

Fluid

CCF = 40%
Interstitial = 12% (space)
plasma = 3% (10%)

Which of the following statements about males?

70% ECF (TBW)

- a) Plasma contributes about 1/4 of total body water
- b) Plasma is easily available
- c) Males have relatively less extracellular fluid
- d) Extracellular fluid is more

not true concerning fluid distribution in an

- a) of extracellular fluid is in the interstitium
- b) biochemical analysis than females
- c) intracellular fluid

Electrolytes

Dilutional hyponatraemia occurs

only in the following conditions except:-

- a) Renal failure
- b) Congestive cardiac failure
- c) Liver failure
- d) Excess ADH secretion
- e) Acute gastroenteritis

33 x 100

→ inflamm can affect intake & absorption

Elevated levels of urea may be seen

the following conditions except:-

- a) Acute dehydration
- b) Renal failure
- c) Severe liver disease
- d) High protein intake
- e) Upper GIT bleeding

- low pressure (2.25-6)
- CCF
- shock
- dehydration
- dehydration
- stress
- fever

The following is a cause of hyperkalemia

Crininulin insufficiency

- a) Acute renal failure
- b) Insulin administration
- c) Mineralocorticoid excess
- d) Severe diarrhea
- e) Cushing's syndrome

Management of Hypokalemia (primary & secondary) don't cause inc. loss

The major protein associated with plasma iron transport is

- a) Apoferritin
- b) Ferritin
- c) Transferrin
- d) Apoprotein A
- e) Apoprotein D

binds to apotransferrin forming a transferrin complex

Biostat 10

In data analysis, the measure of central tendency of that data, when it is not symmetrical is:-

- a) Mean
- b) Range
- c) Median
- d) Variance
- e) Standard deviation

C ✓

Biostat 11

A confidence interval commonly used as an acceptance/rejection criteria for laboratory analytical runs is:-

- a) 58% (1SD)
- b) 85%
- c) 95% (2nd SD)
- d) 99% (3rd SD)
- e) 100%

E x C

Biostat 12

In data where the number of observations are few; the best measure of variation is:-

- a) Variance
- b) Standard deviation
- c) Mode
- d) Range
- e) Mean

A x D

Range
SD
Variance

Biostat 13

Which of the following statistics would be ideal while testing for significant difference between two means?

- a) Student's t-test
- b) F-test
- c) Chi square
- d) ANOVA
- e) Correlation coefficient

C x D

Reference Intervals 14

While setting up reference ranges, which would not be an exclusion criteria while setting up health based reference ranges?

- a) Hypertension
- b) Diabetes
- c) Obesity
- d) Height
- e) Genetic abnormalities

E x D

MBERE II AND BOS REGIONAL CHEMISTRY CAT
24TH MARCH, 2010
VENUE: CHERONO CAMPUS
TIME: 2-3PM

2

Clinical Chemistry

INSTRUCTIONS

1. Circle the correct response.
2. There is only one correct response for each question
3. Do not guess. An incorrect response will be -1/2 mark

Fluid

1. Vasopressin is a hormone that is secreted by:

- a) Kidneys ✓
- b) Anterior pituitary
- c) Posterior pituitary ✓
- d) Thymus ✓
- e) Pineal body ✓

only 2: Vasopressin, Oxytocin.

Fluid

2. The normal daily urine output in a healthy adult is -

- a) 300 - 500mls
- b) 500 - 1000mls
- c) 1000 - 2000mls ✓
- d) 1500 - 2500mls
- e) 500-1500mls

E ✓

Electrolytes

3. The following has least effect on sodium and fluid homeostasis:

- a) Vasopressin - ADH ✓
- b) Aldosterone ✓
- c) Cortisol → diuretic → inc. Na⁺ absorption ✓
- d) Atrial natriuretic peptide ✓
- e) Thyroxine (T₄) →

↓ Na⁺ = Cardiac Failure
SI.

Electrolytes

4. The following analyte is predominantly intracellular:

- a) Sodium ✓
- b) Chlorides ✓
- c) Potassium, Mg, PO₄ ✓
- d) Urea
- e) Glucose

inc.

19. The accepted cause of hypoalphalipoproteinaemia (Tangier's disease) is:-

- a) Hypercatabolism of apo B
- b) Defective Lecithin: cholesterol acyl transferase (LCAT)
- c) Lack of the liver based hepatic lipase
- d) Low levels of lipoprotein AI
- e) Decreased activity of the enzyme ACAT

20. Which of the following would best describe a mechanism responsible for genotoxicity of chromium VI:-

- a) Glucose intolerance may lead to accumulation of chromium in the cells.
- b) Hydroxyl radicals released during reduction of chromium (VI) to chromium (III).
- c) Binding to the RNA of the end product of chromium (III) reactions
- d) Binding of chromium VI and chromium (III) directly to the DNA
- e) Interaction of chromium VI with sulfurhydryl ligands on proteins.

21. The following would be associated with copper deficiency except:-

- a) Anaemia
- b) Kinky hair syndrome
- c) Keratomalacia
- d) Hypocupraemia
- e) Hypoferroaemia

hypocupraemia
↓ serum copper
Anaemia

22. The type of amino acid commonly found in proteins is:-

- a) α -amino acid
- b) gamma-amino acid
- c) beta-amino acid
- d) δ -amino acid
- e) κ -amino acid

23. The finding of large amounts of amino acid in urine following protein ingestion is associated with:-

- a) Abnormal renal function
- b) Pathological amino acid metabolism
- c) Normal renal function
- d) Typical pathological aminoaciduria
- e) Impaired renal Glomerular function

24. Aminoacidopathies are:-

- a) Common inborn errors of amino acid metabolism
- b) Rare inherited disorders of amino acid metabolism
- c) Examples of enzymopathies
- d) Only evident when there is transport disorders of amino acids
- e) The most frequent disorders of protein metabolism

... long term sequelae of ... and ...

- (A) Pilon's syndrome
- (B) Osteonecrosis of the condylar process of the mandible
- (C) Stenosis of the salivary ducts
- (D) Jugular vein thrombosis
- (E) Squamous cell carcinoma

... likely aetiology of a four year old child presenting with myocardial infarction

- (A) Kawasaki's disease
- (B) Congenital syphilis
- (C) Coronary atherosclerosis
- (D) Aorta-lipoproteinemia
- (E) Thrombotic thrombocytopenic purpura

Dystrophic calcification

- (A) Is encountered in areas of necrosis of any type
- (B) Is rarely a cause of organ dysfunction
- (C) Is the end product of formation of crystalline calcium bicarbonate
- (D) Occurs in normal tissue in hypocalcaemia
- (E) Occurs only in cartilage

Which screening technique has had the greatest impact on reduction of cancer deaths?

- (A) Chest radiograph
- (B) Urinalysis
- (C) HDsAg
- (D) Pap smear
- (E) Mammogram

Least likely to give rise to a subsequent carcinoma in the affected tissue?

- (A) Chronic atrophic gastritis
- (B) Oral leukoplakia
- (C) Atypical endometrial hyperplasia
- (D) Multiple skin nevi
- (E) Macronodular cirrhosis

Anatomy

Pathology

- (A) Basal cell carcinoma
- (B) Well-differentiated squamous cell carcinoma
- (C) Pleomorphic leiomyosarcoma
- (D) Anaplastic carcinoma
- (E) Osteogenic sarcoma

The following cells do not normally circulate in the peripheral blood.

- (A) Red cells
- (B) Plasma cells
- (C) Platelets
- (D) Monocytes
- (E) Basophils

Shelf life of CPDA-1 whole blood stored at 4°C is

- (A) 21 days
- (B) 28 days
- (C) 30 days
- (D) 35 days
- (E) 42 days

Aplastic anemia may be associated with one of the following:

- (A) Hypersplenism
- (B) Bleeding
- (C) Elevated white cell count
- (D) Marked enlargement of the lymph nodes
- (E) Bone pain

One of the following is not a possible complication of blood transfusion:

- (A) Hyperkalemia
- (B) Iron overload
- (C) Circulatory overload
- (D) Thrombosis
- (E) Hepatitis

A function of the hospital blood transfusion unit

- (A) Screening for Transfusion Transmitted Infections
- (B) Policy formation
- (C) Donor recruitment
- (D) Investigation of blood transfusion reactions
- (E) Donor education drives

Mofan's 5
7 9

OCHENG

- Hyperchromatic
- Abnormal mitoses
- Loss of polarity
- High N/C = 1:1
- Tumor giant (70)
- O/S

- The best indicator of malignancy in a tumour is:
- A. Rapid growth x
 - B. Presence of numerous mitotic figures. -
 - C. Presence of necrosis. x
 - D. Pleomorphism. -
 - E. Presence of metastasis. x

Panel from test 71:

SFT	RTF
<ul style="list-style-type: none"> Creatinine clearance Diurnal variation of uric acid content of urine Measure of RBC in urine SFTs 	<ul style="list-style-type: none"> Glycosuria Aminoaciduria Microhaematuria HCl₂ discharge Fundal deposit Urinary casts Ca 72 cont

- Test of renal tubular function include the following except:-
- A. Urine acidification test - for dx of renal tubular acidosis
 - B. Urine specific gravity ✓
 - C. Urine volume ✓
 - D. Creatinine clearance test ✓ → GFR
 - E. Water deprivation test ✓ - for dx of diabetes insipidus (↓ADH)

- Raised CA 19.9 can be found in the following malignancies except:-
- A. Colorectal
 - B. Gastric
 - C. Hepatocellular ✓
 - D. Ovarian ✓ → CA 125
 - E. Pancreatic ✓
- CA 19.9 → GIT tumors
CA 15-5 breast

- Ca 19.9 -
- Ca 15.3 -
- Ca 50 -
- Ca 125 -

- Panel 73
- Normal fetal defect
- Tromby 21 (Down's)
- dsPP
 - US-increased nuchal thickness
 - chromosomes
 - 16-18 weeks

73. Prenatal screening is recommended for:-
- A. Congenital hypothyroidism
 - B. Homocystinuria
 - C. Down's syndrome ✓ → + maternal plasma AFP, ↑HCG at 16-18 weeks gestat
 - D. Hereditary Haemochromatosis
 - E. Wilson's disease

- Cystic fibrosis
- Metabolic dx

74. * Substrate deficiency is the main cause of clinical disease in:-
- A. Congenital adrenal hyperplasia ✓ - deficiency of 21-OH → inherited inability to synthesise cortisol due to 21-hydroxylase
 - B. Crigler Najjar syndrome → direct hyperbilirubinemia (indirect)
 - C. Galactosaemia - enzyme def. of G-1-P uryl transferase → galactose
 - D. Maple syrup urine disease
 - E. Phenylketonuria x

- hypercalcaemia
- hypercalcaemia
- hypercalcaemia
- hypercalcaemia

75. Predisposing factors for calcium containing urinary calculi include the following except:-
- A. Alkaline urine ✓ - precipitation of urine may calcify
 - B. Dehydration ✓
 - C. Obstructive uropathy ✓
 - D. Urinary tract infection ✓
 - E. Prolonged immobilization

- B. Protein synthesis.
- C. Lipogenesis.
- D. Steroidogenesis.
- E. Gluconeogenesis.

12. DM Type I is characterized by all EXCEPT:

- A. Immune mediated. ✓
- B. Young patients. ✓
- C. High levels of insulin.
- D. Low genetic predisposition.
- E. Rapid onset.

There is low or absolute lack of insulin

5.5 - 7.8
7.5 - 11

13. A patient underwent a glucose tolerance test and the fasting blood glucose level 6.5 mmol/L and 2hr levels 9.8 mmol/L. The diagnosis is:

- A. Diabetes Mellitus.
- B. Impaired glucose tolerance. ✓
- C. Normal response.
- D. Lag Storage Disease.
- E. Renal glucosuria.

Fasting 3.0 - 6.1 DM >
2hr 7.0 - 11.0 DM >
OGTT

14. All these endocrinopathies lead to glucose intolerance EXCEPT:

- A. Glucagonoma. ✓
- B. Pheochromocytoma. ✓
- C. Cushing's syndrome. ✓
- D. Hypothyroidism. ✓ *Hypothyroidism*
- E. Acromegaly. ✓

15. The amount in glucose given orally for Oral Glucose Tolerance test is:

- A. 40 gm
- B. 60 gm
- C. 150 gm *CHO*
- D. 75 gm. ✓
- E. 100 gm

16. Causes of a flat curve after glucose load are:

- A. Pregnancy. ✓
- B. Poor positioning. ✓
- C. Insulinomas. ✓
- D. Malabsorption.
- E. Mellitaria.

17. Glycogen storage disorders:

- A. Are always associated with abnormal glycogen storage in all tissues of the body. ✓
- B. May be acquired and present in adulthood. X *congenital*
- C. Are errors of glycogen metabolism associated with enzyme deficiencies. ✓
- D. Are always treatable with pure enzyme extracts. ✓
- E. May occur with normal glycogen metabolism. X

* 7. Pre-natal screening is recommended for :-

- a) Alkaptonuria
- b) Albinism
- c) Congenital adrenal hyperplasia
- d) Congenital hypothyroidism
- e) Down's Syndrome ✓

8. The following statement on lipids and lipoproteins is true:-

- a) Chylomicrons are the major cholesterol carrier in plasma. x *transport of (dietary) fat - Triglycerides*
- b) Lipoproteins form a homogeneous group of plasma proteins x *heterogeneous*
- c) A reciprocal relationship exists between plasma triglyceride concentration and HDL-cholesterol ✓ *doesn't have E.*
- d) The major apoproteins on the LDL surface are apo B and apo E x *apo B*
- e) Both LDL and VLDL exhibit similar floatation properties x *Type III*

9. Which of the following statements is true of Intermediate-density lipoprotein (IDL).

- a) The major surface protein is apo B
- b) Its half-life in plasma is several hours x
- c) Diseases associated with defective catabolism of IDL stem from a defect in apo E. ✓ *apo E*
- d) The major lipid content of IDL is triglycerides x *CE*
- e) It migrates further than HDL in cellulose acetate paper electrophoresis x *IDL*

10. Esterified cholesterol in LDL is released as free cholesterol after hydrolysis in the lysosomes. This free cholesterol is associated with the following except:-

- a) Suppresses HMGCo-reductase and of new cholesterol synthesis ✓
- b) Enhances the LCAT reaction leading to further cholesterol esterification x
- c) Activates the enzyme ACAT which esterifies excess cholesterol intracellularly. ✓
- d) Modulates the no. of receptors on cellular membranes ✓
- e) All of the above

11. Which of the following enzymes, closely associated with nascent HDL and important in reverse cholesterol transport:

- a) ACAT
- b) HMGCoA - reductase
- c) LPL *lipoprotein lipase*
- d) LCAT
- e) Hepatic lipase *IDL → apo B*

12. A reaction involving three very strong and corrosive acids to estimate cholesterol levels in plasma:-

- a) Watson-Schwartz *→ present elevated PBL*
- b) Evelyn - Malloy
- c) Hoesch
- d) Liebermann - Burchard *} most*
- e) Zimmermann

Wentz - TG

*LDL → Friedwald
VLDL*

beriberi → thiamine used in breakdown of glycogen
 → found in membranes of organelles

99. The following are causes of thiamine (Vit B1) deficiency except;

- A. Microbial thiaminases
- B. Chronic alcoholism ✓ Wernicke Korsakoff syndrome
- C. Megaloblastic anaemia
- D. Lactic acidosis of defective pyruvate decarboxylase
- E. Isoniazid use

100. A common method for calculating the low density cholesterol concentration when lipid parameters are provided is:-

- A. Fredrickson
- B. Sorot
- C. Kashan-back
- D. Friedwald → estimation of lipid profile after 12-14h fast
- E. Watson-Schwartz

tg should be < 4.5 mmol/L
 $H = C - L - 1.6T$

Direct NPO

Beriberi

END

Causes

- 1 Diet (all of)
 - unrefined cereals (brown rice, buckwheat)
 - fresh fruits
 - green veget.
 - fruits
 - milk
- 2 Chronic alcoholism (Wernicke-Korsakoff syndrome)
- 3 Acute poisoning → blocks Krebs cycle
- 4 Genetic
- 5 Biotin & T dop deficiencies
- 6 Galactosemia

all are not diet

Effect

- Neuropathy (peroneal nerve death)
- lactic acidosis, brain edema, oxidative stress, inflammation, white matter

25. The aminoaciduria commonly associated with mental retardation in infancy is:-

- a) Marple syrup disease (MSUD)
- b) Homocystinuria
- c) Citrullinaemia
- d) Phenylketonuria
- e) Alkaptonuria

cloud
0.731

26. The most common presenting features of pure protein malnutrition is:-

- a) Increased body weight *slight*
- b) Dehydration
- c) Lethargy ✓
- d) Loss of appetite ✓
- e) Polyuria

27. Kwashiorkor individual will have the following biochemical finding:

- ~~a)~~ Markedly reduced protein and normal glucose
- ~~b)~~ Markedly reduced glucose and normal protein
- ~~c)~~ Mixed reduction in protein and carbohydrates
- d) Reduced body fat
- e) Non of the above

DM 28. An oral glucose tolerance test using 75g of glucose was carried out in a patient. The fasting plasma glucose levels were 6.8 mmol/L and 2 hour levels were 9.5 mmol/L. What is the diagnosis?

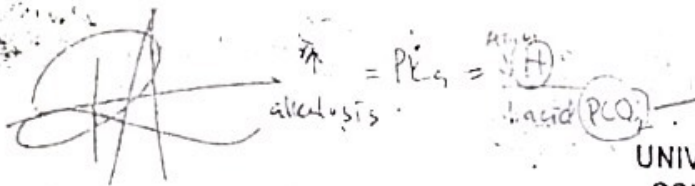
- ~~a) Normal response~~
 - ~~b) Diabetes mellitus~~
 - ~~c) Hypoglycemia~~
 - d) Impaired glucose tolerance ✓ *7.8 < 11.1*
 - e) Unable to interpret the result
- Handwritten notes:*
Normal response: $6.1 < 7$ post < 7.8
Diabetes mellitus: $\text{post glucose} > 11.1 \geq 7.0$
Impaired glucose tolerance: $7.8 < 11.1$

DM 29. Type I DM is characterized by all except:-

- a) Presence of insulin Islet antibodies ✓ *low or no insulin at all*
- b) Low or absolute lack of insulin ✓
- c) Weight loss ✓
- d) Insulin resistance ✓ *Type II*
- e) Sudden onset ✓ *< 30 yrs age*

DM 30. Glycated haemoglobin is used mainly in:-

- a) Diagnosis of Diabetes mellitus ✓
- b) Assessing for renal dysfunction
- c) Assessing for glycaemic control ✓
- d) Assessing for presence of ketoacidosis
- e) Assessing for hypoglycemia



Nephthali Winnie

Mofari
12

UNIVERSITY OF NAIROBI
SCHOOL OF MEDICINE
DEPARTMENT OF HUMAN PATHOLOGY
CLINICAL CHEMISTRY UNIT
MBCHB II/BDS II 2007/2008

CLINICAL CHEMISTRY CAT - 30TH JULY, 2008

Instructions

1. Circle the correct response
2. There is only one correct response
3. DO NOT guess. Any wrong response earns negative 1/2 mark.

1. Iron is normally stored in the following tissues EXCEPT:
 A. Bone marrow ✓
 B. Brain ✓
 C. Liver ✓
 D. Spleen ✓
 E. None of the above

2. Iron in plasma is usually bound to
 A. Albumin ✓
 B. Ferritin ✓
 C. Haemosiderin ✓
 D. Pre-albumin ✓
 E. Transferrin ✓

3. Elevation of plasma ferritin may occur in the following conditions EXCEPT:
 A. Chronic blood loss ✓
 B. Inflammatory conditions ✓
 C. Haemolysis ✓
 D. Liver disease ✓
 E. Malignant disease ✓

4. The following results were obtained from a 49-year-old man attending liver clinic:
 Ferritin - 3234 ug/L (15-300); Iron - 40 umol/L (11-30), TIBC - 42 umol/L (54-80)
 The likely diagnosis is 15-200 ug/L 4-29 umol/L
 A. Acute illness X
 B. Haemochromatosis ✓
 C. Haemolytic anaemia X
 D. Iron deficiency X
 E. Pernicious anaemia X

18 ug/L 50
331

13. A major compound that is associated with interference with both chemical and enzymatic cholesterol methods:-

- ~~a) Bilirubin~~
- b) Urea
- c) Creatinine
- d) Triglycerides
- e) Ethanol

14. In lipid estimation the Hantzsch condensation reaction is often encountered in the measurement of:-

- a) Total cholesterol
- b) HDL-cholesterol
- c) Phospholipids
- d) Triglycerides
- e) Direct LDL-C measurement

15. Glycerol is a common contaminant in most of the triglycerides assays. The best way to eliminate this problem is:-

- a) Standardising all assays
- b) Thoroughly cleaning the reaction tubes with acid
- c) Banking the assay
- d) Using a glycerol calibrant
- e) Using an interference filter

16. The mainstay of HDL-cholesterol estimation in the laboratory is precipitation of B and pre B lipoproteins. Which of the following mixtures is suitable for this:-

- ~~a) Magnesium - dextrin sulphate~~ - *dyglo, LDL, VLDL*
- b) Silicon - Heparin mixture
- c) Cobalt - phosphotungstate
- d) Calcium - Heparin mixture
- e) Manganese - Heparin sulphate

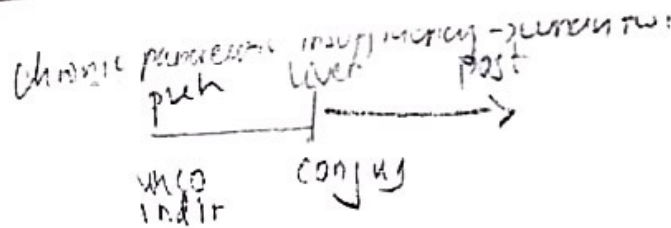
17. Familial hyperchylomicronaemia commonly presents with eruptive Xanthomas and pancreatitis.

The most likely cause of the condition is:-

- a) Defective membrane receptors
- b) Absence of apolipoprotein B in plasma
- c) Defective Apo A1: AII ratio
- d) Lipoprotein lipase deficiency
- e) Decreased lysosomal cholesterol ester activity

18. The most common finding in a patient presenting with familial hypercholesterolaemia is elevated plasma:-

- a) Chylomicrons
- b) Very low density lipoproteins
- c) Triglycerides
- d) HDL-cholesterol
- e) Low density lipoproteins



58. Prehepatic jaundice would be associated with all the following except;

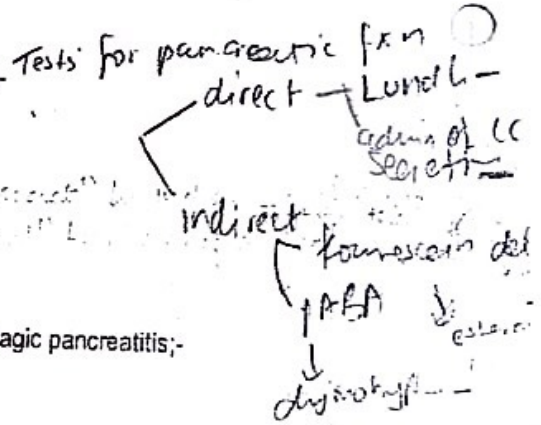
- A. Gilbert's syndrome ✓ and unconjugated
- B. Acute haemolysis ✓
- C. Hypoalbuminaemia ✓
- D. Glucuronyl transferase immaturity - neonatal physiological jaundice
- E. Acute cholecystitis - Post

89. The main biochemical finding differentiating acute hepatitis from chronic hepatitis is;

- A. Low albumin found in acute hepatitis X
- B. Low AST and ALT in chronic hepatitis X
- C. Raised GGT only in chronic hepatitis ✓
- D. Normal protein levels in acute hepatitis ✓
- E. Low alkaline phosphatase in acute hepatitis X

90. Which of the following is not an indirect pancreatic function test;

- A. 24 hour faecal lipid
- B. B-carotene
- C. D-xylose absorption
- D. Secretin in gastric lavage
- E. Lundh test



91. What percentage of patients would present with acute haemorrhagic pancreatitis;

- A. 20% ✓
- B. 80%
- C. 60%
- D. 50%
- E. < 10%

92. A 40 year old male presents with polyuria, polydipsia, and polyphagia after an abdominal operation, what is the most likely cause;

- A. Over perfusion with 5% dextrose X
- B. Injury to the pancreas -
- C. Adult onset DM ✓
- D. Increased glucagon production X
- E. None of the above

93. The basic mechanism for hyperbilirubinaemia in carcinoma of head of pancreas is;

- A. Metastasis to the liver
- B. Obstruction at the ampulla of Vater ✓
- C. Common pancreatic duct & occlusion X common bile duct
- D. Low plasma proteins due to protein malabsorption X
- E. Associated cholecystitis X

Obstructive jaundice

DM 31. All these endocrinopathies lead to secondary diabetes mellitus except:-

- a) Pheochromocytoma ✓
- b) Acromegaly ✓
- c) Cushing's syndrome ✓
- d) Addison's disease X *hypoadrenalism*
- e) Thyrotoxicosis ✓

DM 32. Renal glycosuria is characterized by:- $>10 <10$

- a) Fasting glucose levels of 3.2 - 6.1 mmol/L X
- b) Glycosuria with normal response to glucose level X *NOT*
- c) Hyperglycemia postprandially ✓
- d) Polyuria, polyphagia and weight loss ✓
- e) Increased Glycated haemoglobin ✓

DM 33. Uncontrolled Type II DM might lead to:-

- a) Diabetic ketoacidosis I
- b) Hyperosmolar Non ketotic coma ✓ II, I
- c) Hyperkalemia I
- d) Insulinoma
- e) Hypothyroidism

SPECIMEN 34. The best preservative for a glucose specimen is:-

- a) None at all
- b) Citrate
- c) Fluoride *glucose*
- d) Lithium
- e) Hydrochloric acid

35. Type I Glycogen Storage Disease is characterized by all except:- *Van Gierke*

- a) Accumulation of glycogen of normal chemical structure in the liver ✓
- b) Massive hepatomegaly ✓
- c) Fasting hypoglycemia ✓
- d) Lack of glucose-6-phosphatase enzyme ✓
- e) Hypotriglyceridemia ✓

F. hyperglycemic - + HDL

HDL
ACE

Chylomicrons VLDL IDL

B

94

An apoprotein that plays an important role in intermediate density lipoprotein (IDL) and chylomicron remnant catabolism is:-

- A. Apo A₁ - HDL
- B. Apo B - *LDL*
- C. Apo C₂ - *Chylomicrons*
- D. Apo E - *IDL, VLDL*
- E. Apo D - *LDL*

95

Which of the following lipid patterns would be consistent with a patient with dysbetalipoproteubemia.

- A. Increased total cholesterol and triglycerides
- B. Increased total cholesterol and HDL-cholesterol X
- C. Decreased intermediate density lipoproteins and low density lipoproteins X
- D. Increased total cholesterol, triglycerides and an abnormal low density lipoprotein cholesterol
- E. Decreased VLDL, LDL and HDL - cholesterol X

IDL, VLDL, LDL, HDL

96

Of the acute phase reactions, which is recognized as the most sensitive marker of inflammatory process:-

- A. Transferin
- B. $\delta 2$ - microglobulin
- C. $\delta 1$ - acid glycoprotein
- D. C - reactive protein
- E. $\delta 1$ - antitrypsin

- enzyme in carbohydrate metabolism that converts sorbitol to

97

The enzyme sorbitol dehydrogenase has been used diagnostically as a marker for,

- A. Organophosphorus poisoning - *liver*
- B. Hepatobiliary disease - *liver*
- C. Parenchymal hepatic disease - *parenchymal hepatic disease*
- D. Hepatic carcinoma
- E. Muscle disease of - *muscle*

↓ liver
- seminal vesicle

98

A trace element whose deficiency is associated with Keshan's disease, an endemic cardiomyopathy is:-

- A. Molybdenum
- B. Cobalt
- C. Selenium
- D. Manganese
- E. Zinc

congenital cardiomyopathy caused by a combi of dietary deficiency of selenium and the presence of a mutation of coxsackievirus

Chylomicrons → A, B-100, C, E → to clear, need C → LPL
 → E → liver uptake.

VLDL → B-100, E, E → LPL - need C

IDL → B-100, E → ~~LDL~~ E2/E2.

LDL → B-100

Electrolytes.

5) The following analyte is predominately extracellular:

- A) Magnesium. ✓
- B) Potassium. ✓
- C) Chloride.
- D) AST. ✓
- E) Phosphate. ✓

Major ECF: Na, Cl, HCO₃⁻
 " ICF: K, Mg, PO₄

Fluid.

6) Which of the following statements is NOT TRUE concerning fluid distribution in an adult human being?

- A) Males have relatively more body fluid than females. ✓
- B) Water contributes about 60% of the total body weight in adult males. ✓
- C) Two thirds of total body water is intracellular. ✓
- D) One third of total body water is interstitial fluid. X
- E) Plasma is part of extracellular fluid. ✓

ECF = Interstitial + plasma
 14L = 10.5L + 3.5L

Specimen

7) Factors that reduce quality of blood specimens include the following EXCEPT:

- A) Haemolysis. ✓
- B) Collecting blood from a limb receiving an infusion. ✓
- C) Repeated freezing and thawing. ✓
- D) Use of fine bore needle in collection of blood. ✓
- E) None of the above.

8) Which of the following inherited metabolic disease does not involve amino acid metabolism?

- A) Maple Syrup Urine Disease. ✓
- B) Hartnup disease (defect in tryptophan abs.) ✓
- C) Congenital adrenal hyperplasia.
- D) Alkaptonuria. ✓
- E) Phenylketonuria. ✓

9) Which of the following is not a common feature in babies with inherited metabolic diseases?

- A) Poor feeding. ✓
- B) Neurological abnormalities. ✓
- C) Respiratory alkalosis.
- D) Metabolic acidosis. ✓
- E) Projectile vomiting. ✓

Also dysmorphic features.

10. Features of congenital adrenal hyperplasia include:

- A) Infertility. ✓
- B) Hirsutism. ✓
- C) Salt losing state. ✓
- D) Ambiguous genitalia. ✓
- E) All of the above.

- 1) Early Pubic Hair
- 2) Failure of puberty
- 3) Excessive facial hair
- 4) Large clit, shallow vagina

11. All these processes reduced glucose levels EXCEPT:

- A) Glycogen synthesis.

45. Tests of compatibility for blood transfusion does NOT include:

- (A) ABO grouping
- (B) HIV I & II screening
- (C) Rhesus grouping
- (D) Antibody screening
- (E) Cross matching

47. The following haemoglobin level is normal for an adult male in Kenya

- (A) 10-15 g/dL
- (B) 12-16 g/dL
- (C) 13-18 g/dL
- (D) 15-20 g/dL
- (E) 14-22 g/dL

48. The abnormal cell in infectious mononucleosis is:

- (A) Monocyte
- (B) Basophil
- (C) Lymphocyte
- (D) Eosinophil
- (E) Plasma cell

49. Infections transmissible through blood transfusion does NOT include:

- (A) Malaria
- (B) Hepatitis B
- (C) HIV I and II
- (D) Mycobacteria
- (E) Trypanosomiasis cruzi

50. Classical haemophilia is due to deficiency of:

- (A) Factor V
- (B) Factor VII
- (C) Factor VIII
- (D) Factor IX
- (E) Fibrinogen

51. The most appropriate therapy for Christmas disease would be

- (A) Recombinant factor VIII
- (B) Recombinant factor IX
- (C) Factor VIII concentrates
- (D) Packed red cells
- (E) Heparin

52. Platelet function CANNOT be affected by the following drugs.

- (A) Aspirin
- (B) Ibuprofen
- (C) Diclofenac
- (D) Clopidogrel
- (E) Codeine

53. A 4 year old male presents with bleeding after dental extraction. Which one of the following tests is NOT appropriate in the investigation of this patient?

- (A) Full blood count and peripheral blood film
- (B) Prothrombin time
- (C) Bleeding time
- (D) APTT
- (E) Serum calcium levels

54. Abnormality present in chronic myeloid leukaemia patient

- (A) Elevated leucocyte alkaline phosphatase score
- (B) Philadelphia chromosome
- (C) Normal white cell count
- (D) Positive Sudan black B
- (E) Auer rods

55. A type of leukaemia that does not occur in a paediatric patient

- (A) Acute myeloid leukaemia
- (B) chronic myeloid leukaemia
- (C) Acute lymphoblastic leukaemia
- (D) Acute undifferentiated leukaemia
- (E) chronic lymphocytic leukaemia

56. The mode of inheritance of Christmas disease is:

- (A) Autosomal dominant
- (B) Autosomal recessive
- (C) Sex linked recessive
- (D) Sex linked dominant
- (E) Autosomal recessive with variable penetrance

57. The following drugs are contraindicated in haemophilic patient

- (A) Non steroidal anti-inflammatory drugs
- (B) Anticoagulants
- (C) Steroids
- (D) Antibiotics
- (E) Anti-thyroid drugs

35. Not a long term complication of head and neck irradiation

- (A) Sicca syndrome
- (B) Osteonecrosis of the cortical process of the mandible
- (C) Strictures of the salivary ducts
- (D) Jugular vein thrombosis
- (E) Squamous cell carcinoma

36. A likely aetiology of a four year old child presenting with myocardial infarction:

- (A) Kawasaki's disease
- (B) Congenital syphilis
- (C) Coronary atherosclerosis
- (D) Abeta-lipoproteinemia
- (E) Thrombotic thrombocytopenic purpura

Dystrophic calcification

- (A) Is encountered in areas of necrosis of any type
- (B) Is rarely a cause of organ dysfunction
- (C) Is the end product of formation of crystalline calcium bicarbonate
- (D) Occurs in normal tissue in hypocalcaemia
- (E) Occurs only in cartilage

38. Which screening technique has had the greatest impact on reduction of cancer deaths?

- (A) Chest radiograph
- (B) Urinalysis
- (C) HDsAg
- (D) Pap smear
- (E) Mammogram

39. Least likely to give rise to a subsequent carcinoma in the affected organ is?

- (A) Chronic atrophic gastritis
- (B) Oral leukoplakia
- (C) Atypical endometrial hyperplasia
- (D) Multiple skin nevi
- (E) Macronodular cirrhosis

40. Which tumour is unlikely to metastasize?

- (A) Basal cell carcinoma
- (B) Well-differentiated squamous cell carcinoma
- (C) Pleomorphic leiomyosarcoma
- (D) Anaplastic carcinoma
- (E) Osteogenic sarcoma

41. The following cells do not normally circulate in the peripheral blood.

- (A) Red cells
- (B) Plasma cells
- (C) Platelets
- (D) Monocytes
- (E) Basophils

42. Shelf life of CPDA-1 whole blood stored at 4°C is

- (A) 21 days
- (B) 28 days
- (C) 30 days
- (D) 35 days
- (E) 42 days

43. Aplastic anaemia may be associated with one of the following:

- (A) Hypersplenism
- (B) Bleeding
- (C) Elevated white cell count
- (D) Marked enlargement of the lymph nodes
- (E) Bone pains

44. One of the following is not a possible complication of blood transfusion:

- (A) Hyperkalemia
- (B) Iron overload
- (C) Circulatory overload
- (D) Thrombosis
- (E) Hepatitis

45. A function of the hospital blood transfusion unit

- (A) Screening for Transfusion Transmitted Infections
- (B) Policy formation
- (C) Donor recruitment
- (D) Investigation of blood transfusion reactions
- (E) Donor education drives

Hemat

24. The most striking example of a point mutation is 'found in' which of the following diseases?

- (A) Down's syndrome
- (B) Klinefelter's syndrome
- (C) Sickle cell anemia
- (D) Thalassemia
- (E) Night blindness

25. True regarding metastatic disease.

- (A) Is the most common presentation of melanoma
- (B) In breast cancer is usually to supraclavicular nodes
- (C) Is proven by lymph node enlargement
- (D) Is common in benign neoplasm
- (E) Unequivocally prove malignancy

26. Cellular adaptations are characterized by the following except:

- (A) hyperplasia
- (B) hypertrophy
- (C) atrophy
- (D) metaplasia
- (E) fatty change

27. The commonest aetiological factor of disease in the human beings is

- (A) Nutritional
- (B) Chemical
- (C) Genetic
- (D) Environmental
- (E) Acquired inflammatory agent factors

28. Atrophy of organs in advanced human age is most commonly caused by:

- (A) Cell loss
- (B) Decreased work load or disuse
- (C) Loss of innervation
- (D) Diminished blood supply
- (E) Inadequate nutrition

29. Which of these lesions is associated with vascular sequestration

- (A) Cerebral malaria
- (B) Paroxysmal nocturnal haemoglobinuria
- (C) Secondary syphilis
- (D) Pulmonary thromboembolism
- (E) Ebola viral haemorrhagic fever

30. Inflammatory mechanism in Wegener's granulomatosis as classified by Cogan and Coombs's system

- (A) Type I
- (B) Type II
- (C) Type III
- (D) Type IV
- (E) Type V

31. Not a small vessel vasculitis

- (A) Chag-Strauss syndrome
- (B) Polyarteritis nodosa
- (C) Microscopic polyangitis
- (D) Cutaneous leucocytoclastic angitis
- (E) Wegener's granulomatosis

32. The first manifestation of cell injury is

- (A) Plasma membrane alterations
- (B) Mitochondrial changes
- (C) Dilatation of endoplasmic reticulum
- (D) Hydropic change
- (E) Cellular swelling

33. Characteristic of a type 6 atherosclerotic lesion

- (A) Intimal proliferation with intracellular cholesterol
- (B) Plaque rupture and haemorrhage
- (C) Extracellular cholesterol clefts
- (D) Presence of monocytes within the plaque
- (E) Aortitis with a tree-bark appearance

34. The predominant lesion in Kaposi's sarcoma is

- (A) M
- (B) S
- (C) G₁
- (D) G₂
- (E) G₃

13. Causes of cardiogenic shock EXCEPT:
- Myocardial infarction
 - Arrhythmias
 - Cardiac tamponade
 - Cardiomyopathy
 - Endotoxic shock.
14. Examples of malignancy with defined tumour suppressor gene EXCEPT:
- Retinoblastoma
 - Wilms tumor
 - Adenomatous polyposis coli colonic malignancies
 - Neurofibromatosis I
 - African Burkitt's Lymphoma
15. Defective matrix formation in wound healing is associated with deficiency of:
- Vitamin A
 - Vitamin B₁₂
 - Vitamin D
 - Vitamin C
 - Galactosamine
16. Cytologic features of malignancy EXCEPT:
- Nuclear pleomorphism
 - Large nucleoli
 - Hydropic change
 - Cellular pleomorphism
 - Abnormal mitotic figures
17. Contractures are likely to occur in:
- Pyogenic inflammation
 - Abdominal surgical wounds
 - compound fractures
 - Third degree burns around joints
 - Scalding
18. The study of cytology is best described as branch of pathology involved in:
- study of tissue structure
 - study of organ morphology
 - study of cell structure
 - study of haemopoietic cells
 - study of microbial agents
19. The hallmark of chronic granulomatous inflammation is:
- presence of epithelioid cells
 - lymphocyte accumulation
 - giant cell formation
 - plasma cell collection
 - germinal follicle formation
20. True concerning most pulmonary emboli:
- Cause centrally located pulmonary hemorrhage
 - Cause pulmonary infarction
 - Cause acute right heart failure
 - Are clinically silent
 - Lead to pulmonary hypertension
21. Which of the following is a hereditary disease?
- Gigantism
 - Leprosy
 - River blindness
 - Phenylketonuria
 - Bronchogenic carcinoma
22. In Down's syndrome of a male child the sex complement is:
- CO
 - XY
 - XX
 - XXY
 - YO
23. Albinism is a congenital disorder resulting from the lack of which enzyme:
- Tyrosinase
 - Xanthine oxidase
 - Catalase
 - Fructokinase
 - Maltase

Not a complication of use of prolonged oxygen in emergency facilities.

- (A) Retrolental fibroplasia
- (B) Retinal detachment
- (C) Diffuse alveolar damage
- (D) Apnoea
- (E) Dysplasia

Not associated with amyloidosis

- (A) Pulmonary tuberculosis
- (B) Bronchiectasis
- (C) Alzheimers disease
- (D) Multiple myeloma
- (E) Acute inflammation

Deposits of amyloid can be demonstrated in tissue by all except:

- (A) The naked eye
- (B) Iodine paint
- (C) Congo red stain
- (D) Light microscope
- (E) Immunohistochemistry

4. Commonest opportunistic infection associated with HIV in Kenya

- (A) Candidiasis
- (B) Pneumocystis carini
- (C) Strongyloidosis
- (D) Cryptococcus meningitis
- (E) Herpes Zoster dermatosis

5. Not an AIDS defining malignancy

- (A) Kaposi Sarcoma
- (B) Aggressive B cell lymphoma
- (C) Primary central nervous system lymphoma
- (D) Squamous cell carcinoma of uterine cervix
- (E) Mandibular fibrosarcoma

6. Cells that are a part of entry of HIV virus into circulation except:

- (A) Dendrite cells of the skin
- (B) Macrophages
- (C) CD4 lymphocytes
- (D) Microglial cells
- (E) Epidermal cells

7. The commonest granulomatous inflammation seen in HIV

- (A) Mycobacterial infection
- (B) Fungal infections
- (C) Foreign body type
- (D) Autoimmune
- (E) Parasitic infections

8. Characteristics of chronic inflammation except:

- (A) Mononuclear cell infiltration
- (B) Tissue destruction
- (C) tissue repair
- (D) Angiogenesis
- (E) Dysplastic changes

9. Causes of granulomatous inflammation except:

- (A) Schistosomiasis
- (B) Syphilis
- (C) Mycotic infections
- (D) Cerebral malaria
- (E) Sarcoidosis

10. Endocrine causes of secondary hypertension except:

- (A) Polycystic kidney disease
- (B) Myxedema
- (C) Thyrotoxicosis
- (D) Acromegaly
- (E) Conn's syndrome

11. Risk factors for essential hypertension except:

- (A) Heavy consumption of salt
- (B) Obesity
- (C) Smoking
- (D) Physical inactivity
- (E) Pheochromocytoma

12. Cause of oedema due to reduced plasma oncotic pressure

- (A) Nephrotic syndrome
- (B) Impaired venous return
- (C) Constrictive pericarditis
- (D) Congestive cardiac failure
- (E) Thrombosis

- (A) α TNF and IL-1
- (B) IL-1 and IL-2
- (C) IL-1 and IL-4
- (D) IL-4 and IL-12
- (E) α TNF and IL-12

142. ABO and Rh incompatibility reactions are examples of

- (A) Type I hypersensitivity reaction
- (B) Type II hypersensitivity reaction
- (C) Type III hypersensitivity reaction
- (D) Type IV hypersensitivity reaction
- (E) Type V hypersensitivity reaction

143. In antigen presentation of an extracellular antigen, name the key cytosolic component

- (A) Vacuole
- (B) Golgi apparatus
- (C) Smooth endoplasmic reticulum
- (D) Rough endoplasmic reticulum
- (E) Proteasome

144. One of the following best differentiates innate and adaptive immunity

- (A) Recognition
- (B) Specificity
- (C) Memory
- (D) Diversification of immune response
- (E) Specialization of immune response

145. β - the organ specific autoimmune disease

- (A) Rheumatoid arthritis
- (B) Systemic Lupus Erythematosus
- (C) Sjogrens syndrome
- (D) Diabetes mellitus Type I
- (E) Diabetes mellitus Type II

147. The ELISA technique can be used to

- (A) Detect Liver Enzymes
- (B) Estimate haemoglobin
- (C) Measure Blood Sugar
- (D) Detect antibody
- (E) Detect antibodies and antigens

Select the best response

148. The aim of vaccination is to

- (A) immunize against all diseases
- (B) confer partial immunity
- (C) confer long lasting immunity
- (D) confer both partial and long lasting immunity
- (E) confer active, passive and reactive immunity

149. In the delayed phase of a Type I hypersensitivity reaction, one of the following does not play a crucial role:

- (A) Histamine
- (B) Leukotrienes
- (C) Prostaglandins
- (D) Platelet Derived Factor

131. Which of the following is found in a natural killer cell and is responsible for cytotoxicity

- (A) IL-2
- (B) IL-3
- (C) IL-5
- (D) Granzymes
- (E) Lipzyme

132. Which of the following primary immunodeficiency is self limiting?

- (A) Di. George Syndrome
- (B) Selective IgA deficiency
- (C) X linked agammaglobulinaemia
- (D) Wiskott Aldrich syndrome
- (E) Transient hypogammaglobulinaemia of infancy

133. Which of the following involves the reaction between a soluble antibody and a particle bound antigen?

- (A) Immunoprecipitation
- (B) Deglutination
- (C) ELISA
- (D) Radioimmunoassay
- (E) Complement fixation

134. Which two immune cells are responsible for immunity to viruses and tumours?

- (A) Macrophages
- (B) Neutrophils
- (C) Eosinophils and Basophil
- (D) Macrophages and Neutrophils
- (E) Natural killer cells and T cytotoxic lymphocytes

135. Successful immune response to bacteria which adhere to mucosal surfaces in order to initiate infection depends on the production of

- (A) Active complement
- (B) Armed effector CTLs
- (C) Neutralizing antibodies
- (D) Opsonizing antibodies
- (E) Oxidative burst

136. In type IV hypersensitivity reaction the principal cell responsible for the immunopathology is the

- (A) Th1 lymphocyte
- (B) Plasma cell
- (C) Antigen presenting cell
- (D) Cytotoxic T lymphocytes
- (E) Activated macrophages

137. A five year old girl was noticed to have diarrhoea after ingesting meat. How would you treat this condition?

- (A) An autoimmune phenomenon
- (B) A case of malabsorption
- (C) A case of food allergy
- (D) A case of immunodeficiency
- (E) A case of food intolerance

138. Hereditary angioedema is associated with one of the following:

- (A) Factor 8 deficiency
- (B) Factor 3b deficiency
- (C) C1q deficiency
- (D) C1 INH deficiency
- (E) C5a deficiency

139. One of the following is not a biological characteristic of cytokines

- (A) they are large peptides
- (B) they exhibit potent biological activity
- (C) they have a short half life
- (D) they exhibit synergy and redundancy
- (E) they are pleiotropic

140. The injection of large doses of protein results in the immune tolerance that is due to:

- (A) Removal of antibody by excess antigen
- (B) Catabolism of antibody by excess antigen
- (C) Production of non-reacting antibody
- (D) Suppression of non-reacting antibody
- (E) Induction of cytotoxic anti-idiotypic antibodies

58. A forty five year old female presents with anemia and raised ESR. She has plasma cells more than 10% in the bone marrow and serum protein electrophoresis with immunofixation reveals IgG monoclonal pattern. The patient has

- (A) Acute myeloid leukaemia
- (B) Non-Hodgkin's lymphoma
- (C) Waldenstrom's macroglobulinemia
- (D) Multiple myeloma
- (E) Squamous cell carcinoma

59. A patient is found with INR is suitable for dental procedure to be carried out without the risk of bleeding

- (A) INR of 1.1
- (B) INR of 2.5
- (C) INR of 3.0
- (D) INR of 3.5
- (E) INR of 4.0

60. An elevated MCV is present in anemia associated with:

- (A) Vitamin B₁₂ deficiency
- (B) Folate deficiency
- (C) Iron deficiency
- (D) Thiamine deficiency
- (E) Vitamin K deficiency

61. Which one is the odd one out?

- (A) Congenital hereditary spherocytosis
- (B) Severe malarial infection
- (C) Severe iron deficiency
- (D) Hereditary elliptocytosis
- (E) Glucose 6-phosphate deficiency

62. True of hemolytic anemia

- (A) Reticulocyte count is elevated
- (B) Bone marrow evaluation is mandatory
- (C) Reticulocyte count is reduced
- (D) Indirect (unconjugated) bilirubin is reduced
- (E) They are due to bone marrow failure

63. Positive confirmatory test in sickle cell disease is

- (A) Sickling test
- (B) Peripheral blood film
- (C) Haemoglobin electrophoresis
- (D) Haemoglobin solubility test
- (E) Osmotic fragility test

64. The coagulation screen does NOT include one of the following

- (A) Full blood count
- (B) Peripheral blood film
- (C) Prothrombin time
- (D) Activated partial thromboplastin time
- (E) Factor assay

65. One of the following is used to monitor parenteral anticoagulants

- (A) Factor assay
- (B) Peripheral blood film
- (C) Prothrombin time
- (D) Activated partial thromboplastin time
- (E) Bleeding time

66. When one of the following is prolonged it indicates a problem in the intrinsic pathway

- (A) Factor assay
- (B) Thrombin time
- (C) Prothrombin time
- (D) Activated partial thromboplastin time
- (E) Bleeding time

67. Thrombocytopenia will result in the prolongation of ONE of the following

- (A) Factor assay
- (B) Peripheral blood film
- (C) Prothrombin time
- (D) Activated partial thromboplastin time
- (E) Bleeding time

110. Calculate the amount of glucose to be given to a child when conducting an oral glucose tolerance test. Weight of a child is 20 kg and the formula is 1.75g/kg body weight.

- (A) 4 grams
- (B) 75 grams
- (C) 35 grams
- (D) 20 grams
- (E) None of the above

111. The least plasma levels of glucose diagnostic of diabetes mellitus are:

- (A) 7.3 mmol/L
- (B) 11.4 mmol/L
- (C) 3.2 mmol/L
- (D) 25 mmol/L
- (E) None of the above

112. Causes of hypoglycaemia include all except:

- (A) Hepatocellular insufficiency
- (B) Addison's disease
- (C) Cachexia
- (D) Insulinoma
- (E) Hyperthyroidism

113. Interpret the thyroid function test results with high levels of thyroid stimulating hormone and low levels of free thyroxine.

- (A) Primary hyperthyroidism
- (B) Secondary hyperthyroidism
- (C) Primary hypothyroidism
- (D) Secondary hypothyroidism
- (E) Euthyroidism

114. Secondary diabetes is due to all except:

- (A) Acromegaly
- (B) Pheochromocytoma
- (C) Glucagonoma
- (D) Cushing's syndrome
- (E) Addison's disease

115. The following constitute the amount of cholesterol esterified in plasma:

- (A) > 90%
- (B) About 2/3
- (C) About 1/2
- (D) About 1/4
- (E) < 5%

116. The major triglyceride carrier in plasma of a fasting patient would be:

- (A) Very low density lipoprotein (VLDL)
- (B) Low density lipoprotein (LDL)
- (C) Chylomicrons
- (D) Intermediate density lipoprotein (IDL)
- (E) Lipoprotein (a)

117. The lipoprotein richest in lipid content by weight is:

- (A) HDL
- (B) VLDL
- (C) Chylomicrons
- (D) IDL
- (E) LDL

118. The enzyme deficiency in glycogen storage disorder Type VI is:

- (A) Muscle glycogen phosphorylase
- (B) Liver glycogen phosphorylase
- (C) Amylo 1-6 glucosidase
- (D) α -acid glucosidase
- (E) Glucose 6 phosphatase

119. The following biochemical parameter has a bimodal distribution in plasma:

- (A) Ferritin
- (B) Potassium
- (C) Creatinine
- (D) Glucose
- (E) Calcium

120. The β -globulin band that floats at the density of VLDL would be classified under:

- (A) Type I hyperlipoproteinaemia
- (B) Type II hyperlipoproteinaemia
- (C) Type III hyperlipoproteinaemia
- (D) Type IV hyperlipoproteinaemia
- (E) Type V hyperlipoproteinaemia

89. Relevant history (clinical features for a child) with iron deficiency anaemia does NOT include:

- (A) Dietary history
- (B) Spoon shaped nails
- (C) History of blood in stool
- (D) History of cyanosis
- (E) History of bloody urine

90. INR is

- (A) An expression of APTT
- (B) Used for monitoring of heparin therapy
- (C) A form of thrombin time test
- (D) Used to monitor streptokinase therapy
- (E) An expression of prothrombin time

91. A 5 year old boy presents with haemophilia. Relevant history includes

- (A) Mother being a haemophilic
- (B) Paternal uncle being haemophilia
- (C) Maternal uncle being haemophilic
- (D) Father being a haemophilic
- (E) Sister being a haemophilic

Stem questions 92-95.

A comment on the peripheral blood film of an adult in Kenya reads microcytic hypochromic anaemia.

92. The most likely cause is:

- (A) Megaloblastic anaemia
- (B) Folate deficiency
- (C) Haemolysis
- (D) Iron deficiency
- (E) Bone marrow hypoplasia

93. A most relevant test would be

- (A) coombs test
- (B) nicking test
- (C) Ferritin levels in serum
- (D) Red cell folate levels
- (E) Albumin levels

94. The frequency of blood Rhesus D negativity in Kenya is:

- (A) 2 - 15%
- (B) 75 - 85%
- (C) 2 - 5%
- (D) 85 - 95%
- (E) 50 - 60%

95. The levated reticulocyte is observed in the following condition

- (A) Haemoglobinopathy
- (B) iron deficiency
- (C) Aplastic anaemia
- (D) Leishmaniasis
- (E) Myelofibrosis

96. Relevant test for diagnosis of a jaw tumour in a boy aged 8 years does NOT include

- (A) Fine needle aspirate biopsy
- (B) Immunohistochemistry of mass
- (C) Peripheral blood film
- (D) Histology
- (E) Molecular biology

97. The following factor is NOT considered among the Vitamin K dependent factors.

- (A) F VIII
- (B) F VII
- (C) F IX
- (D) Prothrombin
- (E) FX

98. Common presentation for acute leukaemia does NOT include

- (A) Epistaxis
- (B) Jaundice
- (C) Pottor
- (D) Infections
- (E) Bone pains

120 The following is the severest form of aminoaciduria:

- (A) Alkaptonuria
- (B) Tyrosinaemia Type I ✓
- (C) Maple syrup disease
- (D) Homocystinuria Type I
- (E) Argininosuccinate acidemia

121 Apo B is a constituent of the following lipoproteins:

- (A) Chylomicrons + VLDL
- (B) VLDL + LDL
- (C) LDL only
- (D) HDL + VLDL
- ~~(E) Chylomicrons + HDL + LDL + VLDL~~

122 A 1 month old child was reported to having an inherited metabolic condition. Which of the following is a monogenic disorder:

- (A) Turner's syndrome
- (B) Down's syndrome
- (C) Gaucher's disease
- (D) Diabetes mellitus type II
- (E) Sheehan's syndrome

Use the information provided below to answer questions 124 and 125

Arterial Blood gas analysis was done for a 25 year old female. Results were: $\text{pH} = 7.28$ *Acidosis*
 $\text{HCO}_3^- = 10 \text{ mmol/L}$ (22-24); $\text{PCO}_2 = 36 \text{ mmHg}$ (35-45).

124. What is the acid base disturbance?

- (A) Metabolic acidosis ✓
- (B) Metabolic alkalosis
- (C) Mixed metabolic and respiratory acidosis
- (D) Respiratory acidosis
- (E) Respiratory alkalosis

125. Which of the following conditions may be a cause of these findings?

- (A) Benzodiazepine overdose
- (B) Chronic diarrhoea
- (C) ~~Hypertension~~
- (D) ~~Living at a high altitude~~
- (E) Severe vomiting

126. ~~Rate accumulation~~ is the main cause of clinical symptoms in

- (A) Congenital adrenal hyperplasia
- (B) Congenital hypothyroidism
- (C) Cystinuria
- ~~(D) Galactosaemia~~
- (E) Phenylketonuria

127. Which of the following inherited disorders is life threatening in the neonatal period?

- (A) Gilbert's disease
- (B) Haemochromatosis
- (C) Hartnup disease
- ~~(D) Maple syrup urine disease~~
- (E) Wilson's disease

128. Which of the following disorders is due to a single gene defect?

- (A) Diabetes mellitus
- (B) Down's syndrome
- (C) Klinefelter's syndrome
- ~~(D) Sickle cell disease~~
- (E) Turner syndrome

129. Alternate pathway utilization is the main cause of clinical symptoms in

- (A) Alkaptonuria
- (B) Cystinuria
- ~~(C) Phenylketonuria~~
- (D) Galactosemia
- (E) Congenital hypothyroidism

130. Which of the following tests cannot be done at a point of care setting?

- (A) Drug abuse screening
- (B) Hepatitis B
- ~~(C) Neonatal thyroid function tests~~ ✓
- (D) Cardiac markers
- (E) Pregnancy test

99 An ideal donor is described as

- (A) A paid donor
- (B) A voluntary non remunerated donor
- (C) A relative
- (D) A replacement donor
- (E) None of the above is an ideal donor

100 Vitamin B₁₂ is maximally absorbed in

- (A) Duodenum
- (B) Gastric strum
- (C) Throughout the ileum
- (D) Terminal ileum ✓
- (E) Jejunum

101 A fall in plasma sodium accompanied by a rise in plasma potassium is characteristic of

- (A) Conn's syndrome
- (B) Addison's disease
- (C) Furosemide therapy
- (D) Metabolic alkalosis
- (E) Purgative abuse

102 Recognised causes of renal tubular damage include all except

- (A) Phenacetin
- (B) Hypocalcaemia
- (C) Hypokalaemia
- (D) Galactosaemia
- (E) Wilson's disease

103 The following factor stimulates ADH secretion

- (A) Hyper volaemia
- (B) Alcohol intake
- (C) Increased ECF osmolarity
- (D) Increased fluid intake
- (E) Resting

104 Etiology of plasma ferritin may occur

- (A) Chronic alcoholism
- (B) Inflammatory condition
- (C) Haemolysis
- (D) Liver disease
- (E) Malignant disease

105 The following physiological factor does NOT affect plasma iron concentration

- (A) Weight
- (B) Pregnancy
- (C) Sex
- (D) Random variation
- (E) Diurnal variation

106 Causes of diurnal hyponatraemia include

- (A) Chronic diarrhoea
- (B) Diabetes insipidus
- (C) diuretic therapy
- (D) Nephrotic syndrome ✓
- (E) Severe burns

107 Hypocalcaemia may be due to the following:

Handwritten note: HypoPTH

- (A) Hyperthyroidism
- (B) Prolonged immobilization
- (C) Pseudo hypoparathyroidism
- (D) Tertiary hyperparathyroidism
- (E) Vitamin D toxicity

108 Type II Diabetes mellitus is characterized by all except

- (A) Obesity ✓
- (B) Prone to Hyperosmolar non-ketotic coma ✓
- (C) Adult onset ✓ 790
- (D) No genetic predisposition in monozygote twins 100%
- (E) Slow onset

109 All these metabolic processes increase blood glucose levels except

- (A) Glycogenesis
- (B) Glycolysis ✓
- (C) Protein synthesis
- (D) Lipolysis
- (E) Oxidative phosphorylation

74. The characteristic cell found in Hodgkin's lymphoma

- (A) Reed-Sternberg cell
- (B) Pather neutrophils
- (C) Lymphoplasmacytoid cells
- (D) Basophils
- (E) Blast cells

79. Thrombocytopenia usually manifest as

- (A) Haemorrhasis ✓ *Bleedies*
- (B) Mucosal bleeding
- (C) Recurrent infection
- (D) Dactylitis
- (E) Cynosis

80. A seven year old male presents with gum hypertrophy and persistent fevers. Initial blood counts show Hb 5.5 g/dL, WBC $33 \times 10^9/L$, platelets $31 \times 10^9/L$. Useful investigation will include:

- (A) Gum biopsy
- (B) Bone marrow aspirate
- (C) Coagulation screen
- (D) Sickling test
- (E) Coombs' test

81. Type of sickle cell anaemia

- (A) Characterised by decreased globin chain synthesis *Abnorm a.*
- (B) Most patients diagnosed in the second decade of life
- (C) Found only in Africa
- (D) Inherited sex linked recessive
- (E) Due to ~~presence~~ *absence* of haemoglobin molecule

82. An important initial test in the investigation of anaemia

- (A) Osmotic fragility
- (B) Reticulocyte count
- (C) Sickling test ✓
- (D) Bone marrow aspirate
- (E) Serum ferritin assays.

83. ~~Which~~ Eosinophilia does NOT include one of the following

- (A) Visceral larva migrans
- (B) Atopy
- (C) Whooping cough
- (D) Scabies
- (E) Radiotherapy

84. This cell has coarse orange granules in its cytoplasm

- (A) Lymphocyte
- (B) Neutrophil
- (C) Basophil
- (D) Eosinophil
- (E) Monocyte

85. Lymphocytosis is a common feature of

- (A) Malaria
- (B) Advanced HIV infection
- (C) Acute bacterial infection
- (D) Viral infections
- (E) Helminthiasis

→ lymph. Viral Infective Non-Hgkin.

86. One of the following is a common clinical feature of hereditary spherocytosis

- (A) Acidosis
- (B) Hand and foot syndrome
- (C) Jaundice
- (D) Lymphadenopathy
- (E) Neurotology

87. One of the following is NOT a cause of folate deficiency

- (A) Resection of terminal ileum
- (B) Chronic haemolysis
- (C) Pregnancy
- (D) Resection of jejunum and duodenum
- (E) Malabsorption

88. Neutrophilia is NOT associated with:

- (A) Alcoholism ✓
- (B) Pyogenic infection
- (C) Acute haemorrhage
- (D) Tissue necrosis
- (E) Diabetic ketoacidosis

Inf Drugs Psv. Br.

63. One of the following is NOT a site of red blood cell synthesis in the fetus/embryo

- (A) Liver
- (B) Spleen
- (C) Bone marrow
- (D) Yolk sac
- (E) Lymphoid tissue ✓

69. An ideal stain for the demonstration of white cells in the PBF is

- (A) Haematoxylin
- (B) ~~May Grunwald Giemsa~~
- (C) Pearl stain
- (D) Periodic acid Schiff
- (E) Haematoxylin and Eosin (H/E)

70. The following drugs may predispose to abnormal bleeding during a dental procedure

- (A) Steroids
- (B) Anti-tuberculosis
- (C) Antimalarials
- (D) Warfarin
- (E) Tranexamic acid

71. Serum ferritin is reduced in:

Iron def

- (A) Anaemia of chronic disease
- (B) Megaloblastic anaemia
- (C) Inflammatory states
- (D) Iron deficiency states ✓
- (E) Haemochromatosis

72. Sickle cell disease inheritance pattern is:

- (A) Sex linked recessive ✓
- (B) Autosomal recessive
- (C) Sex linked dominant
- (D) Autosomal dominant
- (E) Autosomal co-dominant

For Q 73-74

A five year old boy from east province presents with a rapidly growing mass over 2 months duration.

73. A likely diagnosis

- (A) Hodgkin Lymphoma
- (B) Ameloblastoma
- (C) Acute myeloid leukaemia
- (D) Burkett's lymphoma
- (E) Multiple myeloma

74. Management of this patient will NOT include:

- (A) Surgical excision
- (B) Palliative care
- (C) Psychosocial care
- (D) Chemotherapy
- (E) Supportive care

75. Indication of bone marrow examination

- (A) Disseminated intravascular coagulation
- (B) Pancytopenia
- (C) Jaundice
- (D) Sickle cell anaemia
- (E) Haemophilia A

76. The following malignancy is NOT frequently seen in patients with HIV/AIDS

- (A) Cancer of cervix
- (B) Kaposi sarcoma
- (C) ~~Sarcoma lymphoma~~
- (D) Burkett's lymphoma
- (E) Osteogenic sarcoma

Act HIV Defining

B.S.

ker.

Kaposi Sarcoma

Pancreas C

non-Hogkin

A

77. A drug that interferes with platelet function

- (A) Warfarin
- (B) Paracetamol
- (C) ~~Aspirin~~
- (D) Vincristine
- (E) Penicillin

46. Tests of compatibility for blood transfusion does NOT include:

- (A) ABO grouping
- (B) HIV I & II screening
- (C) Rhesus grouping
- (D) Antibody screening
- (E) Cross matching

47. The following haemoglobin level is normal for an adult male in Kenya

- (A) 10-13 g/dL
- (B) 12-16 g/dL
- (C) 13-18 g/dL ✓
- (D) 15-20 g/dL
- (E) 14-22 g/dL

48. The abnormal cell in infectious mononucleosis is:

- (A) Monocyte
- (B) Basophil
- (C) Lymphocyte
- (D) Eosinophil
- (E) Plasma cell

49. Infections transmissible through blood transfusion does NOT include:

- (A) Malaria
- (B) Hepatitis B
- (C) HIV I and II
- (D) Mycobacteria
- (E) Trypanosomiasis cruzi

50. Classical haemophilia is due to deficiency of:

- (A) Factor V
- (B) Factor VII
- (C) Factor VIII
- (D) Factor IX
- (E) Fibrinogen

51. The most appropriate therapy for Christmas disease would be

- (A) Recombinant factor VIII
- (B) Recombinant factor IX
- (C) Factor VIII concentrate ✓
- (D) Packed red cells
- (E) Heparin

52. Platelet function CANNOT be affected by the following drugs.

- (A) Aspirin
- (B) Ibuprofen
- (C) Diclofenac
- (D) Clopidogrel
- (E) Codeine

53. A 4 year old male presents with bleeding after dental extraction. Which one of the following tests is NOT appropriate in the investigation of this patient?

- (A) Full blood count and peripheral blood film
- (B) Prothrombin time
- (C) Bleeding time
- (D) APTT
- (E) Serum calcium levels

54. Abnormality present in chronic myeloid leukaemia patient

- (A) Elevated leucocyte alkaline phosphatase score
- (B) Philadelphia chromosome
- (C) Normal white cell count
- (D) Positive Sudan black B
- (E) Auer rods

55. A type of leukaemia that does not occur in a paediatric patient

- (A) Acute myeloid leukaemia
- (B) chronic myeloid leukaemia
- (C) Acute lymphoblastic leukaemia
- (D) Acute undifferentiated leukaemia
- (E) chronic lymphocytic leukaemia

56. The mode of inheritance of ~~Christmas disease~~ is

- (A) Autosomal dominant
- (B) Autosomal recessive
- (C) Sex linked recessive
- (D) Sex linked dominant
- (E) Autosomal recessive with variable penetrance

57. The following drugs are contraindicated in haemophilic patient

- (A) Non steroidal anti-inflammatory drugs
- (B) Anticoagulants
- (C) Steroids
- (D) Antibiotics
- (E) Anti-thyroid drugs

essential hypertension constitutes _____ of systemic hypertension

- A. 30-35%
- B. 90-95%
- C. 70%
- D. 50-60%
- E. 5-10%

70. The following are endocrine causes of hypertension Except

- A. Polycystic kidney disease
- B. Pheochromocytoma
- C. Myxedema
- D. Acromegaly
- E. Cushing syndrome

71. The following are associated with essential hypertension Except

- A. Coronary heart disease
- B. Cerebrovascular accident
- C. Cardiac hypertrophy and heart failure
- D. Frequent infections
- E. Aortic dissection

72. The following organs are central players in blood pressure regulation:

- A. Heart and blood vessels
- B. Brain
- C. Kidney and adrenals
- D. Lungs and pulmonary vessels
- E. Aorta and peripheral arteries

73. The following are vasodilators Except

- A. Prostaglandins
- B. Alpha-adrenergic receptors
- C. Beta-adrenergic receptors
- D. Guano
- E. Nitric oxide

74. Any of the following is a cardiovascular cause of secondary hypertension?

- A. Coarctation of the aorta
- B. Renal artery stenosis
- C. Raised intracranial pressure
- D. Acute stress
- E. Renin-producing tumours

75. The following is the commonest paraneoplastic syndrome:

- A. Syndrome of inappropriate antidiuretic hormone secretion
- B. Hyponatraemia
- C. Cushing syndrome
- D. Fever
- E. Cachexia

77. All the following are endocrine paraneoplastic syndromes Except

- A. Hypercalcaemia
- B. Hypoglycaemia
- C. Polycythaemia
- D. Carcinoid syndrome
- E. Hypertalkaemia

78. Hypertrophy is:

- A. Increase in the number of cells with increase in size of organ
- B. Change from one cell type to another
- C. Increase in the size of cells with increase in the size of the organ
- D. Growth of the tissues
- E. Development of tumours

79. Trausseau phenomenon is associated with the following conditions Except

- A. Pancreatic carcinomas
- B. Bronchogenic carcinomas
- C. Acute promyelocytic leukaemia
- D. Prostatic adenocarcinomas
- E. Glioblastoma multiforme

80. Which of the following is a metaplastic change?

- A. Cervical intraepithelial neoplasia
- B. Skin acanthosis
- C. Myositis ossificans
- D. Squamous cell carcinoma of the oesophagus
- E. Granulation tissue developing in an infected wound

81. Which specific receptors located on the surface of a T cell are responsible for antigen recognition?

- A. Surface immunoglobulins (sIg)
- B. Major histocompatibility complex (MHC peptide complex)
- C. Antigen receptor (TCR/CD3) in association with CD4 or CD8 molecules
- D. CD16
- E. CD56

82. Select the term that best describes tolerance

- A. Regulation
- B. Immunocompetence
- C. Unresponsiveness
- D. Immunodeficiency
- E. Energy

-subsets of the normal immune response (20)

Conversion of a normal cell into a malignant cell may occur when a mutation occurs in the

- A. Oncogene
- B. Regulatory gene
- C. Tumour suppressor gene
- D. All of the above
- E. None

The most reliable marker currently available for prostate cancer is

- A. CEA
- B. PSA
- C. AFP
- D. CA 125
- E. BcrA

Peptides bound to class I MHC molecules may be referred to all of the following except

- A. Antigenic peptides
- B. Degraded protein
- C. Intracellular antigens
- D. Genetically determined molecules
- E. Vitamins

Antigens displayed by an antigen-presenting cell (APC) for recognition by T lymphocytes (CD4+) are categorized as

- A. Extracellular antigens
- B. Intracellular antigens
- C. T cell antigens
- D. None of the above
- E. Bull antigens

A T cell receptor (TCR) which recognizes an immunogenic molecule as foreign is located on the surface of the

- A. B lymphocyte
- B. Immunogenic molecule
- C. CD4+ T lymphocyte
- D. All of the above
- E. Macrophage

Which of the mechanisms listed following is involved in removal of antigens during the effector phase of an immune response?

- A. Antigen/antibody formation
- B. Cytotoxicity
- C. Phagocytosis
- D. All of the above
- E. Endocytosis

Macrophages may be stimulated to proliferate by antigenic products and by which of the following

- A. Complement
- B. Interferons
- C. Opsonins
- D. Growth factors
- E. Hormones

- A. Mononuclear anti
- B. Virally infected cells
- C. All of the above
- E. Tumour infected cells

91 T cells are capable of circulating between the blood and the various tissues of the immune system except

- A. Lymphoid organs
- B. Blood circulation
- C. Central nervous system
- D. Mucosal lymphoid tissue
- E. Gastrointestinal tract

92 Natural killer (NK) cells have all the following characteristics except

- A. Are neither T or B cells
- B. Have specific T cell receptors *They lack TCR.*
- C. Are Cytotoxic (cytolytic)
- D. Eliminate tumor and virally infected cells
- E. Have (1) 16 receptor

93 Select the membrane receptor that is expressed on Monocytes and Macrophages and that has the ability to bind with an antibody to produce or enhance a variety of biologic responses

- A. Fc receptor (FcR) *FCR.*
- B. T cell receptor (TCR)
- C. Surface immunoglobulin (sIg)
- D. Major histocompatibility complex (MHC)
- E. Human leucocyte antigen

94 Cytokines are molecules that serve as mediators in the cell-to-cell communication that occurs during an immune response. Select the cells that do not secrete these molecules:

- A. B cells
- B. T cells
- C. Plasma cells
- D. NK cells
- E. Fibroblasts

95 Select the soluble effector molecules of humoral immunity

- A. Cytokines
- B. Interleukins
- C. Immunoglobulin
- D. Complement components
- E. Hormones

96 Interaction between B and T cells is necessary for inducing a normal immune response. Select the molecules that participate in the interaction.

- A. Class II MHC-peptide complex
- B. T cell surface receptors (TCRs)
- C. CD4+ T cell secreted cytokines
- D. All of the above
- E. CD15 and CD16 receptors

Which of the following are not considered as part of a thrombotic process each?

- A. Fatty or massive calcification
- B. Deep venous thrombosis
- C. Haemorrhage into the plaque
- D. Focal rupture and ulceration
- E. Superimposed thrombosis

- 1) Rupture
- 2) Embolism
- 3) Ulcer
- 4) Arteriothrombosis
- 5) Bt Haema

The primary function of mitochondria is

- A. Packaging enzymes
- B. Detoxification
- C. Energy production
- D. Production of intracellular protein
- E. Digestion of worn-out cell components

During cell hydropic swelling, the following occurs

- A. The cytoplasmic membrane contracts
- B. Water accumulates within the cell followed by the mitochondrial swell
- C. There is aggregation of lipids
- D. Ischaemia results in loss of water from the cytoplasm
- E. The amount of chromosomal material increases

The organ that contains capillaries impermeable to large molecules in the placenta is

- A. Placenta
- B. Lungs
- C. Liver
- D. Brain
- E. Kidney

In which one of the following malignant tumours is metastasis rarely seen?

- A. Basal cell carcinoma
- B. Malignant mesothelioma
- C. Squamous cell carcinoma of skin
- D. Oligodendrogloma
- E. Embryonal carcinoma

Deficiency of Vitamin C in the body predominantly affects

- A. Collagen synthesis
- B. White cell migration
- C. Laying down of calcium
- D. Fibrinolysis
- E. Fluid excretion

Complications of tumours include All of the following Except

- A. Haemorrhage
- B. Deformities/infections
- C. Cachexia
- D. Hormonal disturbances
- E. Weight gain

- A. Cell membrane change
- B. Cell body change
- C. Is seen in a myxoid stroma

Which of the following tests are not useful in differentiating amyloid from colloid and foamy?

- A. Polarizing light
- B. Congo red stain
- C. Immunocytochemistry
- D. Immunocytochemistry
- E. Amyloid stain

- Differentiate it from Hyaline
- Electron microscope
- TCC

Which of the following factors does not predispose one to develop amyloidosis?

- A. Ankylosing spondylitis
- B. Hodgkins disease
- C. Tuberculosis
- D. Intravenous abuse of heroin
- E. Basal cell carcinoma

Myeloma
Lipoma
Renal Fail
Tumour: DM
P.A. Bionchiastasis
Osteomyelitis

Which of the following is not a pathogenic mechanism for development of amyloid?

- A. Chronic inflammation leads to elevation and accumulation of serum AA
- B. Chronic inflammation leads to elevation of TNF leading to production of amyloid
- C. Deficiency of monocyte derived enzymes leads to accumulation of amyloid precursors
- D. Genetically determined structural abnormality of SAA
- E. Genetically determined abnormality of transthyretin

Which of the following is not true of paraneoplastic syndrome?

- A. Paraneoplastic syndromes are clinicopathological changes seen cancer patients that can be readily explained by local or distant effects
- B. Paraneoplastic syndromes occur in 10% of patients with cancer
- C. Paraneoplastic syndrome may be associated with proopiomelanocortin hormone production
- D. Hypercalcaemia a paraneoplastic syndromes may be due to production of osteolytic humoral factors
- E. Multiple myeloma may be a cutaneous manifestation of paraneoplastic syndromes

Which of the following is not a feature used as determining the grade of a malignant tumour?

- A. Mitotic rate
- B. Differentiation
- C. Pleomorphism
- D. Necrosis and apoptosis
- E. Invasion

Union International contre Cancer (UICC) advises on the use of the TNM staging of tumours. In staging using the TNM system, all of the following are true Except

- A. Tumour size
- B. Tumour necrosis
- C. Lymph node involvement
- D. Number of symptoms involved
- E. Metastasis

B2 M. Hemochromatosis

Aspirin can be used to treat fever by interfering production of

- A. Prostaglandin E2 (PGE2)
- B. Bradykinin
- C. Histamine
- D. Leukotriene
- E. Prostaglandin F2 (PGF2)

Which of the following neoplastic proliferation is malignant?

- A. Leiomyoma
- B. Lipoma
- C. Lymphangioma
- D. Lymphoma
- E. Fibroma

Oedema as a result of increased hydrostatic pressure is seen in:

- A. Hypertension
- B. Cirrhosis of liver
- C. Starvation
- D. Protein-losing gastroenteropathy
- E. Thrombosis of veins

Clinical diagnosis of Rheumatic fever includes all of the following EXCEPT

- A. Migratory polyarthralgia ✓
- B. Carditis ✓
- C. Subcutaneous nodules ✓
- D. Depressed acute phase proteins *Infla*
- E. Chorea ✓

In hypoxic cell injury swelling of the cells occur because of intracytoplasmic accumulation of

- 1. Lipid
- 1. Proteins
- 2. Water
- 1. Lipofuscin
- 1. Glycogen

Regarding melanin pigments

- Most common of the exogenous pigments *Encl*
- Usually derived from hemoglobin *A-110*
- Found in the melanocytes
- Cartilage is the main reservoir
- Accumulation causes anthracosis *coal*

Causes of insufficient cell energy production include the following EXCEPT

- Amylodosis *Fib*
- Enzyme inhibition ✓
- Hypoglycaemia ✓
- Hypoxia ✓
- Uncoupling of oxidative phosphorylation ✓

- A. Leukotrienes
- C. Histamine
- D. Bradykinin
- E. Prostaglandins

37. Which of the following mediators of acute inflammation is chemotactic?

- A. Oxygen radicals
- B. Serotonin
- C. Lysosomal proteases
- D. Complement 3a ✓
- E. Prostaglandins

38. Characteristic feature of granulomatous inflammation is the presence of

- A. Eosinophils
- B. Neutrophils
- C. Langhan's giant cell *??*
- D. Multinucleated giant cells *??*
- E. Aggregation of epithelioid macrophages ✓

39. Rapidly regenerating cells are:

- A. Neurons
- B. Stable cells *
- C. Hepatocytes
- D. Lacuna cells ✓
- E. Myocardial cells

40. Cleft lip defect can genetically be classified as a:

- A. Mendelian disorder
- B. Polygenic disorder ✓
- C. Chromosomal disorder
- D. Autosomal recessive condition
- E. None of the above

41. The predominant component of acute inflammatory exudates is:

- A. Neutrophils and tissue fluid ✓
- B. Lymphocytes and tissue fluid ✓
- C. Fibrous tissue ✓
- D. Pus ✓
- E. Lymphocytes, plasma cells and macrophages

42. The following statement is correct:

- A. The healing of simple bone fracture is empowered by deficiency of vitamin C, C and Zinc
- B. Collagen type III replace type I in increasing wound strength ✓
- C. Galactosamine deficiency affects the ground substance in wound healing
- D. Linear scars are seen in infected surgical wounds.

- Unaffected persons can transmit the trait
- Martin's syndrome is an example
- Always skip a generation
- Males are more often affected than females
- Affected persons transmit the trait to half their children

Oxynomic calcification:

- Is encountered in areas of necrosis of any type
- Is rarely a cause of organ dysfunction
- Is the end product of formation of crystalline calcium phosphate
- Occurs in normal tissue in hypercalcaemia
- Occurs only in cartilage

phosphate
phosphat

17. Which of the following screening techniques has had the most impact on reduction of cancer deaths?

- Chest radiograph
- Urinalysis
- HBSAg
- Pap smear
- Mammogram

18. Which of the following is unlikely to metastasize?

- Basal cell carcinoma
- Well-differentiated Squamous cell carcinoma
- Pleomorphic leiomyosarcoma
- Anaplastic carcinoma
- Osteogenic sarcoma

19. A 25-year-old female has had multiple episodes of deep vein thrombosis in the past 3 years and one episode of pulmonary Thromboembolism in the same period. Which of the most likely risk factor to have contributed to her condition?

- Factor V Leiden mutation/VIII-thrombin III deficiency
- Antithrombin III deficiency
- Mutation in Protein C
- Hyperhomocysteinemia
- Smoking

20. Which of the following organs is an arterial hemangioendothelioma most likely to produce an infarct?

- Brain
- Liver
- Kidney
- Heart
- Spleen

kidney & spleen

21. Which of the following mechanism does not cause fatty change?

- Increased synthesis of apoproteins
- Excess of mitochondrial
- Excess of fatty acid oxidation
- Excess of fatty acid synthesis
- Excess of fatty acid oxidation

Excess synthesis of lipids
Oxidation to ketone

- Excess of fatty acid synthesis
- Excess of fatty acid oxidation

22. The major pathology associated with arterial thrombosis is

- Stasis - Vein
- Atherosclerosis
- Hypercoagulability
- Protein C & S deficiency
- None of the above

Lung spleen - 1st Red cells of cong
G.I. then -> Pal

23. Red thrombotic clots are seen in all the above Except

- Spleen
- Ovaries
- Testis
- Lungs
- Intestines

24. Which of the following is not a cellular adaptive change?

- LSIL
- HSIL
- Atrophy
- Hyperplasia
- Hydroxy change

Hig Grad squamous

25. Which of the following is not a major criteria for diagnosis of rheumatic fever?

- Carditis
- Chorea
- Arthritis
- Antichorea
- Erythema Marginatum

26. Which of the following statements on acute inflammation is false?

- It is a physiological response to injury
- It occurs around a microvasculature
- The key cell involved is the neutrophil
- It never progresses to chronic inflammation
- It is an exudative process

27. The Epstein-Barr virus (EBV) has a proven positive association with the following condition

- Carcinoma of the cervix
- Hepatocellular carcinoma
- Burkitt's lymphoma
- Meningioma
- Carcinoma of the nasopharynx

58. A forty five year old female presents with anemia & raised ESR. She has plasma cells more than 10% in the bone marrow and serum protein electrophoresis with immunofixation reveals IgG monoclonal pattern. The patient has

- (A) Acute myeloid leukaemia
- (B) Non-Hodgkins lymphoma
- (C) Waldenstroms macroglobulinemia
- (D) Multiple myeloma
- (E) Squamous cell carcinoma

59. A patient is found with INR is suitable for dental procedure to be carried out without the risk of bleeding.

- (A) INR of 1.1
- (B) INR of 2.5
- (C) INR of 3.0
- (D) INR of 3.5
- (E) INR of 4.0

60. An elevated MCV is present in anemia associated with:

- (A) Vitamin B₁₂ deficiency
- (B) Folate deficiency
- (C) Iron deficiency
- (D) Thiamine deficiency
- (E) Vitamin K deficiency

61. Which one is the odd one out?

- (A) Congenital hereditary spherocytosis
- (B) Severe malarial infection
- (C) Severe iron deficiency
- (D) Hereditary elliptocytosis
- (E) Glucose 6-phosphate deficiency

62. True of haemolytic anemia

- (A) Reticulocyte count is elevated
- (B) Bone marrow evaluation is mandatory
- (C) Reticulocyte count is reduced
- (D) Indirect (unconjugated) bilirubin is reduced
- (E) They are due to bone marrow failure

63. Definitive confirmatory test in sickle cell disease is

- (A) Sickling test
- (B) Peripheral blood film
- (C) Haemoglobin electrophoresis
- (D) Haemoglobin solubility test
- (E) Osmotic fragility test

64. The coagulation screen does NOT include one of the following

- (A) Full blood count
- (B) Peripheral blood film
- (C) Prothrombin time
- (D) Activated partial thromboplastin time
- (E) Factor assay

65. One of the following is used to monitor parenteral anticoagulants

- (A) Factor assay
- (B) Peripheral blood film
- (C) Prothrombin time
- (D) Activated partial thromboplastin time
- (E) Bleeding time

66. When one of the following is prolonged it indicates a problem in the intrinsic pathway.

- (A) Factor assay
- (B) Thrombin time
- (C) Prothrombin time
- (D) Activated partial thromboplastin time
- (E) Bleeding time

67. Thrombocytopenia will result in a prolonged value of ONE of the following.

- (A) Factor assay
- (B) Peripheral blood film
- (C) Prothrombin time
- (D) Activated partial thromboplastin time
- (E) Bleeding time

17. A 7 year old Kenyan presenting with a painless jaw rapidly growing mass is most likely has:

- a. Rhabdomyosarcoma
- b. Dental abscess
- c. Ameloblastoma
- d. Neuroblastoma
- ~~e. Burkitt's lymphoma.~~

18. One of the following is increased in iron deficiency: *TIB*

- a. Serum Iron
- b. Serum ferritin
- c. Iron stores
- d. TIBC
- e. Tissue Stainable iron

19. One of the following severe factor deficiency will not lead to both males and females bleeding :

- a. Factor XI.
- b. Factor VII *XG*.
- ~~c. Von Willebrand's factor~~ *- 8*
- d. Factor IX ***
- e. Factor X *- 10, 11*

20. One of the following is not usually associated with HIV infection:

- ~~a. Lymphocytosis~~ *- ↑ lymphocytes*
- b. Pancytopenia
- c. Leucopenia
- d. Decrease in CD4 count.
- e. Lymphopenia.

21. Increased neutrophil count does not ensue from

- a. Bleeding ✓
- b. Haemolysis ✓
- c. Infection ✓
- d. Acute leukaemia ✓
- ~~e. Myeloproliferative disorder.~~

*PH Lact Dn
Leu. Bc*

22. Oral anticoagulant therapy is clinically monitored preferably by one of the following tests:

- a. Activated partial Thromboplastin time (APTT)

- ~~c.~~ Hypervolemia
- d. Urticaria
- e. Hypertension

12. A known haemophilic patient presents to the accident and emergency with a bleeding that is not life threatening. The most appropriate investigation is:

- ~~a.~~ Haemostasis profile
- b. Skull X-ray
- c. CT scan or MRI of the brain
- d. Serum blood sugar
- e. Blood slide for malaria parasite

13. A six years old with the diagnosis of Aplastic anaemia, and has skeletal, dermatological features, and failure to thrive should be evaluated for

- a. Myelodysplastic syndrome
- ~~b.~~ Fanconi's anaemia
- c. Lymphoproliferative disorder -
- d. Myeloproliferative disorder
- e. Chronic Myelo Monocytic Leukaemia (CMML)

14. Which of the following statements is correct on blood groups

antibody D
antigen for Rhesus factor

- ~~a.~~ Blood group O does not have antigens
- b. Blood group AB does not have antibodies
- c. Blood group D negative truly describes rhesus negative
- d. Rhesus D_u is Rhesus D positive
- e. Minor blood groups do not cause blood transfusion reaction.

O - No anti
AB - Rh⁺

15. A finding which is a requirement for the diagnosis of Hodgkin lymphoma is:

- a. Histocyte
- b. Reed Sternberg cell
- c. Plasma cells
- d. Neutrophils
- ~~e.~~ Lymphocyte

NHL

16. Reticulocyte are generally raised in: *Her.*

- a. All anaemia
- b. Megaloblastic anaemias
- ~~c.~~ Hemolytic anaemias - RBC
- d. Iron deficiency
- e. Multiple deficiencies.

Neutrophilia
CHIMTS

Eosinophilia
HL
DKAPTE

No

Lymphocytosis
me.
NHL

Neutrophilia
BOLOHIM

36. The mean osmotic fragility is increased in

- a) Sickle cell disease
- b) Thalassaemia syndromes
- c) Congenital hereditary spherocytosis ✓
- d) Iron deficiency anaemia
- e) Megaloblastic anaemia

37. The following is NOT considered a haematologic effect of parasites:

- a) Thrombocytopenia ✓
- b) Leucocytosis ✓
- c) Polycythaemia ✓
- d) Leucopenia ✓
- e) Splenomegaly

38. The following parasitic disease is associated with anaemia resulting from bleeding oesophageal varices

- a) Malaria x
- b) Hookworm ✓
- c) Leishmaniasis x
- d) Amoebiasis ✓
- e) Schistosomiasis ✓

39. One of the following viruses is NOT known to be one of the idiosyncratic causes of bone marrow failure

- a) EBV ✓
- b) HIV x
- c) CMV ✓
- ~~d) HPV~~
- e) Parvovirus ✓

40. One of the following drugs is NOT strongly linked to aplastic anaemia

- a) Phenylbutazone ✓
- b) Phenytoin ✓
- c) Paracetamol x -hepatotoxicity
- d) Chloramphenicol ✓
- e) Pyrimethamine ✓

29. The following is NOT a physical feature associated with SCD

- a) Bossing of the skull ✓
- b) Splenomegaly ✓
- c) Proptosis ✗
- d) Non-healing leg ulcers ✓
- e) Hip joint deformity ✓

30. Important aspects of comprehensive care of sickle cell disease does NOT include

- a) Education of parent/patient ✓
- b) Psychosocial support ✓
- c) Genetic counseling ✓
- d) Multidisciplinary management ✓
- e) Limitation of as much activity as possible ✗

31. Foetal haemoglobin consists of:

- a) 2 α and 2 γ
- b) 2 α and 2 ϵ \rightarrow Gower II
- c) 2 α and 2 ζ \rightarrow 2 ζ & 2 β \rightarrow Hb Portland
- d) 2 α and 3 δ
- e) 2 α and 3 β

32. Lymphopenia may be seen in

- a) Acute chest syndrome
- b) Steroid therapy
- c) Viral infections ✓ ✗
- d) Chronic lymphocytic leukaemia ✓
- e) Chronic Lymphocytic leukaemia ✗

33. G6PD, deficiency is commonly found in this region

- a) Northern Europe
- b) Middle East ✓
- c) North West Asia
- d) South America
- e) Australasia

34. A laboratory finding that may indicate the cause of anemia:

- a) Reduced MCH ✓
- b) Reduced MCHC ✓
- c) Raised serum bilirubin ✓
- d) Normal MCH ✗
- e) Raised neutrophil alkaline phosphatase \rightarrow

35. A feature associated with haemolysis

- a) Increased Indirect (unconjugated) bilirubin ✓
- b) Increased direct (conjugated) bilirubin ✗
- c) Increased haptoglobins ✗ ↓
- d) Reduced reticulocyte count ✗ ↑
- e) Reduced bone marrow activity ✗ ↑

5. Folate in the plasma is bound to
- Haemoglobin \times
 - Albumin \checkmark
 - Gammaglobulin \times
 - Haptoglobulin - Hb \times
 - Transferrin \times - Fe
6. A normal haemoglobin variant
- Hb AS \times
 - Hb Barts \times
 - Hb SF \times
 - Hb Gower 1 \checkmark in embryo
 - Hb Nyanza \times
7. Red cell inclusions seen in peripheral blood film include;
- Dohle bodies
 - Howell jolly bodies \checkmark
 - Primary azurophilic granules \rightarrow neutrophils \times
 - Auer rods $\times \rightarrow$ AML
 - Toxic vacuolations \checkmark
8. Iron absorption is enhanced by
- Acchlohydria \times - no HCl
 - Alkaline PH \times
 - Ferrous state \rightarrow Fe^{2+} \checkmark Fe^{3+} \times
 - Ferric State \rightarrow Fe^{3+} \times
 - Tannin \times
9. Haematopoiesis in the human embryo occurs in the
- Bone marrow \times
 - Yolk sac \checkmark
 - Thymus \times
 - Spleen \times
 - Liver \times
10. The initial evaluation of anaemia does NOT include
- White cell count \times
 - Reticulocyte count \checkmark
 - Bone marrow aspirate examination \checkmark
 - Blood film \checkmark
 - Red cell count \checkmark

Which of the following assay is Not used in the diagnosis of tumours?

- A. Histology
- B. Cytology
- C. Flow cytometry
- D. Cell culture
- E. Immunohistochemistry

Which of the following is Not a well established indicator for tumour marker?

- A. Confirmation of the presence of a malignancy
- B. Determine the response to therapy
- C. Check for relapse
- D. Screen for the presence of a tumour
- E. Try to distinguish between two possible tumours

Which of the following is Not a mechanism by which tumours invade the extracellular matrix?

- A. Detachment from neighboring cells
- B. Active migration of tumour cells
- C. Degradation of extracellular matrix
- D. Attachment to the extracellular matrix
- E. Up-regulation of cadherins

Which of the following enzyme is Not known to assist in tumour invasion of surrounding tissues?

- A. Collagenase
- B. Serine protease
- C. Homocysteine protease
- D. Cysteine protease
- E. Matrix metalloprotease

Which of the following cases is a clinical autopsy most indicated?

- A. Death of an elderly patient with a triple coronary by-pass who collapses and dies a few hours after complaining of precordial pain at home
- B. A 12-year-old boy who is admitted for investigations for generalized lymphadenopathy, collapses and dies in the ward
- C. A five day old who dies from a drug overdose
- D. A 50-year-old man who dies following soon after being knocked down by a moving vehicle
- E. A 70-year-old prisoner known to suffer from multiple drug resistant multi-ry pulmonary tuberculosis who collapses and dies at his prison ward

Which of the following best defines the processes involved in a clinical autopsy?

- A. Consent, identification, external examination, internal examination, death notification and report writing
- B. Identification, consent, external examination, internal examination, death notification and report writing
- C. Identification, external examination, internal examination, consent, death notification and report writing
- D. Consent, identification, internal examination, external examination, death notification and report writing

- A. Injury, infection, neutrophil infiltration, macrophage infiltration, release of cytokines, necrosis, granulation tissue formation
- B. Injury, neutrophil infiltration, macrophage infiltration, release of cytokines, infection, necrosis, granulation tissue formation
- C. Infection, injury, neutrophil infiltration, macrophage infiltration, release of cytokines, necrosis, granulation tissue formation
- D. Injury, infection, neutrophil infiltration, macrophage infiltration, release of cytokines, necrosis, granulation tissue formation
- E. Injury, neutrophil infiltration, macrophage infiltration, release of cytokines, necrosis, infection, granulation tissue formation

Injury, Infection

64. Which is the not correctly matched pair?

- A. Cicatricial interstitial pneumonia and lung metastasis *Born*
- B. Fibrous pericarditis and acute rheumatic fever *late*
- C. Suppurative inflammation and pneumonia
- D. Healing by secondary intention and crush type tissue injury
- E. Healing by primary intention and surgical incisions

Which of the following is not correctly matched?

- A. Atheromatous plaque and cholesterol clefts
- B. Malignant hypertension and necrotizing fibrous medial degeneration
- C. HIV infection and vasculitis with fibrinoid vascular necrosis
- D. Takayasu's arteritis and giant cells
- E. Polyarteritis nodosa and giant cells

Which of the following best describes metastatic calcification?

- A. Deposition of calcium salts in normal tissue.
- B. Deposition of calcium salts in necrotic tissue.
- C. Deposition of calcium in neoplastic tissue.
- D. High calcium levels in blood.
- E. Deposition of iron, magnesium and calcium in necrotic tissue.

Which of the following is Not cause of fatty change of the liver?

- A. Protein malnutrition
- B. Diabetes mellitus
- C. Obesity
- D. Alcohol abuse
- E. Acute haemorrhage

All the following are vasoconstrictors except:

- A. Angiotensin II
- B. Catecholamines
- C. Prostaglandins
- D. Thromboxane
- E. Endothelin

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HAEMATOLOGY AND BLOOD TRANSFUSION

2

BDS II 2015 CONTINUOUS ASSESSMENT TEST 1 DATE: 14TH JULY, 2015 1 ½ HR

SECTION A: MULTIPLE CHOICE QUESTIONS (1 mark for each correct answer)

- Write your index number on your answer sheet
- There is only one correct response
- Write the correct response in the answer sheet
- Make any corrections clearly

Motani 21
10

Haematology

1. Hypochromic red cells may **NOT** characterize
 - a) Vitamin E deficiency x
 - b) Lead Poisoning
 - c) Sideroblastic anaemia
 - d) Iron Deficiency
 - e) B Thalassemia
2. The following Cell is **NOT** normally confined to the bone marrow
 - a) Metamyelocyte
 - b) Megakaryocyte
 - c) Stem cells x
 - d) Progenitor cells
 - e) Blast cell
3. Vitamin B₁₂ is maximally absorbed in
 - a) Duodenum
 - b) Gastric Antrum
 - c) Terminal ileum ✓
 - d) Jejunum
 - e) Gastric Body
4. Factors defined in the determination of anaemia include
 - a) Surface area
 - b) Body mass index
 - c) Weight
 - d) Age ✓
 - e) Height

23. The abnormality that reflects defective haemoglobin synthesis is:

- a) Macrocytosis
- b) Reticulocytosis
- c) Heinz bodies enzyme $\Delta\alpha \rightarrow$ G6PD deficiency
- d) Howell-jolly bodies
- e) Ring sideroblasts \rightarrow iron overload

24. Fetal haemoglobin (HbF) consists of the following chains

- a) 2 alpha and 2 zeta
- b) 2 alpha and 2 gamma
- c) 2 alpha and 2 epsilon
- d) 2 alpha and 2 delta
- e) 2 alpha and 2 beta

25. The following range of Hb level is normal for an adult male in Kenya

- a) 10-15g/dl
- b) 12-16g/dl
- c) 13-18g/dl
- d) 15-20g/dl
- e) 10-20g/dl

26. The cause of the sickle shape in sickle cell anaemia is

- a) Abnormal rbc membrane structure
- b) Defect in the vasculature
- c) Abnormal rate of globin chain synthesis
- d) Point mutation in red cell enzyme genes
- e) Point mutation in β globulin gene

27. The sickle cell crises is best defined as

- a) Hypoxic state causing sickling of red cells
- b) Skeletal abnormalities seen
- c) Increased intensity of what is occurring in the steady state
- d) Increased jaundice
- e) All the above are true

28. Diagnostic test in sickle cell anaemia is:

- a) Sickling test
- b) Haemoglobin electrophoresis
- c) Elevated LDH levels
- d) Peripheral blood film appearances
- e) b and c

11. Bone marrow stromal cells do NOT include

- a) Kupffer cells ~~x~~ - liver
- b) Endothelial cells ✓
- c) Fibroblasts ✓
- d) Reticulocyte cells ✓
- e) Macrophages ✓

12. Iron transport in the plasma is mainly in the form of

- a) Ferritin ~~x~~ storage
- b) Transferrin ✓
- c) Heme ~~x~~
- d) Haemosiderin ~~x~~ storage
- e) Methaemoglobin ~~x~~ $Fe^{3+}Hb$

13. Determination of haemoglobin reference ranges does NOT consider

- a) Body mass index ~~x~~
- b) Gender ✓
- c) Age ✓
- d) Physiological status ✓
- e) Residence ✓

14. The following parameter may be used to measure the degree of anaemia

- a) ~~MCVA~~ type
- b) MCHC
- c) MCH
- d) Haematocrit
- e) Red cell diameter

15. Hormones that play a role in haemopoiesis includes:

- a) Insulin
- b) Thyroxine ~~x~~
- c) Parathormone ~~x~~
- d) Androgens ~~x~~
- e) Prolactin ✓

16. True about vitamin B12

- a) Synthesized by micro-organisms ✓
- b) Available in selected plant foods ~~x~~
- c) Easily denatured by boiling ~~x~~ fruit
- d) Normal diet contains 1-30 µg of Vit B12 daily ~~x~~ µg
- e) Highest amounts found in eggs milk and cheese liver

17 Reticulocyte recognition in suprarital staining is based on presence of

- a) Iron
- b) Haemoglobin
- c) DNA
- d) Membrane
- e) RNA

18. Biochemical findings in iron deficiency

- a) Reduced transferrin receptors $\times \uparrow$
- b) Elevated transferrin saturation $\times \downarrow$
- c) ~~Raised serum ferritin levels $\times \downarrow$~~
- d) Elevated total iron binding capacity TIBC \checkmark
- e) Elevated mean cell volume \times

19. Deficiency of folate may result in the following condition:

- a) Severe haemorrhage \times
- b) Pernicious anaemia \times
- c) Chronic haemolysis \times
- d) Usually accompany Vitamin B12 deficiency \checkmark
- e) Resection of terminal ileum \times

20. Target cells may NOT be seen in

- a) Liver disease \times
- b) Haemoglobin C disease \checkmark
- c) Sickle cell disease \checkmark
- d) Aplastic anaemia \times pancytopenia \checkmark
- e) Thalassemia trait \checkmark

21. The ^{2°} secondary structure of haemoglobin is:

- a) The amino acid chain $\times 1^\circ$
- b) Coming together of the four globin chains $\times 4'$
- c) Folding of the polypeptide chain to create a niche for the haem group $\times 3^\circ$
- d) Folding of the polypeptide chain upon itself to the alpha helix form 2°
- e) Synthesis of the amino acid groups that form the β chain \times

22. Iron is stored primarily in the form of

- a) Haemosiderin
- b) Myoglobin \times
- c) Haem \times
- d) Ferritin \checkmark
- e) Transferrin