 2--20.5 umol/L
TG 0.85 0.7--1.7 mmol/L
Sample No.
No. Patient Name Print status
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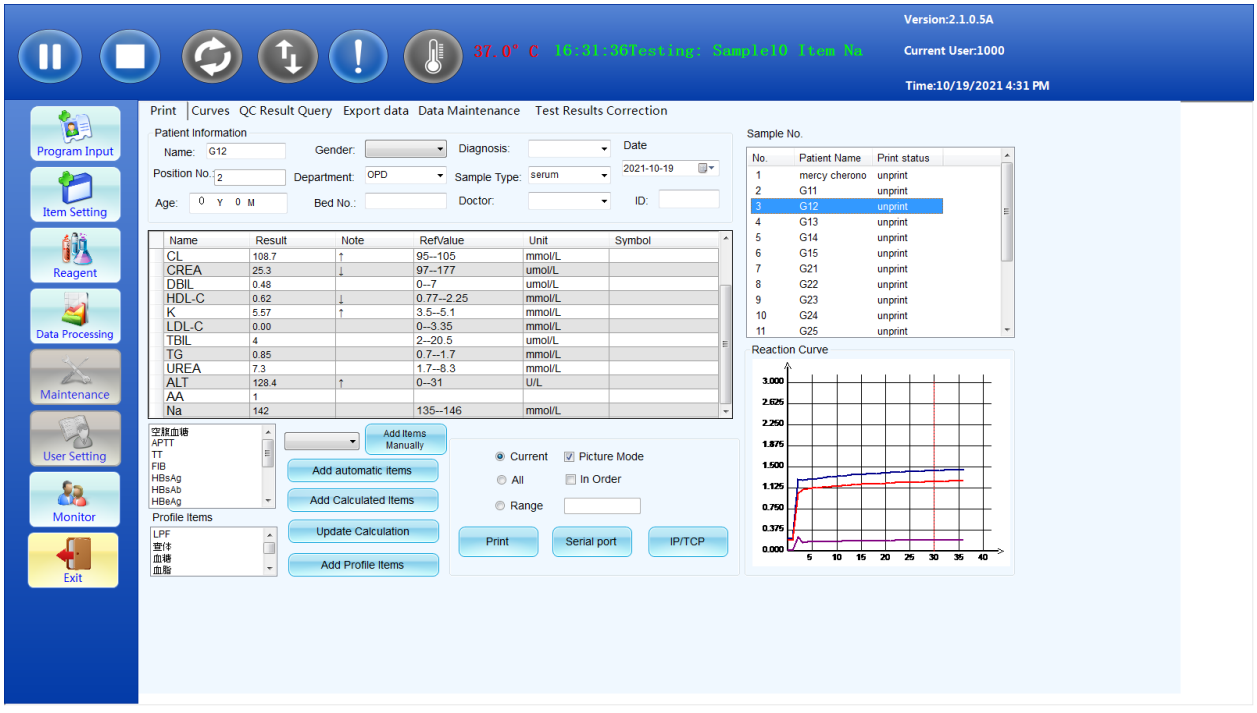
2 G11 unprint
3 G12 unprint
4 G13 unprint
5 G14 unprint
6 G15 unprint
7 G21 unprint
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
蛮体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP


Version:2.1.0.5A
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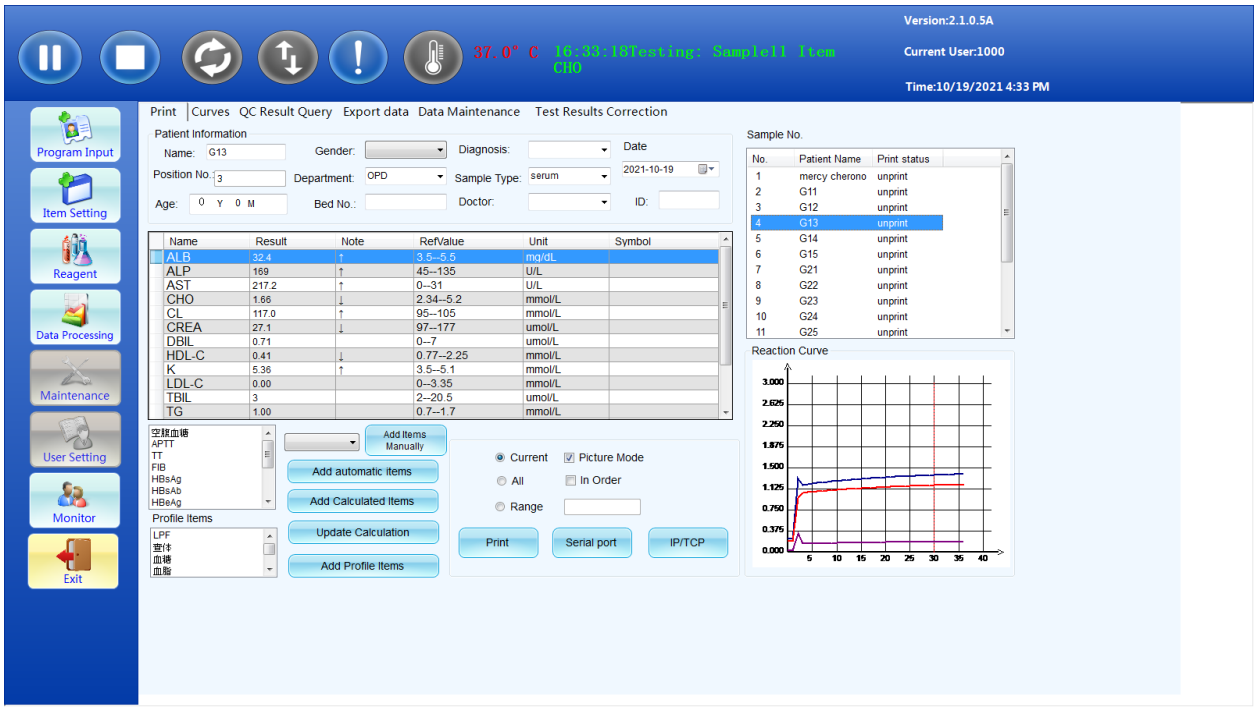
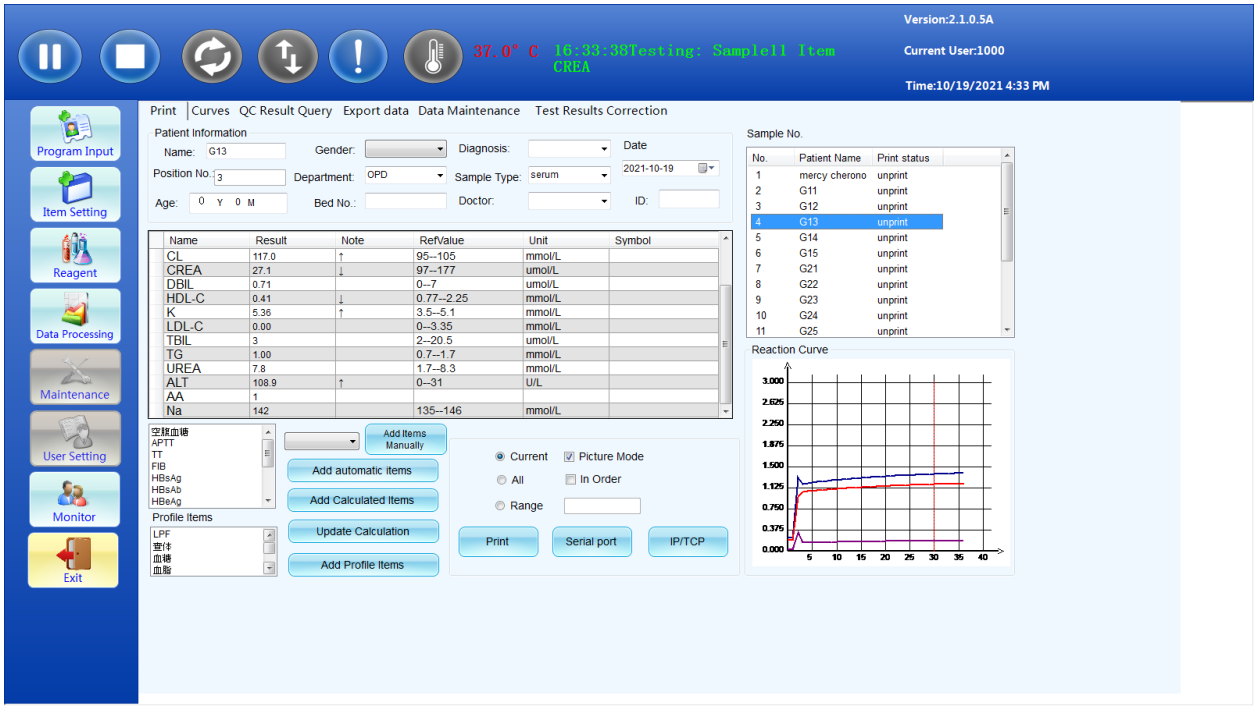
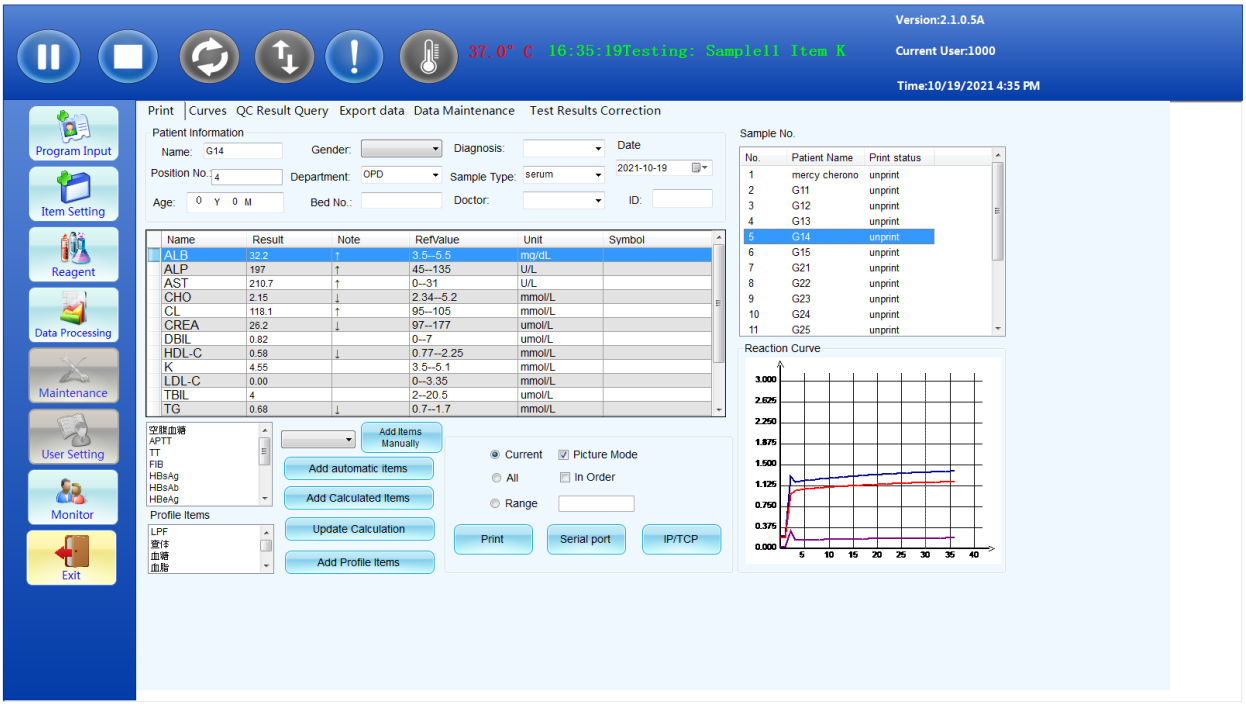
Current User:1000
Time:10/19/2021 4:31 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print Curves QC Result Query Export data Data Maintenance Test Results Correction
Patient Information
Name: G12
Gender:
Diagnosis:
Date
Position No.: 2
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
CL 108.7 ↑ 95--105 mmol/L
CREA 25.3 ↓ 97--177 umol/L
DBIL 0.48 0--7 umol/L
HDL-C 0.62 ↓ 0.77--2.25 mmol/L
K 5.57 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 4 2--20.5 umol/L
TG 0.85 0.7--1.7 mmol/L
UREA 7.3 1.7--8.3 mmol/L
ALT 128.4 ↑ 0--31 U/L
AA 1
Na 142 135--146 mmol/L
Sample No.
No. Patient Name Print status
1 mercy cherono unprint
2 G11 unprint
3 G12 unprint
4 G13 unprint
5 G14 unprint
6 G15 unprint
7 G21 unprint
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
蛮体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

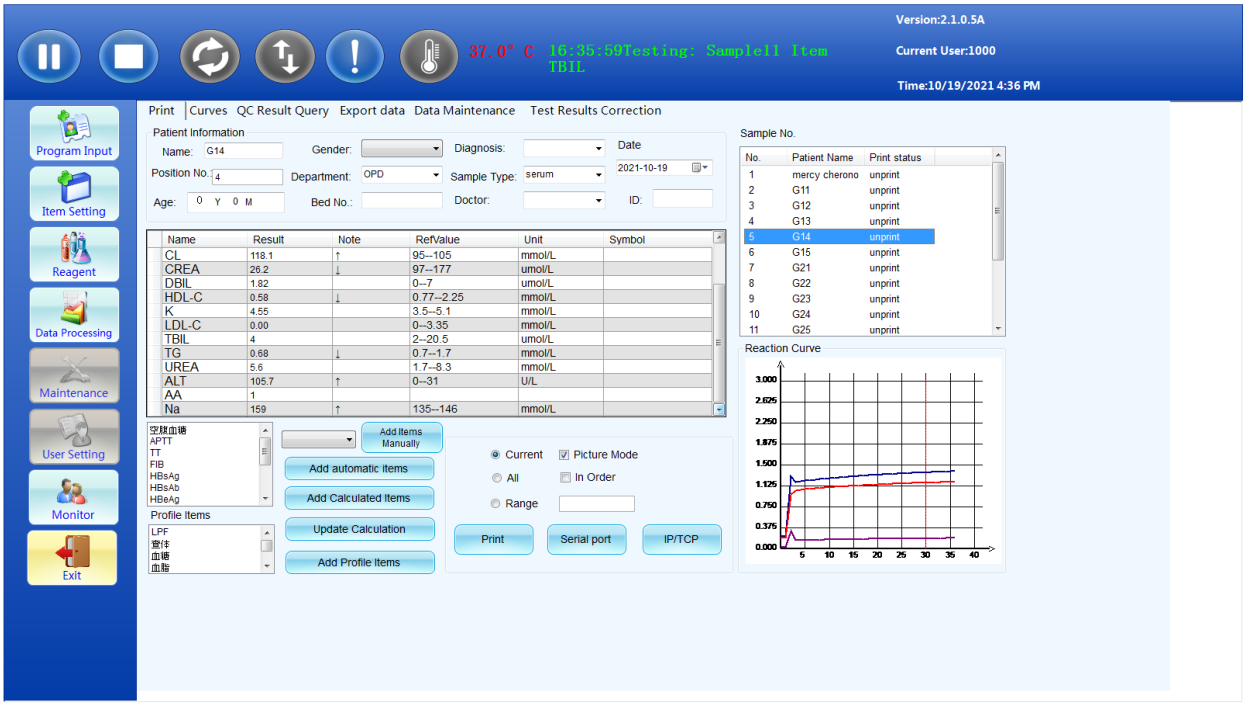
G13


Version:2.1.0.5A
37.0° C 16:33:18Testing: Sample11 Item CHO
Current User:1000
Time:10/19/2021 4:33 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print Curves QC Result Query Export data Data Maintenance Test Results Correction
Patient Information
Name: G13
Gender:
Diagnosis:
Date
Position No.: 3
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
ALB 32.4 ↑ 3.5--5.5 mg/dL
ALP 169 ↑ 45--135 U/L
AST 217.2 ↑ 0--31 U/L
CHO 1.66 ↓ 2.34--5.2 mmol/L
CL 117.0 ↑ 95--105 mmol/L
CREA 27.1 ↓ 97--177 umol/L
DBIL 0.71 0--7 umol/L
HDL-C 0.41 ↓ 0.77--2.25 mmol/L
K 5.36 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 3 2--20.5 umol/L
TG 1.00 0.7--1.7 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
蛋白
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Sample No.
No. Patient Name Print status
1 mercy cherono unprint
2 G11 unprint
3 G12 unprint
4 G13 unprint
5 G14 unprint
6 G15 unprint
7 G21 unprint
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

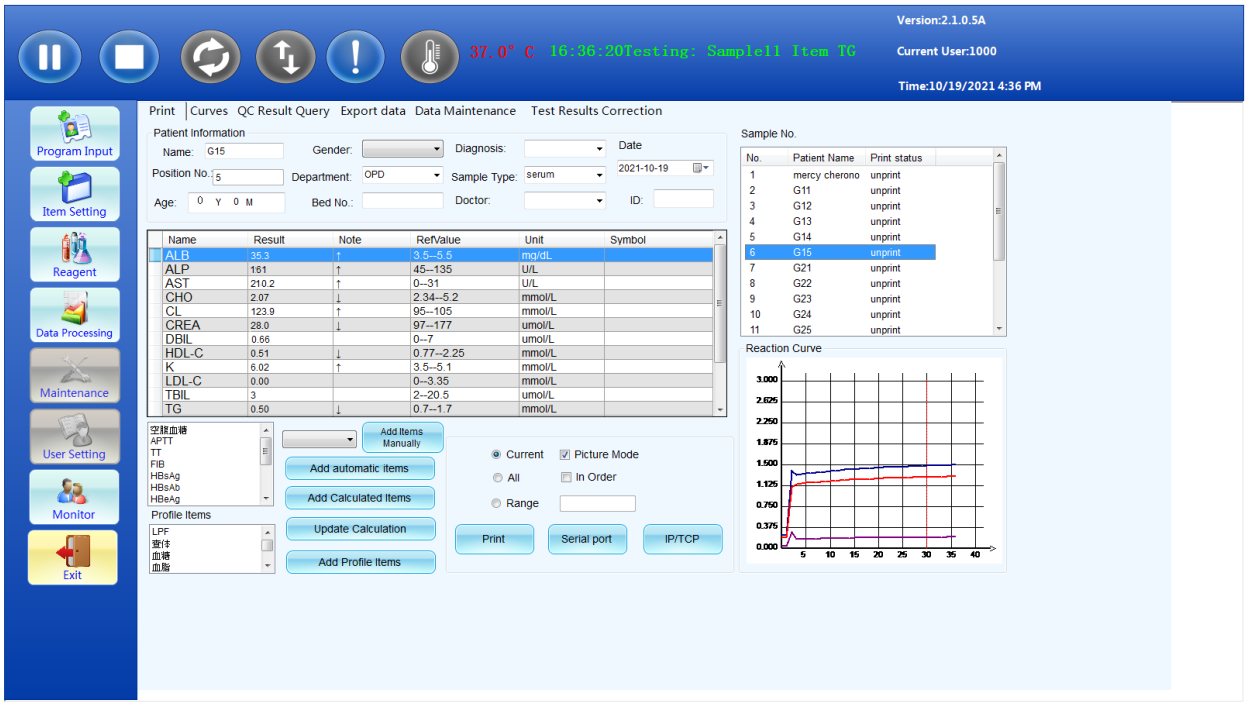

Version:2.1.0.5A
37.0° C 16:33:38Testing: Sample11 Item CREA
Current User:1000
Time:10/19/2021 4:33 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print Curves QC Result Query Export data Data Maintenance Test Results Correction
Patient Information
Name: G13
Gender:
Diagnosis:
Date
Position No.: 3
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
CL 117.0 ↑ 95--105 mmol/L
CREA 27.1 ↓ 97--177 umol/L
DBIL 0.71 0--7 umol/L
HDL-C 0.41 ↓ 0.77--2.25 mmol/L
K 5.36 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 3 2--20.5 umol/L
TG 1.00 0.7--1.7 mmol/L
UREA 7.8 1.7--8.3 mmol/L
ALT 108.9 ↑ 0--31 U/L
AA 1
Na 142 135--146 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
蛋白
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Sample No.
No. Patient Name Print status
1 mercy cherono unprint
2 G11 unprint
3 G12 unprint
4 G13 unprint
5 G14 unprint
6 G15 unprint
7 G21 unprint
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

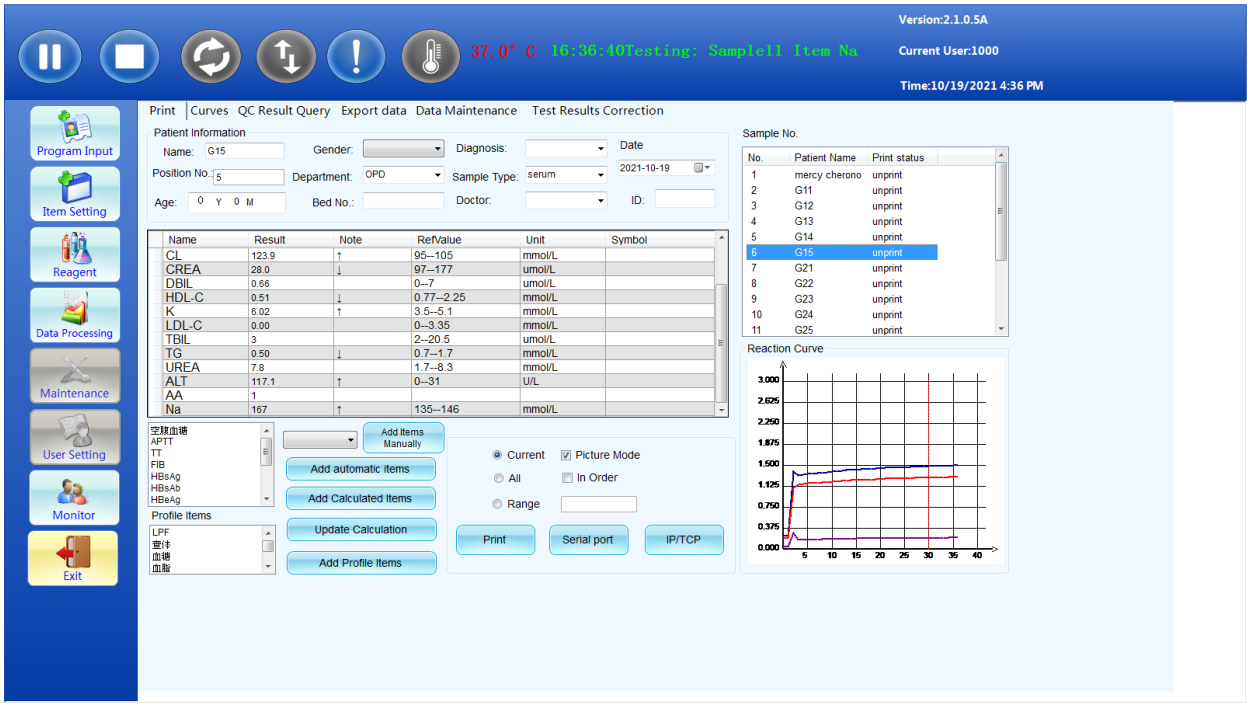
G14


Version:2.1.0.5A
Current User:1000
Time:10/19/2021 4:35 PM
37.0° C 16:35:19Testing: Sample11 Item K
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G14
Gender:
Diagnosis:
Date
Position No.: 4
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 mercy cherono unprint
2 G11 unprint
3 G12 unprint
4 G13 unprint
5 G14 unprint
6 G15 unprint
7 G21 unprint
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
Name Result Note RefValue Unit Symbol
ALB 32.2 ↑ 3.5--5.5 mg/dL
ALP 197 ↑ 45--135 U/L
AST 210.7 ↑ 0--31 U/L
CHO 2.15 ↓ 2.34--5.2 mmol/L
CL 118.1 ↑ 95--105 mmol/L
CREA 26.2 ↓ 97--177 umol/L
DBIL 0.82 0--7 umol/L
HDL-C 0.58 ↓ 0.77--2.25 mmol/L
K 4.55 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 4 2--20.5 umol/L
TG 0.68 ↓ 0.7--1.7 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
蛋白
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

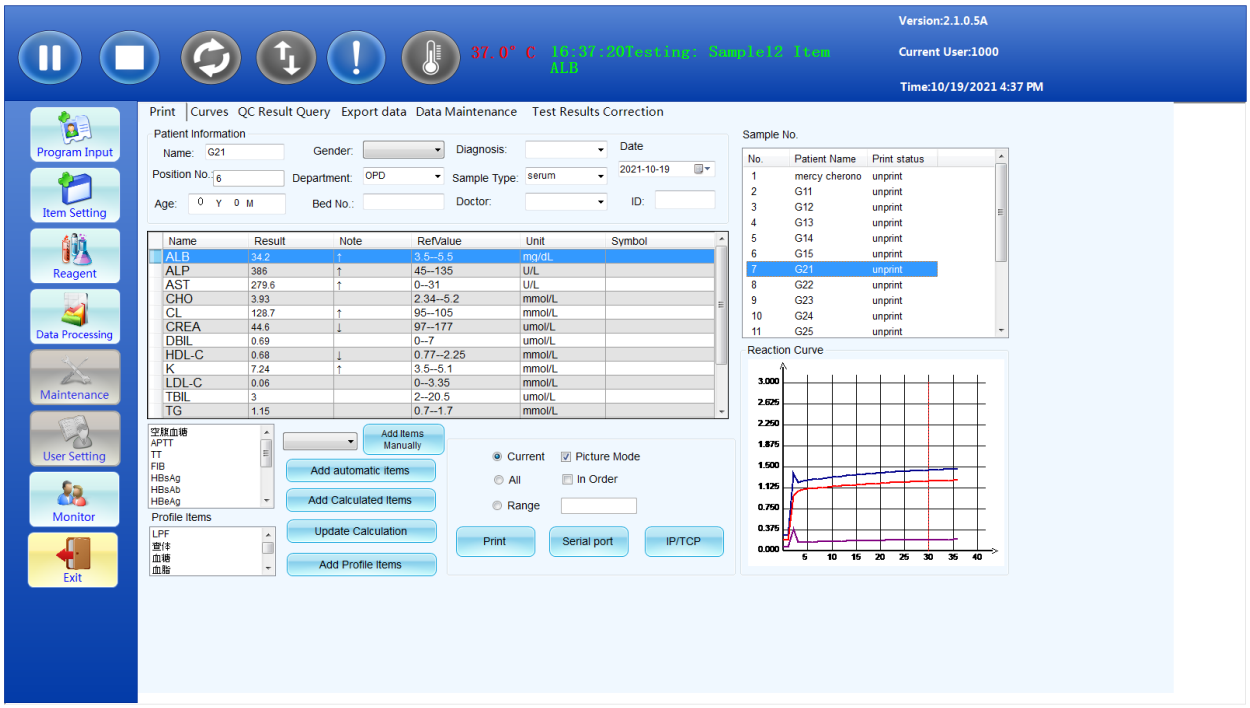

Version:2.1.0.5A
Current User:1000
Time:10/19/2021 4:36 PM
37.0° C 16:35:59Testing: Sample11 Item TBIL
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G14
Gender:
Diagnosis:
Date
Position No.: 4
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 mercy cherono unprint
2 G11 unprint
3 G12 unprint
4 G13 unprint
5 G14 unprint
6 G15 unprint
7 G21 unprint
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
Name Result Note RefValue Unit Symbol
CL 118.1 ↑ 95--105 mmol/L
CREA 26.2 ↓ 97--177 umol/L
DBIL 1.82 0--7 umol/L
HDL-C 0.58 ↓ 0.77--2.25 mmol/L
K 4.55 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 4 2--20.5 umol/L
TG 0.68 ↓ 0.7--1.7 mmol/L
UREA 5.6 1.7--8.3 mmol/L
ALT 105.7 ↑ 0--31 U/L
AA 1
Na 159 ↑ 135--146 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
蛋白
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

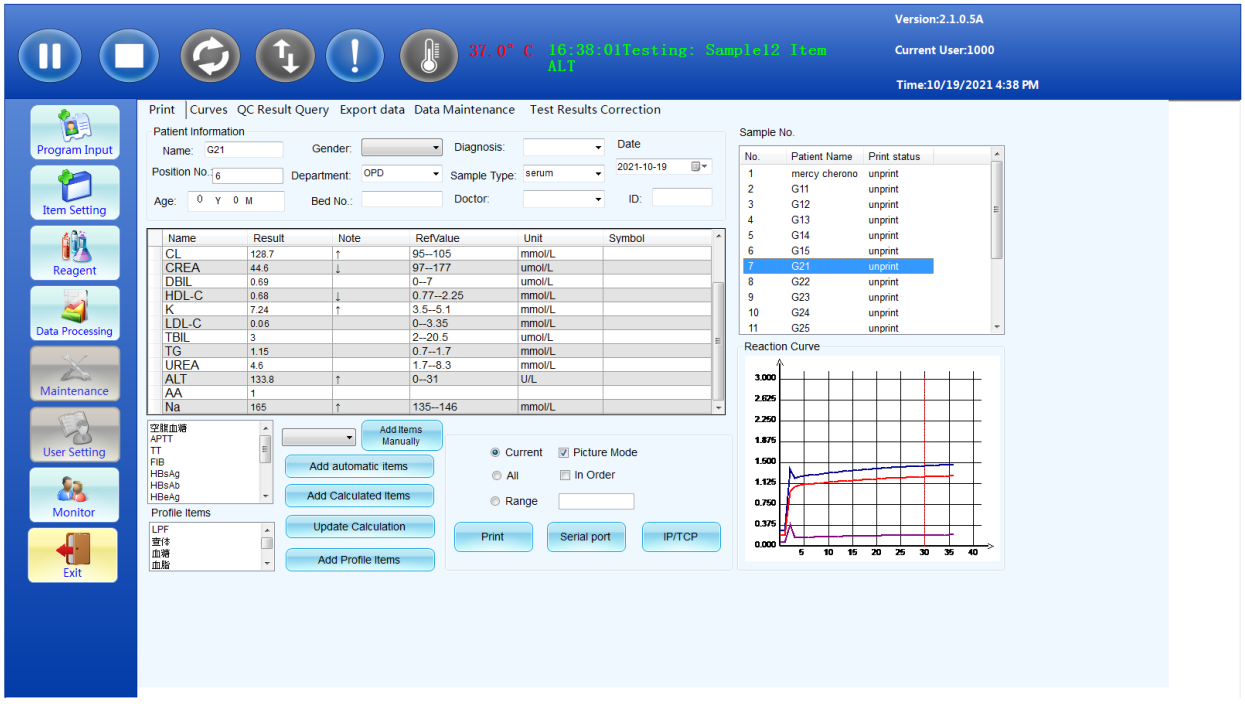
G15


Version:2.1.0.5A
37.0° C 16:36:20Testing: Sample11 Item TG
Current User:1000
Time:10/19/2021 4:36 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G15
Gender:
Diagnosis:
Date
Position No.: 5
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 mercy cherono unprint
2 G11 unprint
3 G12 unprint
4 G13 unprint
5 G14 unprint
6 G15 unprint
7 G21 unprint
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
Name Result Note RefValue Unit Symbol
ALB 35.3 ↑ 3.5--5.5 mg/dL
ALP 161 ↑ 45--135 U/L
AST 210.2 ↑ 0--31 U/L
CHO 2.07 ↓ 2.34--5.2 mmol/L
CL 123.9 ↑ 95--105 mmol/L
CREA 28.0 ↓ 97--177 umol/L
DBIL 0.66 0--7 umol/L
HDL-C 0.51 ↓ 0.77--2.25 mmol/L
K 6.02 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 3 2--20.5 umol/L
TG 0.50 ↓ 0.7--1.7 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

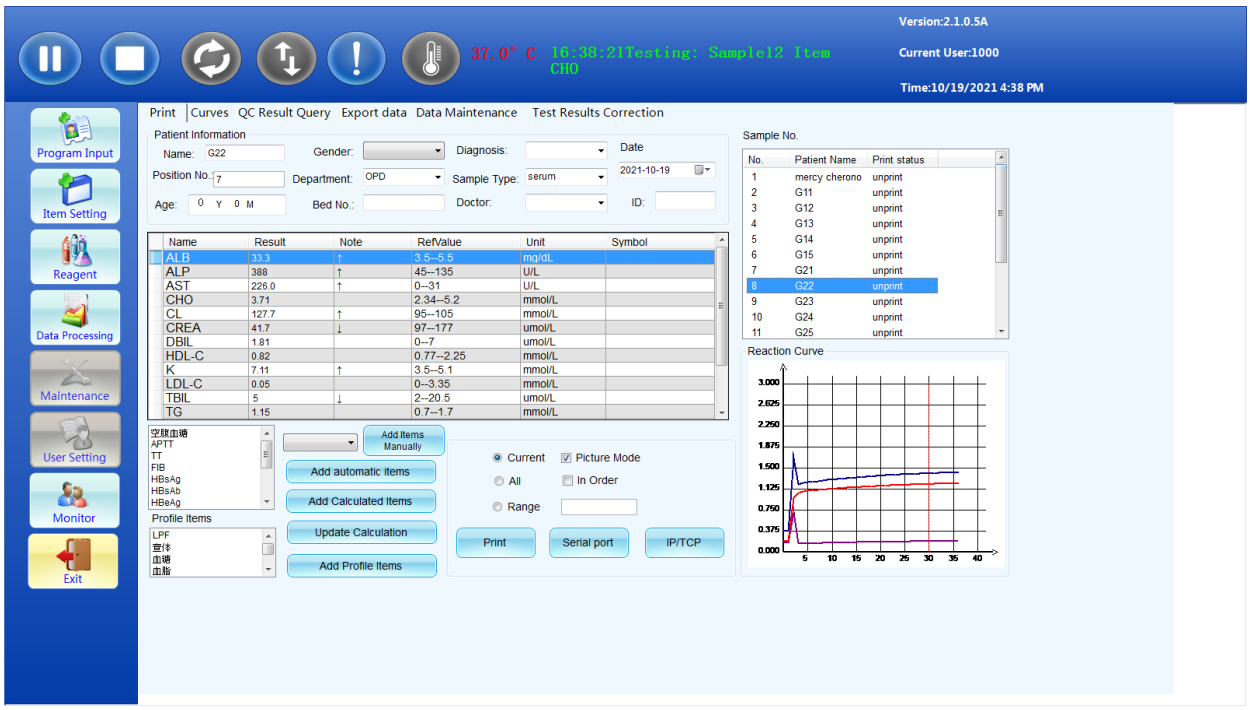

Version:2.1.0.5A
37.0° C 16:36:40Testing: Sample11 Item Na
Current User:1000
Time:10/19/2021 4:36 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G15
Gender:
Diagnosis:
Date
Position No.: 5
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 mercy cherono unprint
2 G11 unprint
3 G12 unprint
4 G13 unprint
5 G14 unprint
6 G15 unprint
7 G21 unprint
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
Name Result Note RefValue Unit Symbol
CL 123.9 ↑ 95--105 mmol/L
CREA 28.0 ↓ 97--177 umol/L
DBIL 0.66 0--7 umol/L
HDL-C 0.51 ↓ 0.77--2.25 mmol/L
K 6.02 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 3 2--20.5 umol/L
TG 0.50 ↓ 0.7--1.7 mmol/L
UREA 7.8 1.7--8.3 mmol/L
ALT 117.1 ↑ 0--31 U/L
AA 1
Na 167 ↑ 135--146 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

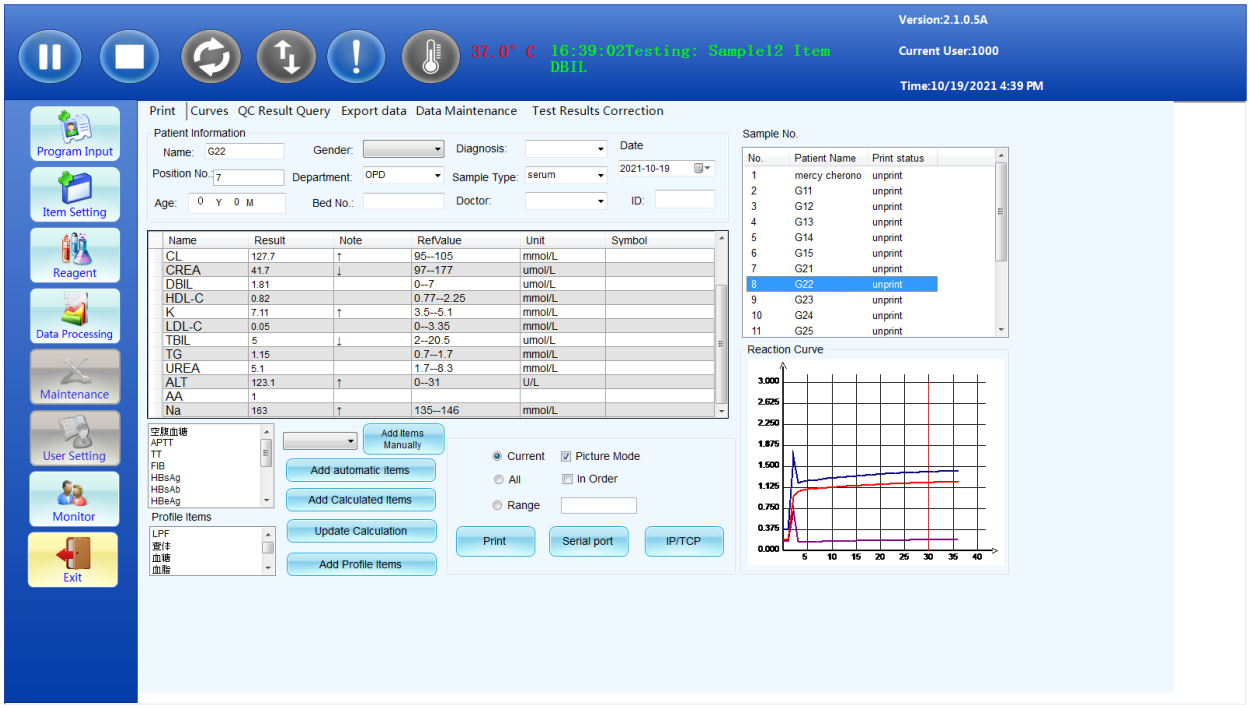
G21


37.0° C 16:37:20Testing: Sample12 Item ALB
Version:2.1.0.5A
Current User:1000
Time:10/19/2021 4:37 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G21
Gender:
Diagnosis:
Date
Position No.: 6
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 mercy cherono unprint
2 G11 unprint
3 G12 unprint
4 G13 unprint
5 G14 unprint
6 G15 unprint
7 G21 unprint
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
Name Result Note RefValue Unit Symbol
ALB 34.2 ↑ 3.5--5.5 mg/dL
ALP 386 ↑ 45--135 U/L
AST 279.6 ↑ 0--31 U/L
CHO 3.93 2.34--5.2 mmol/L
CL 128.7 ↑ 95--105 mmol/L
CREA 44.6 ↓ 97--177 umol/L
DBIL 0.69 0--7 umol/L
HDL-C 0.68 ↓ 0.77--2.25 mmol/L
K 7.24 ↑ 3.5--5.1 mmol/L
LDL-C 0.06 0--3.35 mmol/L
TBIL 3 2--20.5 umol/L
TG 1.15 0.7--1.7 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Profile Items
LPF
宣侏
血糖
血脂
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

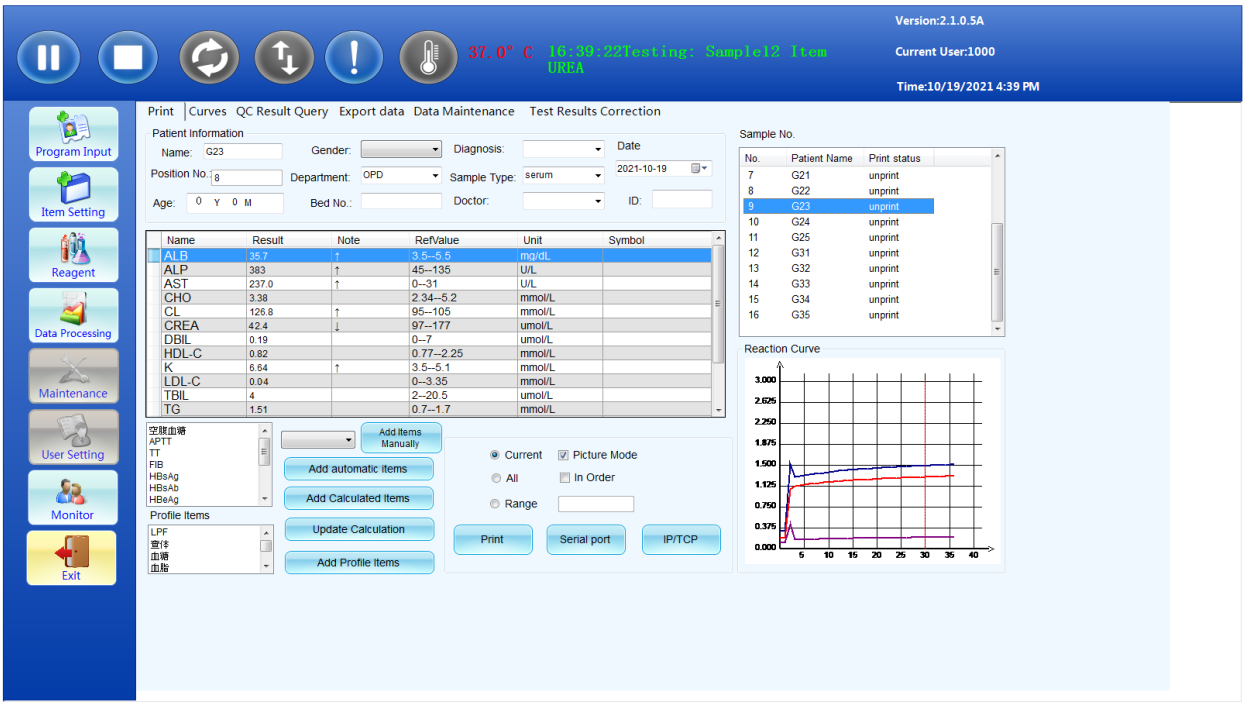

37.0° C 16:38:01Testing: Sample12 Item ALT
Version:2.1.0.5A
Current User:1000
Time:10/19/2021 4:38 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G21
Gender:
Diagnosis:
Date
Position No.: 6
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 mercy cherono unprint
2 G11 unprint
3 G12 unprint
4 G13 unprint
5 G14 unprint
6 G15 unprint
7 G21 unprint
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
Name Result Note RefValue Unit Symbol
CL 128.7 ↑ 95--105 mmol/L
CREA 44.6 ↓ 97--177 umol/L
DBIL 0.69 0--7 umol/L
HDL-C 0.68 ↓ 0.77--2.25 mmol/L
K 7.24 ↑ 3.5--5.1 mmol/L
LDL-C 0.06 0--3.35 mmol/L
TBIL 3 2--20.5 umol/L
TG 1.15 0.7--1.7 mmol/L
UREA 4.6 1.7--8.3 mmol/L
ALT 133.8 ↑ 0--31 U/L
AA 1
Na 165 ↑ 135--146 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Profile Items
LPF
宣侏
血糖
血脂
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

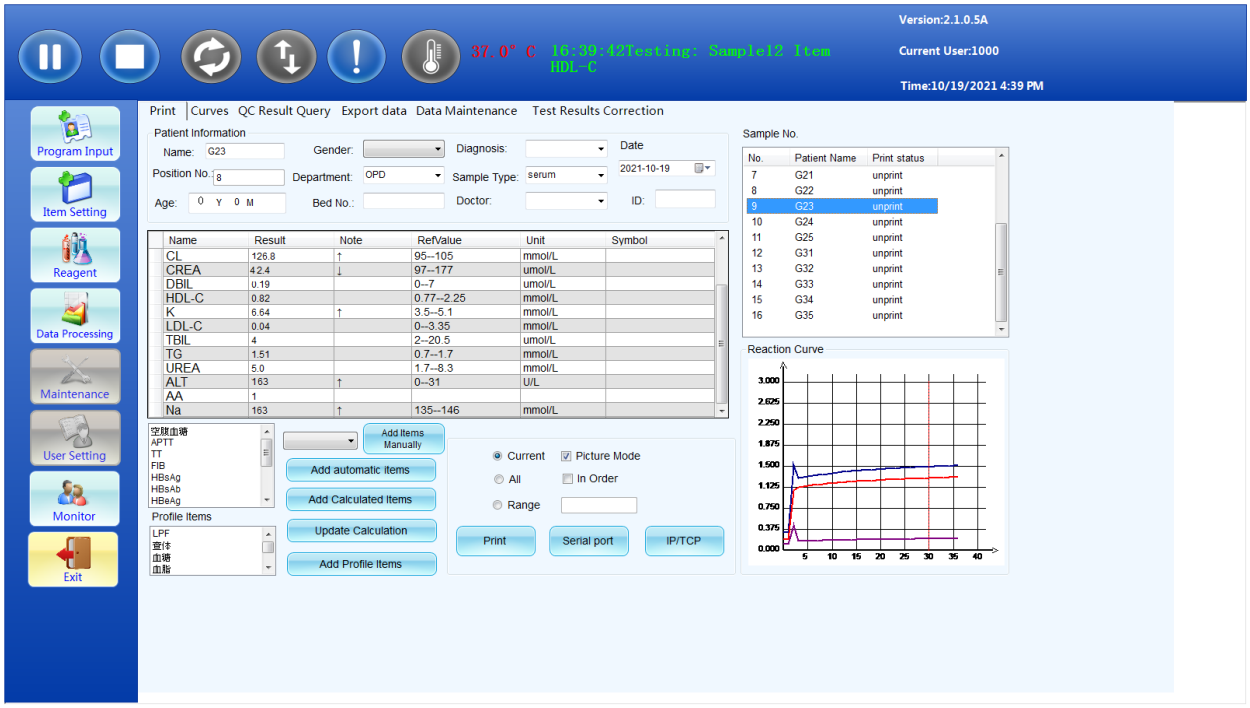
G22


37.0° C 16:38:21Testing: Sample12 Item CHO
Version:2.1.0.5A
Current User:1000
Time:10/19/2021 4:38 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G22
Gender:
Diagnosis:
Date
Position No.: 7
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
ALB 33.3 ↑ 3.5--5.5 mg/dL
ALP 388 ↑ 45--135 U/L
AST 226.0 ↑ 0--31 U/L
CHO 3.71 2.34--5.2 mmol/L
CL 127.7 ↑ 95--105 mmol/L
CREA 41.7 ↓ 97--177 umol/L
DBIL 1.81 0--7 umol/L
HDL-C 0.82 0.77--2.25 mmol/L
K 7.11 ↑ 3.5--5.1 mmol/L
LDL-C 0.05 0--3.35 mmol/L
TBIL 5 ↓ 2--20.5 umol/L
TG 1.15 0.7--1.7 mmol/L
Sample No.
No. Patient Name Print status
1 mercy cherono unprint
2 G11 unprint
3 G12 unprint
4 G13 unprint
5 G14 unprint
6 G15 unprint
7 G21 unprint
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Profile Items
LPF
查体
血糖
血脂
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

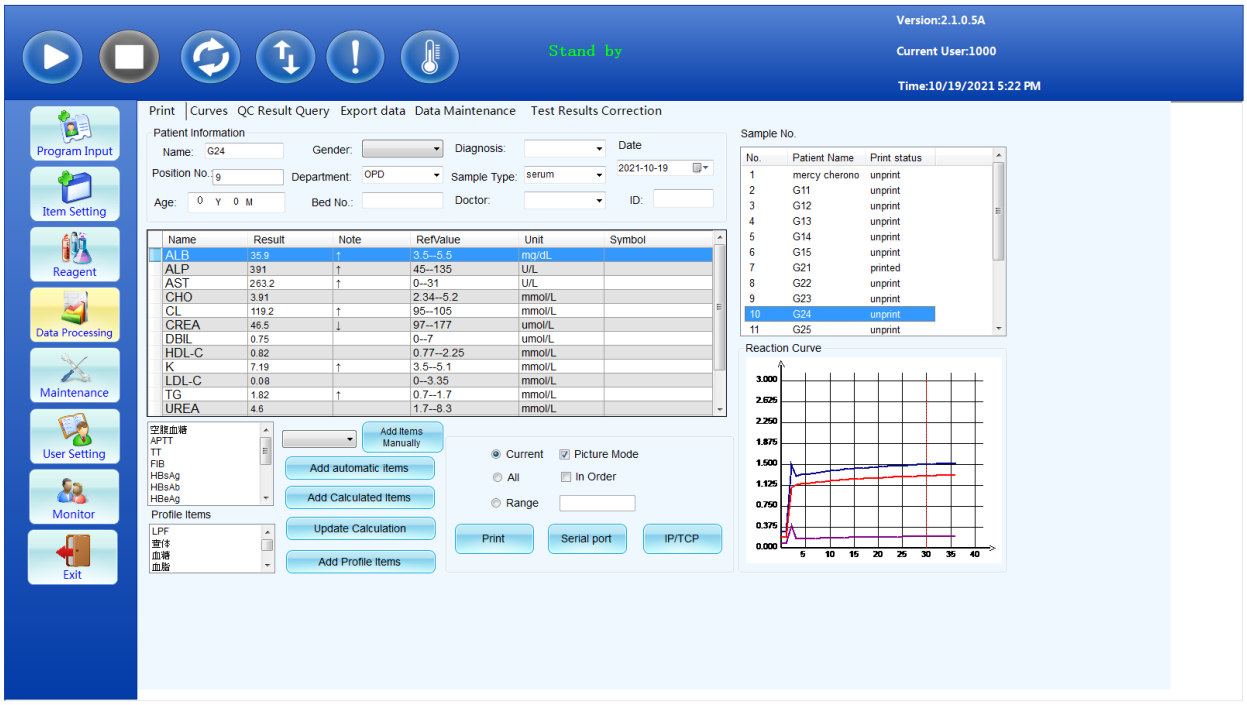

37.0° C 16:39:02Testing: Sample12 Item DBIL
Version:2.1.0.5A
Current User:1000
Time:10/19/2021 4:39 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G22
Gender:
Diagnosis:
Date
Position No.: 7
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
CL 127.7 ↑ 95--105 mmol/L
CREA 41.7 ↓ 97--177 umol/L
DBIL 1.81 0--7 umol/L
HDL-C 0.82 0.77--2.25 mmol/L
K 7.11 ↑ 3.5--5.1 mmol/L
LDL-C 0.05 0--3.35 mmol/L
TBIL 5 ↓ 2--20.5 umol/L
TG 1.15 0.7--1.7 mmol/L
UREA 5.1 1.7--8.3 mmol/L
ALT 123.1 ↑ 0--31 U/L
AA 1
Na 163 ↑ 135--146 mmol/L
Sample No.
No. Patient Name Print status
1 mercy cherono unprint
2 G11 unprint
3 G12 unprint
4 G13 unprint
5 G14 unprint
6 G15 unprint
7 G21 unprint
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Profile Items
LPF
查体
血糖
血脂
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

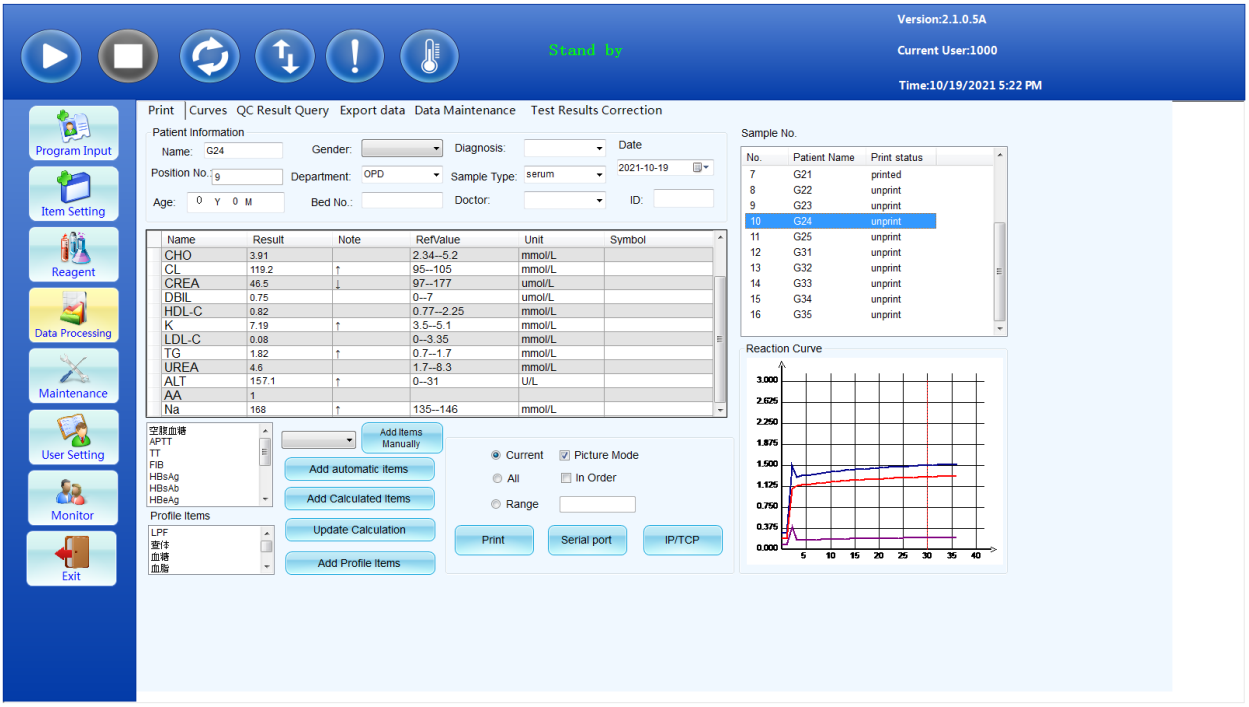
G23


37.0° C 16:39:22Testing: Sample12 Item UREA
Version:2.1.0.5A
Current User:1000
Time:10/19/2021 4:39 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G23
Gender:
Diagnosis:
Date
Position No.: 8
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
7 G21 unprint
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
12 G31 unprint
13 G32 unprint
14 G33 unprint
15 G34 unprint
16 G35 unprint
Name Result Note RefValue Unit Symbol
ALB 35.7 ↑ 3.5--5.5 mg/dL
ALP 383 ↑ 45--135 U/L
AST 237.0 ↑ 0--31 U/L
CHO 3.38 2.34--5.2 mmol/L
CL 126.8 ↑ 95--105 mmol/L
CREA 42.4 ↓ 97--177 umol/L
DBIL 0.19 0--7 umol/L
HDL-C 0.82 0.77--2.25 mmol/L
K 6.64 ↑ 3.5--5.1 mmol/L
LDL-C 0.04 0--3.35 mmol/L
TBIL 4 2--20.5 umol/L
TG 1.51 0.7--1.7 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Profile Items
LPF
查体
血糖
血脂
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

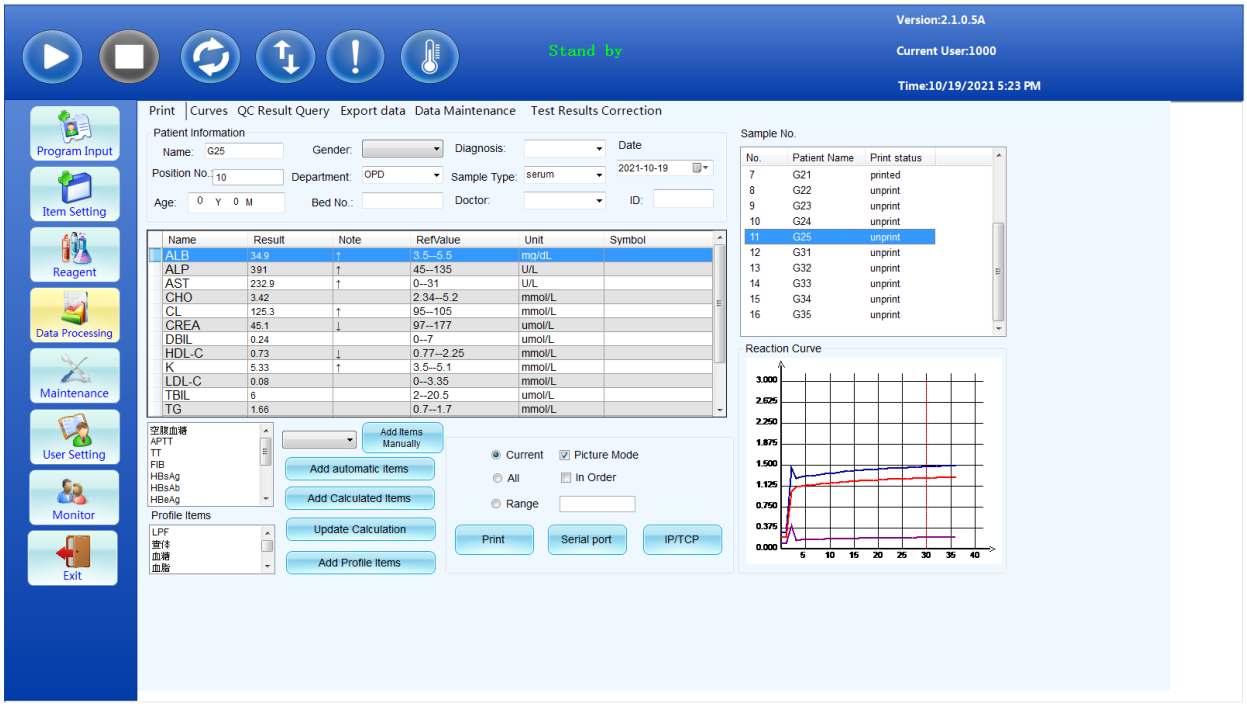

37.0° C 16:39:42Testing: Sample12 Item HDL-C
Version:2.1.0.5A
Current User:1000
Time:10/19/2021 4:39 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G23
Gender:
Diagnosis:
Date
Position No.: 8
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
7 G21 unprint
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
12 G31 unprint
13 G32 unprint
14 G33 unprint
15 G34 unprint
16 G35 unprint
Name Result Note RefValue Unit Symbol
CL 126.8 ↑ 95--105 mmol/L
CREA 42.4 ↓ 97--177 umol/L
DBIL 0.19 0--7 umol/L
HDL-C 0.82 0.77--2.25 mmol/L
K 6.64 ↑ 3.5--5.1 mmol/L
LDL-C 0.04 0--3.35 mmol/L
TBIL 4 2--20.5 umol/L
TG 1.51 0.7--1.7 mmol/L
UREA 5.0 1.7--8.3 mmol/L
ALT 163 ↑ 0--31 U/L
AA 1
Na 163 ↑ 135--146 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Profile Items
LPF
查体
血糖
血脂
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

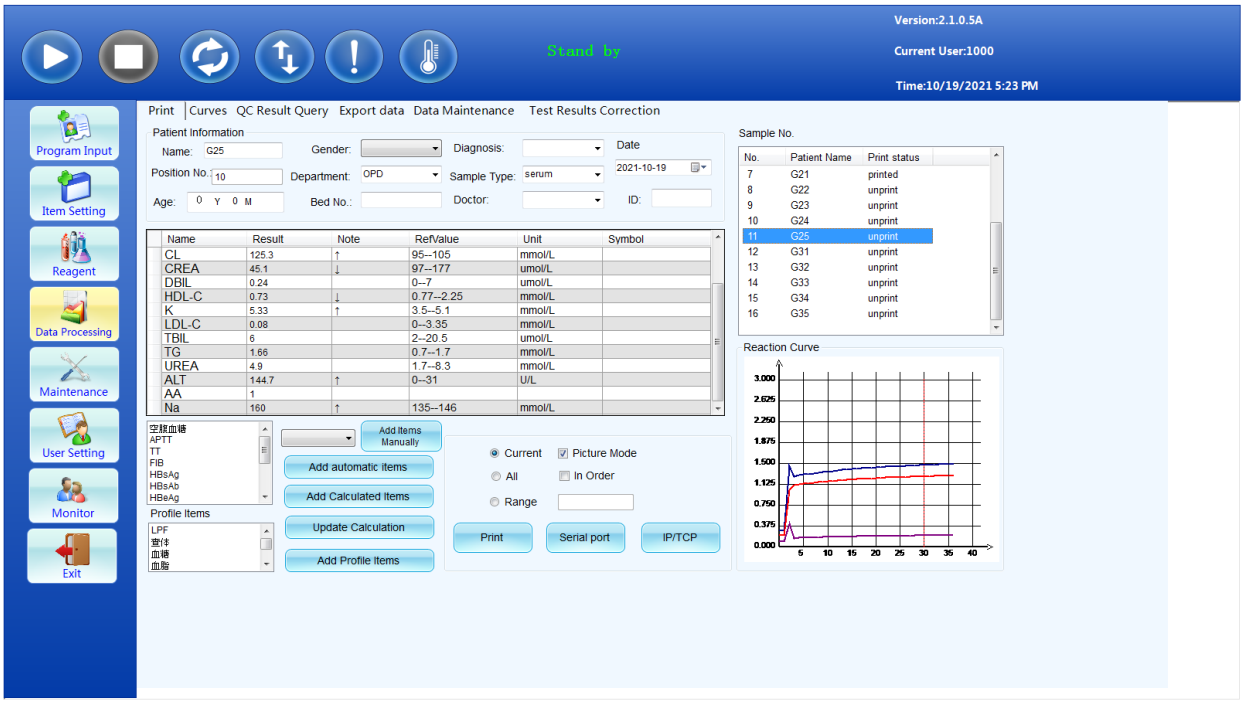
G24


Stand by
Version:2.1.0.5A
Current User:1000
Time:10/19/2021 5:22 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G24
Gender:
Diagnosis:
Date
Position No.: 9
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
ALB 35.9 ↑ 3.5--5.5 mg/dL
ALP 391 ↑ 45--135 U/L
AST 263.2 ↑ 0--31 U/L
CHO 3.91 2.34--5.2 mmol/L
CL 119.2 ↑ 95--105 mmol/L
CREA 46.5 ↓ 97--177 umol/L
DBIL 0.75 0--7 umol/L
HDL-C 0.82 0.77--2.25 mmol/L
K 7.19 ↑ 3.5--5.1 mmol/L
LDL-C 0.08 0--3.35 mmol/L
TG 1.82 ↑ 0.7--1.7 mmol/L
UREA 4.6 1.7--8.3 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Profile Items
LPF
查体
血糖
血脂
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Sample No.
No. Patient Name Print status
1 mercy cherono unprint
2 G11 unprint
3 G12 unprint
4 G13 unprint
5 G14 unprint
6 G15 unprint
7 G21 printed
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

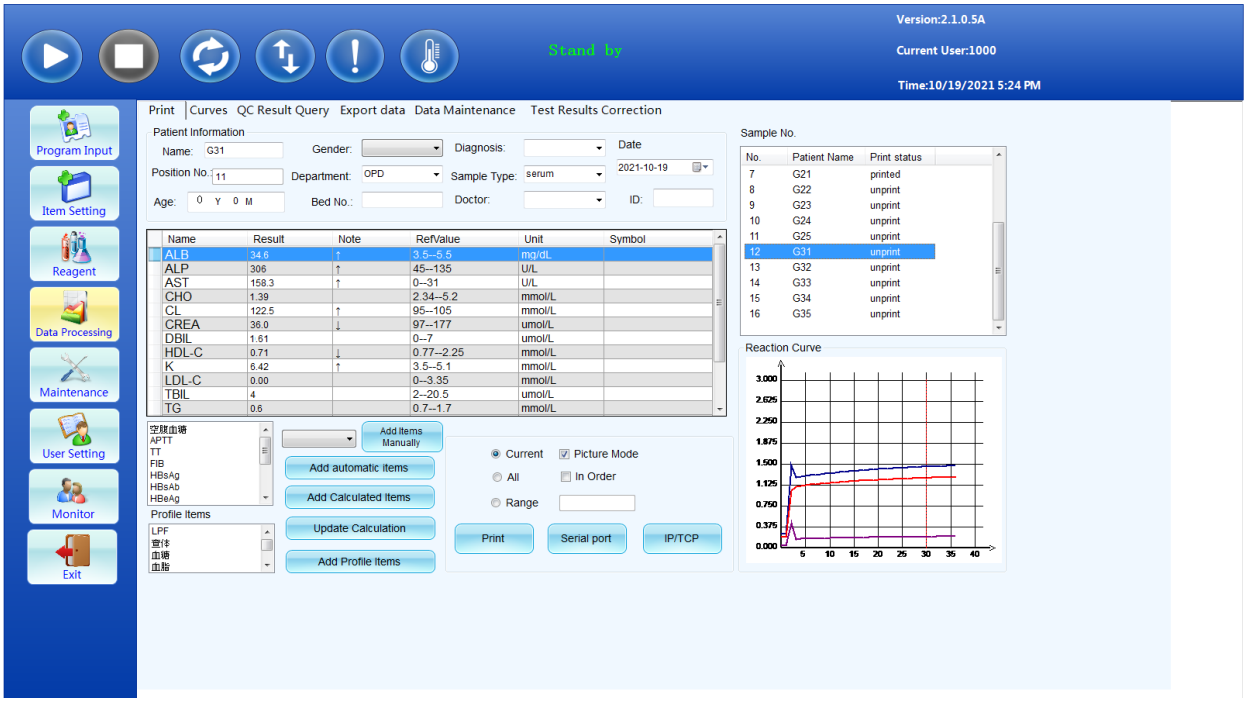

Stand by
Version:2.1.0.5A
Current User:1000
Time:10/19/2021 5:22 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G24
Gender:
Diagnosis:
Date
Position No.: 9
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
CHO 3.91 2.34--5.2 mmol/L
CL 119.2 ↑ 95--105 mmol/L
CREA 46.5 ↓ 97--177 umol/L
DBIL 0.75 0--7 umol/L
HDL-C 0.82 0.77--2.25 mmol/L
K 7.19 ↑ 3.5--5.1 mmol/L
LDL-C 0.08 0--3.35 mmol/L
TG 1.82 ↑ 0.7--1.7 mmol/L
UREA 4.6 1.7--8.3 mmol/L
ALT 157.1 ↑ 0--31 U/L
AA 1
Na 168 ↑ 135--146 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Profile Items
LPF
查体
血糖
血脂
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Sample No.
No. Patient Name Print status
7 G21 printed
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
12 G31 unprint
13 G32 unprint
14 G33 unprint
15 G34 unprint
16 G35 unprint
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

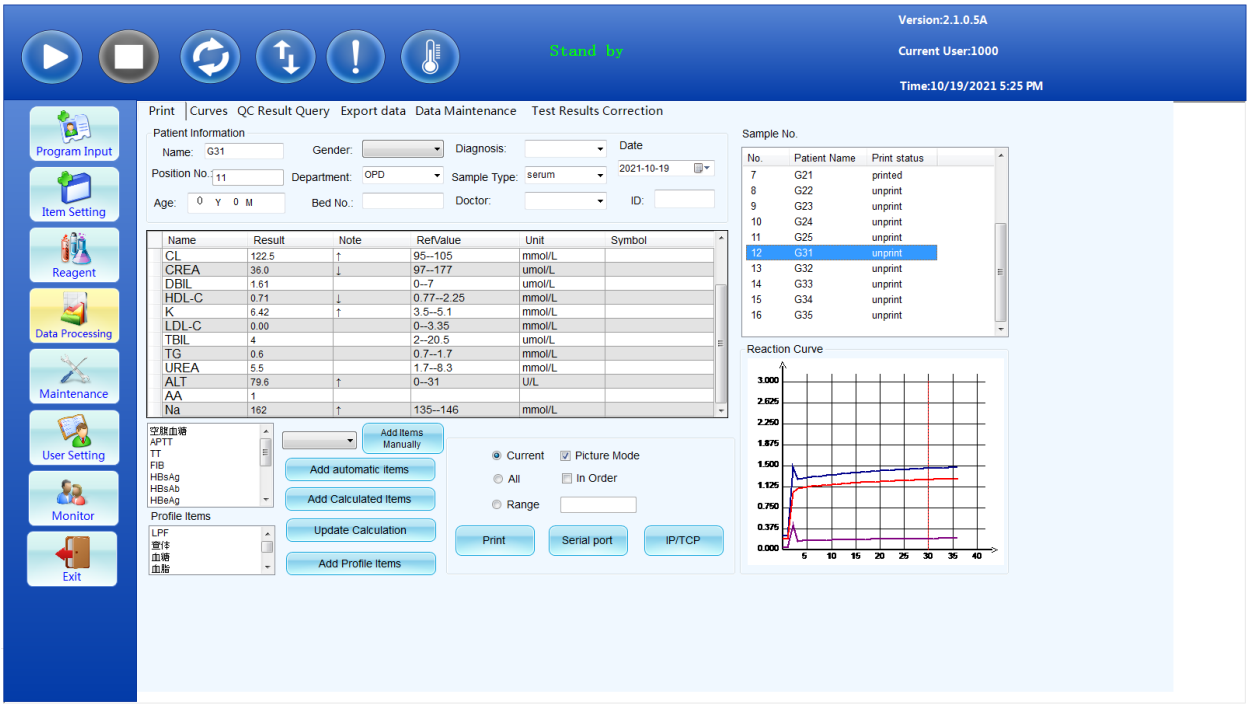
G25


Stand by
Version:2.1.0.5A
Current User:1000
Time:10/19/2021 5:23 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G25
Gender:
Diagnosis:
Date
Position No.: 10
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
ALB 34.9 ↑ 3.5--5.5 mg/dL
ALP 391 ↑ 45--135 U/L
AST 232.9 ↑ 0--31 U/L
CHO 3.42 2.34--5.2 mmol/L
CL 125.3 ↑ 95--105 mmol/L
CREA 45.1 ↓ 97--177 umol/L
DBIL 0.24 0--7 umol/L
HDL-C 0.73 ↓ 0.77--2.25 mmol/L
K 5.33 ↑ 3.5--5.1 mmol/L
LDL-C 0.08 0--3.35 mmol/L
TBIL 6 2--20.5 umol/L
TG 1.66 0.7--1.7 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Profile Items
LPF
宣伟
血糖
血脂
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Sample No.
No. Patient Name Print status
7 G21 printed
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
12 G31 unprint
13 G32 unprint
14 G33 unprint
15 G34 unprint
16 G35 unprint
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

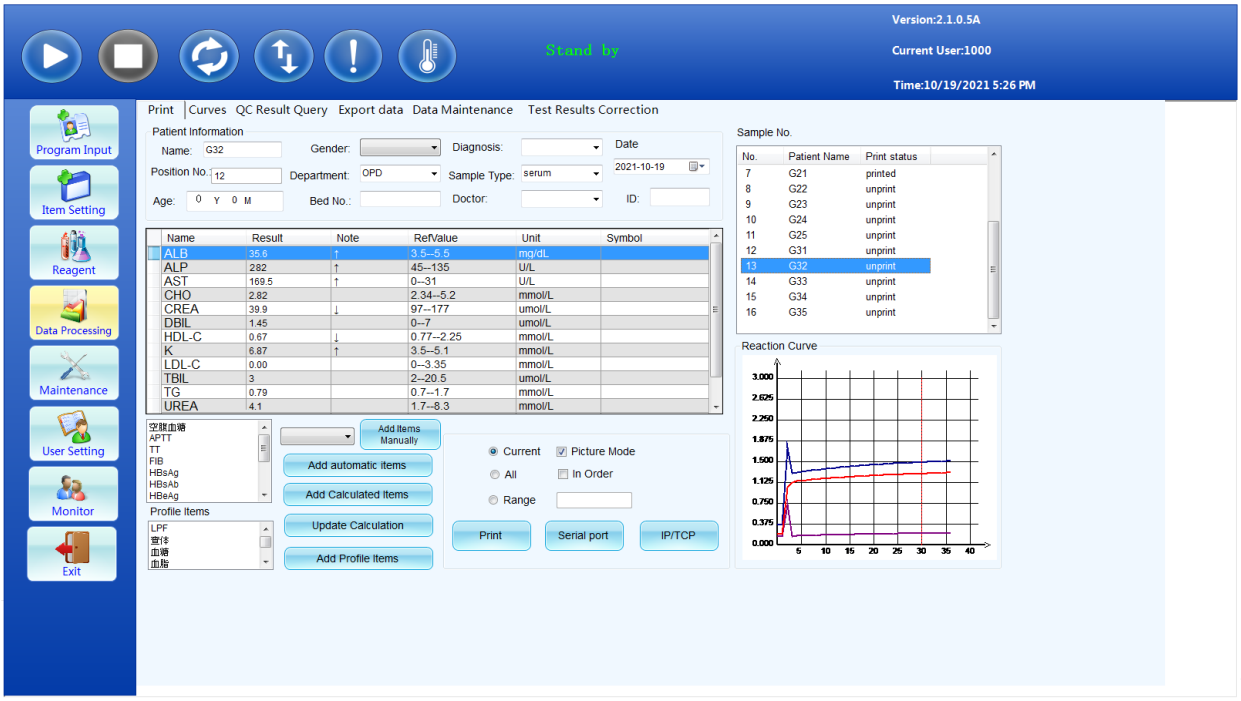

Stand by
Version:2.1.0.5A
Current User:1000
Time:10/19/2021 5:23 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G25
Gender:
Diagnosis:
Date
Position No.: 10
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
CL 125.3 ↑ 95--105 mmol/L
CREA 45.1 ↓ 97--177 umol/L
DBIL 0.24 0--7 umol/L
HDL-C 0.73 ↓ 0.77--2.25 mmol/L
K 5.33 ↑ 3.5--5.1 mmol/L
LDL-C 0.08 0--3.35 mmol/L
TBIL 6 2--20.5 umol/L
TG 1.66 0.7--1.7 mmol/L
UREA 4.9 1.7--8.3 mmol/L
ALT 144.7 ↑ 0--31 U/L
AA 1
Na 160 ↑ 135--146 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Profile Items
LPF
宣伟
血糖
血脂
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Sample No.
No. Patient Name Print status
7 G21 printed
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
12 G31 unprint
13 G32 unprint
14 G33 unprint
15 G34 unprint
16 G35 unprint
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

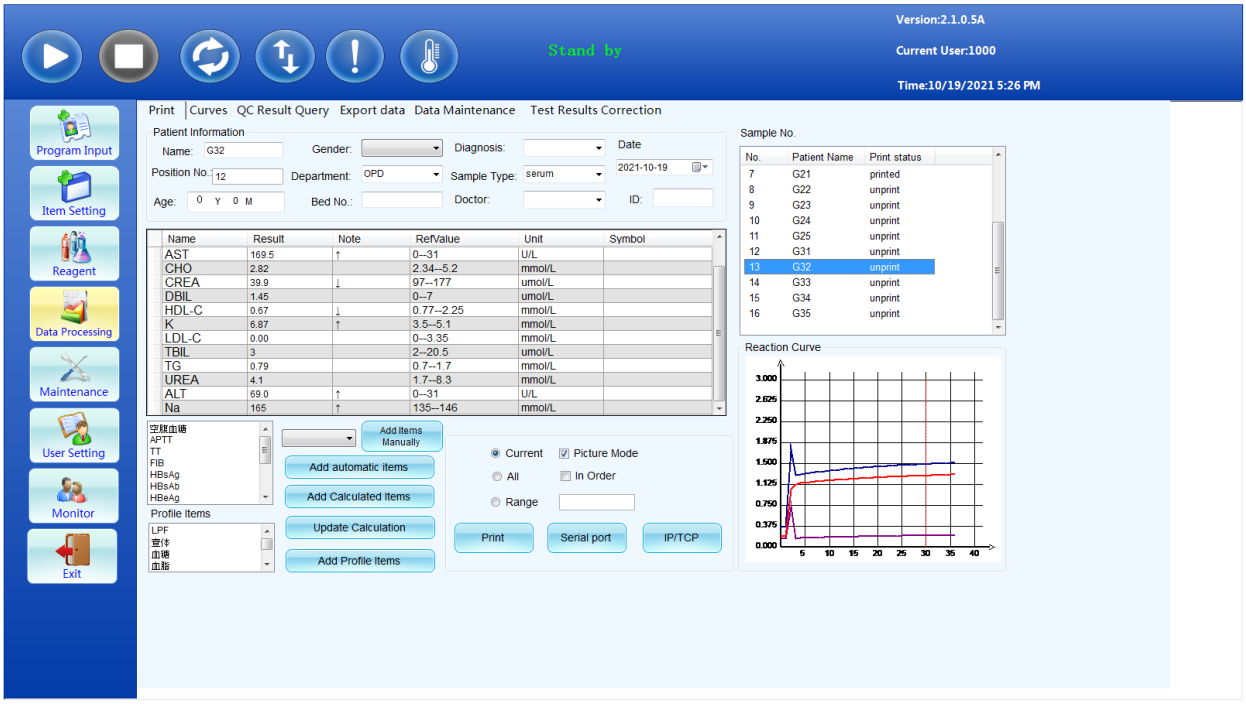
G31


Stand by
Version:2.1.0.5A
Current User:1000
Time:10/19/2021 5:24 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G31
Gender:
Diagnosis:
Date
Position No.: 11
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
ALB 34.6 ↑ 3.5--5.5 mg/dL
ALP 306 ↑ 45--135 U/L
AST 158.3 ↑ 0--31 U/L
CHO 1.39 2.34--5.2 mmol/L
CL 122.5 ↑ 95--105 mmol/L
CREA 36.0 ↓ 97--177 umol/L
DBIL 1.61 0--7 umol/L
HDL-C 0.71 ↓ 0.77--2.25 mmol/L
K 6.42 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 4 2--20.5 umol/L
TG 0.6 0.7--1.7 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Profile Items
LPF
宣伟
血糖
血脂
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Sample No.
No. Patient Name Print status
7 G21 printed
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
12 G31 unprint
13 G32 unprint
14 G33 unprint
15 G34 unprint
16 G35 unprint
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

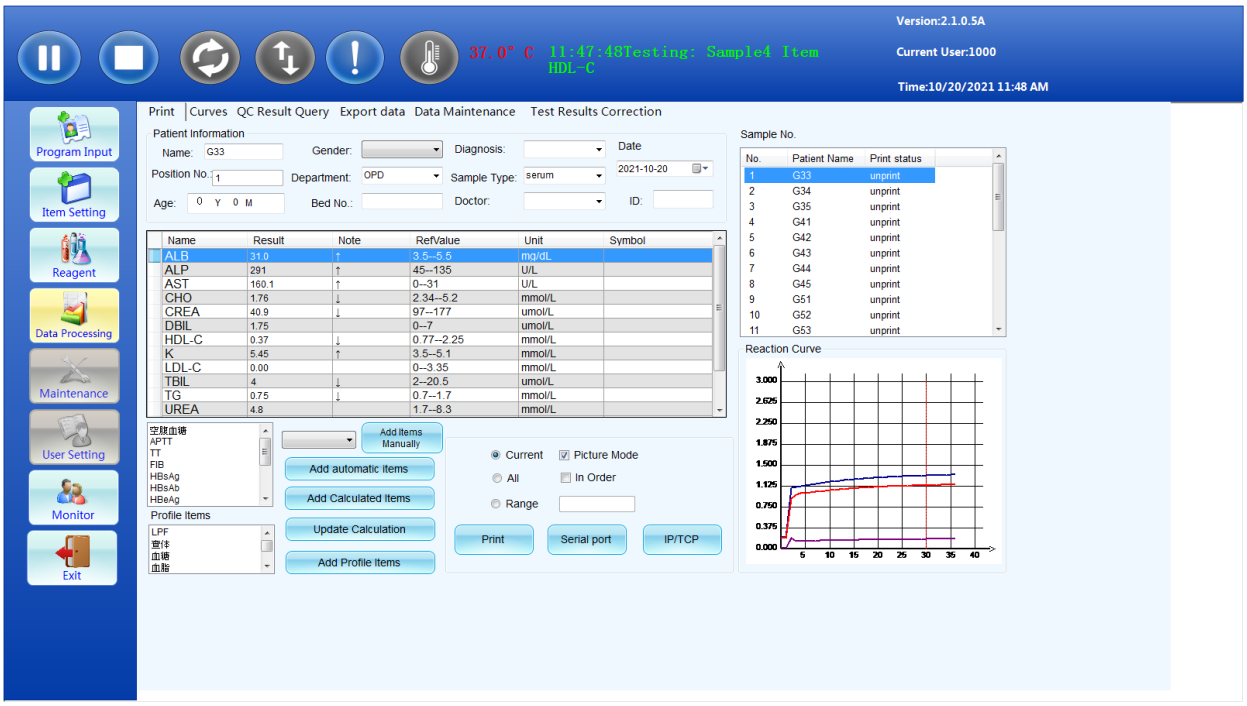

Stand by
Version:2.1.0.5A
Current User:1000
Time:10/19/2021 5:25 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G31
Gender:
Diagnosis:
Date
Position No.: 11
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
CL 122.5 ↑ 95--105 mmol/L
CREA 36.0 ↓ 97--177 umol/L
DBIL 1.61 0--7 umol/L
HDL-C 0.71 ↓ 0.77--2.25 mmol/L
K 6.42 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 4 2--20.5 umol/L
TG 0.6 0.7--1.7 mmol/L
UREA 5.5 1.7--8.3 mmol/L
ALT 79.6 ↑ 0--31 U/L
AA 1
Na 162 ↑ 135--146 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Profile Items
LPF
宣伟
血糖
血脂
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Sample No.
No. Patient Name Print status
7 G21 printed
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
12 G31 unprint
13 G32 unprint
14 G33 unprint
15 G34 unprint
16 G35 unprint
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

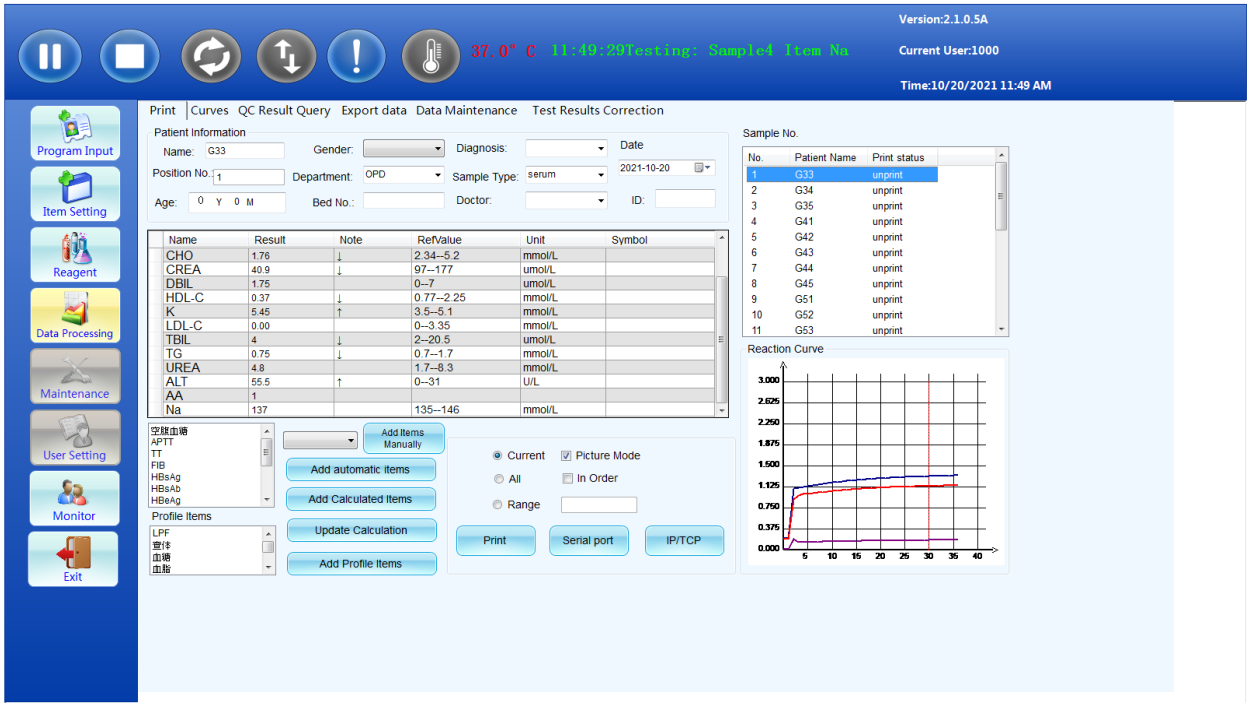
G32


Stand by
Version:2.1.0.5A
Current User:1000
Time:10/19/2021 5:26 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G32
Gender:
Diagnosis:
Date
Position No.: 12
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
ALB 35.6 ↑ 3.5--5.5 mg/dL
ALP 282 ↑ 45--135 U/L
AST 169.5 ↑ 0--31 U/L
CHO 2.82 2.34--5.2 mmol/L
CREA 39.9 ↓ 97--177 umol/L
DBIL 1.45 0--7 umol/L
HDL-C 0.67 ↓ 0.77--2.25 mmol/L
K 6.87 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 3 2--20.5 umol/L
TG 0.79 0.7--1.7 mmol/L
UREA 4.1 1.7--8.3 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
宣伴
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Sample No.
No. Patient Name Print status
7 G21 printed
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
12 G31 unprint
13 G32 unprint
14 G33 unprint
15 G34 unprint
16 G35 unprint
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

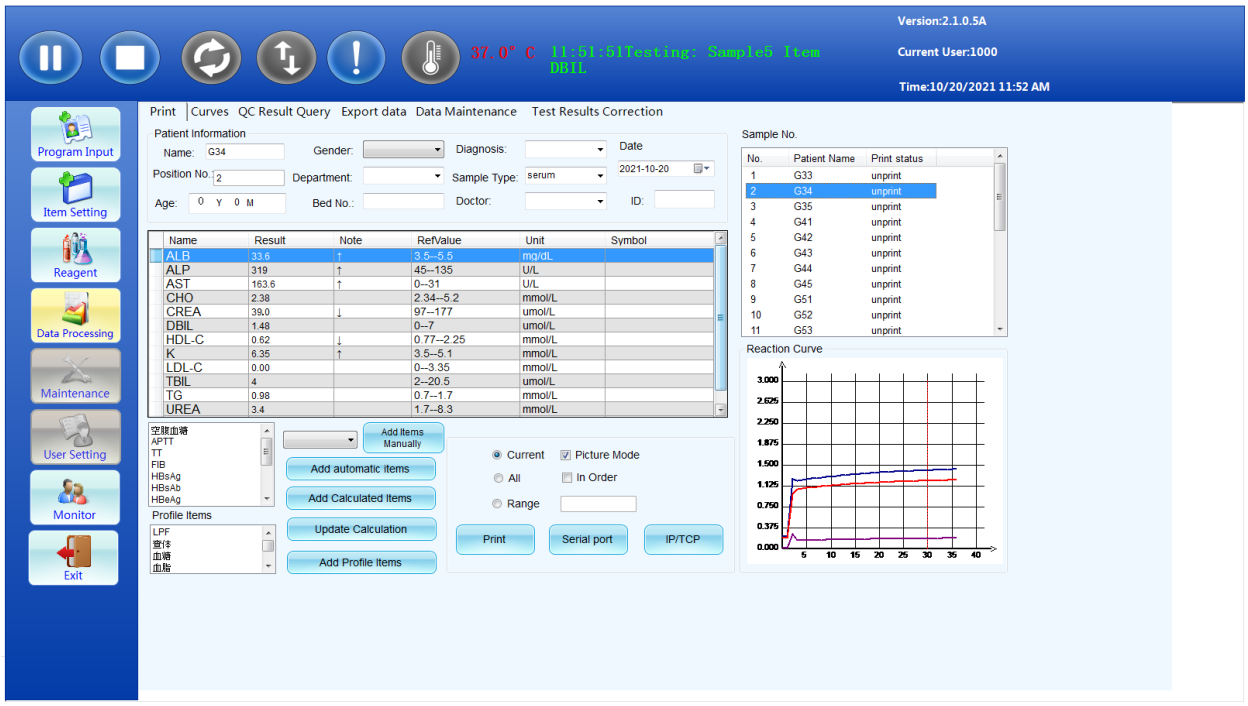

Stand by
Version:2.1.0.5A
Current User:1000
Time:10/19/2021 5:26 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G32
Gender:
Diagnosis:
Date
Position No.: 12
Department: OPD
Sample Type: serum
2021-10-19
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
AST 169.5 ↑ 0--31 U/L
CHO 2.82 2.34--5.2 mmol/L
CREA 39.9 ↓ 97--177 umol/L
DBIL 1.45 0--7 umol/L
HDL-C 0.67 ↓ 0.77--2.25 mmol/L
K 6.87 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 3 2--20.5 umol/L
TG 0.79 0.7--1.7 mmol/L
UREA 4.1 1.7--8.3 mmol/L
ALT 69.0 ↑ 0--31 U/L
Na 165 ↑ 135--146 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
宣伴
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Sample No.
No. Patient Name Print status
7 G21 printed
8 G22 unprint
9 G23 unprint
10 G24 unprint
11 G25 unprint
12 G31 unprint
13 G32 unprint
14 G33 unprint
15 G34 unprint
16 G35 unprint
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

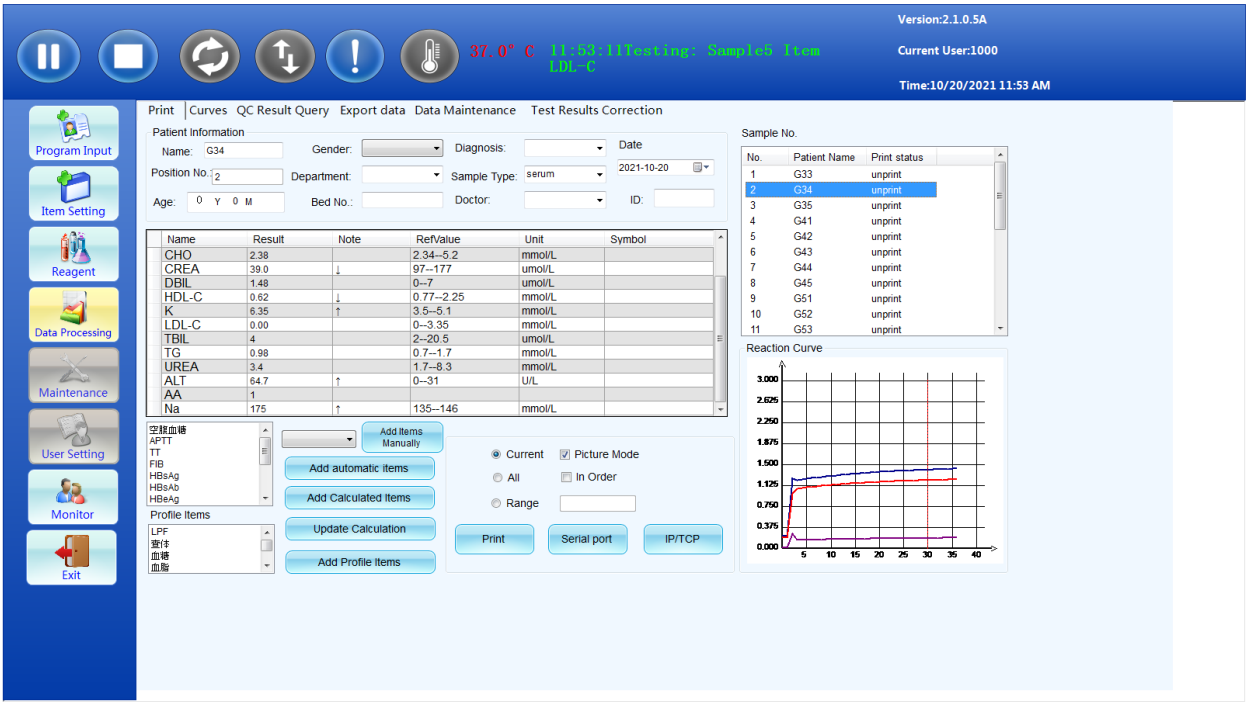
G33


37.0° C 11:47:48Testing: Sample4 Item HDL-C
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 11:48 AM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G33
Gender:
Diagnosis:
Date
Position No.: 1
Department: OPD
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 G33 unprint
2 G34 unprint
3 G35 unprint
4 G41 unprint
5 G42 unprint
6 G43 unprint
7 G44 unprint
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
Name Result Note RefValue Unit Symbol
ALB 31.0 ↑ 3.5--5.5 mg/dL
ALP 291 ↑ 45--135 U/L
AST 160.1 ↑ 0--31 U/L
CHO 1.76 ↓ 2.34--5.2 mmol/L
CREA 40.9 ↓ 97--177 umol/L
DBIL 1.75 0--7 umol/L
HDL-C 0.37 ↓ 0.77--2.25 mmol/L
K 5.45 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 4 ↓ 2--20.5 umol/L
TG 0.75 ↓ 0.7--1.7 mmol/L
UREA 4.8 1.7--8.3 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
宣传
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

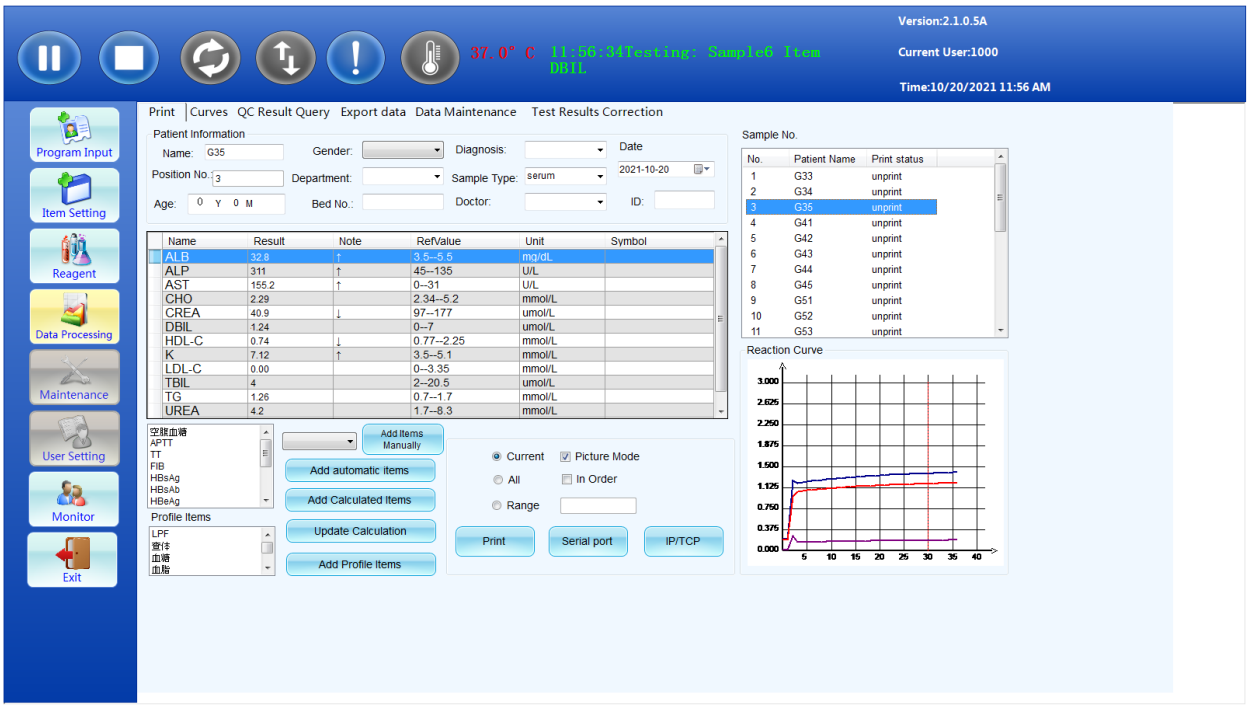

37.0° C 11:49:29Testing: Sample4 Item Na
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 11:49 AM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G33
Gender:
Diagnosis:
Date
Position No.: 1
Department: OPD
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 G33 unprint
2 G34 unprint
3 G35 unprint
4 G41 unprint
5 G42 unprint
6 G43 unprint
7 G44 unprint
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
Name Result Note RefValue Unit Symbol
CHO 1.76 ↓ 2.34--5.2 mmol/L
CREA 40.9 ↓ 97--177 umol/L
DBIL 1.75 0--7 umol/L
HDL-C 0.37 ↓ 0.77--2.25 mmol/L
K 5.45 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 4 ↓ 2--20.5 umol/L
TG 0.75 ↓ 0.7--1.7 mmol/L
UREA 4.8 1.7--8.3 mmol/L
ALT 55.5 ↑ 0--31 U/L
AA 1
Na 137 135--146 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
宣传
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

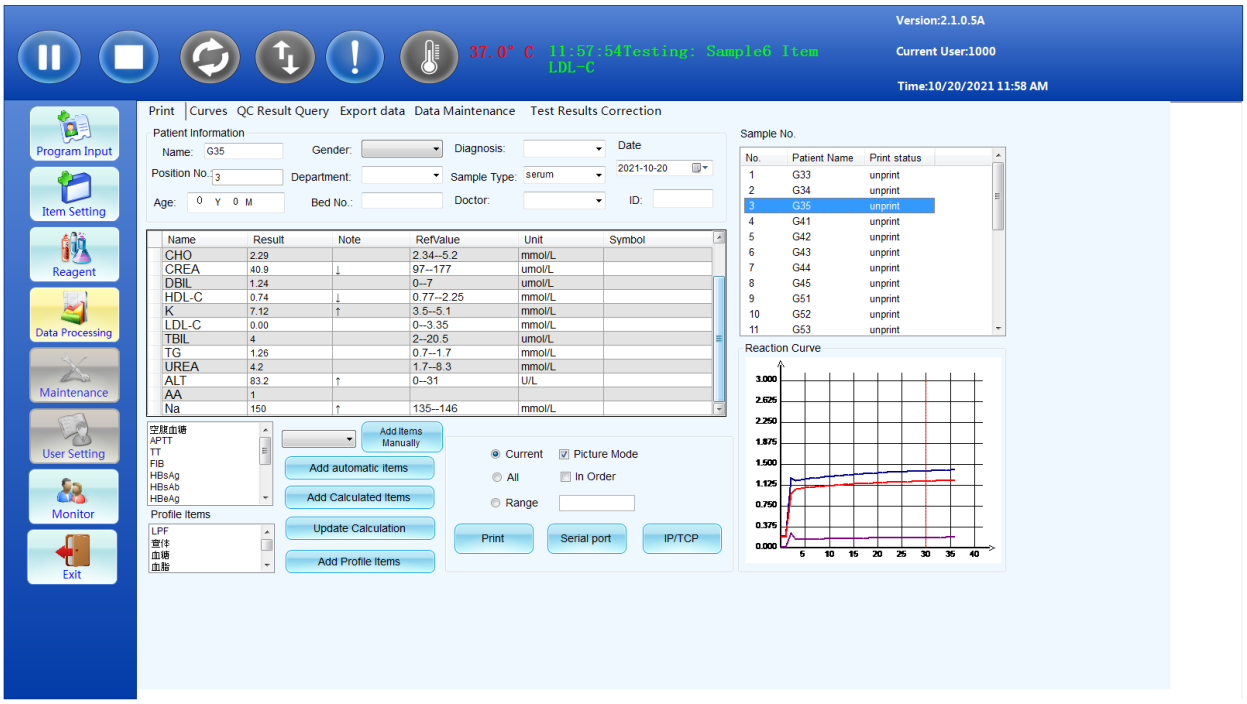
G34


37.0° C 11:51:51Testing: Sample5 Item DBIL
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 11:52 AM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G34
Gender:
Diagnosis:
Date
Position No.: 2
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 G33 unprint
2 G34 unprint
3 G35 unprint
4 G41 unprint
5 G42 unprint
6 G43 unprint
7 G44 unprint
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
Name Result Note RefValue Unit Symbol
ALB 33.6 ↑ 3.5--5.5 mg/dL
ALP 319 ↑ 45--135 U/L
AST 163.6 ↑ 0--31 U/L
CHO 2.38 2.34--5.2 mmol/L
CREA 39.0 ↓ 97--177 umol/L
DBIL 1.48 0--7 umol/L
HDL-C 0.62 ↓ 0.77--2.25 mmol/L
K 6.35 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 4 2--20.5 umol/L
TG 0.98 0.7--1.7 mmol/L
UREA 3.4 1.7--8.3 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

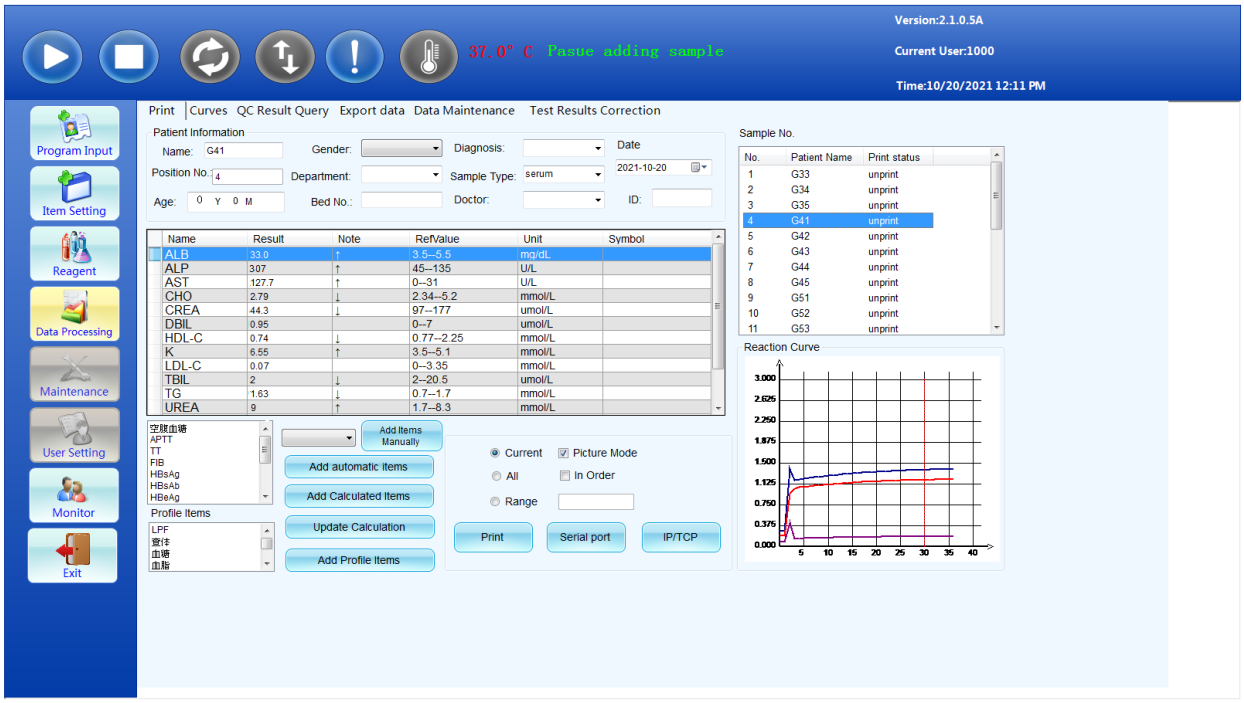

37.0° C 11:53:11Testing: Sample5 Item LDL-C
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 11:53 AM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G34
Gender:
Diagnosis:
Date
Position No.: 2
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 G33 unprint
2 G34 unprint
3 G35 unprint
4 G41 unprint
5 G42 unprint
6 G43 unprint
7 G44 unprint
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
Name Result Note RefValue Unit Symbol
CHO 2.38 2.34--5.2 mmol/L
CREA 39.0 ↓ 97--177 umol/L
DBIL 1.48 0--7 umol/L
HDL-C 0.62 ↓ 0.77--2.25 mmol/L
K 6.35 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 4 2--20.5 umol/L
TG 0.98 0.7--1.7 mmol/L
UREA 3.4 1.7--8.3 mmol/L
ALT 64.7 ↑ 0--31 U/L
AA 1
Na 175 ↑ 135--146 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

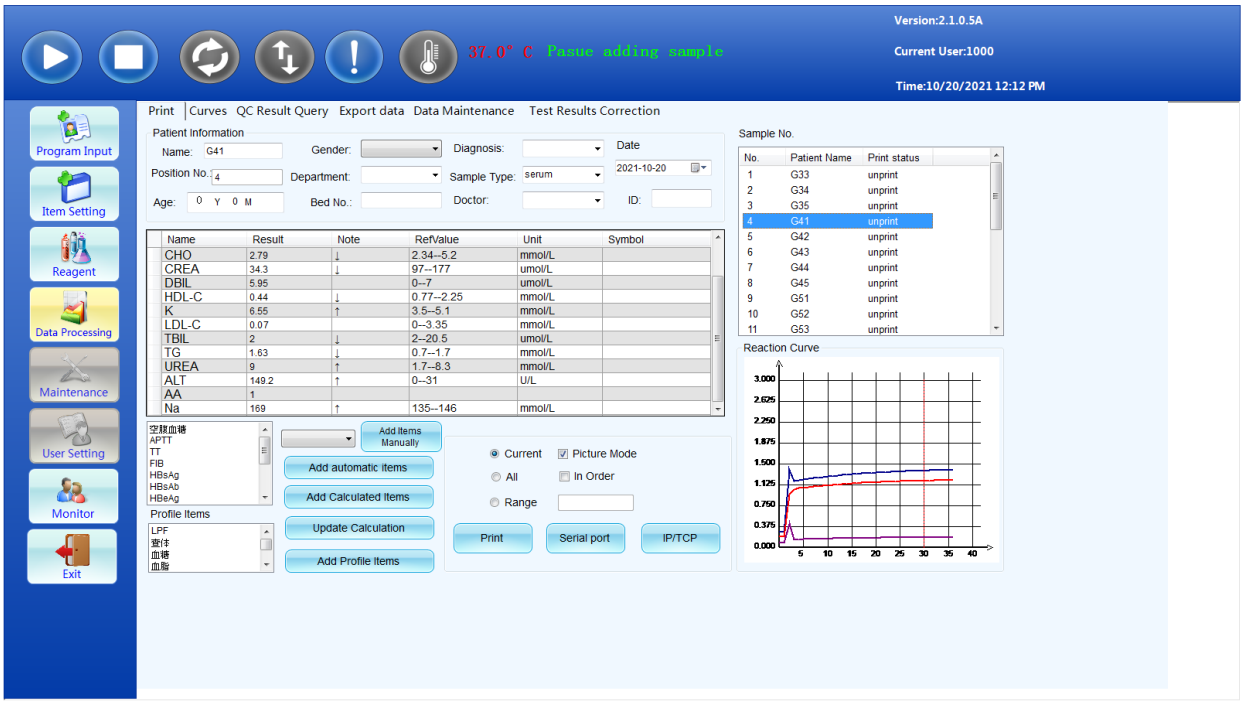
G35


Version:2.1.0.5A
Current User:1000
Time:10/20/2021 11:56 AM
37.0° C 11:56:34Testing: Sample6 Item DBIL
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print Curves QC Result Query Export data Data Maintenance Test Results Correction
Patient Information
Name: G35
Gender:
Diagnosis:
Date
Position No.: 3
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 G33 unprint
2 G34 unprint
3 G35 unprint
4 G41 unprint
5 G42 unprint
6 G43 unprint
7 G44 unprint
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
Name Result Note RefValue Unit Symbol
ALB 32.8 ↑ 3.5--5.5 mg/dL
ALP 311 ↑ 45--135 U/L
AST 155.2 ↑ 0--31 U/L
CHO 2.29 2.34--5.2 mmol/L
CREA 40.9 ↓ 97--177 umol/L
DBIL 1.24 0--7 umol/L
HDL-C 0.74 ↓ 0.77--2.25 mmol/L
K 7.12 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 4 2--20.5 umol/L
TG 1.26 0.7--1.7 mmol/L
UREA 4.2 1.7--8.3 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
宣佳
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

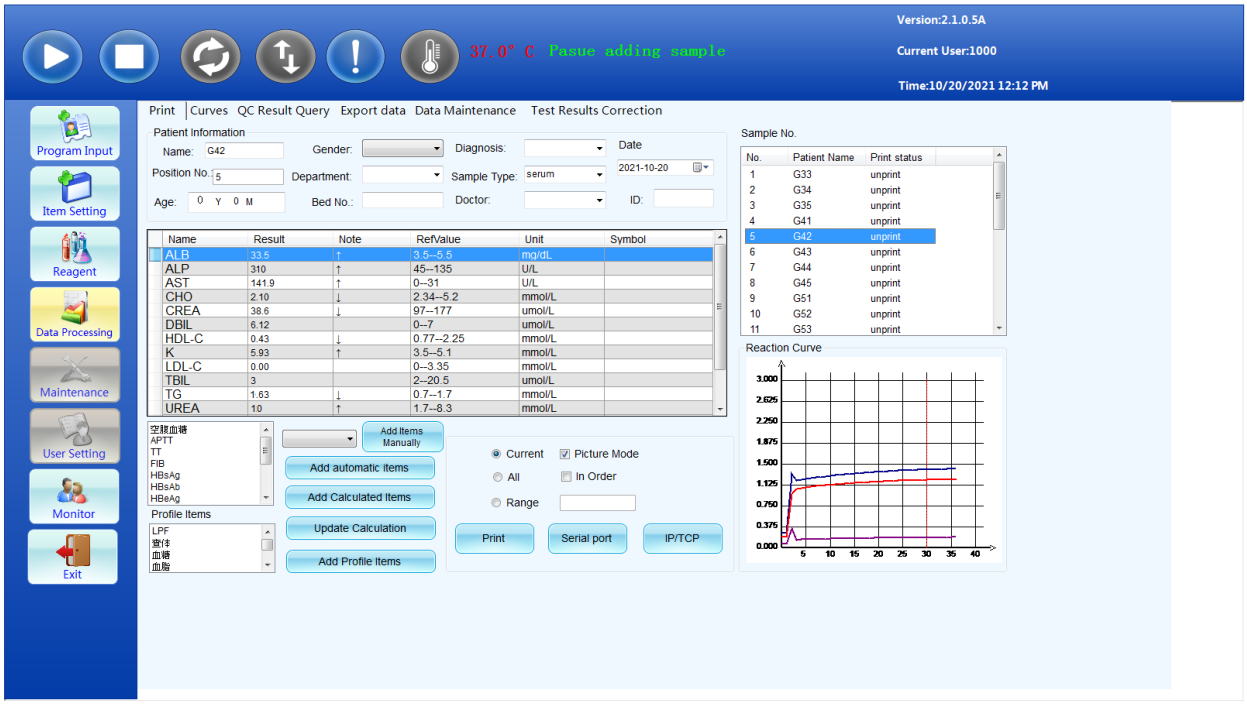

Version:2.1.0.5A
Current User:1000
Time:10/20/2021 11:58 AM
37.0° C 11:57:54Testing: Sample6 Item LDL-C
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print Curves QC Result Query Export data Data Maintenance Test Results Correction
Patient Information
Name: G35
Gender:
Diagnosis:
Date
Position No.: 3
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 G33 unprint
2 G34 unprint
3 G35 unprint
4 G41 unprint
5 G42 unprint
6 G43 unprint
7 G44 unprint
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
Name Result Note RefValue Unit Symbol
CHO 2.29 2.34--5.2 mmol/L
CREA 40.9 ↓ 97--177 umol/L
DBIL 1.24 0--7 umol/L
HDL-C 0.74 ↓ 0.77--2.25 mmol/L
K 7.12 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 4 2--20.5 umol/L
TG 1.26 0.7--1.7 mmol/L
UREA 4.2 1.7--8.3 mmol/L
ALT 83.2 ↑ 0--31 U/L
AA 1
Na 150 ↑ 135--146 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
宣佳
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

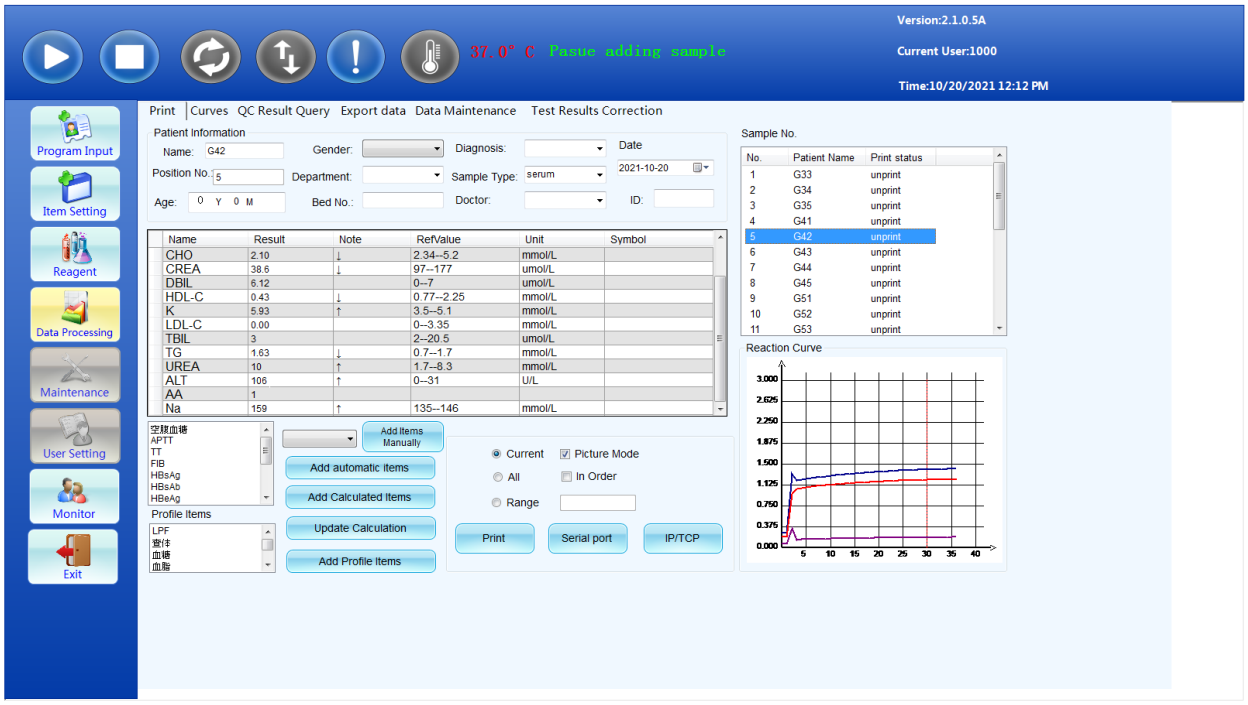
G41


37.0° C Pasue adding sample
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 12:11 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G41
Gender:
Diagnosis:
Date
Position No.: 4
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 G33 unprint
2 G34 unprint
3 G35 unprint
4 G41 unprint
5 G42 unprint
6 G43 unprint
7 G44 unprint
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
Name Result Note RefValue Unit Symbol
ALB 33.0 ↑ 3.5--5.5 mg/dL
ALP 307 ↑ 45--135 U/L
AST 127.7 ↑ 0--31 U/L
CHO 2.79 ↓ 2.34--5.2 mmol/L
CREA 44.3 ↓ 97--177 umol/L
DBIL 0.95 0--7 umol/L
HDL-C 0.74 ↓ 0.77--2.25 mmol/L
K 6.55 ↑ 3.5--5.1 mmol/L
LDL-C 0.07 0--3.35 mmol/L
TBIL 2 ↓ 2--20.5 umol/L
TG 1.63 ↓ 0.7--1.7 mmol/L
UREA 9 ↑ 1.7--8.3 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
蛋白
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

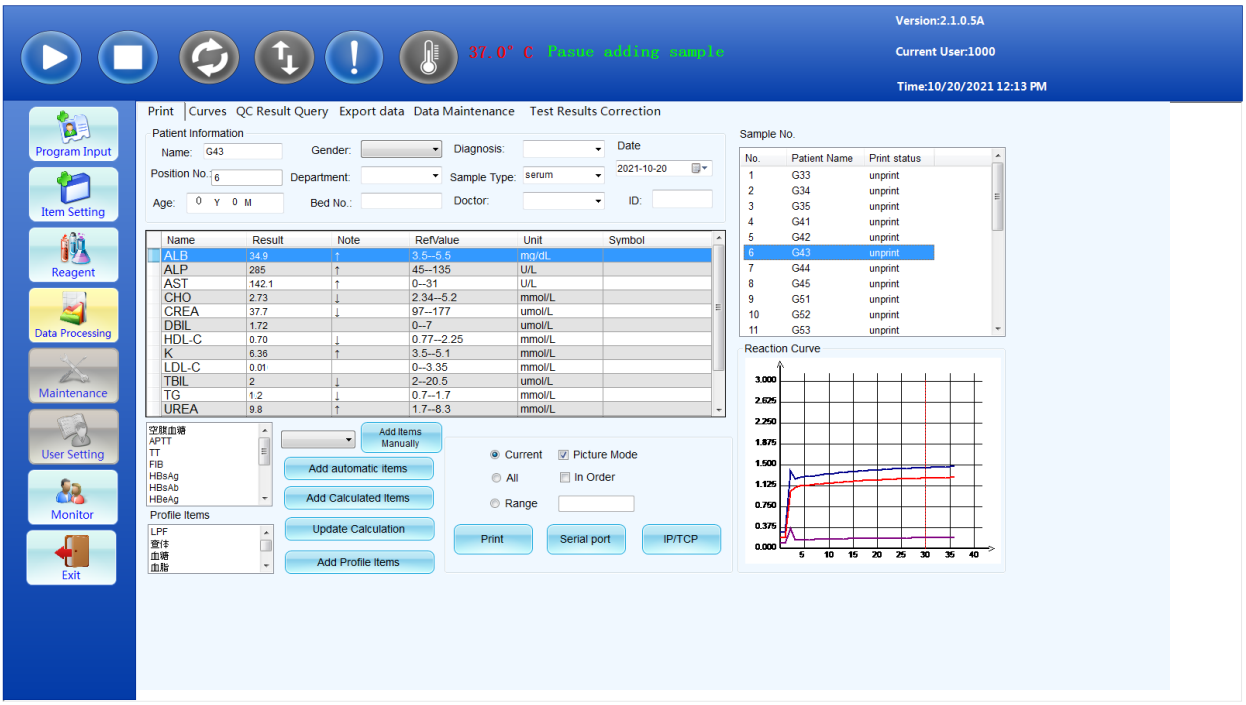

37.0° C Pasue adding sample
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 12:12 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G41
Gender:
Diagnosis:
Date
Position No.: 4
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 G33 unprint
2 G34 unprint
3 G35 unprint
4 G41 unprint
5 G42 unprint
6 G43 unprint
7 G44 unprint
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
Name Result Note RefValue Unit Symbol
CHO 2.79 ↓ 2.34--5.2 mmol/L
CREA 34.3 ↓ 97--177 umol/L
DBIL 5.95 0--7 umol/L
HDL-C 0.44 ↓ 0.77--2.25 mmol/L
K 6.55 ↑ 3.5--5.1 mmol/L
LDL-C 0.07 0--3.35 mmol/L
TBIL 2 ↓ 2--20.5 umol/L
TG 1.63 ↓ 0.7--1.7 mmol/L
UREA 9 ↑ 1.7--8.3 mmol/L
ALT 149.2 ↑ 0--31 U/L
AA 1
Na 169 ↑ 135--146 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
蛋白
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

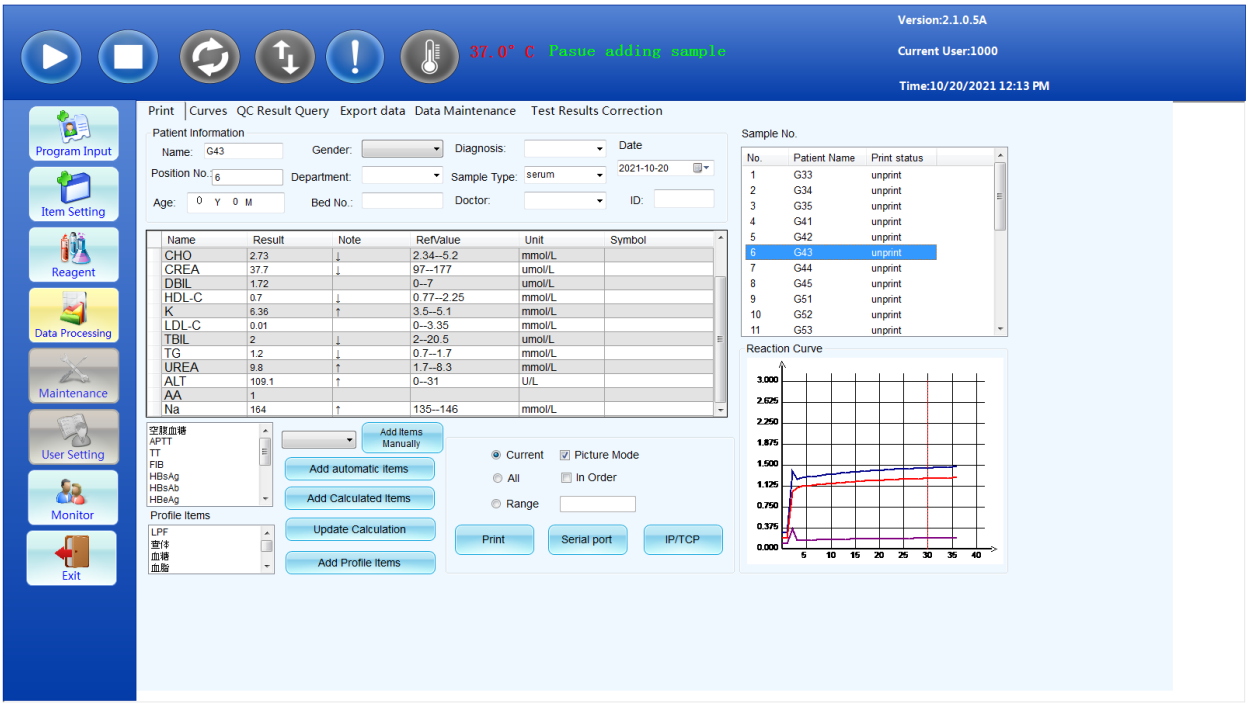
G42


Version:2.1.0.5A
Current User:1000
Time:10/20/2021 12:12 PM
37.0° C Pasue adding sample
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G42
Gender:
Diagnosis:
Date
Position No.: 5
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 G33 unprint
2 G34 unprint
3 G35 unprint
4 G41 unprint
5 G42 unprint
6 G43 unprint
7 G44 unprint
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
Name Result Note RefValue Unit Symbol
ALB 33.5 ↑ 3.5--5.5 mg/dL
ALP 310 ↑ 45--135 U/L
AST 141.9 ↑ 0--31 U/L
CHO 2.10 ↓ 2.34--5.2 mmol/L
CREA 38.6 ↓ 97--177 umol/L
DBIL 6.12 0--7 umol/L
HDL-C 0.43 ↓ 0.77--2.25 mmol/L
K 5.93 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 3 2--20.5 umol/L
TG 1.63 ↓ 0.7--1.7 mmol/L
UREA 10 ↑ 1.7--8.3 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

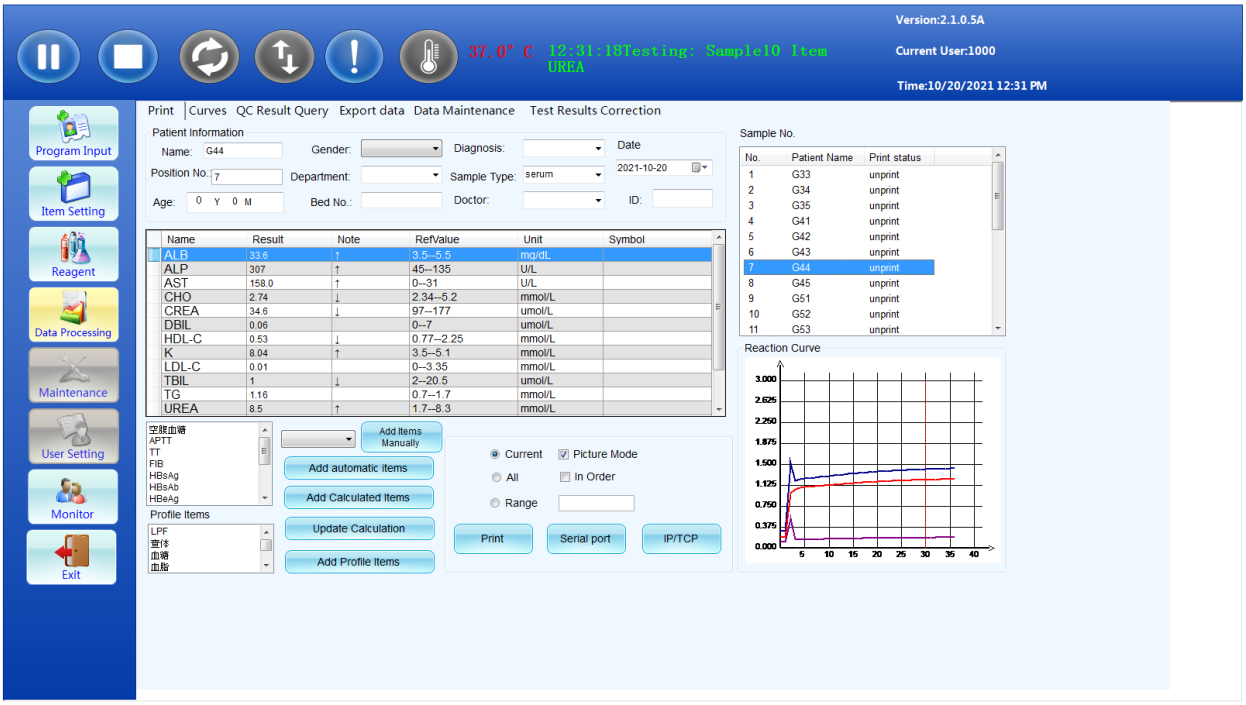

Version:2.1.0.5A
Current User:1000
Time:10/20/2021 12:12 PM
37.0° C Pasue adding sample
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G42
Gender:
Diagnosis:
Date
Position No.: 5
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 G33 unprint
2 G34 unprint
3 G35 unprint
4 G41 unprint
5 G42 unprint
6 G43 unprint
7 G44 unprint
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
Name Result Note RefValue Unit Symbol
CHO 2.10 ↓ 2.34--5.2 mmol/L
CREA 38.6 ↓ 97--177 umol/L
DBIL 6.12 0--7 umol/L
HDL-C 0.43 ↓ 0.77--2.25 mmol/L
K 5.93 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 3 2--20.5 umol/L
TG 1.63 ↓ 0.7--1.7 mmol/L
UREA 10 ↑ 1.7--8.3 mmol/L
ALT 106 ↑ 0--31 U/L
AA 1
Na 159 ↑ 135--146 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

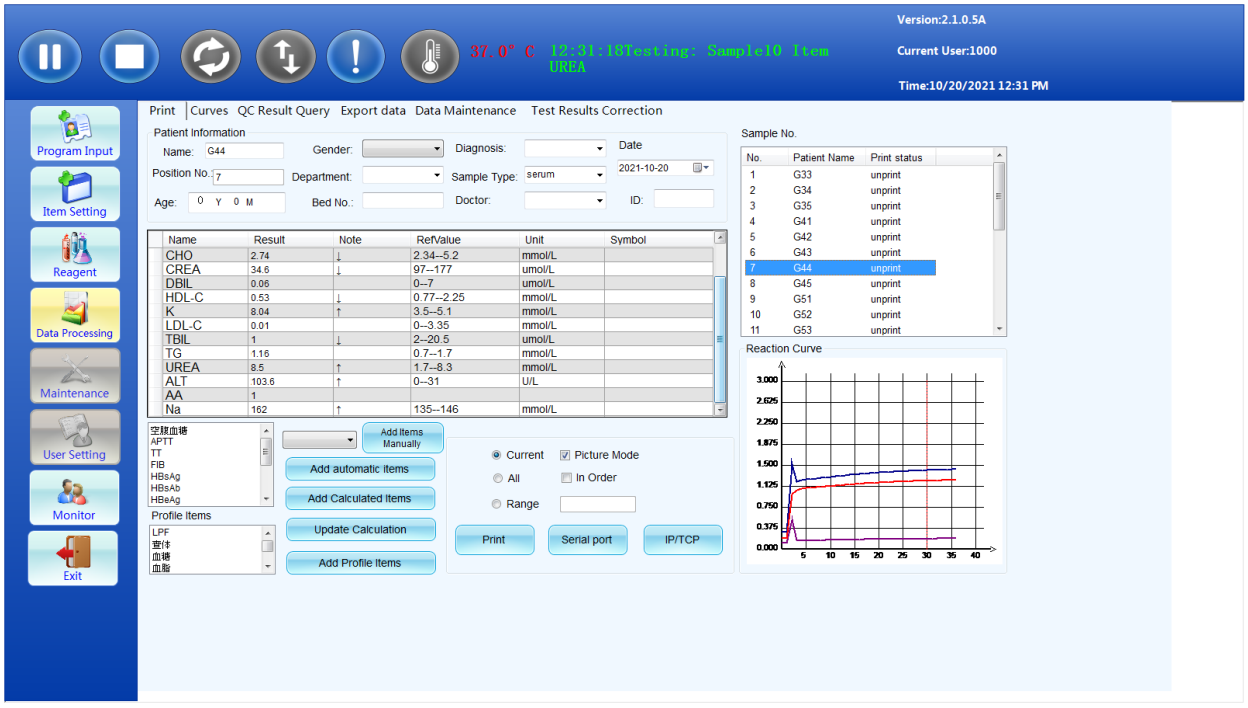
G43


37.0° C Pasue adding sample
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 12:13 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G43
Gender:
Diagnosis:
Date
Position No.: 6
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 G33 unprint
2 G34 unprint
3 G35 unprint
4 G41 unprint
5 G42 unprint
6 G43 unprint
7 G44 unprint
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
Name Result Note RefValue Unit Symbol
ALB 34.9 ↑ 3.5--5.5 mg/dL
ALP 285 ↑ 45--135 U/L
AST 142.1 ↑ 0--31 U/L
CHO 2.73 ↓ 2.34--5.2 mmol/L
CREA 37.7 ↓ 97--177 umol/L
DBIL 1.72 0--7 umol/L
HDL-C 0.70 ↓ 0.77--2.25 mmol/L
K 6.36 ↑ 3.5--5.1 mmol/L
LDL-C 0.01 0--3.35 mmol/L
TBIL 2 ↓ 2--20.5 umol/L
TG 1.2 ↓ 0.7--1.7 mmol/L
UREA 9.8 ↑ 1.7--8.3 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Profile Items
LPF
查体
血糖
血脂
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

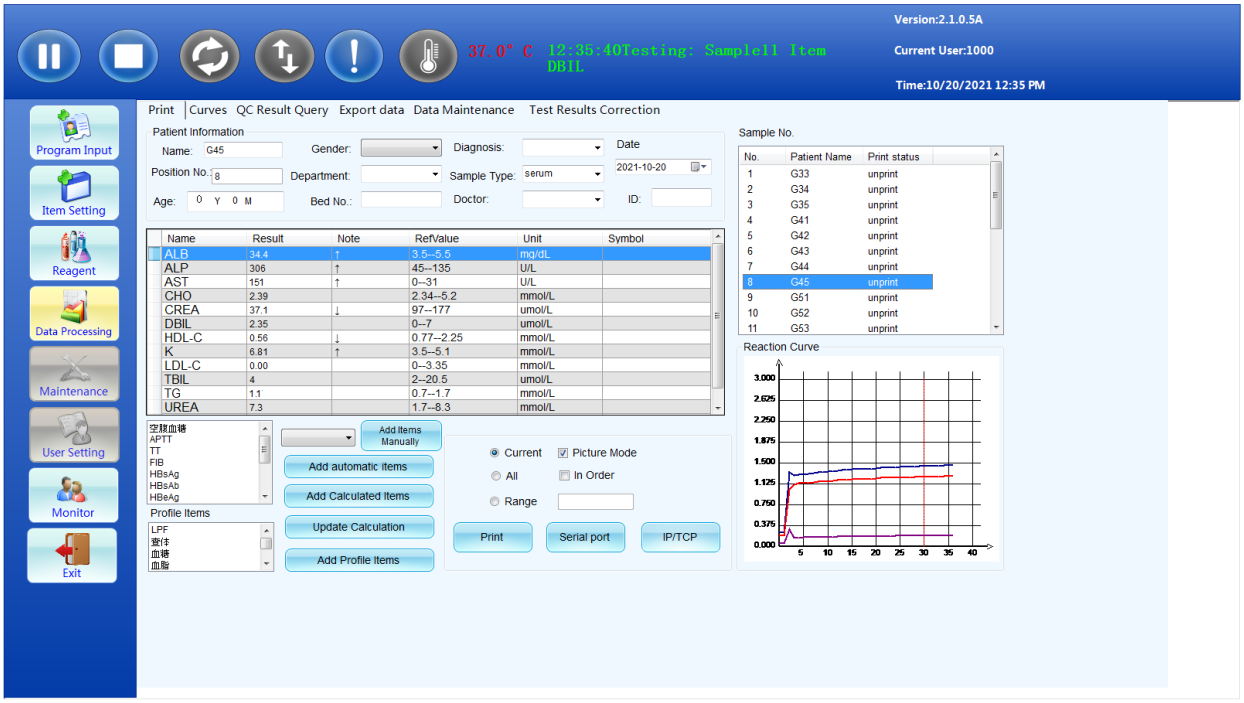

37.0° C Pasue adding sample
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 12:13 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G43
Gender:
Diagnosis:
Date
Position No.: 6
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 G33 unprint
2 G34 unprint
3 G35 unprint
4 G41 unprint
5 G42 unprint
6 G43 unprint
7 G44 unprint
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
Name Result Note RefValue Unit Symbol
CHO 2.73 ↓ 2.34--5.2 mmol/L
CREA 37.7 ↓ 97--177 umol/L
DBIL 1.72 0--7 umol/L
HDL-C 0.7 ↓ 0.77--2.25 mmol/L
K 6.36 ↑ 3.5--5.1 mmol/L
LDL-C 0.01 0--3.35 mmol/L
TBIL 2 ↓ 2--20.5 umol/L
TG 1.2 ↓ 0.7--1.7 mmol/L
UREA 9.8 ↑ 1.7--8.3 mmol/L
ALT 109.1 ↑ 0--31 U/L
AA 1
Na 164 ↑ 135--146 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Profile Items
LPF
查体
血糖
血脂
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

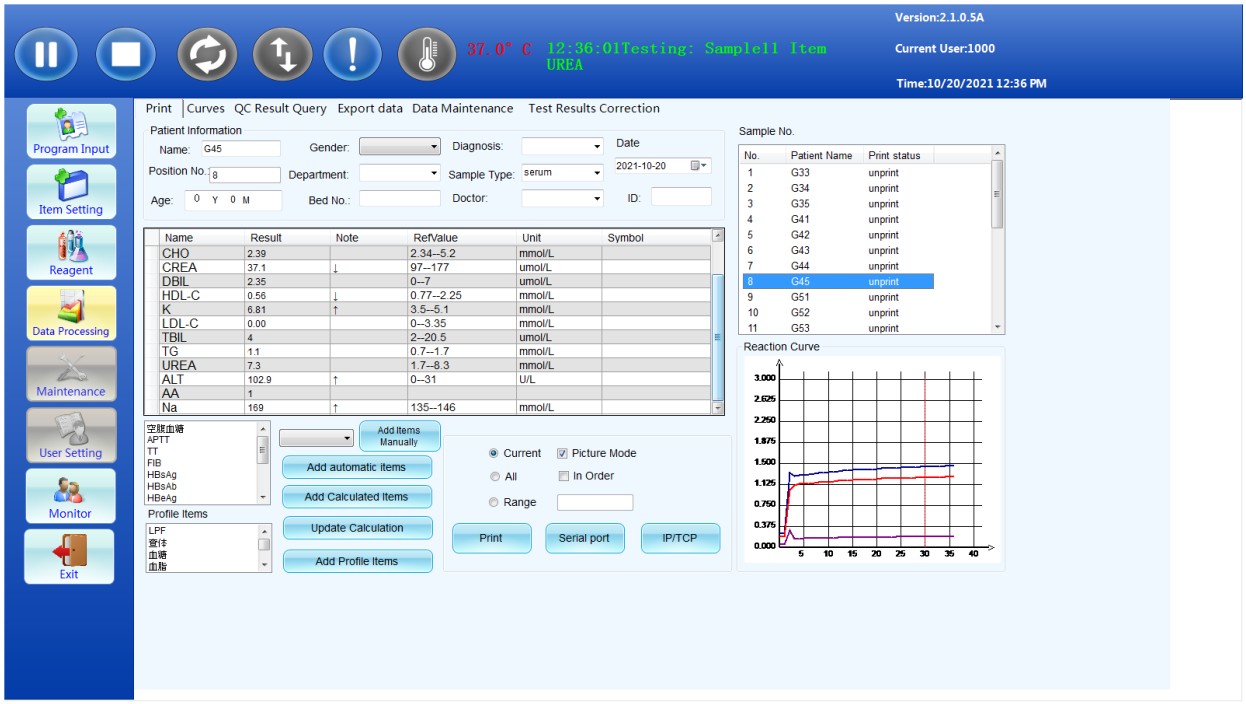
G44


Version:2.1.0.5A
Current User:1000
Time:10/20/2021 12:31 PM
37.0° C 12:31:18Testing: Sample10 Item
UREA
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G44
Gender:
Diagnosis:
Date
2021-10-20
Position No.: 7
Department:
Sample Type: serum
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 G33 unprint
2 G34 unprint
3 G35 unprint
4 G41 unprint
5 G42 unprint
6 G43 unprint
7 G44 unprint
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
Name Result Note RefValue Unit Symbol
ALB 33.6 ↑ 3.5--5.5 mg/dL
ALP 307 ↑ 45--135 U/L
AST 158.0 ↑ 0--31 U/L
CHO 2.74 ↓ 2.34--5.2 mmol/L
CREA 34.6 ↓ 97--177 umol/L
DBIL 0.06 0--7 umol/L
HDL-C 0.53 ↓ 0.77--2.25 mmol/L
K 8.04 ↑ 3.5--5.1 mmol/L
LDL-C 0.01 0--3.35 mmol/L
TBIL 1 ↓ 2--20.5 umol/L
TG 1.16 0.7--1.7 mmol/L
UREA 8.5 ↑ 1.7--8.3 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
宣休
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

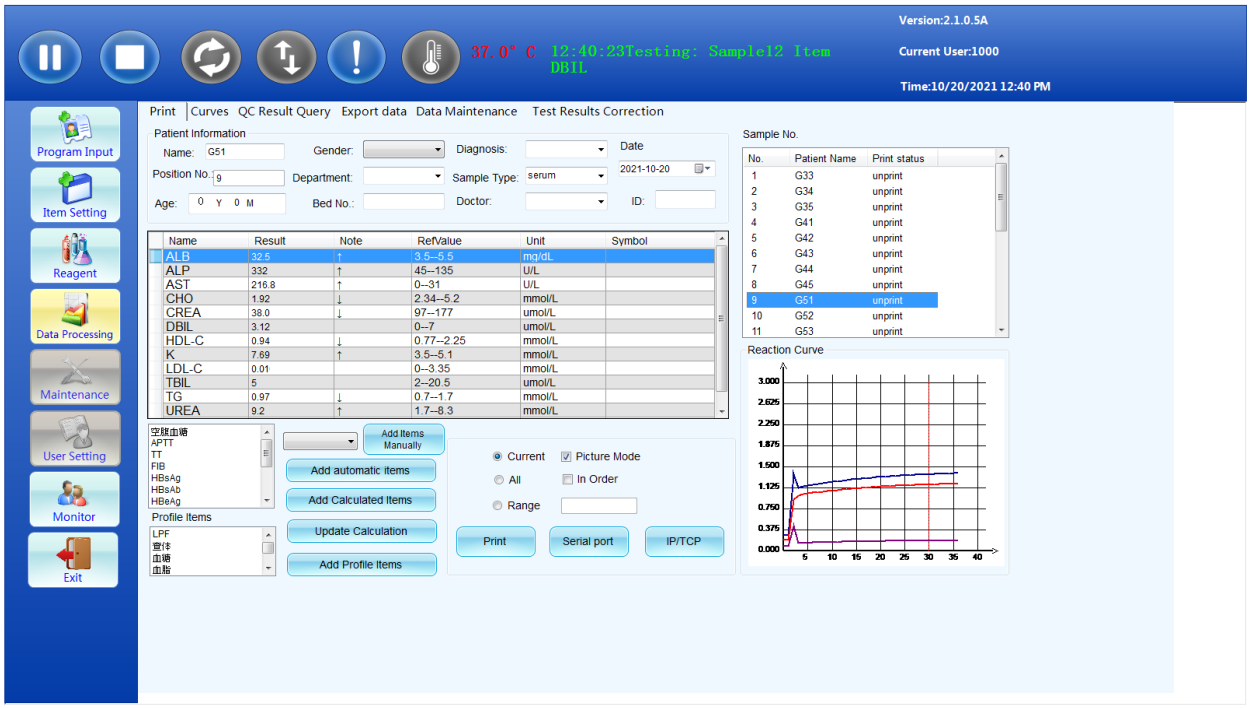

Version:2.1.0.5A
Current User:1000
Time:10/20/2021 12:31 PM
37.0° C 12:31:18Testing: Sample10 Item
UREA
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G44
Gender:
Diagnosis:
Date
2021-10-20
Position No.: 7
Department:
Sample Type: serum
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 G33 unprint
2 G34 unprint
3 G35 unprint
4 G41 unprint
5 G42 unprint
6 G43 unprint
7 G44 unprint
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
Name Result Note RefValue Unit Symbol
CHO 2.74 ↓ 2.34--5.2 mmol/L
CREA 34.6 ↓ 97--177 umol/L
DBIL 0.06 0--7 umol/L
HDL-C 0.53 ↓ 0.77--2.25 mmol/L
K 8.04 ↑ 3.5--5.1 mmol/L
LDL-C 0.01 0--3.35 mmol/L
TBIL 1 ↓ 2--20.5 umol/L
TG 1.16 0.7--1.7 mmol/L
UREA 8.5 ↑ 1.7--8.3 mmol/L
ALT 103.6 ↑ 0--31 U/L
AA 1
Na 162 ↑ 135--146 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
宣休
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

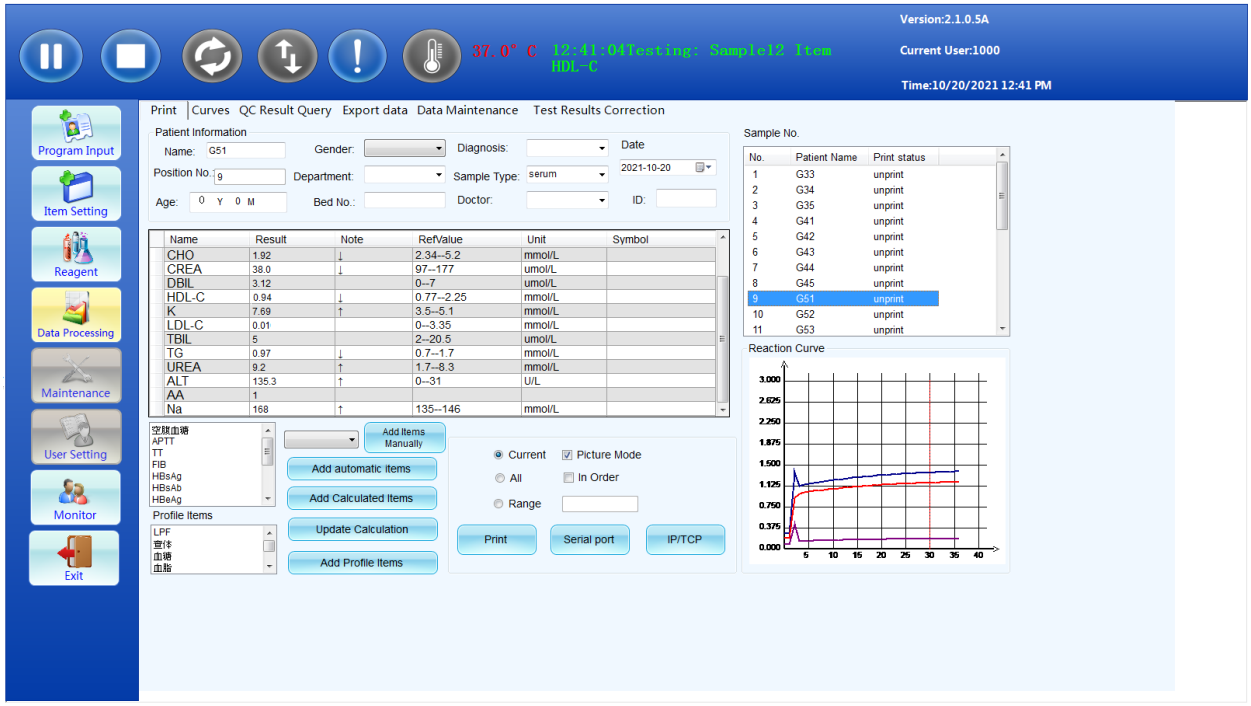
G45


Version:2.1.0.5A
Current User:1000
Time:10/20/2021 12:35 PM
37.0° C 12:35:40Testing: Sample11 Item DBIL
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print Curves QC Result Query Export data Data Maintenance Test Results Correction
Patient Information
Name: G45
Gender:
Diagnosis:
Date
Position No.: 8
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 G33 unprint
2 G34 unprint
3 G35 unprint
4 G41 unprint
5 G42 unprint
6 G43 unprint
7 G44 unprint
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
Name Result Note RefValue Unit Symbol
ALB 34.4 ↑ 3.5--5.5 mg/dL
ALP 306 ↑ 45--135 U/L
AST 151 ↑ 0--31 U/L
CHO 2.39 2.34--5.2 mmol/L
CREA 37.1 ↓ 97--177 umol/L
DBIL 2.35 0--7 umol/L
HDL-C 0.56 ↓ 0.77--2.25 mmol/L
K 6.81 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 4 2--20.5 umol/L
TG 1.1 0.7--1.7 mmol/L
UREA 7.3 1.7--8.3 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

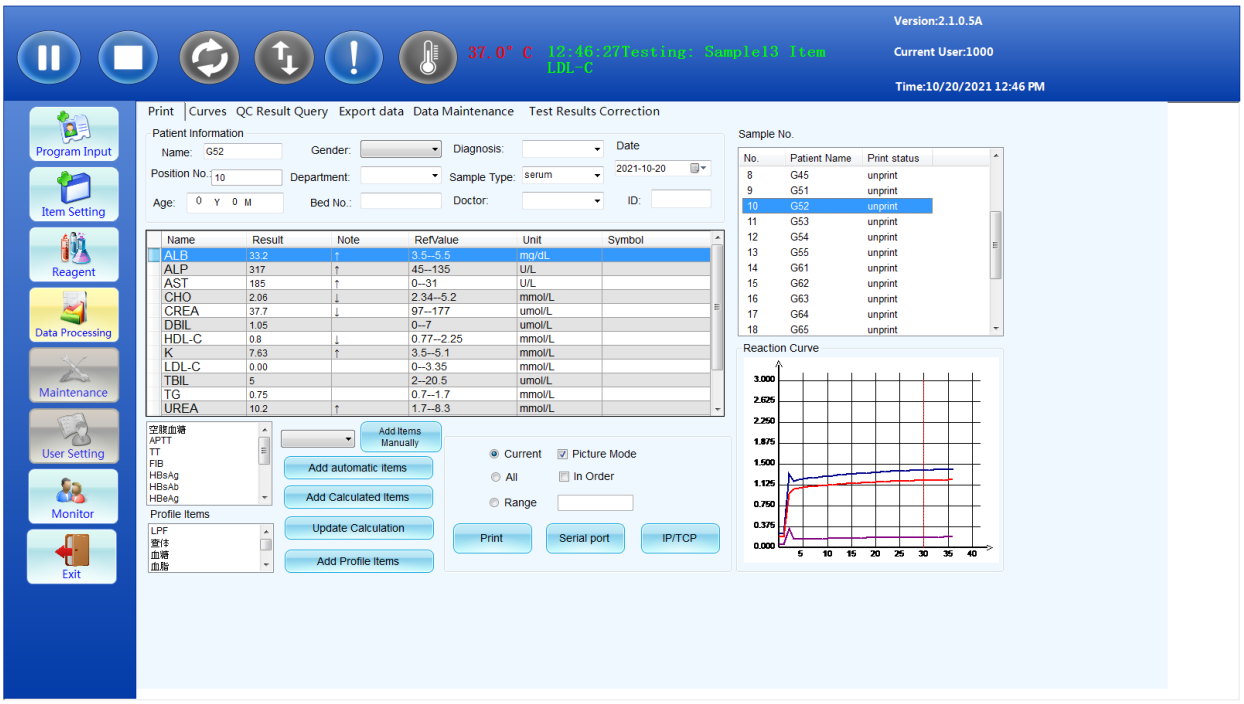

Version:2.1.0.5A
Current User:1000
Time:10/20/2021 12:36 PM
37.0° C 12:36:01Testing: Sample11 Item UREA
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print Curves QC Result Query Export data Data Maintenance Test Results Correction
Patient Information
Name: G45
Gender:
Diagnosis:
Date
Position No.: 8
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 G33 unprint
2 G34 unprint
3 G35 unprint
4 G41 unprint
5 G42 unprint
6 G43 unprint
7 G44 unprint
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
Name Result Note RefValue Unit Symbol
CHO 2.39 2.34--5.2 mmol/L
CREA 37.1 ↓ 97--177 umol/L
DBIL 2.35 0--7 umol/L
HDL-C 0.56 ↓ 0.77--2.25 mmol/L
K 6.81 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 4 2--20.5 umol/L
TG 1.1 0.7--1.7 mmol/L
UREA 7.3 1.7--8.3 mmol/L
ALT 102.9 ↑ 0--31 U/L
AA 1
Na 169 ↑ 135--146 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

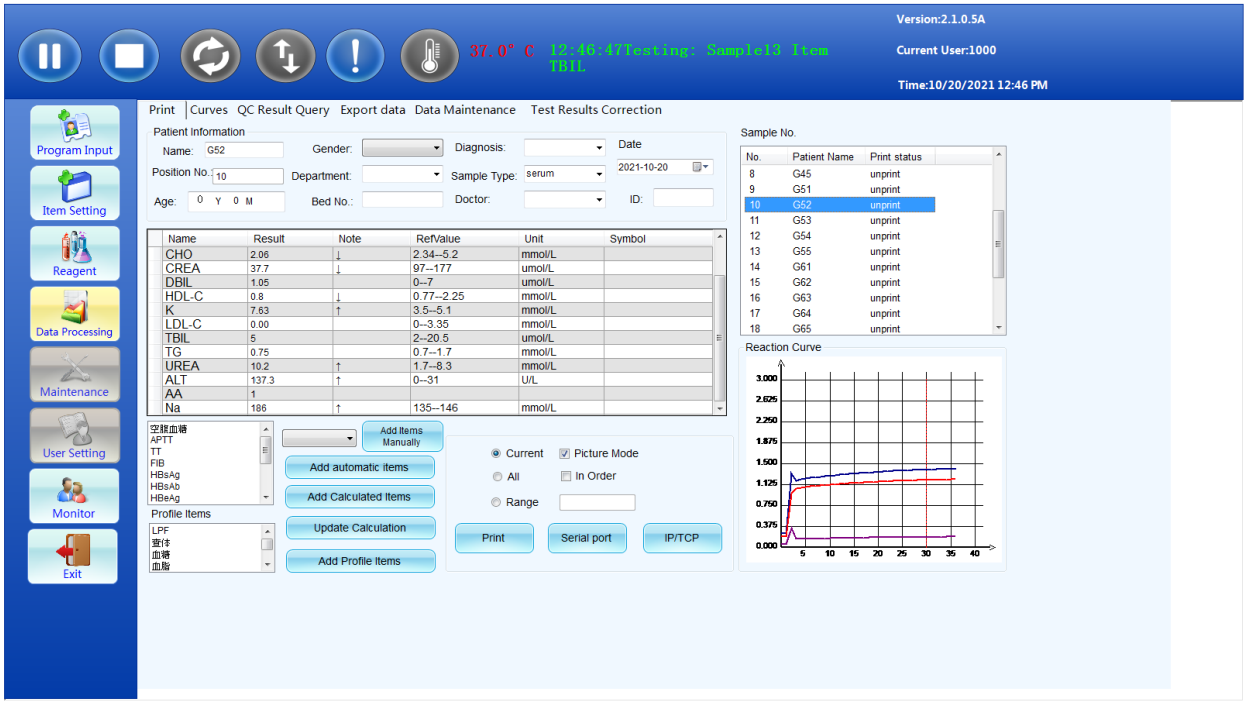
G51


37.0° C 12:40:23Testing: Sample12 Item DBIL
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 12:40 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G51
Gender:
Diagnosis:
Date
Position No.: 9
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 G33 unprint
2 G34 unprint
3 G35 unprint
4 G41 unprint
5 G42 unprint
6 G43 unprint
7 G44 unprint
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
Name Result Note RefValue Unit Symbol
ALB 32.5 ↑ 3.5--5.5 mg/dL
ALP 332 ↑ 45--135 U/L
AST 216.8 ↑ 0--31 U/L
CHO 1.92 ↓ 2.34--5.2 mmol/L
CREA 38.0 ↓ 97--177 umol/L
DBIL 3.12 0--7 umol/L
HDL-C 0.94 ↓ 0.77--2.25 mmol/L
K 7.69 ↑ 3.5--5.1 mmol/L
LDL-C 0.01 0--3.35 mmol/L
TBIL 5 2--20.5 umol/L
TG 0.97 ↓ 0.7--1.7 mmol/L
UREA 9.2 ↑ 1.7--8.3 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
宣传
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

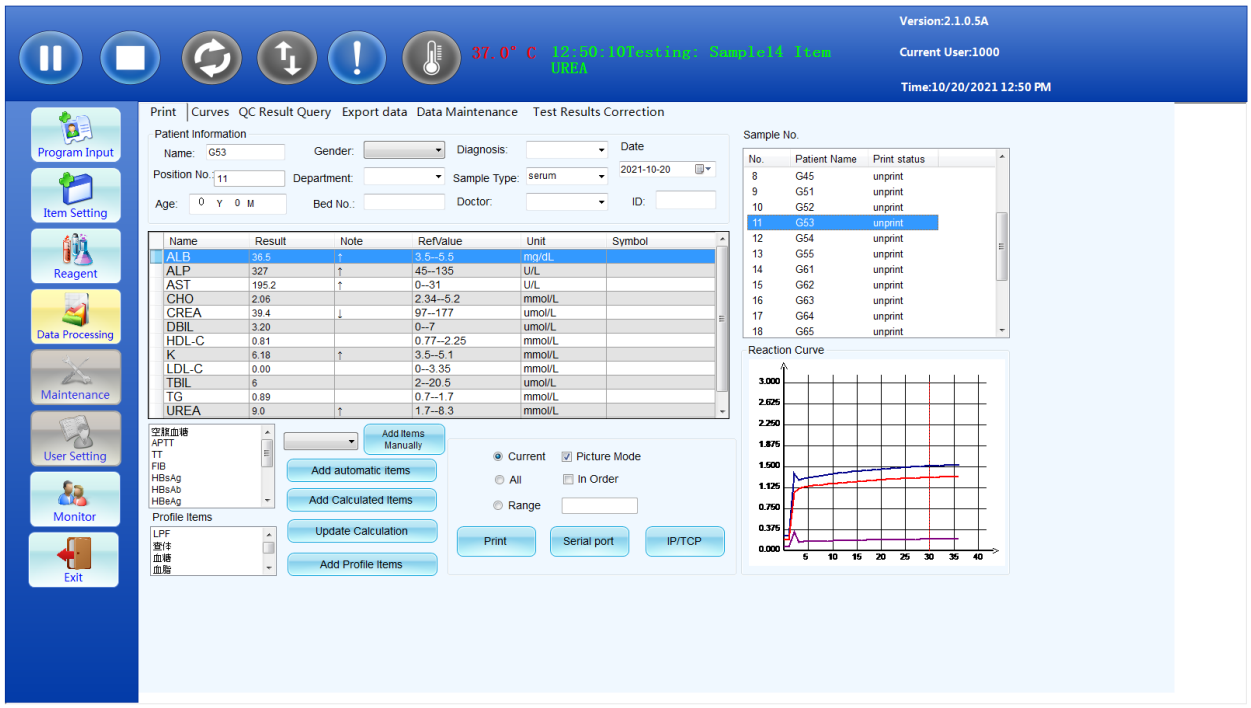

37.0° C 12:41:04Testing: Sample12 Item HDL-C
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 12:41 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G51
Gender:
Diagnosis:
Date
Position No.: 9
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
1 G33 unprint
2 G34 unprint
3 G35 unprint
4 G41 unprint
5 G42 unprint
6 G43 unprint
7 G44 unprint
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
Name Result Note RefValue Unit Symbol
CHO 1.92 ↓ 2.34--5.2 mmol/L
CREA 38.0 ↓ 97--177 umol/L
DBIL 3.12 0--7 umol/L
HDL-C 0.94 ↓ 0.77--2.25 mmol/L
K 7.69 ↑ 3.5--5.1 mmol/L
LDL-C 0.01 0--3.35 mmol/L
TBIL 5 2--20.5 umol/L
TG 0.97 ↓ 0.7--1.7 mmol/L
UREA 9.2 ↑ 1.7--8.3 mmol/L
ALT 135.3 ↑ 0--31 U/L
AA 1
Na 168 ↑ 135--146 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
宣传
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

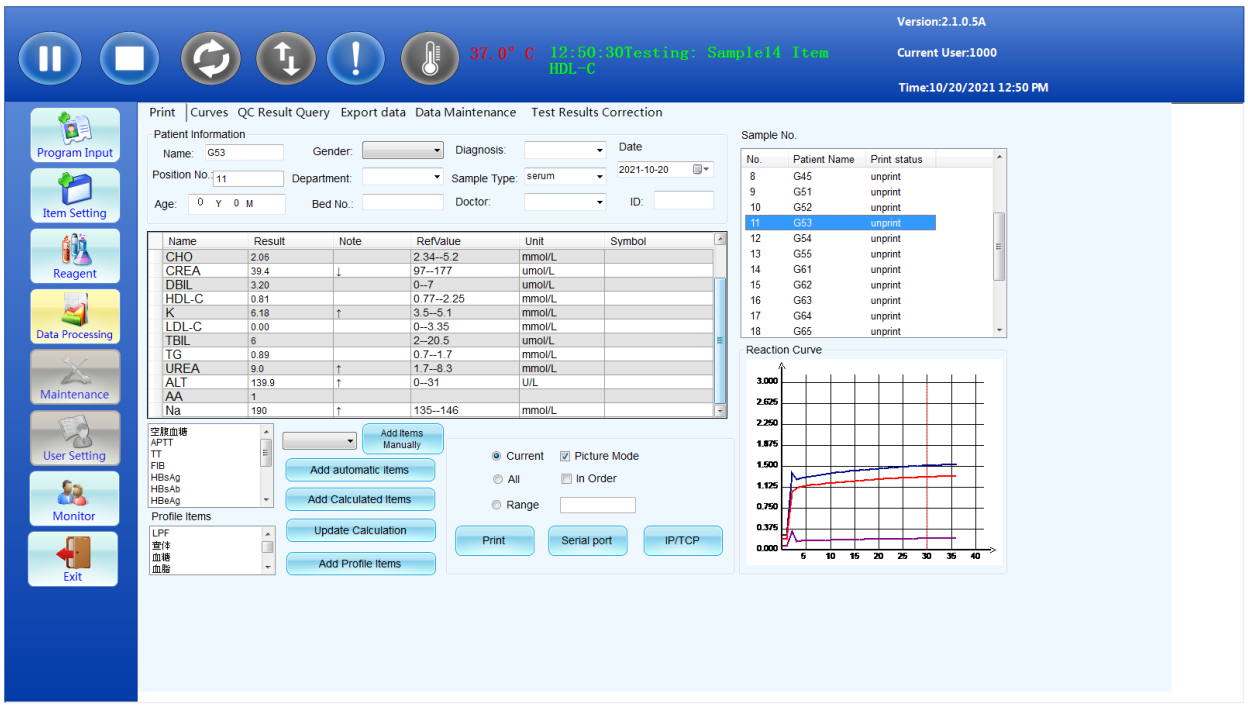
G52


37.0° C 12:46:27Testing: Sample13 Item LDL-C
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 12:46 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print Curves QC Result Query Export data Data Maintenance Test Results Correction
Patient Information
Name: G52
Gender:
Diagnosis:
Date
Position No.: 10
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
12 G54 unprint
13 G55 unprint
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
Name Result Note RefValue Unit Symbol
ALB 33.2 ↑ 3.5--5.5 mg/dL
ALP 317 ↑ 45--135 U/L
AST 185 ↑ 0--31 U/L
CHO 2.06 ↓ 2.34--5.2 mmol/L
CREA 37.7 ↓ 97--177 umol/L
DBIL 1.05 0--7 umol/L
HDL-C 0.8 ↓ 0.77--2.25 mmol/L
K 7.63 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 5 2--20.5 umol/L
TG 0.75 0.7--1.7 mmol/L
UREA 10.2 ↑ 1.7--8.3 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Reaction Curve

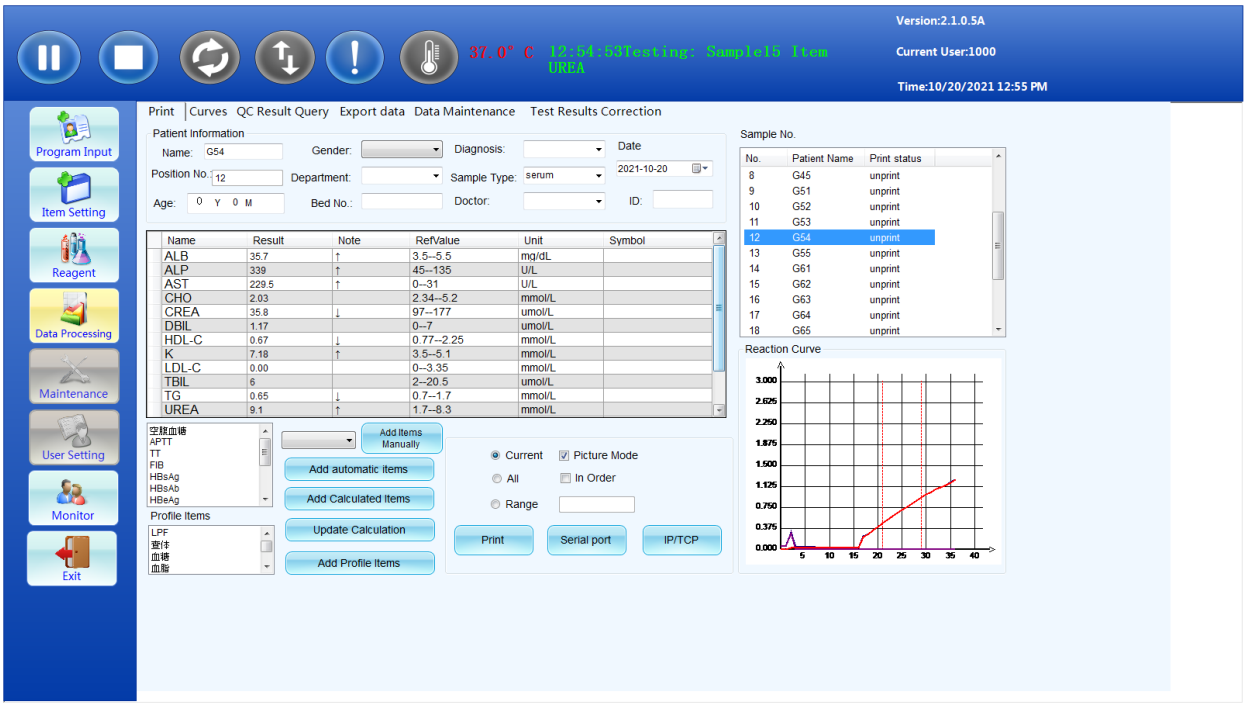

37.0° C 12:46:47Testing: Sample13 Item TBIL
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 12:46 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print Curves QC Result Query Export data Data Maintenance Test Results Correction
Patient Information
Name: G52
Gender:
Diagnosis:
Date
Position No.: 10
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
12 G54 unprint
13 G55 unprint
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
Name Result Note RefValue Unit Symbol
CHO 2.06 ↓ 2.34--5.2 mmol/L
CREA 37.7 ↓ 97--177 umol/L
DBIL 1.05 0--7 umol/L
HDL-C 0.8 ↓ 0.77--2.25 mmol/L
K 7.63 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 5 2--20.5 umol/L
TG 0.75 0.7--1.7 mmol/L
UREA 10.2 ↑ 1.7--8.3 mmol/L
ALT 137.3 ↑ 0--31 U/L
AA 1
Na 186 ↑ 135--146 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Reaction Curve

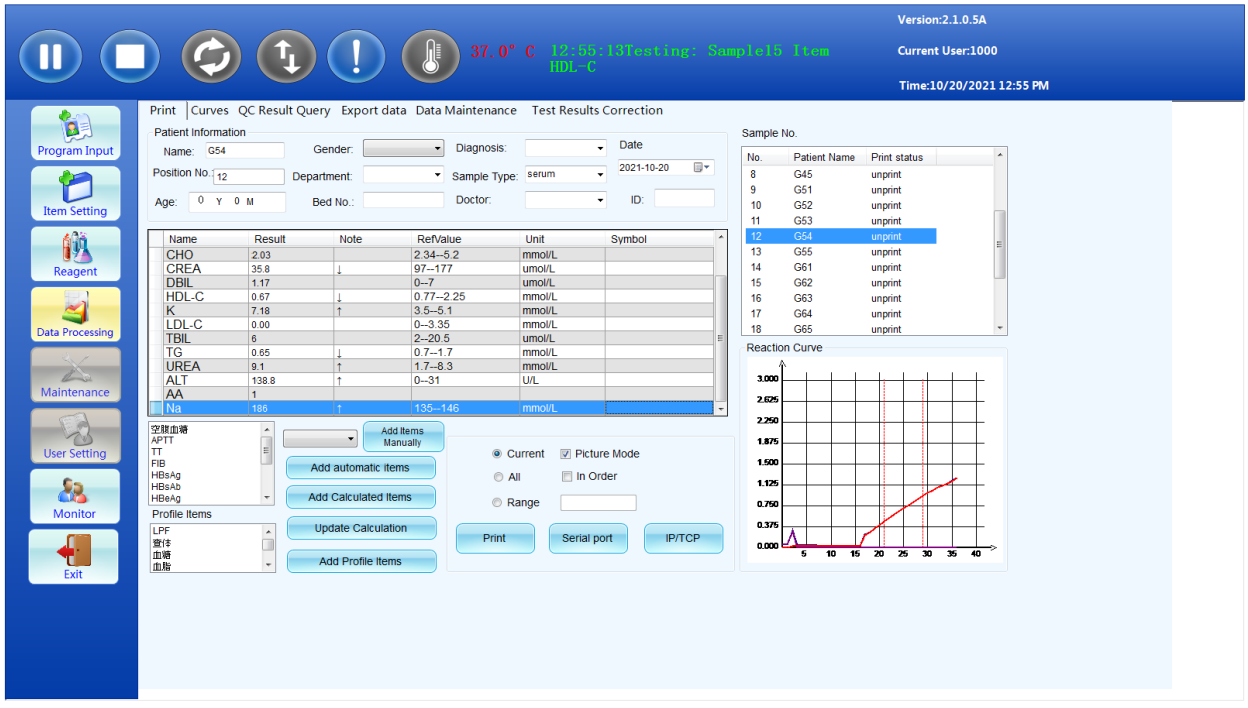
G53


37.0° C 12:50:10Testing: Sample14 Item UREA
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 12:50 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G53
Gender:
Diagnosis:
Date
Position No.: 11
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
12 G54 unprint
13 G55 unprint
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
Name Result Note RefValue Unit Symbol
ALB 36.5 ↑ 3.5--5.5 mg/dL
ALP 327 ↑ 45--135 U/L
AST 195.2 ↑ 0--31 U/L
CHO 2.06 2.34--5.2 mmol/L
CREA 39.4 ↓ 97--177 umol/L
DBIL 3.20 0--7 umol/L
HDL-C 0.81 0.77--2.25 mmol/L
K 6.18 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 6 2--20.5 umol/L
TG 0.89 0.7--1.7 mmol/L
UREA 9.0 ↑ 1.7--8.3 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

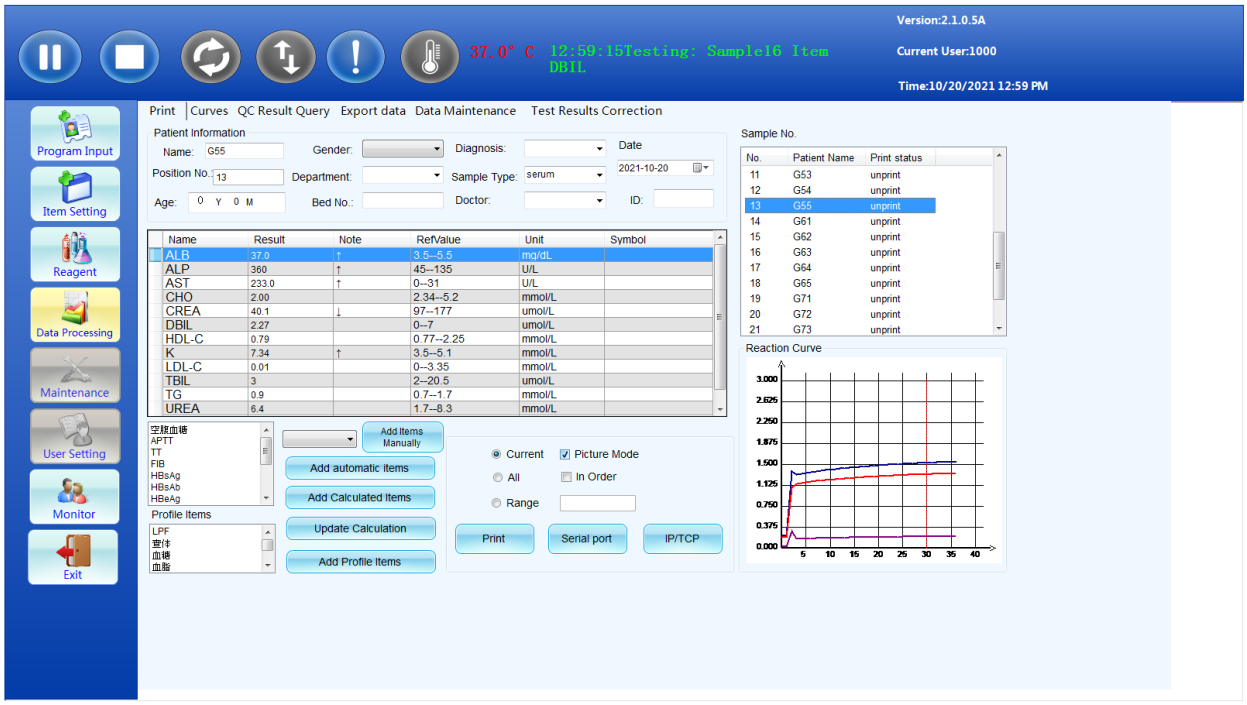

37.0° C 12:50:30Testing: Sample14 Item HDL-C
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 12:50 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G53
Gender:
Diagnosis:
Date
Position No.: 11
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
12 G54 unprint
13 G55 unprint
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
Name Result Note RefValue Unit Symbol
CHO 2.06 2.34--5.2 mmol/L
CREA 39.4 ↓ 97--177 umol/L
DBIL 3.20 0--7 umol/L
HDL-C 0.81 0.77--2.25 mmol/L
K 6.18 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 6 2--20.5 umol/L
TG 0.89 0.7--1.7 mmol/L
UREA 9.0 ↑ 1.7--8.3 mmol/L
ALT 139.9 ↑ 0--31 U/L
AA 1
Na 190 ↑ 135--146 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

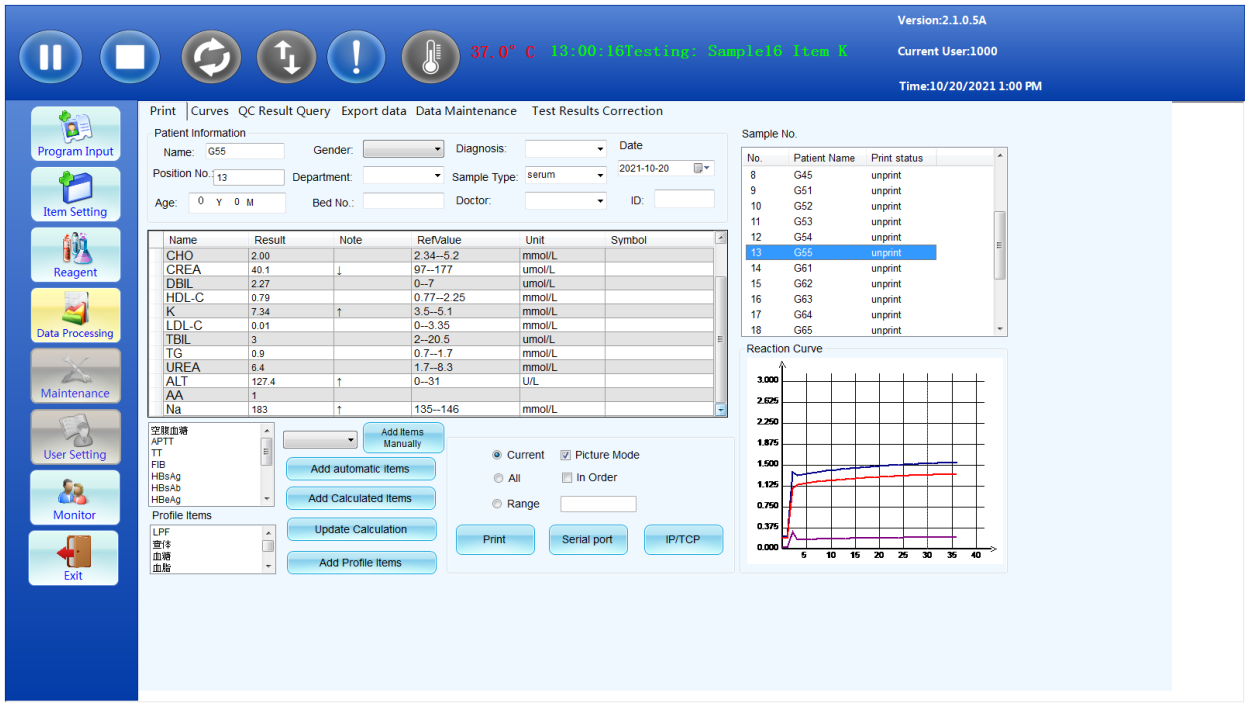
G54


Version:2.1.0.5A
Current User:1000
Time:10/20/2021 12:55 PM
37.0° C 12:54:53Testing: Sample15 Item UREA
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G54
Gender:
Diagnosis:
Date
Position No.: 12
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
ALB 35.7 ↑ 3.5--5.5 mg/dL
ALP 339 ↑ 45--135 U/L
AST 229.5 ↑ 0--31 U/L
CHO 2.03 2.34--5.2 mmol/L
CREA 35.8 ↓ 97--177 umol/L
DBIL 1.17 0--7 umol/L
HDL-C 0.67 ↓ 0.77--2.25 mmol/L
K 7.18 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 6 2--20.5 umol/L
TG 0.65 ↓ 0.7--1.7 mmol/L
UREA 9.1 ↑ 1.7--8.3 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Sample No.
No. Patient Name Print status
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
12 G54 unprint
13 G55 unprint
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

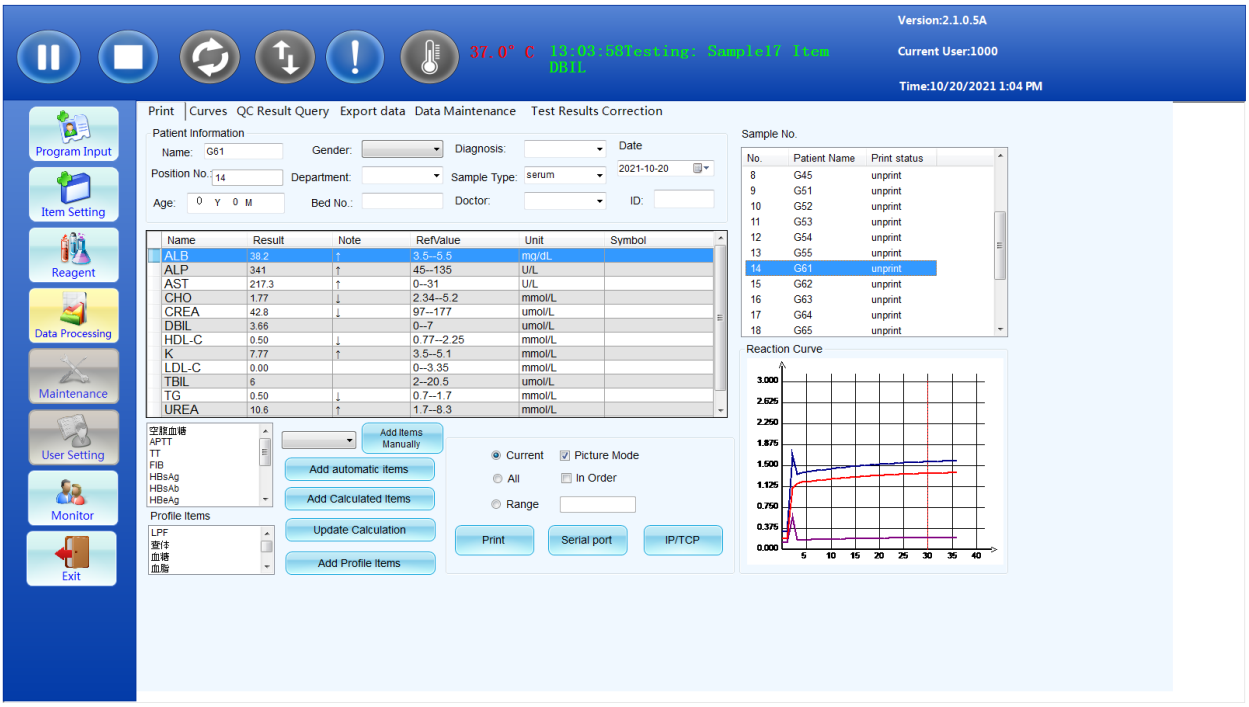

Version:2.1.0.5A
Current User:1000
Time:10/20/2021 12:55 PM
37.0° C 12:55:13Testing: Sample15 Item HDL-C
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G54
Gender:
Diagnosis:
Date
Position No.: 12
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
CHO 2.03 2.34--5.2 mmol/L
CREA 35.8 ↓ 97--177 umol/L
DBIL 1.17 0--7 umol/L
HDL-C 0.67 ↓ 0.77--2.25 mmol/L
K 7.18 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 6 2--20.5 umol/L
TG 0.65 ↓ 0.7--1.7 mmol/L
UREA 9.1 ↑ 1.7--8.3 mmol/L
ALT 138.8 ↑ 0--31 U/L
AA 1
Na 186 ↑ 135--146 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Sample No.
No. Patient Name Print status
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
12 G54 unprint
13 G55 unprint
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

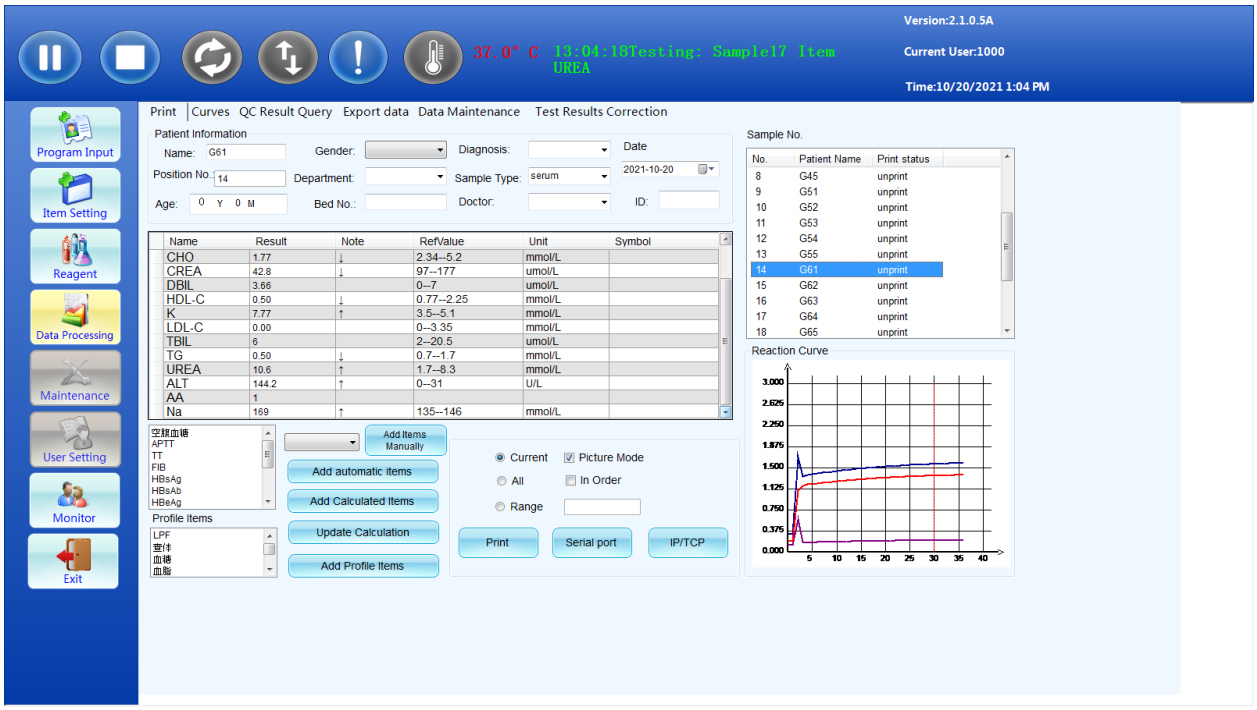
G55


37.0° C 12:59:15Testing: Sample16 Item DBIL
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 12:59 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G55
Gender:
Diagnosis:
Date
Position No.: 13
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
ALB 37.0 ↑ 3.5--5.5 mg/dL
ALP 360 ↑ 45--135 U/L
AST 233.0 ↑ 0--31 U/L
CHO 2.00 2.34--5.2 mmol/L
CREA 40.1 ↓ 97--177 umol/L
DBIL 2.27 0--7 umol/L
HDL-C 0.79 0.77--2.25 mmol/L
K 7.34 ↑ 3.5--5.1 mmol/L
LDL-C 0.01 0--3.35 mmol/L
TBIL 3 2--20.5 umol/L
TG 0.9 0.7--1.7 mmol/L
UREA 6.4 1.7--8.3 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Sample No.
No. Patient Name Print status
11 G53 unprint
12 G54 unprint
13 G55 unprint
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
19 G71 unprint
20 G72 unprint
21 G73 unprint
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

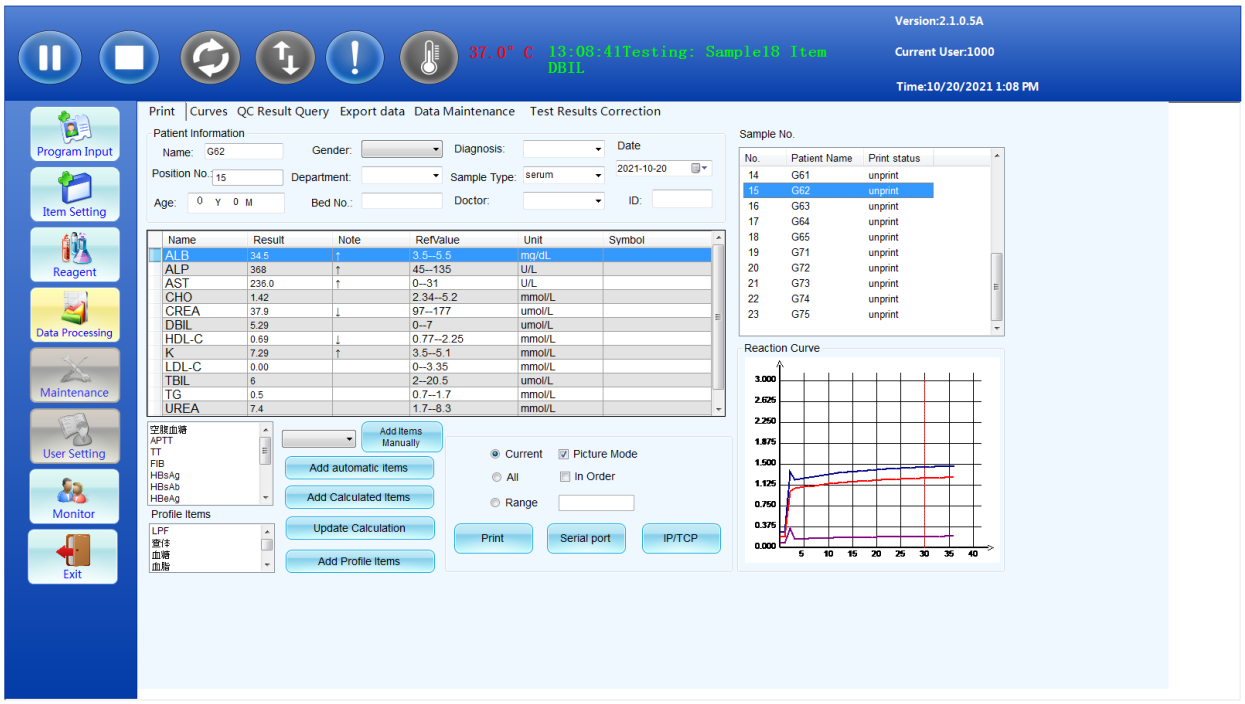

37.0° C 13:00:16Testing: Sample16 Item K
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 1:00 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G55
Gender:
Diagnosis:
Date
Position No.: 13
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
CHO 2.00 2.34--5.2 mmol/L
CREA 40.1 ↓ 97--177 umol/L
DBIL 2.27 0--7 umol/L
HDL-C 0.79 0.77--2.25 mmol/L
K 7.34 ↑ 3.5--5.1 mmol/L
LDL-C 0.01 0--3.35 mmol/L
TBIL 3 2--20.5 umol/L
TG 0.9 0.7--1.7 mmol/L
UREA 6.4 1.7--8.3 mmol/L
ALT 127.4 ↑ 0--31 U/L
AA 1
Na 183 ↑ 135--146 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Sample No.
No. Patient Name Print status
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
12 G54 unprint
13 G55 unprint
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

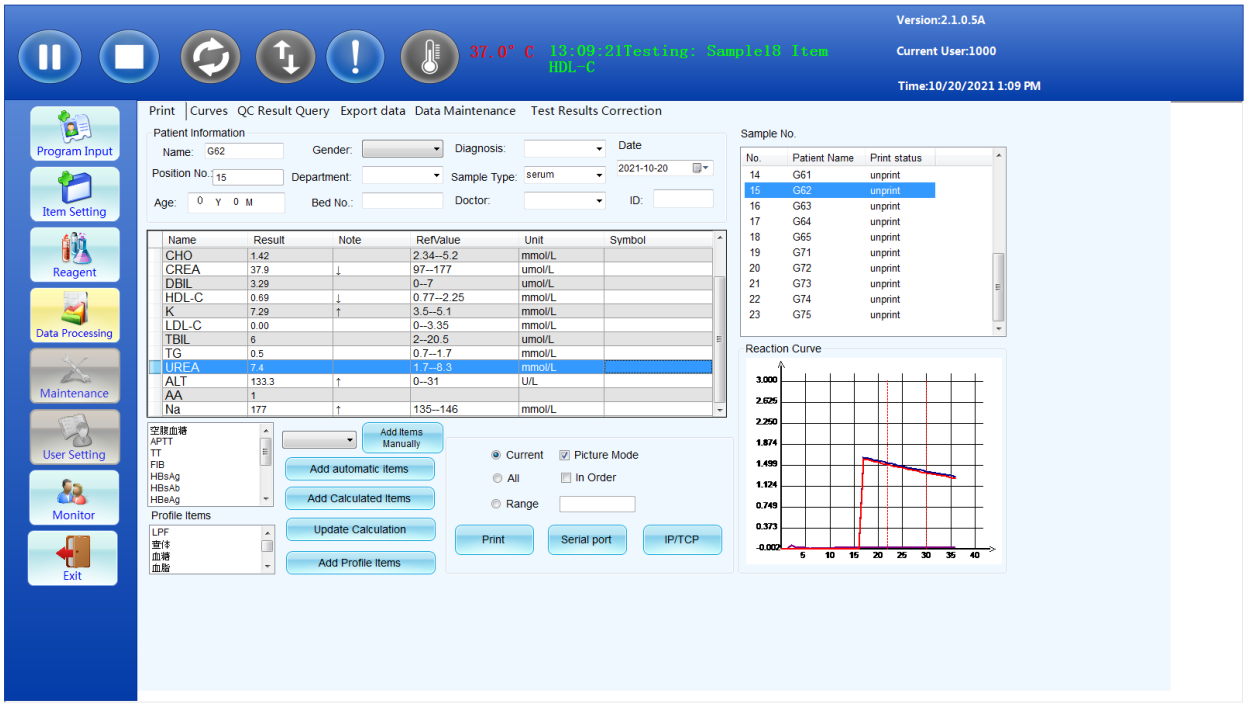
G61


37.0° C 13:03:58Testing: Sample17 Item DBIL
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 1:04 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G61
Gender:
Diagnosis:
Date
Position No.: 14
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
12 G54 unprint
13 G55 unprint
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
Name Result Note RefValue Unit Symbol
ALB 38.2 ↑ 3.5--5.5 mg/dL
ALP 341 ↑ 45--135 U/L
AST 217.3 ↑ 0--31 U/L
CHO 1.77 ↓ 2.34--5.2 mmol/L
CREA 42.8 ↓ 97--177 umol/L
DBIL 3.66 0--7 umol/L
HDL-C 0.50 ↓ 0.77--2.25 mmol/L
K 7.77 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 6 2--20.5 umol/L
TG 0.50 ↓ 0.7--1.7 mmol/L
UREA 10.6 ↑ 1.7--8.3 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Profile Items
LPF
蜜饯
血糖
血脂
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

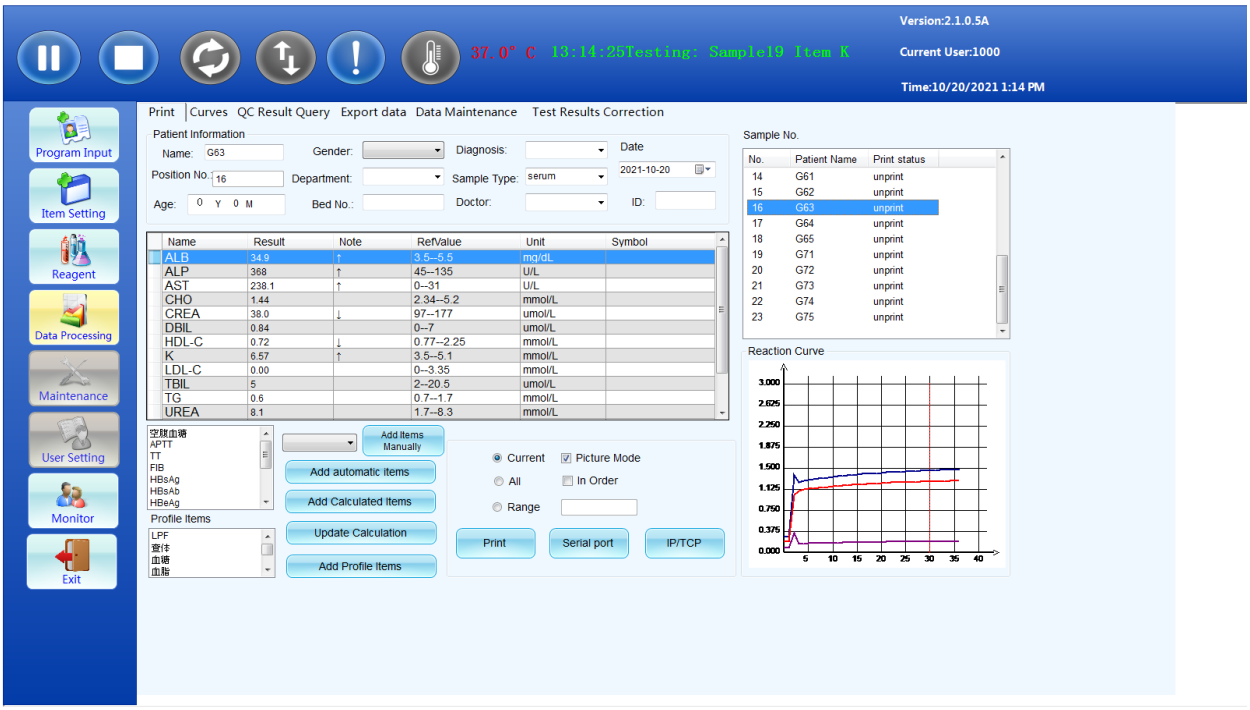

37.0° C 13:04:18Testing: Sample17 Item UREA
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 1:04 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G61
Gender:
Diagnosis:
Date
Position No.: 14
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
8 G45 unprint
9 G51 unprint
10 G52 unprint
11 G53 unprint
12 G54 unprint
13 G55 unprint
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
Name Result Note RefValue Unit Symbol
CHO 1.77 ↓ 2.34--5.2 mmol/L
CREA 42.8 ↓ 97--177 umol/L
DBIL 3.66 0--7 umol/L
HDL-C 0.50 ↓ 0.77--2.25 mmol/L
K 7.77 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 6 2--20.5 umol/L
TG 0.50 ↓ 0.7--1.7 mmol/L
UREA 10.6 ↑ 1.7--8.3 mmol/L
ALT 144.2 ↑ 0--31 U/L
AA 1
Na 169 ↑ 135--146 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Profile Items
LPF
蜜饯
血糖
血脂
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

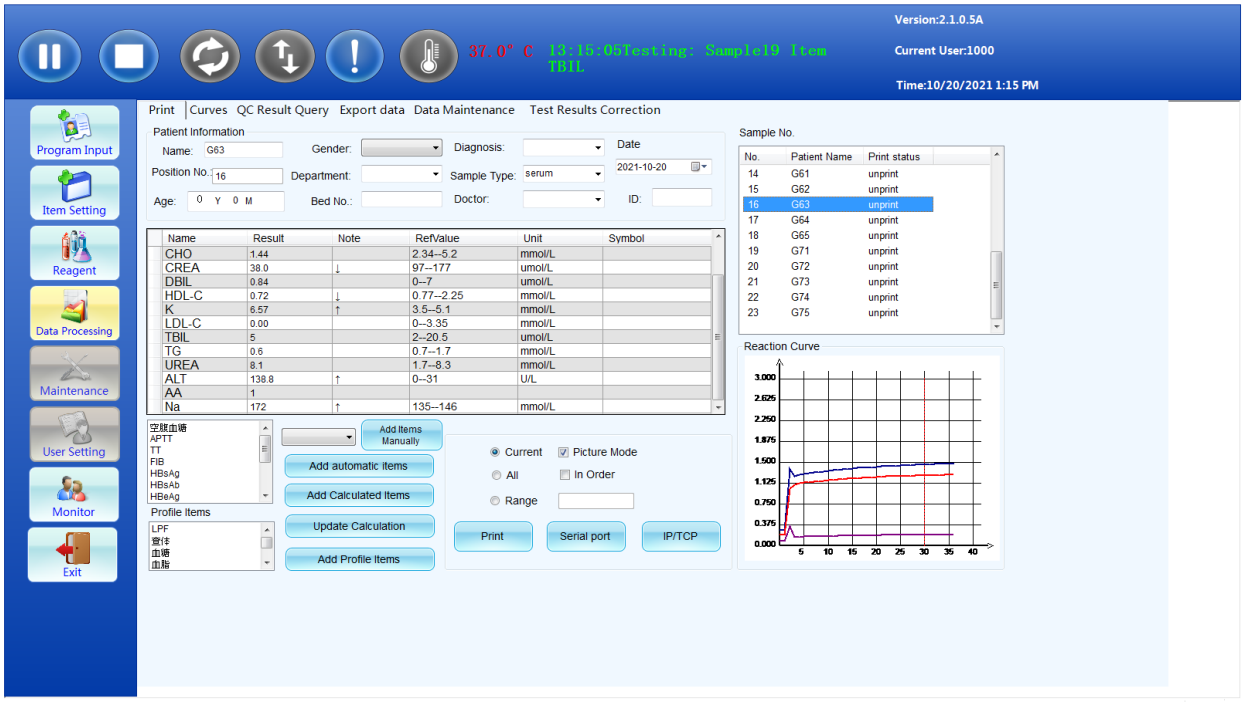
G62


37.0° C 13:08:41Testing: Sample18 Item DBIL
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 1:08 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G62
Gender:
Diagnosis:
Date
Position No.: 15
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
19 G71 unprint
20 G72 unprint
21 G73 unprint
22 G74 unprint
23 G75 unprint
Name Result Note RefValue Unit Symbol
ALB 34.5 ↑ 3.5--5.5 mg/dL
ALP 368 ↑ 45--135 U/L
AST 236.0 ↑ 0--31 U/L
CHO 1.42 2.34--5.2 mmol/L
CREA 37.9 ↓ 97--177 umol/L
DBIL 5.29 0--7 umol/L
HDL-C 0.69 ↓ 0.77--2.25 mmol/L
K 7.29 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 6 2--20.5 umol/L
TG 0.5 0.7--1.7 mmol/L
UREA 7.4 1.7--8.3 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

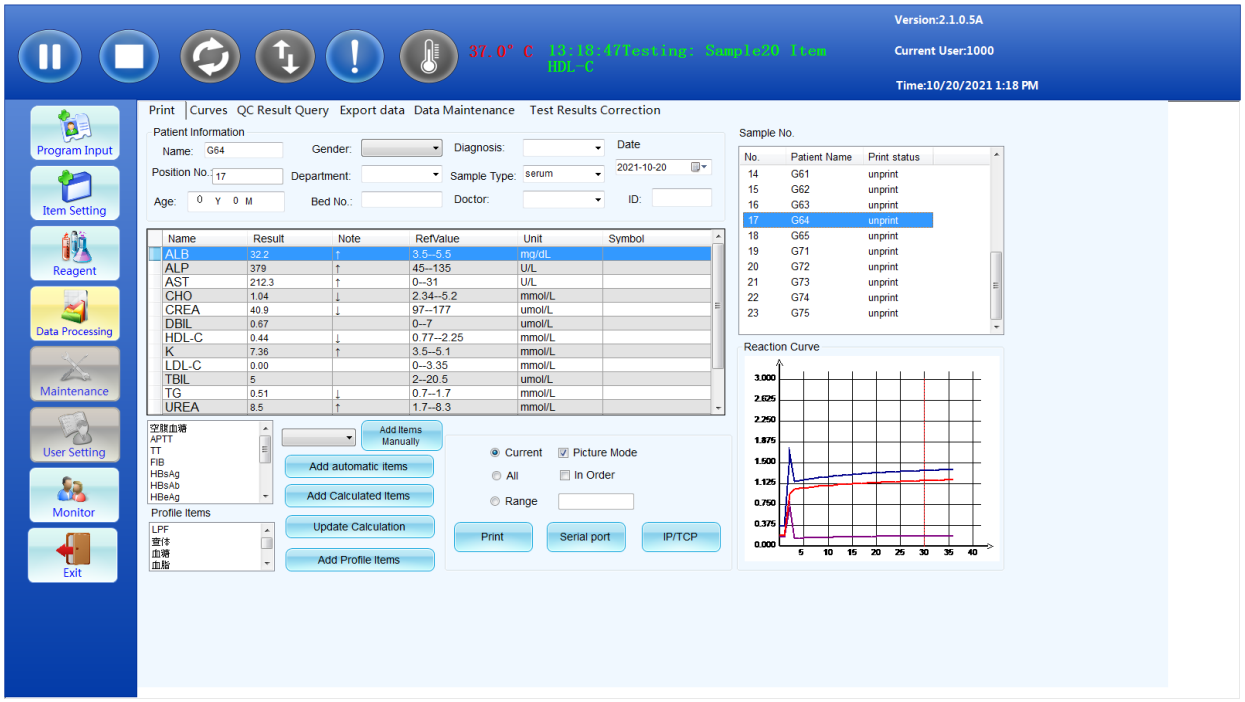

37.0° C 13:09:21Testing: Sample18 Item HDL-C
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 1:09 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G62
Gender:
Diagnosis:
Date
Position No.: 15
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
19 G71 unprint
20 G72 unprint
21 G73 unprint
22 G74 unprint
23 G75 unprint
Name Result Note RefValue Unit Symbol
CHO 1.42 2.34--5.2 mmol/L
CREA 37.9 ↓ 97--177 umol/L
DBIL 3.29 0--7 umol/L
HDL-C 0.69 ↓ 0.77--2.25 mmol/L
K 7.29 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 6 2--20.5 umol/L
TG 0.5 0.7--1.7 mmol/L
UREA 7.4 1.7--8.3 mmol/L
ALT 133.3 ↑ 0--31 U/L
AA 1
Na 177 ↑ 135--146 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

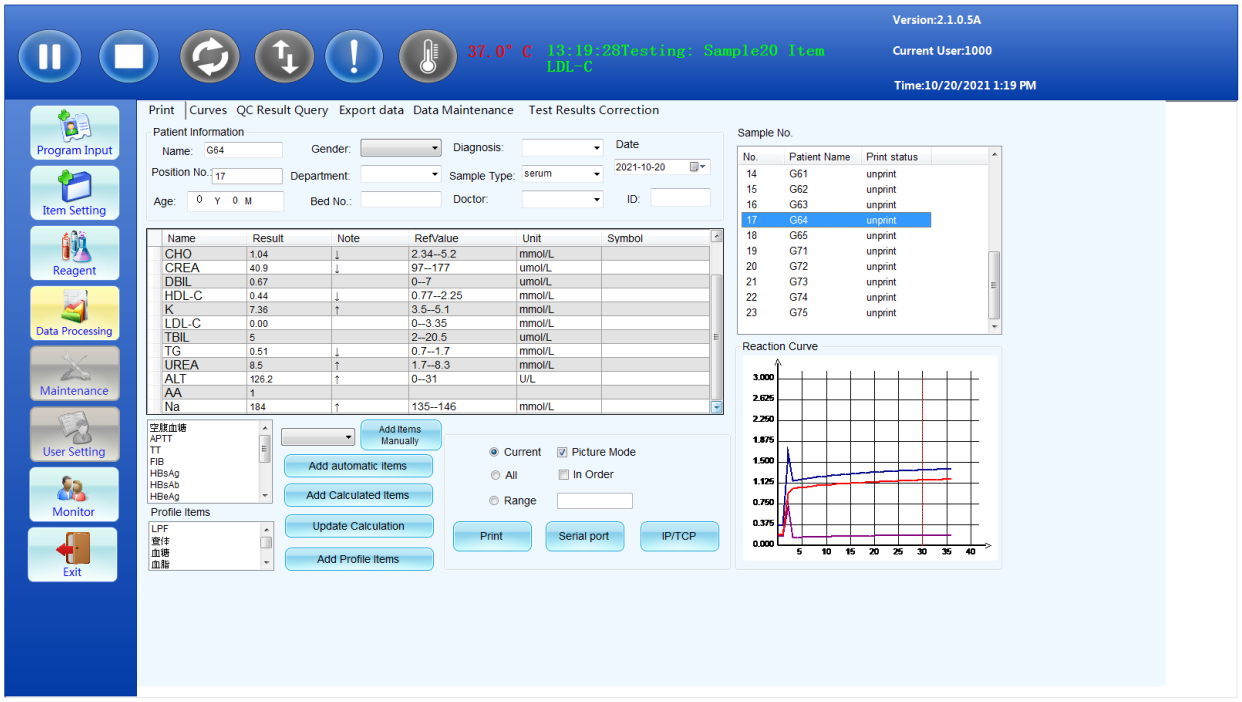
G63


37.0° C 13:14:25Testing: Sample19 Item K
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 1:14 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G63
Gender:
Diagnosis:
Date
Position No.: 16
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
ALB 34.9 ↑ 3.5--5.5 mg/dL
ALP 368 ↑ 45--135 U/L
AST 238.1 ↑ 0--31 U/L
CHO 1.44 2.34--5.2 mmol/L
CREA 38.0 ↓ 97--177 umol/L
DBIL 0.84 0--7 umol/L
HDL-C 0.72 ↓ 0.77--2.25 mmol/L
K 6.57 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 5 2--20.5 umol/L
TG 0.6 0.7--1.7 mmol/L
UREA 8.1 1.7--8.3 mmol/L
Sample No.
No. Patient Name Print status
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
19 G71 unprint
20 G72 unprint
21 G73 unprint
22 G74 unprint
23 G75 unprint
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

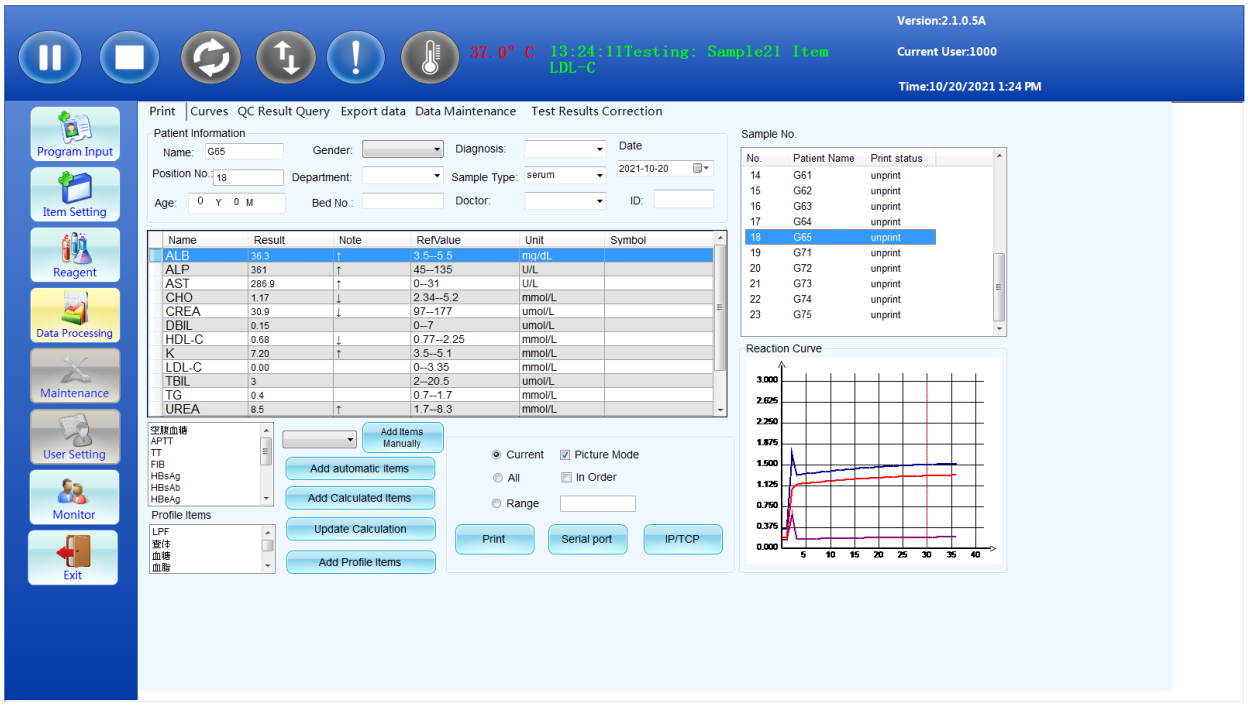

37.0° C 13:15:05Testing: Sample19 Item TBIL
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 1:15 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G63
Gender:
Diagnosis:
Date
Position No.: 16
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
CHO 1.44 2.34--5.2 mmol/L
CREA 38.0 ↓ 97--177 umol/L
DBIL 0.84 0--7 umol/L
HDL-C 0.72 ↓ 0.77--2.25 mmol/L
K 6.57 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 5 2--20.5 umol/L
TG 0.6 0.7--1.7 mmol/L
UREA 8.1 1.7--8.3 mmol/L
ALT 138.8 ↑ 0--31 U/L
AA 1
Na 172 ↑ 135--146 mmol/L
Sample No.
No. Patient Name Print status
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
19 G71 unprint
20 G72 unprint
21 G73 unprint
22 G74 unprint
23 G75 unprint
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

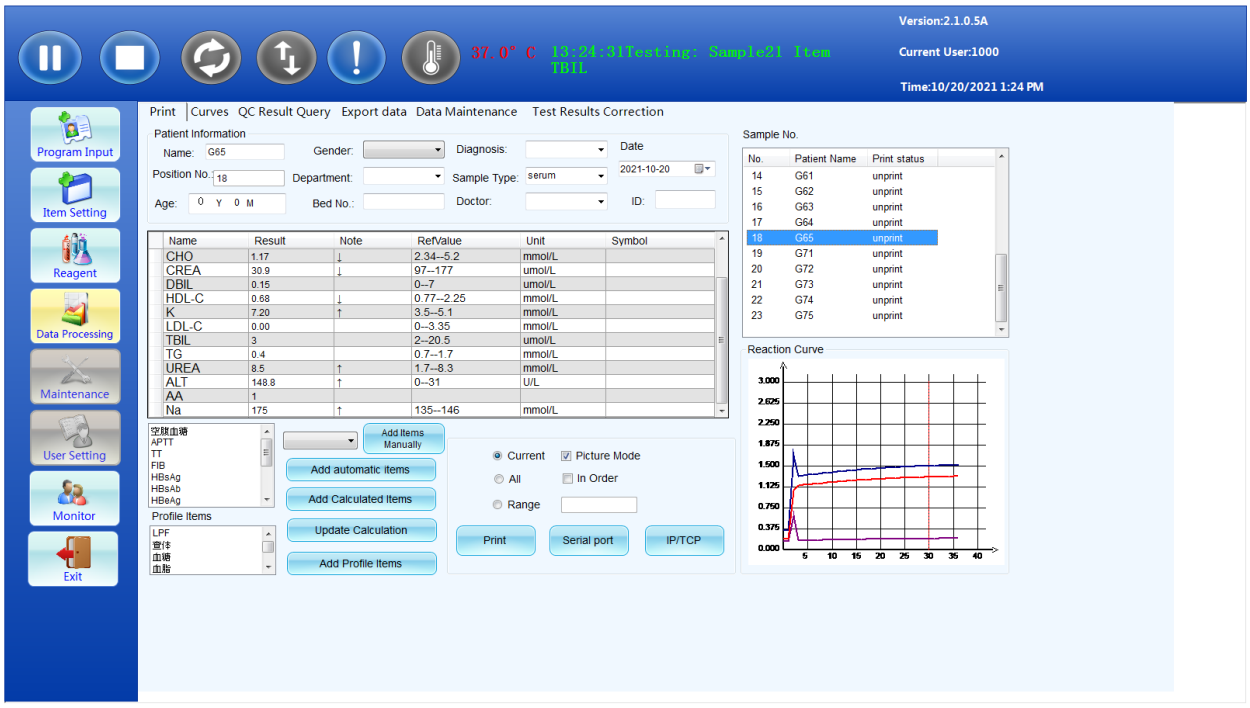
G64


Version:2.1.0.5A
37.0° C 13:18:47Testing: Sample20 Item HDL-C
Current User:1000
Time:10/20/2021 1:18 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print Curves QC Result Query Export data Data Maintenance Test Results Correction
Patient Information
Name: G64
Gender:
Diagnosis:
Date
Position No.: 17
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
ALB 32.2 ↑ 3.5--5.5 mg/dL
ALP 379 ↑ 45--135 U/L
AST 212.3 ↑ 0--31 U/L
CHO 1.04 ↓ 2.34--5.2 mmol/L
CREA 40.9 ↓ 97--177 umol/L
DBIL 0.67 0--7 umol/L
HDL-C 0.44 ↓ 0.77--2.25 mmol/L
K 7.36 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 5 2--20.5 umol/L
TG 0.51 ↓ 0.7--1.7 mmol/L
UREA 8.5 ↑ 1.7--8.3 mmol/L
Sample No.
No. Patient Name Print status
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
19 G71 unprint
20 G72 unprint
21 G73 unprint
22 G74 unprint
23 G75 unprint
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

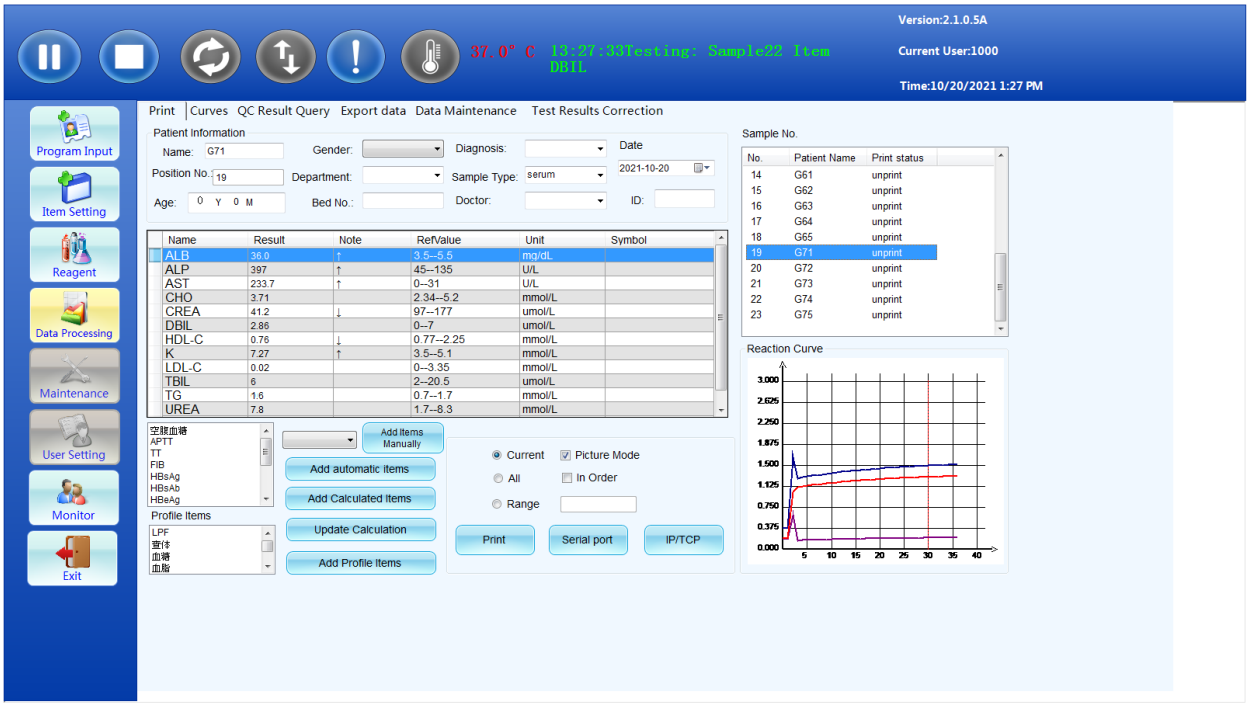

Version:2.1.0.5A
37.0° C 13:19:28Testing: Sample20 Item LDL-C
Current User:1000
Time:10/20/2021 1:19 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print Curves QC Result Query Export data Data Maintenance Test Results Correction
Patient Information
Name: G64
Gender:
Diagnosis:
Date
Position No.: 17
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
CHO 1.04 ↓ 2.34--5.2 mmol/L
CREA 40.9 ↓ 97--177 umol/L
DBIL 0.67 0--7 umol/L
HDL-C 0.44 ↓ 0.77--2.25 mmol/L
K 7.36 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 5 2--20.5 umol/L
TG 0.51 ↓ 0.7--1.7 mmol/L
UREA 8.5 ↑ 1.7--8.3 mmol/L
ALT 126.2 ↑ 0--31 U/L
AA 1
Na 184 ↑ 135--146 mmol/L
Sample No.
No. Patient Name Print status
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
19 G71 unprint
20 G72 unprint
21 G73 unprint
22 G74 unprint
23 G75 unprint
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

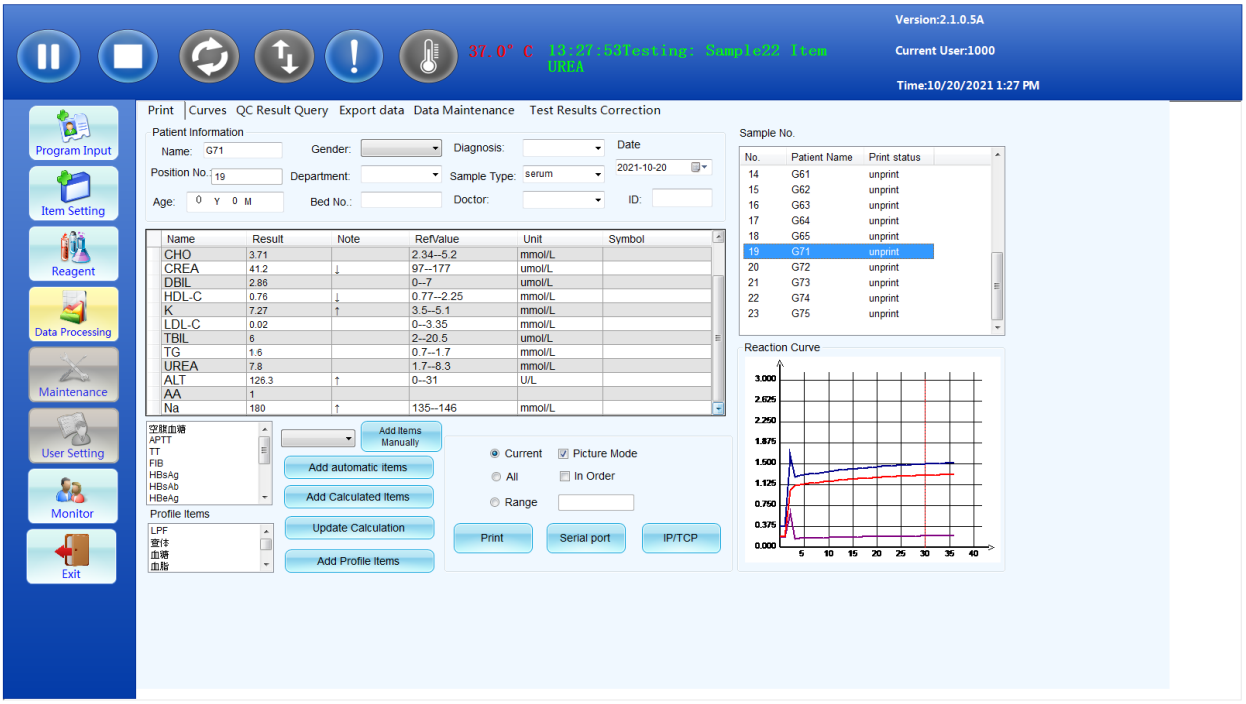
G65


Version:2.1.0.5A
Current User:1000
Time:10/20/2021 1:24 PM
37.0° C 13:24:11Testing: Sample21 Item LDL-C
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G65
Gender:
Diagnosis:
Date
Position No.: 18
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
ALB 36.3 ↑ 3.5--5.5 mg/dL
ALP 361 ↑ 45--135 U/L
AST 286.9 ↑ 0--31 U/L
CHO 1.17 ↓ 2.34--5.2 mmol/L
CREA 30.9 ↓ 97--177 umol/L
DBIL 0.15 0--7 umol/L
HDL-C 0.68 ↓ 0.77--2.25 mmol/L
K 7.20 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 3 2--20.5 umol/L
TG 0.4 0.7--1.7 mmol/L
UREA 8.5 ↑ 1.7--8.3 mmol/L
Sample No.
No. Patient Name Print status
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
19 G71 unprint
20 G72 unprint
21 G73 unprint
22 G74 unprint
23 G75 unprint
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
糖体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

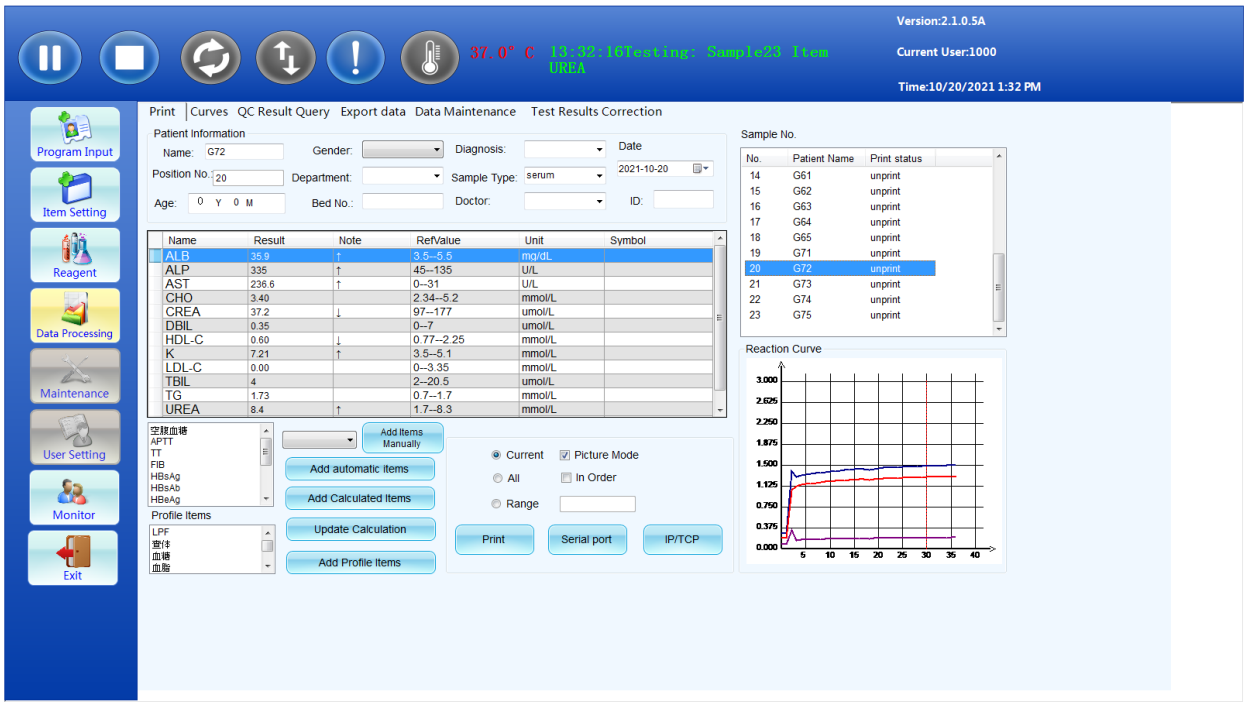

Version:2.1.0.5A
Current User:1000
Time:10/20/2021 1:24 PM
37.0° C 13:24:31Testing: Sample21 Item TBIL
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G65
Gender:
Diagnosis:
Date
Position No.: 18
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
CHO 1.17 ↓ 2.34--5.2 mmol/L
CREA 30.9 ↓ 97--177 umol/L
DBIL 0.15 0--7 umol/L
HDL-C 0.68 ↓ 0.77--2.25 mmol/L
K 7.20 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 3 2--20.5 umol/L
TG 0.4 0.7--1.7 mmol/L
UREA 8.5 ↑ 1.7--8.3 mmol/L
ALT 148.8 ↑ 0--31 U/L
AA 1
Na 175 ↑ 135--146 mmol/L
Sample No.
No. Patient Name Print status
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
19 G71 unprint
20 G72 unprint
21 G73 unprint
22 G74 unprint
23 G75 unprint
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
糖体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

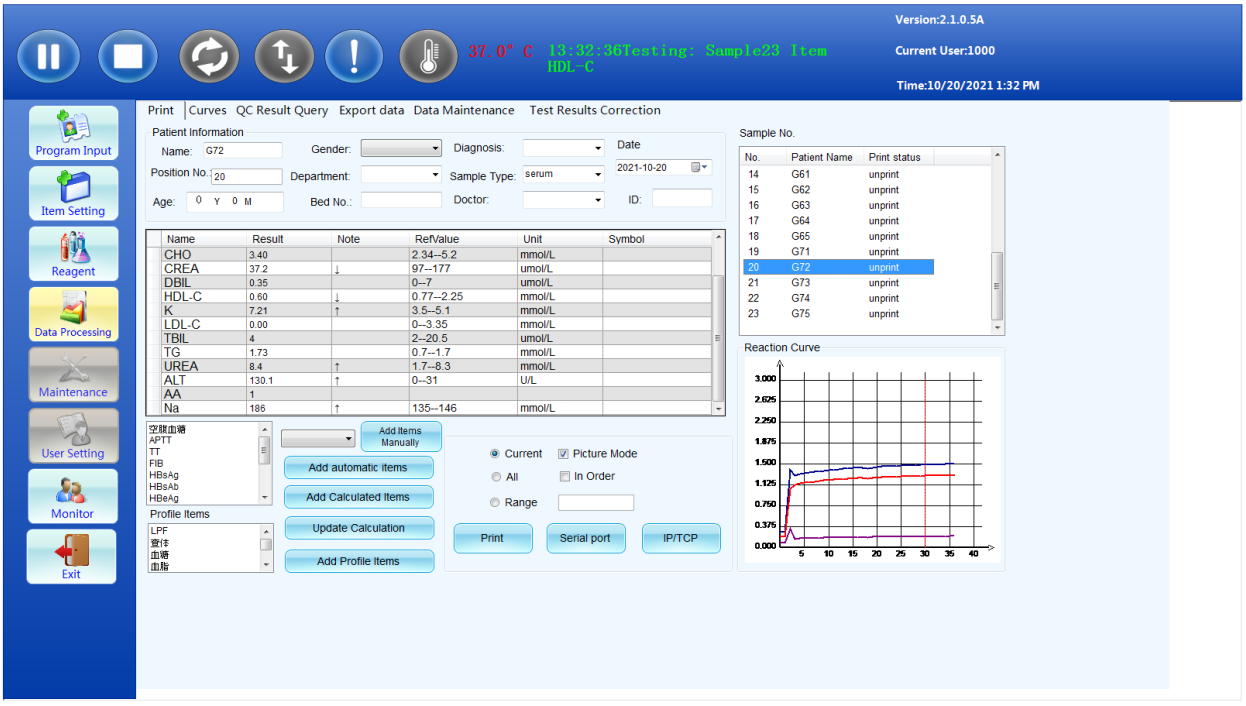
G71


37.0° C 13:27:33Testing: Sample22 Item DBIL
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 1:27 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G71
Gender:
Diagnosis:
Date
Position No.: 19
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
ALB 36.0 ↑ 3.5--5.5 mg/dL
ALP 397 ↑ 45--135 U/L
AST 233.7 ↑ 0--31 U/L
CHO 3.71 2.34--5.2 mmol/L
CREA 41.2 ↓ 97--177 umol/L
DBIL 2.86 0--7 umol/L
HDL-C 0.76 ↓ 0.77--2.25 mmol/L
K 7.27 ↑ 3.5--5.1 mmol/L
LDL-C 0.02 0--3.35 mmol/L
TBIL 6 2--20.5 umol/L
TG 1.6 0.7--1.7 mmol/L
UREA 7.8 1.7--8.3 mmol/L
Sample No.
No. Patient Name Print status
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
19 G71 unprint
20 G72 unprint
21 G73 unprint
22 G74 unprint
23 G75 unprint
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
蛋白
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

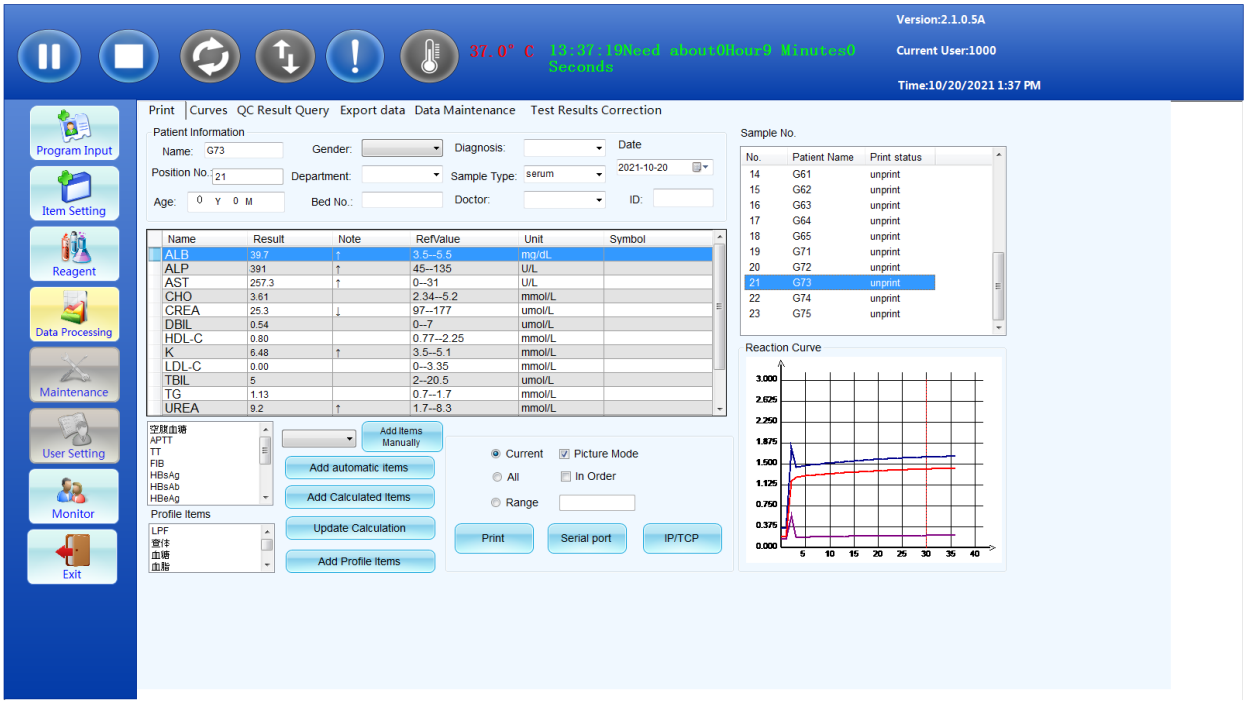

37.0° C 13:27:53Testing: Sample22 Item UREA
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 1:27 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G71
Gender:
Diagnosis:
Date
Position No.: 19
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
CHO 3.71 2.34--5.2 mmol/L
CREA 41.2 ↓ 97--177 umol/L
DBIL 2.86 0--7 umol/L
HDL-C 0.76 ↓ 0.77--2.25 mmol/L
K 7.27 ↑ 3.5--5.1 mmol/L
LDL-C 0.02 0--3.35 mmol/L
TBIL 6 2--20.5 umol/L
TG 1.6 0.7--1.7 mmol/L
UREA 7.8 1.7--8.3 mmol/L
ALT 126.3 ↑ 0--31 U/L
AA 1
Na 180 ↑ 135--146 mmol/L
Sample No.
No. Patient Name Print status
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
19 G71 unprint
20 G72 unprint
21 G73 unprint
22 G74 unprint
23 G75 unprint
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
蛋白
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

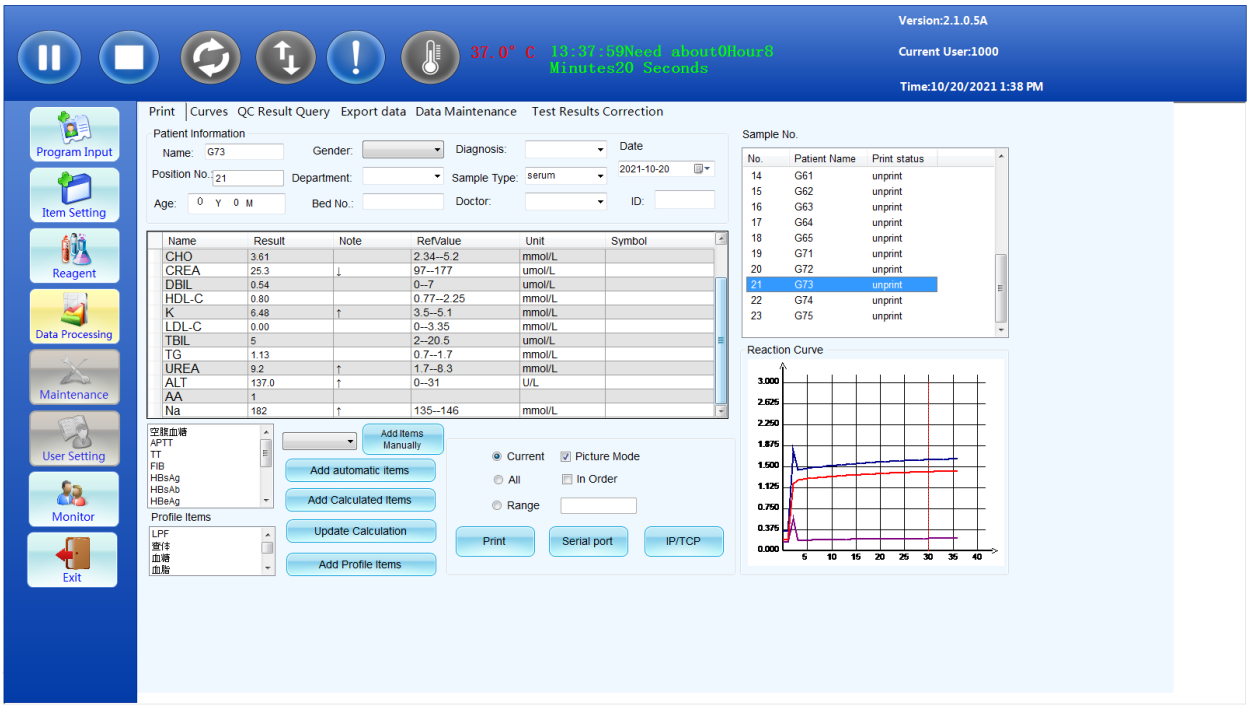
G72


Version:2.1.0.5A
Current User:1000
Time:10/20/2021 1:32 PM
37.0° C 13:32:16Testing: Sample23 Item UREA
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print Curves QC Result Query Export data Data Maintenance Test Results Correction
Patient Information
Name: G72
Gender:
Diagnosis:
Date
Position No.: 20
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
19 G71 unprint
20 G72 unprint
21 G73 unprint
22 G74 unprint
23 G75 unprint
Name Result Note RefValue Unit Symbol
ALB 35.9 ↑ 3.5--5.5 mg/dL
ALP 335 ↑ 45--135 U/L
AST 236.6 ↑ 0--31 U/L
CHO 3.40 2.34--5.2 mmol/L
CREA 37.2 ↓ 97--177 umol/L
DBIL 0.35 0--7 umol/L
HDL-C 0.60 ↓ 0.77--2.25 mmol/L
K 7.21 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 4 2--20.5 umol/L
TG 1.73 0.7--1.7 mmol/L
UREA 8.4 ↑ 1.7--8.3 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Profile Items
LPF
蛋白
血糖
血脂
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

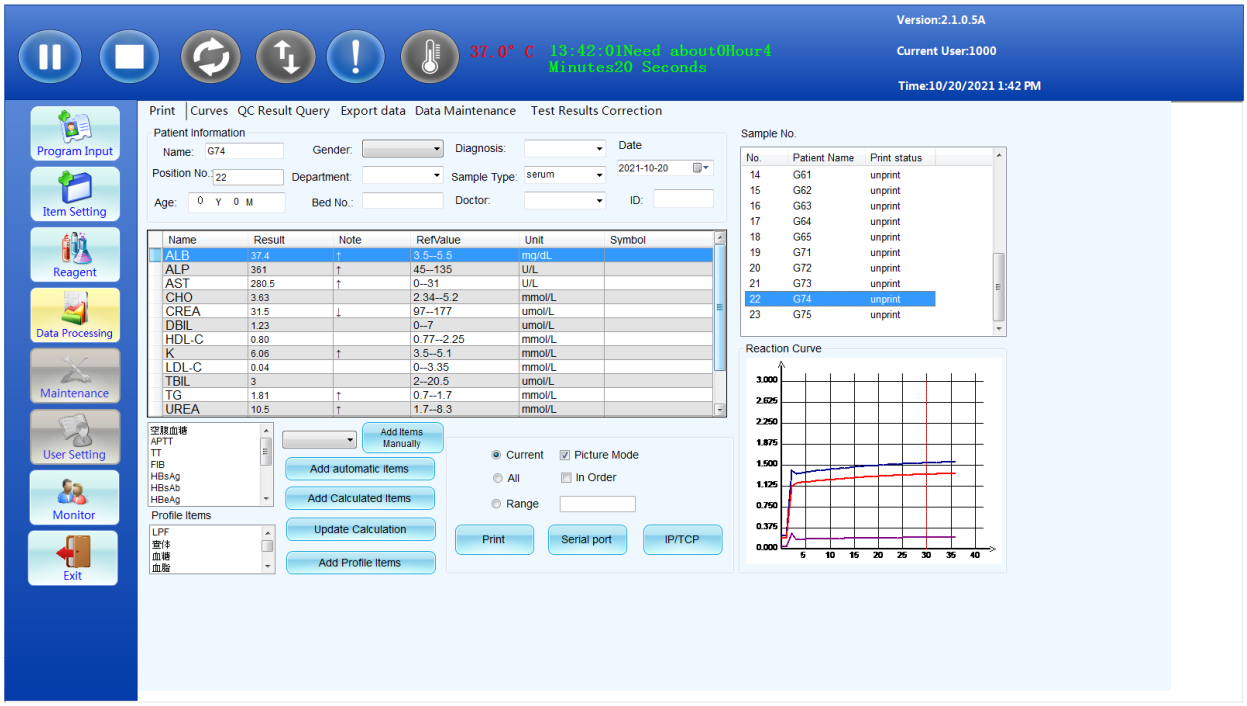

Version:2.1.0.5A
Current User:1000
Time:10/20/2021 1:32 PM
37.0° C 13:32:36Testing: Sample23 Item HDL-C
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print Curves QC Result Query Export data Data Maintenance Test Results Correction
Patient Information
Name: G72
Gender:
Diagnosis:
Date
Position No.: 20
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
19 G71 unprint
20 G72 unprint
21 G73 unprint
22 G74 unprint
23 G75 unprint
Name Result Note RefValue Unit Symbol
CHO 3.40 2.34--5.2 mmol/L
CREA 37.2 ↓ 97--177 umol/L
DBIL 0.35 0--7 umol/L
HDL-C 0.60 ↓ 0.77--2.25 mmol/L
K 7.21 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 4 2--20.5 umol/L
TG 1.73 0.7--1.7 mmol/L
UREA 8.4 ↑ 1.7--8.3 mmol/L
ALT 130.1 ↑ 0--31 U/L
AA 1
Na 186 ↑ 135--146 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Profile Items
LPF
蛋白
血糖
血脂
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP

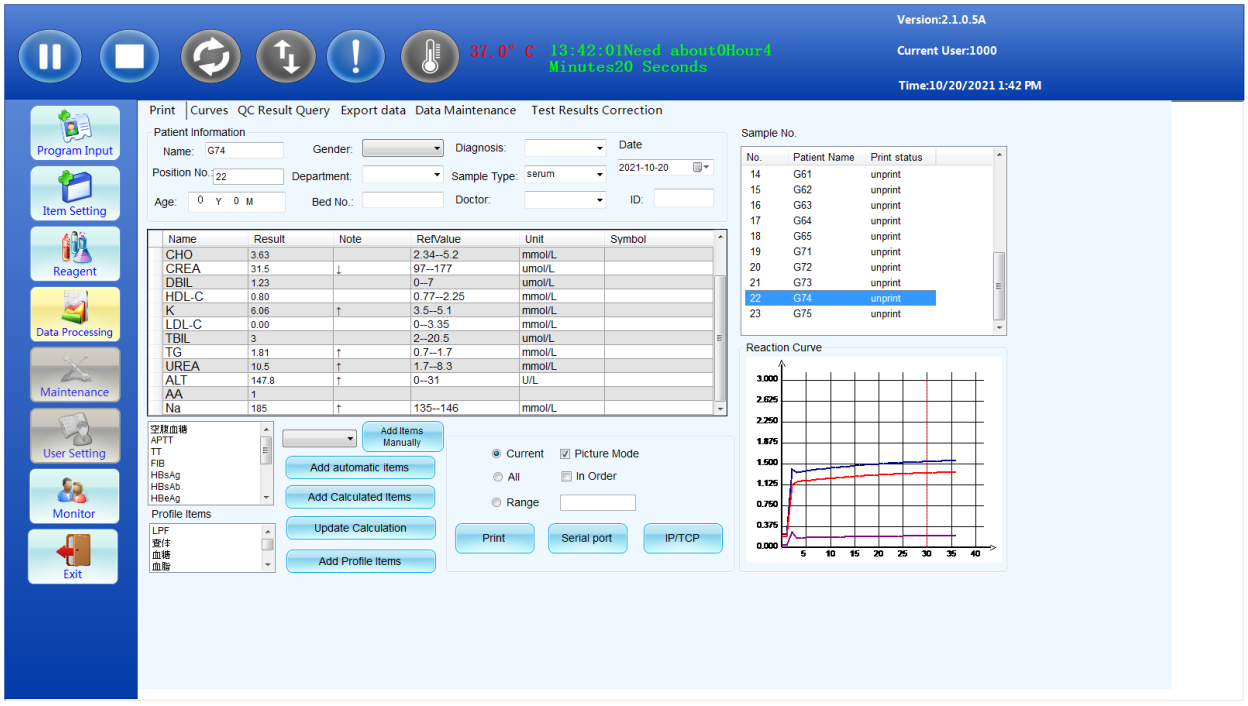
G73


37.0° C 13:37:19Need about0Hour9 Minutes0 Seconds
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 1:37 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G73
Gender:
Diagnosis:
Date
Position No.: 21
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
19 G71 unprint
20 G72 unprint
21 G73 unprint
22 G74 unprint
23 G75 unprint
Name Result Note RefValue Unit Symbol
ALB 39.7 ↑ 3.5--5.5 mg/dL
ALP 391 ↑ 45--135 U/L
AST 257.3 ↑ 0--31 U/L
CHO 3.61 2.34--5.2 mmol/L
CREA 25.3 ↓ 97--177 umol/L
DBIL 0.54 0--7 umol/L
HDL-C 0.80 0.77--2.25 mmol/L
K 6.48 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 5 2--20.5 umol/L
TG 1.13 0.7--1.7 mmol/L
UREA 9.2 ↑ 1.7--8.3 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

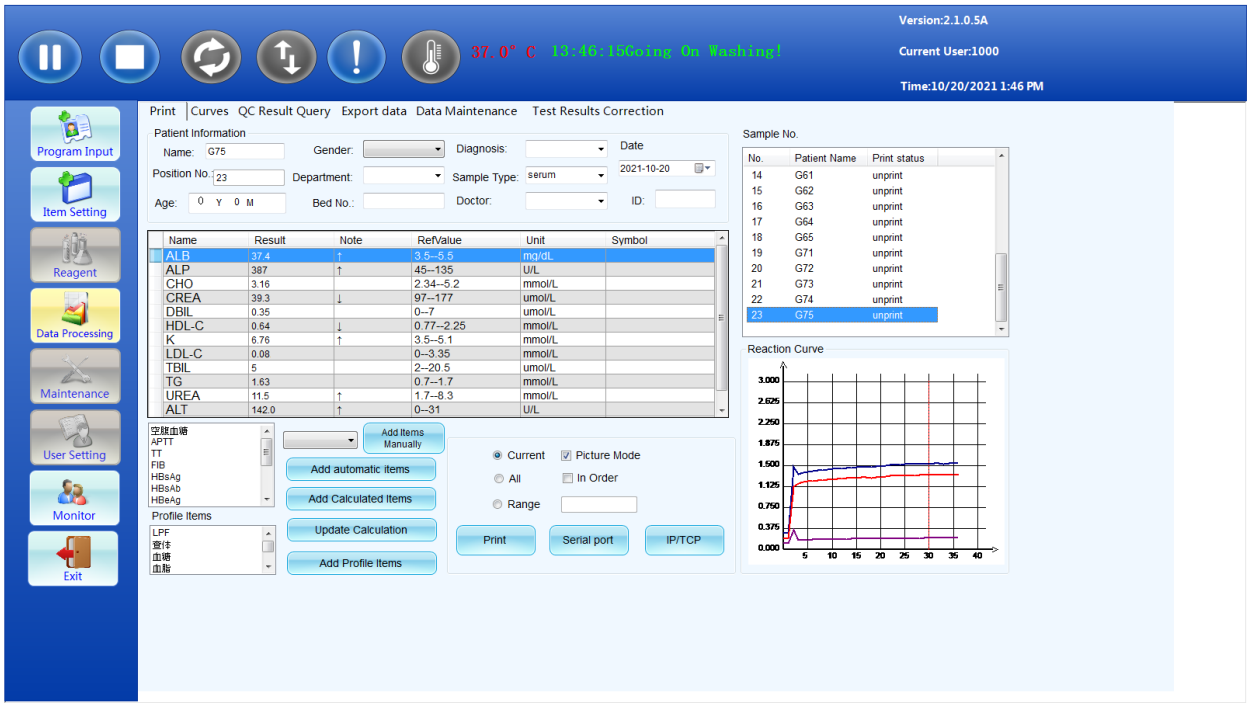

37.0° C 13:37:59Need about0Hour8 Minutes20 Seconds
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 1:38 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G73
Gender:
Diagnosis:
Date
Position No.: 21
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
19 G71 unprint
20 G72 unprint
21 G73 unprint
22 G74 unprint
23 G75 unprint
Name Result Note RefValue Unit Symbol
CHO 3.61 2.34--5.2 mmol/L
CREA 25.3 ↓ 97--177 umol/L
DBIL 0.54 0--7 umol/L
HDL-C 0.80 0.77--2.25 mmol/L
K 6.48 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 5 2--20.5 umol/L
TG 1.13 0.7--1.7 mmol/L
UREA 9.2 ↑ 1.7--8.3 mmol/L
ALT 137.0 ↑ 0--31 U/L
AA 1
Na 182 ↑ 135--146 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

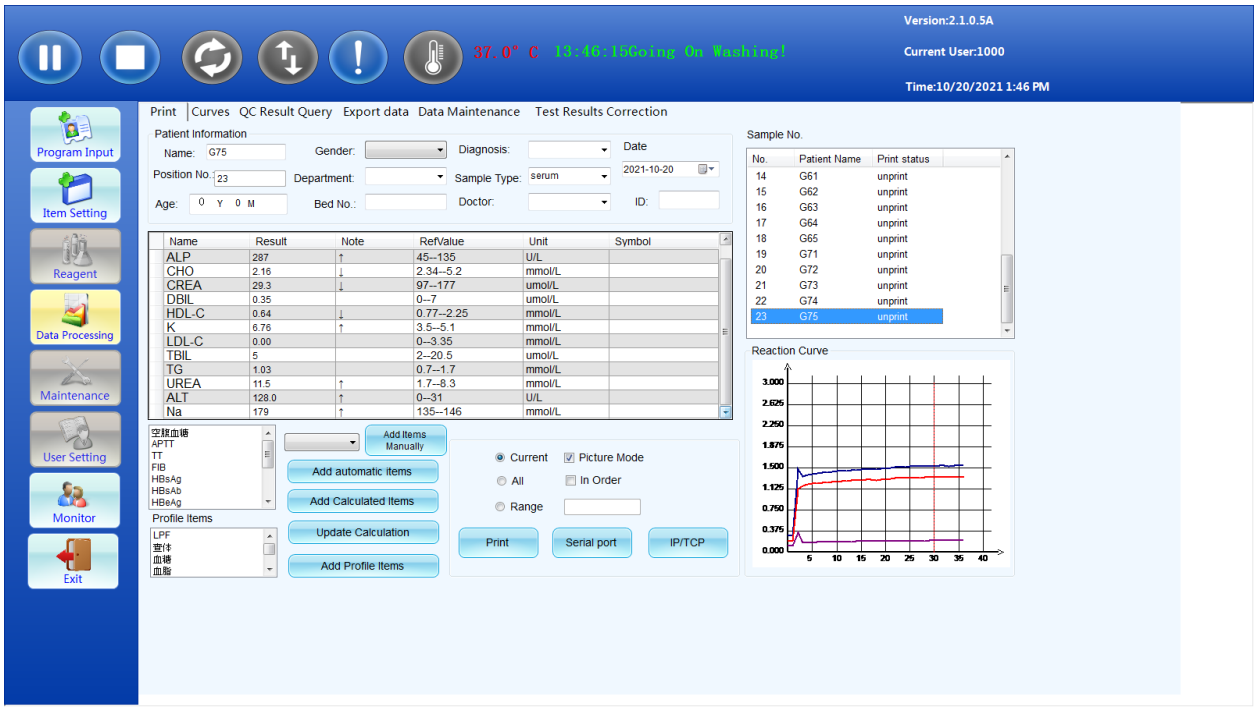
G74


Version:2.1.0.5A
Current User:1000
Time:10/20/2021 1:42 PM
37.0° C 13:42:01Need about0Hour4 Minutes20 Seconds
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G74
Gender:
Diagnosis:
Date
Position No.: 22
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
ALB 37.4 ↑ 3.5--5.5 mg/dL
ALP 361 ↑ 45--135 U/L
AST 280.5 ↑ 0--31 U/L
CHO 3.63 2.34--5.2 mmol/L
CREA 31.5 ↓ 97--177 umol/L
DBIL 1.23 0--7 umol/L
HDL-C 0.80 0.77--2.25 mmol/L
K 6.06 ↑ 3.5--5.1 mmol/L
LDL-C 0.04 0--3.35 mmol/L
TBIL 3 2--20.5 umol/L
TG 1.81 ↑ 0.7--1.7 mmol/L
UREA 10.5 ↑ 1.7--8.3 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Sample No.
No. Patient Name Print status
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
19 G71 unprint
20 G72 unprint
21 G73 unprint
22 G74 unprint
23 G75 unprint
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40


Version:2.1.0.5A
Current User:1000
Time:10/20/2021 1:42 PM
37.0° C 13:42:01Need about0Hour4 Minutes20 Seconds
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G74
Gender:
Diagnosis:
Date
Position No.: 22
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Name Result Note RefValue Unit Symbol
CHO 3.63 2.34--5.2 mmol/L
CREA 31.5 ↓ 97--177 umol/L
DBIL 1.23 0--7 umol/L
HDL-C 0.80 0.77--2.25 mmol/L
K 6.06 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 3 2--20.5 umol/L
TG 1.81 ↑ 0.7--1.7 mmol/L
UREA 10.5 ↑ 1.7--8.3 mmol/L
ALT 147.8 ↑ 0--31 U/L
AA 1
Na 185 ↑ 135--146 mmol/L
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
Picture Mode
All
In Order
Range
Print
Serial port
IP/TCP
Sample No.
No. Patient Name Print status
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
19 G71 unprint
20 G72 unprint
21 G73 unprint
22 G74 unprint
23 G75 unprint
Reaction Curve
3.000
2.625
2.250
1.875
1.500
1.125
0.750
0.375
0.000
5 10 15 20 25 30 35 40

G75


37.0° C 13:46:15Going On Washing!
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 1:46 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G75
Gender:
Diagnosis:
Date
Position No.: 23
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
19 G71 unprint
20 G72 unprint
21 G73 unprint
22 G74 unprint
23 G75 unprint
Name Result Note RefValue Unit Symbol
ALB 37.4 ↑ 3.5--5.5 mg/dL
ALP 387 ↑ 45--135 U/L
CHO 3.16 2.34--5.2 mmol/L
CREA 39.3 ↓ 97--177 umol/L
DBIL 0.35 0--7 umol/L
HDL-C 0.64 ↓ 0.77--2.25 mmol/L
K 6.76 ↑ 3.5--5.1 mmol/L
LDL-C 0.08 0--3.35 mmol/L
TBIL 5 2--20.5 umol/L
TG 1.63 0.7--1.7 mmol/L
UREA 11.5 ↑ 1.7--8.3 mmol/L
ALT 142.0 ↑ 0--31 U/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
All
Range
Picture Mode
In Order
Print
Serial port
IP/TCP


37.0° C 13:46:15Going On Washing!
Version:2.1.0.5A
Current User:1000
Time:10/20/2021 1:46 PM
Program Input
Item Setting
Reagent
Data Processing
Maintenance
User Setting
Monitor
Exit
Print
Curves
QC Result Query
Export data
Data Maintenance
Test Results Correction
Patient Information
Name: G75
Gender:
Diagnosis:
Date
Position No.: 23
Department:
Sample Type: serum
2021-10-20
Age: 0 Y 0 M
Bed No.:
Doctor:
ID:
Sample No.
No. Patient Name Print status
14 G61 unprint
15 G62 unprint
16 G63 unprint
17 G64 unprint
18 G65 unprint
19 G71 unprint
20 G72 unprint
21 G73 unprint
22 G74 unprint
23 G75 unprint
Name Result Note RefValue Unit Symbol
ALP 287 ↑ 45--135 U/L
CHO 2.16 ↓ 2.34--5.2 mmol/L
CREA 29.3 ↓ 97--177 umol/L
DBIL 0.35 0--7 umol/L
HDL-C 0.64 ↓ 0.77--2.25 mmol/L
K 6.76 ↑ 3.5--5.1 mmol/L
LDL-C 0.00 0--3.35 mmol/L
TBIL 5 2--20.5 umol/L
TG 1.03 0.7--1.7 mmol/L
UREA 11.5 ↑ 1.7--8.3 mmol/L
ALT 128.0 ↑ 0--31 U/L
Na 179 ↑ 135--146 mmol/L
Reaction Curve
空腹血糖
APTT
TT
FIB
HBsAg
HBsAb
HBeAg
Add Items Manually
Add automatic items
Add Calculated Items
Update Calculation
Add Profile Items
Profile Items
LPF
查体
血糖
血脂
Current
All
Range
Picture Mode
In Order
Print
Serial port
IP/TCP

APPENDIX II: RESEARCH ETHICS COMMITTEE PERMISSION

OFFICE OF THE DIRECTOR OF GRADUATE STUDIES AND RESEARCH
UNIVERSITY OF EASTERN AFRICA, BARATON
P.O. BOX 2500-30100, Eldoret, Kenya, East Africa

B1618032020 March 18, 2020

TO: Okuna Damaris Akinyi
School of Science
Moi University

Dear Damaris,

RE: Effects Of *Tithonia diversifoloa* Aqueous Root Extract On Blood Glucose And Serum Lipid Profiles In Western Diet Fed Wistar Albino Rats

This is to inform you that the Research Ethics Committee (REC) of the University of Eastern Africa Baraton has reviewed and approved your above research proposal. Your application approval number is UEAB/REC/16/03/2020. The approval period is 18th March, 2020 – 17th March, 2021.

This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments, MTA) will be used.
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by the Research Ethics Committee (REC) of the University of Eastern Africa Baraton.
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to the Research Ethics Committee (REC) of the University of Eastern Africa Baraton within 72 hours of notification.
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to the Research Ethics Committee (REC) of the University of Eastern Africa Baraton within 72 hours.
v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to the Research Ethics Committee (REC) of the University of Eastern Africa Baraton.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://oris.nacosti.go.ke and also obtain other clearances needed.

Sincerely yours,

Prof. Jackie K. Obey, PhD
Chairperson, Research Ethics Committee

University of Eastern Africa, Baraton
18 MAR 2020
P. O. Box 2500-30100, ELDORET
Research Ethics Committee

APPENDIX III: PERMISSION TO CONDUCT RESEARCH

OFFICE OF DEAN,
SCHOOL OF PHARMACY.
P.O. Private Bag – 20157, Kabarak; Tel: 0777223375.
Website: www.kabarak.ac.ke. Email: deanpharmacy@kabarak.ac.ke

23rd August 2021

Ms. Damaris Akinyi
Department of Medical Biochemistry
Moi University
P.O. Box 3900, Eldoret – 30100

Dear Ms. Damaris Akinyi,

SUBJECT: APPROVAL TO CONDUCT YOUR RESEARCH IN SCHOOL OF PHARMACY LABS

I am writing to acknowledge receipt of your request to conduct research titled *"Hypoglycemic and Hypolipidemic activities of Aqueous Root Extract of Tithonia Diversifolia (Hemsley) A. Gray and its Biochemical Effects on Liver and Kidney Functions in Western Diet-Fed Wistar Albino Rats"* within the School of Pharmacy labs.

We appreciate the thoroughness of your proposal and the efforts you have taken to secure ethical approval from the University of Eastern Africa, Baraton (IREC). The ethical approval number provided (UEAB/REC/16/03/2020) has been duly noted.

After careful consideration, I am pleased to inform you that your request has been approved. You are hereby granted permission to utilize the animal house and Biochemistry lab facilities at our school between the months of September and December 2021 for the aforementioned research project.

To ensure that all activities conducted within our facilities adhere strictly to the ethical protocols outlined in the approved proposal and the accompanying ethical approval letter, you will be assigned an internal supervisor to work with you on this research. Additionally, you are responsible for covering all expenses associated with your research. Report to our office for orientation on September 1st, 2021 at 9:00am.

OFFICE OF DEAN,
SCHOOL OF PHARMACY.
P.O. Private Bag – 20157, Kabarak; Tel: 0777223375.
Website: www.kabarak.ac.ke. Email: deanpharmacy@kabarak.ac.ke

Your commitment to advancing scientific knowledge is commendable, and we are pleased to support your academic pursuits. Should you require any further assistance or have any questions, please do not hesitate to contact us.

Thank you for choosing our institution for your research needs. We look forward to the successful execution of your project.

Yours sincerely,

KABARAK UNIVERSITY
DEAN, SCHOOL OF PHARMACY
PRIVATE BAG - 20157, KABARAK
02 AUG 2021
Signed By:.....

Dr. Suge, Titus K.
Dean, School of Pharmacy – Kabarak University.
Phone Number: +254733448810
Email: sugetitus@kabarak.ac.ke