Lect.1

Blood

Blood is defined is a body fluid in humans and other animals that delivers necessary substances such as nutrients and oxygen to the cells, and transports metabolic waste products away from those same cells.

Fig (1) Blood

Composition of blood:

1- Plasma contains :

a)Ions Na^+ &Cl^-

b)Nutrients Sugar , amino acid

، Lipid, cholesterol, Vitamins.

C)Three main portions , Albumin 60% ,globulin 35%, fibrinogen 4%

d) Dissolved Gasses such O_2 & CO_2.

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In vertebrates, it is composed of blood cells suspended in blood plasma.

Plasma, which constitutes 55% of blood fluid, is mostly water (92% by volume,
and contains proteins, glucose, mineral ions, hormones, carbon dioxide).

(plasma being the main medium for excretory product transportation), and blood cells themselves.

Albumin is the main protein in plasma, and it functions to regulate the colloidal osmotic pressure of blood.

The blood cells are mainly red blood cells (also called RBCs or erythrocytes), white blood cells (also called WBCs or leukocytes) and platelets (also called thrombocytes).

The most abundant cells in vertebrate blood are red blood cells. These contain hemoglobin, an iron-containing protein, which facilitates oxygen transport by reversibly binding to this respiratory gas and greatly increasing its solubility in blood.

In contrast, carbon dioxide is mostly transported extracellular as bicarbonate ion transported in plasma.

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Serum

Serum is The clear liquid that can be separated from clotted blood. Serum differs from plasma, the liquid portion of normal unclotted blood containing the red and white cells and platelets. It is the clot that makes the difference between serum and plasma.

The term serum:

refers to plasma from which the clotting proteins have been removed. Most of the proteins remaining are albumin and immunoglobulins.

Plasma

Main article: **Blood plasma**

About 55% of blood is blood plasma, a fluid that is the blood's liquid medium, which by itself is straw-yellow in color.

The blood plasma volume totals of 2.7–3.0 liters (2.8–3.2 quarts) in an average human.

It is essentially an aqueous solution containing 92% water, 8% blood plasma proteins, and trace amounts of other materials.

Plasma circulates dissolved nutrients, such as glucose, amino acids, and fatty acids (dissolved in the blood or bound to plasma proteins), and removes waste products, such as carbon dioxide, urea, and lactic acid.

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What ,s the different between Plasma and serum

A key different between Plasma and serum is that Plasma liquid and serum fluid, while most of the components are the same for both Plasma and serum , Plasma contains fibrinogen .

pH values

also: Acid-base homeostasis

Blood pH is regulated to stay within the narrow range of 7.35 to 7.45, making it slightly basic. Blood that has a pH below 7.35 is too acidic, whereas blood pH above 7.45 is too basic.

Blood pH, partial pressure of oxygen (pO_2), partial pressure of carbon dioxide (pCO_2), and bicarbonate (HCO_3^-) are carefully regulated by a number of homeostatic mechanisms, which exert their influence principally through the respiratory system and the urinary system to control the acid-base balance and respiration.

An arterial blood gas test measures these.

Plasma also circulates hormones transmitting their messages to various tissues.

The list of normal reference ranges for various blood electrolytes is extensive.

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Glucose

Clinical significance :

The glucose level in blood is maintained within a fairly narrow range under diverse condition (feeding , fasting ,) by regulatory hormones such as insulin, glucagon .
The most frequently disorder of carbohydrate metabolism in blood is Hyperglycemia , glucose higher than 300mg\dl (16.5mmol\L) due diabetes mellitus.
Hypoglycemia, lower than 30mg\dl (1.7 m mol\L)

Diabetes mellitus :

Is a group of metabolic disorders resulting from insufficiency of insulin. The two most common types of diabetes mellitus are insulin dependent and non-insulin dependent diabetes.

Type of Diabetes:

1-Insulin dependent diabetes(Type1) :
Is a condition in which the pancreas stops producing insulin and is usually diagnosed before 18 years of age. Insulin helps the body use carbohydrates ,students mange diabetes by taking insulin, eating regular meal and snacks, exercising regularly and monitoring blood sugars.

2- Non dependent diabetes(Type2):
Onset is gradual and frequently does not occur until after 30 years of age. Insulin therapy is usually not necessary because individuals with this type of diabetes , usually retain some Insulin secretion capabilities .

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Hyperglycemia:

High blood sugar(hyperglycemia)is a problem for active individuals with type 1 or type 2 diabetes, it results when daily exercise volume is Suddenly reduced without increasing Insulin or oral agents used to control glucose levels .

Symptoms of Hyperglycemia:

1-Inattentiveness 2- Lethargy
3-Extreme thirst 4-frequent need to urinate

Hypoglycemia

Low blood sugar(hypoglycemia) is the greatest concern hypoglycemia can occur quickly and needs immediate attention ,Skipping or delaying meal or snacks , or too much Insulin can cause blood sugar to fall rapidly

Symptoms of Hypoglycemia

1-Shaking . 2- Irritability.
3- Sweating. 4- weakness.
5- Headache . 6- Sudden anger.
7- Sudden Silence . 8-Doublevision.
9-Sleepiness . 10- Sudden hunger.
11-Numbness. 12- Slurred Speech .

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Glucose (Mono Reagent)
(GOD/POD method) For the determination of glucose in serum or plasma For in vitro diagnostic use only (Store at 2-8°C.)

INTENDED USE

For the determination of glucose in serum or plasma.
Glucose is the major carbohydrate present in blood.
Its oxidation in the cells is the source of energy for the body.

PRINCIPLE OF THE METHOD

Glucose oxidase (GOD) catalyses' the oxidation of glucose to gluconate. The formed hydrogen peroxide (H_2O_2) is detected by a chromogenic oxygen acceptor, phenol, 4-Amino phenazone (4-AP) in the presence of peroxidase (POD):
β-D-Glucose + O_2+ H_2O → H_2O_2+ Gluconate.

$_2H_2O_2$+Phenol+ (4-Amino-antiPyrine) → Red Quinonedye + $14H_2O_2$

GLUCOSE STD

Glucose aqueous primary standard 100mg\dl
Spectrophotometer or colorimeter measuring at 505nm. Matched cuvettes 1.0 cm light pat.

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ASSAY PARAMETER

Reaction End point Interval Wavelength 505nm Sample.
Vol. 0.01ml
Blank Reagent Vol. 1.0ml.
Incub. Temp. 37C/15-25C Standard 100mg/dl

ASSAY PROCEDURE

1. Wavelength……505nm (500-510)
2. Cuvette……1cm.light path
3. Temperature……37C/15-25C.
4. Adjust the instrument to zero with distilled water.
5. Pipette into clean dry test tubes labeled as Blank (B), Standard(S), and Sample.

	Blank	Standard	Sample
Standard	-	10ml	-
Sample	-	-	10ml
Work reagent	1ml	1ml	1ml

CALCULATIONS:

Glucose conc. = O.D Sample \ O.D Standard x n
Mg\dl :n=100
g\l: n=1
mmol\l : n=5.56

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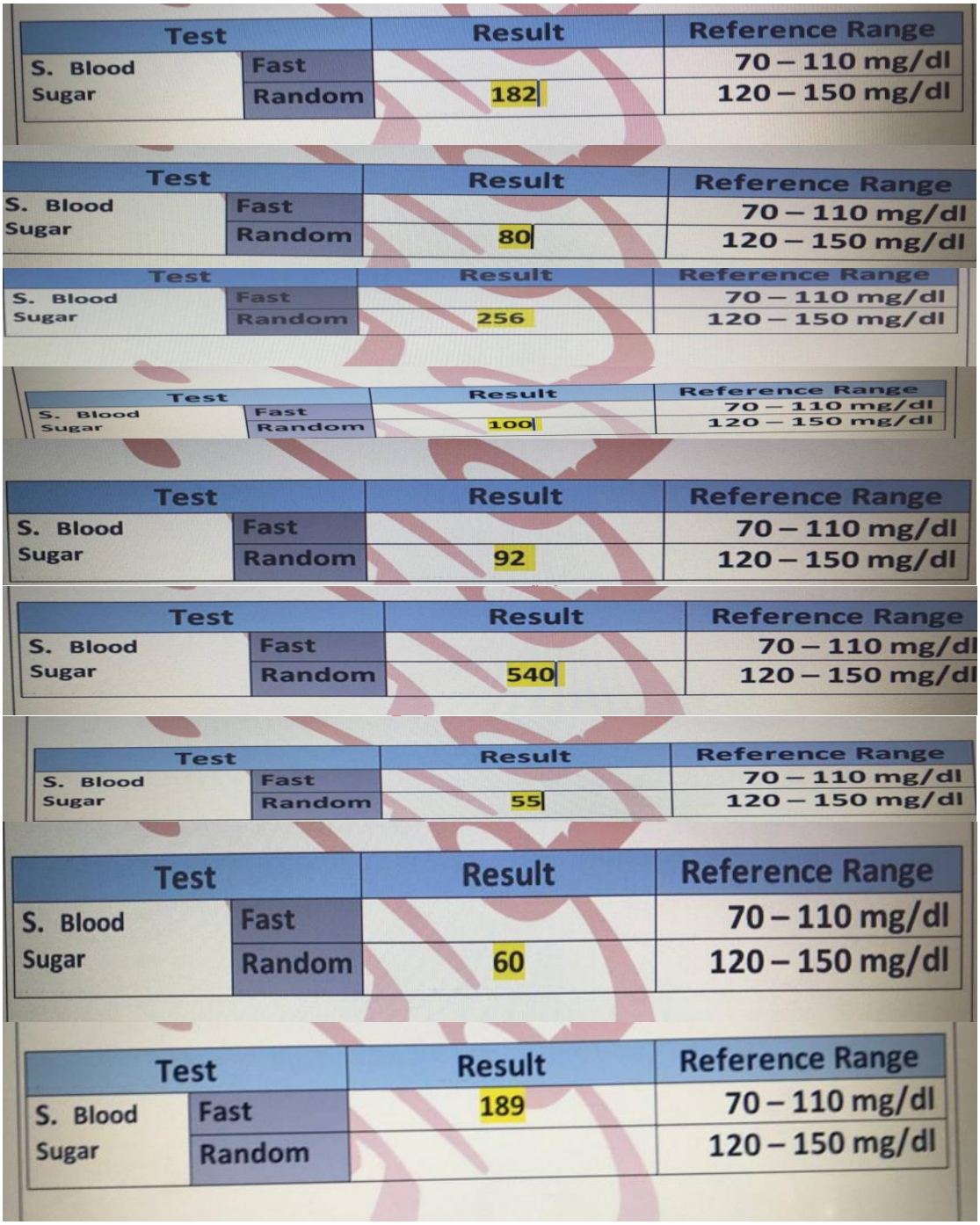
Result of serum blood sugar Random.



Test		Result	Reference Range
S. Blood Sugar	Fast		70 – 110 mg/dl
	Random	182	120 – 150 mg/dl

Test		Result	Reference Range
S. Blood Sugar	Fast		70 – 110 mg/dl
	Random	80	120 – 150 mg/dl

Test		Result	Reference Range
S. Blood Sugar	Fast		70 – 110 mg/dl
	Random	256	120 – 150 mg/dl

Test		Result	Reference Range
S. Blood Sugar	Fast		70 – 110 mg/dl
	Random	100	120 – 150 mg/dl

Test		Result	Reference Range
S. Blood Sugar	Fast		70 – 110 mg/dl
	Random	92	120 – 150 mg/dl

Test		Result	Reference Range
S. Blood Sugar	Fast		70 – 110 mg/dl
	Random	540	120 – 150 mg/dl

Test		Result	Reference Range
S. Blood Sugar	Fast		70 – 110 mg/dl
	Random	55	120 – 150 mg/dl

Test		Result	Reference Range
S. Blood Sugar	Fast		70 – 110 mg/dl
	Random	60	120 – 150 mg/dl

Test		Result	Reference Range
S. Blood Sugar	Fast	189	70 – 110 mg/dl
	Random		120 – 150 mg/dl

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Test		Result	Reference Range
S. Blood Sugar	Fast	60	70 – 110 mg/dl
	Random		120 – 150 mg/dl

Test		Result	Reference Range
S. Blood Sugar	Fast		70 – 110 mg/dl
	Random	319	120 – 150 mg/dl

Test		Result	Reference Range
S. Blood Sugar	Fast		70 – 110 mg/dl
	Random	209	120 – 150 mg/dl

Test		Result	Reference Range
S. Blood Sugar	Fast	110	70 – 110 mg/dl
	Random		120 – 150 mg/dl

Test		Result	Reference Range
S. Blood Sugar	Fast	162	70 – 110 mg/dl
	Random		120 – 150 mg/dl

Test		Result	Reference Range
S. Blood Sugar	Fast	209	70 – 110 mg/dl
	Random		120 – 150 mg/dl

Test		Result	Reference Range
S. Blood Sugar	Fast	120	70 – 110 mg/dl
	Random		120 – 150 mg/dl

Test		Result	Reference Range
S. Blood Sugar	Fast	75	70 – 110 mg/dl
	Random		120 – 150 mg/dl

Test		Result	Reference Range
S. Blood Sugar	Fast	380	70 – 110 mg/dl
	Random		120 – 150 mg/dl

Test		Result	Reference Range
S. Blood Sugar	Fast	143	70 – 110 mg/dl
	Random		120 – 150 mg/dl

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Questions for Lec 1

Q1\defined Blood & what Composition of blood?

Q2\ Explain Clinical significance for glucose?

Q3\ What Diabetes mellitus& Enumerate the Type of diabetes?

Q4\ comparison between Hypoglycemia& Hyperglycemia & Symptoms of Hypoglycemia & Symptoms Hyperglycemia?

Q5\ write Principle of glucose &with equation?

Q6\ Assay:

1- Wavelength of Glucose……

2-Temperature of Glucose ……

Glucose conc. = ---------- x n

n=

Q7\ Defined The term serum?

Q8\ What ,s the different between Plasma and serum?

Q9\ Defined plasma?

Q10\ pH values of blood?

Q11\ full in the blank

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