CLINICAL CHEMISTRY MCQs

A. CARBOHYDRATES

_____1. Hypoglycemia comes about for various reasons and clinical symptoms usually occur at blood glucose concentrations:
A. <3.8mmol/L   B. < 3.0mmol/L   C. <2.8mmol/L   D. <5.0mmol/L

_____2. The healthy organism maintains the extracellular glucose concentration remarkably constant within the limits of:
A. 5-12mmol/L   C. 2.8- 3.8mmol/L
B. 3.3 – 10mmol/L   D. 1.2- 2.4 mmol/L

_____3. Which classification of diabetes mellitus is genetically predetermined, HLA-associated, chronic autoimmune disease with insulin deficiency and glucagons excess as its pathophysiologic sequelae?
A. Type I   C. non-obese type II
B. obese type II   D. MODY-maturity onset diabetes of the young

_____4. According to the WHO criteria, patients with type I diabetes mellitus are, at the time of diagnosis, characterized by:
1. hyperglycemia   2. ketonuria   3. ketoacidosis 4. normal weight
A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____5. In diabetic patient, this provides information about the average blood glucose concentration during the preceding 6-8 weeks:
A. HbA1c   C. HbB
B. HbF   D. HbS

_____6. This term describes the disturbed insulin effect on cells such as adipocytes, skeletal muscle cells, and hepatocytes. In simplified terms, glucose uptake by these insulin-dependent cells is reduced. As compensdation, a rise in insulin secretion with hyperinsulinemia ensues.
A. progressive hyperglycemia   C. insulin resistance
B. impaired glucose tolerance   D. glucose-mediated insulin secretion

_____7. Diabetes mellitus secondary to certain and other diseases and disorders may involve the following organs:
1. pancreas   2. liver   3. anterior pituitary 4. adrenal gland
A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____8. In the case of gestational diabetes mellitus, a normal diurnal glucose profile performed on the 3rd to 4th postpartum day rules out persistent diabetes mellitus. In women with macrosomic children, the diurnal glucose profile does not become valuable as an indicator until how many weeks after delivery?
A. 3 weeks   B. 6 weeks   C. 9 weeks   D. 12 weeks

_____9. The determination of glucose tolerance following the oral administration of glucose is recommended as a screening test for the presence of underlying

gestational diabetes mellitus. How much gram of glucose is recommended in this tolerance test?

A. 50 grams   B. 75 grams   C. 100 grams   D. 120 grams

_____10.   Which of the following statements is true in screening tests for diabetes mellitus?

A. The European Association for the Study of Diabetes recommends to perform the Oral glucose tolerance test using 75g of glucose with 3 capillary blood collections.

B. The European Association for the Study of Diabetes recommends to perform the Oral glucose tolerance test using 100g of glucose with 4 capillary blood collections.

C. In the USA the oral glucose tolerance test is performed using 100g of glucose with 3 venipuntures.

D. In the USA the oral glucose tolerance test is performed using 75g of glucose with 4 venipuntures.

_____11. Which chromosome number is associated with non-HLA genes type 1 diabetes mellitus?

A. 9   B. 11   C. 15   D. 17

_____12. Which of the following clinical laboratory tests are used for detecting the risk of complications in newborns born to mothers with gestational diabetes or type 1 diabetes mellitus?

1. glucose   2. hematocrit   3. bilirubin   4. calcium

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct

B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____13.   Which of the following glucose concentrations denote plasma insulin concentration as almost zero?

A. 20 mg/dL   B. 40 mg/dL   C. 60 mg/dL   D. 80mg/dL

_____14. What enzyme catalyzes the oxidation of glucose into gluconic acid and H_2O_2?

A. glucose oxidase   C. glucose hexokinase

B. glucose dehydrogenase   D. mutarotase

_____15. What enzyme catalyzes the oxidation of glucose to glucolactone?

A. glucose oxidase   C. glucose hexokinase

B. glucose dehydrogenase   D. mutarotase

_____16.   The diagnosis of diabetes mellitus is reliably established by which of the following criteria?

1. unequivocally elevated postprandial or non-fasting glucose concentration with or without classical symptoms of diabetes mellitus such as polydipsia, polyuria, polyphagia, and weight loss

2. fasting and preprandial glucose values should be <90 mg/dl

3. increased fasting blood glucose values on at least two occasions.

4. glucosuria is usually present without ketonuria

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____17. Which of the following statements regarding glucose blood samples is/are correct?
1. After a period of fasting, the glucose concentration in venous blood is 5-10% lower than arterial blood.
2. deproteinization will result to glucose decrease.
3. the glucose content of erythrocytes is lower than that in plasma
4. glucose values in venous plasma are 10% lower than those in venous whole blood.
A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____18. In case of capillary blood sampling, 0.01-0.05 mL of blood are placed in a solution to hemolyze red cells if the glucose determination will be performed using automated analysis systems. Which of the following glycolysis inhibitors are used with hemolyzation solution?
1. maleinimide   2. monoiodine acetate   3. sodium fluoride 4. cresol
A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____19. Which of the following statements are correct in relation to the stability of glucose in blood samples?
1. In venous blood at 4C there is only a slight decrease during the first 2h and approximately 20% after 24h.
2. In collection tubes containing EDTA there is no decrease within 24h in the presence of maleinimide or sodium fluoride
3. by adding 2.5g/L sodium fluoride or 0.5g/L sodium monoiodine acetate the decrease in plasma glucose is only 3-5% in 24h
4. Perchloric acid deproteinized sample gives stable values in the supernatant, obtained by centrifugation for at least 5 days.
A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____20. Which method of determination for glucose is the reference method?
A. oxidase   B. dehydrogenase C. hexokinase D. glucometers

_____21. Among the sugars usually occurring in the blood, which of the following are detected by glucose dehydrogenase method?
1. glucose   2. sucrose   3. xylose   4. galactose
A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____22. In the hexokinase method, which of the following may be a source of methodologic errors?
A. the addition of maleinimide in a hemolysate
B. deproteinization using perchloric acid
C. drug interference
D. maleinimide inhibits erythrocyte enzymes

_____23. Which of the following are diagnostic significance of glucose determinations in body fluids?

1. In CSF, bacteria are associated with decreases in glucose concentration
2. In nonbacterial peritonitis the ascite/blood glucose ratio is $\geq$ 1.0
3. In bacterial peritonitis the ascite/blood glucose ratio is $\leq$ 1.0
4. Decreased values in conjunction with pleural fluid/blood glucose ratios <1.0 may occur in effusions due to underlying bacterial, tuberculous, malignant, and rheumatic disease.

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____24. The oral glucose tolerance test will provide valuable results if the following requirements have been met by the patient prior to the test:
1. maintenance of usual eating habits for at least 3 days
2. discontinuation of interfering medications for at least 3 days
3. continuation of usual physical activities
4. a time interval to menstruation of at least 3 days

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____25. In OGTT, a load of 75g of glucose (WHO recommendation) is ingested within:
A. 5mins   B. 10 mins   C. 20 mins   D. 30mins

_____26. The screening test for gestational diabetes mellitus recommended between 24th to 28th week of gestation requires 50g of glucose dissolved in 200ml of water and slowly drunk. A blood sample is collected after:
A. 30mins   B. 60 mins   C. 90 mins   D. 120mins

_____27. Gestational diabetes mellitus is present if the following threshold values are obtained:
1. fasting $\geq$ 90mg/dL
2. 60mins $\geq$ 190mg/dL
3. 120mins $\geq$ 160mg/dL
4. 150mins $\geq$ 90mg/dL

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____28. Which of the following statements regarding glycohemoglobins are correct?
1. The degree of glycation depends essentially on the degree as well as the duration of the blood glucose elevation.
2. The nonglycated hemoglobin is A_o
3. The reference method for glycated hemoglobin analysis is FPLC
4. The mean blood glucose of the preceding 6-8 weeks is correlated with corresponding glycohemoglobin value.

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____29. Which of the following are done in C-peptide suppression test?
1. 1g of tolbutamide is administered to the patient intravenously over 3 mins as a 5% aqueous solution
2. children receive 25mg/kg body weight of tolbutamide but no more than 1g

3. prior to the start of the test as well as 5,10,20,3040,60,90,120 and 180mins later blood samples are collected
4. glucose, insulin and C-peptide are determined
   A. only 1 and 3 are correct
   B. only 2 and 4 are correct
   C. only 1,2, and 3 are correct
   D. 1,2,3 and 4 are correct

_____30. In glucagon test, determination of glucose insulin, C-peptide and B-hydroxybutyrate are done in sample collected:
   A. prior to the start as well as 1,5,10,15 and 30 mins later.
   B. prior to the start as well as 5,10,15,20 and 30 mins later.
   C. prior to the start as well as 5,10,15, 30 and 60 mins later.
   D. prior to the start as well as 10,15, 30 and 60 mins later.

_____31. Which of the following is true about portable glucose meters?
   A. Not recommended for all insulin-treated patients.
   B. Should be performed at least 2 times a day for type 1 diabetes.
   C. Should be performed at least 3 times a day for type 2 diabetes.
   D. Should not be used for diagnosis of diabetes and have limited value in screening.

_____32. The need to reevaluate treatment regimen for diabetes is necessary when the glycated hemoglobin is greater than:
   A. 2%   B. 4%   C. 6%   D. 8%

_____33. Which of the following statements about type 1 diabetes mellitus are correct?
   1. Formerly known as insulin dependent
   2. Adult onset
   3. Caused by autoimmune destruction of the B-cells of the pancreas
   4. The pancreas synthesizes insulin but unable to secrete.
      A. only 1 and 3 are correct
      B. only 2 and 4 are correct
      C. only 1,2, and 3 are correct
      D. 1,2,3 and 4 are correct

_____34. Which of the following is the correct diagnostic criterion for establishing diabetes?
   A. Fasting blood glucose greater than 7.0mmol/L
   B. Fasting blood glucose greater than 4.0mmol/L
   C. Fasting blood glucose greater than 2.0mmol/L
   D. Fasting blood glucose greater than 20.0mmol/L

_____35. Which of the following is the correct diagnostic criterion for establishing diabetes?
   A. 2hpp greater than 7.0mmol/L
   B. 2hpp greater than 9.11mmol/L
   C. 2hpp greater than 11.1mmol/L
   D. 2hpp greater than 20.0mmol/L

_____36. For overweight individuals, starting at age 10 years, diabetes testing should be performed every:
   A. Month   B. six months   C. year   D. 2years

_____37. For inhibition of glycolysis, how much mg of fluoride must be used per mL of blood?
   A. 1.0   B. 2.5   C. 3.0   D. 0.5

_____38. For inhibition of glycosis, how much lithium iodoacetate must be used per mL of blood?

    A. 1.0mg   B. 2.5mg   C. 3.0mg   D. 0.5mg

_____39. Given a normal hematocrit, the glucose concentrations in plasma is higher than that of whole blood by approximately:

    A. 7%   B. 11%   C. 4%   D. 17%

_____40. Glucose concentrations in heparinized plasma are reported to be lower than in serum by:

    A. 2%   B. 5%   C. 10%   D. 0.5%

_____41. Which of the following enzymatic methods is least used for glucose measurement?

    A. Hexokinase   C. Dehydrogenase

    B. Oxidase   D. Isomerase

_____42. Multiple factors can interfere with glucose analysis with portable meters such as:

    1. Improper application, timing and removal of excess blood

    2. Changes in hematocrit, altitude, environmental temperature or humidity

    3. Training and technique of user

    4. Hypotension, hypoxia and high triglyceride concentration

    A. only 1 and 3 are correct   C. only 1,2, and 3 are correct

    B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____43. SMBG should be performed at least how many times per day in patients with type 1 diabetes?

    A. 1   B. 2   C. 3   D. 4

_____44. High-risk pregnant patients should undergo immediate testing when they are defined as having which of the following?

    1. marked obesity   3. Glycosuria

    2. personal history of GDM   4. Strong family history of diabetes

    A. only 1 and 3 are correct   C. only 1,2, and 3 are correct

    B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____45. This test is used as an index of mean glycemia and as measure of risk for the development of diabetes complications.

    A. Ketone   B. GHb   C. IFG   D. IGT

_____46.

E. LIPIDS and LIPOPROTEINS

_____31. Which of the following are true about cholesterol?

    1. The sterol ring of the cholesterol molecule can be broken down further

    2. The peripherally synthesized or intestinally absorbed cholesterol is transported to the liver where it is partly converted to bile acids and the remainder excreted unchanged into the intestine via the bile, which serves as an emulsifying agent

    3. 25 to 40% of the cholesterol in the plasma is present as esterified and the remaining 60-75% as free "unesterified."

4. Most of the cholesterol is transported in the plasma via low density lipoprotein
   A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
   B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____32. It is generally agreed that coronary heart disease is infrequent at cholesterol level <160mg/dL and the value that constitutes a threshold value beyond which the risk of disease rises at first:
   A. 200 mg/dL   B. 250mg/dL   C. 300mg/dL D. 350mg/dL

_____33. In cholesterol assay:
   1. serum values are about 3% higher than plasma values
   2. a three-minute venous compression can increase cholesterol values by up to 10%
   3. ascorbic acid and methyldopa or metamizol lead to lower cholesterol values
   4. plasma and serum may be stored for cholesterol assay for up to 4 days at 4C.
   A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
   B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____34. Which of the following interfering factors result in too low triglyceride values because the substances can react with H_2O_2?
   1. hemoglobin   2. ascorbic acid   3. heparin   4. bilirubin
   A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
   B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____35. Precipitation of VLDL and LDL can be achieved with:
   1. phosphotungstic acid/ $MgCl_2$ 3. Polyethylene glycol 6000
   2. heparin/$MnCl_2$ 4. dextran sulfate/ $MgCl_2$
   A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
   B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____36. Which of the following equations is the correct Friedewald's formula?
   A. LDL cholesterol = Cholesterol – Triglyceride / 5 – HDL cholesterol(mg/dL)
   B. LDL cholesterol = Cholesterol – Triglyceride /10 – HDL cholesterol(mg/dL)
   C. LDL cholesterol = Triglyceride -Cholesterol /2.2 – HDL cholesterol(mg/dL)
   D. LDL cholesterol = Triglyceride - Cholesterol / 5 – HDL cholesterol(mg/dL)

_____37. This apolipoprotein makes up more than 95% of the protein coat of LDL:
   A. apo A-I   B. apo A-II   C. apo B100   D. apo C

_____38. These are the principal apolipiproteins of HDL:
   1. apo A-I   2. apo B100   3. apo A-II   4. apo-B48
   A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
   B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____39. This apolipoprotein is the activator of LCAT:
   A. apo A-I   B. apo A-II   C. apo A-III   D. apo A-IV

_____40. Which apolipoprotein is associated with Tangier disease?
   A. apo A-I   B. apo A-II   C. apo A-III   D. apo A-IV

_____41. Which apolipoprotein is the cofactor of lipoprotein lipase?
   A. apo C-I   B. apo C-II   C. apo C-III   D. apo C-IV

_____42. Lp(a) is increased in:
   1. nephritic ssyndrome

2. uremic patient undergoing hemodialysis
3. patients with uncontrolled DM
4. patients with hyperthyroidism
   A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
   B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____43. Which of the following statements are correct about LDL:
5. LDL are formed b y the hydrolysis of VLDL
6. LDL are mainly responsible for carrying cholesterol to peripheral cells
7. LDL are the only lipoprotein class possessing a single apolipoprotein, apo B100.
8. LDL on electropheretic separation migrate in the a-globulin position
   A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
   B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____44. Which of the following statements are correct about HDL?
1. HDL are the smallest lipoproteins
2. HDL has the highest protein content
3. HDL float in the ultracentrifuge at a density of 1.063 to 1.21
4. HDL facilitate and accelerate the clearance of cholesterol from cells and vascular walls and its transport to the liver.
   A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
   B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____45. According to Fredrickson classification of primary hyperlipoproteinemias, which of the following do not match?
   A. type I : fat-induced hypertriglyceridemia
   B. type II : hypercholesterolemia
   C. type III : combined endogenous and exogenous triglyceridemia
   D. type IV : endogenous triglyceridemia

_____46. Which of the following serves as the building block for triglyceride and phospholipids synthesis?
   A. acetate   B. cholesterol   C. amino acids   D. fatty acids

_____47. Which of the following lipids function as a surfactant in the lungs?
   A. cholesterol   B. fatty acids   C. phospholipids   D. triglycerides

_____48. The secretion of pancreatic lipase into the small intestine is necessary for the hydrolysis of:
   A. cholesterol   B. fatty acids   C. phospholipids   D. triglycerides

_____49. Lipids are transported in the blood by:
   A. albumin   B. amino acids   C. gamma globulin   D. lipoproteins

_____50. The lipoprotein class involved in the transport of triglycerides from the small intestine through the circulation to various tissues is:
   A. chylomicron   B. VLDL   C. LDL   D. HDL

_____51. The lipoprotein class associated with the removal of cholesterol from the body is:

A. chylomicron   B. VLDL   C. LDL   D. HDL

_____52. The lipid component whose measurement would be the most severely affected by analyzing a non-fasting specimen is:

A. apolipiprotein   B. cholesterol   C. triglyceride   D. fatty acid

_____53. In general, the quantitation of triglyceride is based on measuring:

A. chylomicron   B. fatty acids   C. glycerol   D. triglyceride directly

_____54. In what form must cholesterol be for it to react with cholesterol oxidase in the enzymatic methods?

A. esterified   B. free   C. bound to lipoproteins   D. bound to albumin

_____55. Which of the following is not a finding in type IIa Fredrickson primary hyperlipoproteinemias:

A. increased LDL cholesterol

B. turbid appearance of fasting serum

C. often decreased HDL cholesterol

D. normal triglyucerides

_____56. Which lipoprotein shows the following characteristics? A-fraction in electrophoresis, 50% protein, cholesterol and phospholipids are principal lipids, produced in the liver and intestine.

A. chylomicron   B. VLDL   C. LDL   D. HDL

_____57. Which lipoprotein is produced only in the intestine?

A. chylomicron   B. VLDL   C. LDL   D. HDL

_____58. Apo A-I is:

1. a cofactor of LCAT
2. a cofactor of LPL
3. structural protein of HDL
4. structural protein of chylomicron

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____59. Which of the following methods are used for Lp(a) analysis?

1. immunoassays   3. radial immunodiffusion
2. electroimmunodiffusion   4. immunonephelometry

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____60. This apoliprotein is a cofactor for lipoprotein lipase:

A. A-I   B. B-100   C. C-II   D. D

C. PROTEINS AND AMINO ACIDS

_____61. Which of the following reagents are components of biuret?

1. copper sulfate   3. sodium potassium tartrate
2. potassium iodide   4. sodium hydroxide

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____62. Which of the following diseases and conditions may cause hypoproteinemia?

1. severe liver damage   3. glomerulonephritis
2. ulcerative colitis   4. skin diseases

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct

B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____63. In total protein determination, which of the following statements is correct?

A. The blood should be collected with the patient in a supine position since blood samples obtained in an upright position lead to measurement of up to 10% lower TP concentration.

B. After more than 3 mins. of venous occlusion during blood collection, the protein level may rise by up to 10%

C. Due to fibrinogen, the mean total protein concentration in plasma is lower than in serum.

D. The patient need to be in fasting state for the blood collection.

_____64. Which of the following substances may elevate protein level?

1. hemolysis   3. dextran

2. x-ray contrast media   4. bilirubin

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct

B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____65. Which of the following diseases and conditions may cause hyperproteinemia?

1. macroglobulinemia   3. chronic inflammatory disease

2. liver cirrhosis   4. Schistosomiasis

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct

B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____66. All proteins are pure polypeptide chains whose molecular mass is composed of nitrogen in approximately:

A. 6%   B. 16%   C. 26%   D. 36%

_____67. Which of the following is used as the calibrator in the methods of determination for total protein?

A. bovine serum albumin   C. plasma protein

B. serum protein   D. hemoglobin

_____68. These proteins migrate in the alpha1 and alpha2 globulin band and are elevated by 50-300% in acute inflammatory conditions but are decreased in acute hepatitis, chronic active liver diseases, and protein-losing syndromes.

A. immunoglobulins   C. transerythrin-transferrin group

B. acute phase proteins   D. polyclonal gammopathies

_____69. Hypoalbuminemia may be caused by:

1. liver dysfunction   3. nephritic syndromes

2. pregnancy   4. acute phase response

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct

B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____70. In comparison to upright position, plasma albumin concentration declines by about 15% after a supine position has been assumed for at least:

A. 5 mins   C. 15 mins

B. 10 mins   D. 20 mins

_____71. Based on their electrophoretic mobility, which of the following alpha1 antitrypsin variants do not match?

A. F: located near the anode   C. S: towards the cathode

B. M: medium mobility   D. Z: located near the cathode

_____72. Alpha1 antitrypsin is used in the diagnosis of:

    1. prolonged jaundice in neonates

    2. hepatitis of uncertain origin during infancy and early childhood

    3. pulmonary emphysema in adults

    4. hepatitis or liver cirrhosis of uncertain origin in adults

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct

B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____73. Which of the following anticoagulants may cause falsely reduced alpha1 antitrypsin concentrations in the case of determination by means of radial immunodiffusion?

1. buffered citrate   3. EDTA

2. potassium oxalate   4. heparin

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct

B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____74. The Kjeldahl procedure for total protein is based upon the premise that:

A. proteins are negatively charged

B. the pK of proteins is the same

C. the nitrogen content of proteins is constant

D. proteins have similar tyrosine and tryptophan content

_____75. All of the following statements about total protein assays are true, except?

A. refractive index of serum correlates with total protein, but is falsely high in uremia

B. the Folin-Lowry assay is subject to interference from nonprotein reductants

C. Turbidimetric assays are subject to positive interference from many drugs

D. Direct UV methods are based on the absorbance of peptide bonds at 254nm.

_____76. Hyperalbuminemia is caused by:

A. dehydration syndromes

B. Liver disease

C. Burns

D. Gastroenteropathy

_____77. The term biuret reaction refers to:

A. the reaction of phenolic groups with $CuSO_4$

B. coordinate bonds between Cu and carboxyl and amino groups of biuret

C. the protein error of indicator effect producing color when dyes bind protein

D. the reaction of phosphomolybdic acid with protein.

_____78. Which protein is an acute phase protein and a transport protein. Its function is to transport intravascular, free hemoglobin to its degradation site in the reticulo-endothelial system?

A. haptoglobin   C. hemopexin

B. ceruloplasmin   D. ferritin

_____79.   Which protein is important for the estimation of extent of intravascular hemolysis if serum haptoglobin shows to nonmeasurable levels?
   A. hemoglobin   C. hemopexin
   B. ceruloplasmin   D. ferritin

_____80. Which of the following is true about ceruloplasmin?
   1. transport copper in plasma
   2. deficiency is associated with Wilson's disease
   3. contains about 9% carbohydrate
   4. synthesized in the liver
   A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
   B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

KIDNEY FUNCTION TESTS

_____81. This is the gold standard in for the glomerular filtration:
   A. urea clearance   C. inulin clearance
   B. creatinine clearance   D. uric acid clearance

_____82. In order to accurately determine the GFR, a substance must meet the following criteria:
   1. free glomerular filtration   3. inert
   2. no tubular absorption or secretion   4. non toxic
   A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
   B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____83. Concerning glomerular filtration rate, which of the following statements is not true?
   A. In its early stage, type I diabetes mellitus results in a rise of the GRF as well as the renal plasma flow.
   B. Following donation of a kidney, the GFR in the organ donor stabilizes at 70-80% of the level prior to removal of the kidney.
   C. At the beginning of pregnancy the GRF decreases, by the end of the first trimester it is decreased by 20-30%
   D. A protein challenge, an amino acid infusion or the administration of dopamine cause the GFR to rise.

_____84.   Concerning an evaluation of renal function, the following laboratory investigations are correct for routine clinical diagnostic purposes:
   1. serum creatinine; is elevated as of a GFR $<50mL/min/1.73m^2$
   2. serum urea; is elevated as of a GFR $<30mL/min/1.73m^2$
   3. serum beta-2-microglobulin; a concentration of $<2.4mg/L$ indicates a normal or only slightly decreased GFR
   4. serum cystatin C; the upper reference limit of healthy people is exceeded if the GFR is $<80mL/min/1.73m^2$
   A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
   B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____85. The approved reference method for creatinine determination is the:

A. isocratic HLPC   C. Jaffe method
B. Fuller's earth method   D. Kinetic method

_____86. The low analytical specificity in creatinine determination is due to non-creatinine chromogens. Which of the following statements is true regarding non-creatinine chromogens?
1. Non-creatinine chromogens form a reaction product with alkaline picrate similar to that produced by creatinine.
2. During the early reaction phase, rapid reacting substances such as acetic acid contribute towards the color reaction.
3. During the middle phase reaction, the color reaction is almost exclusively due to creatinine.
4. During the late phase, glucose influence the color reaction.
A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____87. In the enzymatic method for creatinine using phenol-aminophenazone peroxidase, creatinine is hydrolyzed to creatine by creatininase. In a further reaction step, both creatine produced from creatinine as well as endogenous creatine are degraded by creatinase into:
1. glycine   2. urea   3. H2O2   4. sarcosine
A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____88. In uric acid methodology, the transformation of uric acid to allantoin and hydrogen peroxide by uricase in the presence of ambient air oxygen is used as the first reaction. For routine diagnositic purposes, which of the following enzymes are used to produce chromogen in the secondary reaction?
1. uricase-catalase reaction   3. peroxidase
2. aldehyde dehydrogenase   4. uricase
A. only 1 and 3 are correct   C. only 1, 2, and 3 are correct
B. only 2 and 4 are correct   D. 1, 2, 3 and 4 are correct

_____89. By definition hyperuricemia is present if the serum uric acid concentration is $\geq$ 6.5mg/dL. This definition is based on physico-chemical factors taking into consideration that the solutbility of sodium urate at 37^0C is:
A. 6.4 mg/dL   B. 6.0 mg/dL   C. 6.6 mg/dL   D. 6.5 mg/dL

_____90. Which of the following substances may cause decreased levels due to inhibition of uricase?
1. citrate   2. oxalate   3. formaldehyde   4. oxalic acid
A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____91. Which of the following statements regarding uric acid determination is correct?
A. Blood collection can be performed even without fasting as long as it is done in the morning.
B. Circadian rhythm does exist for the uric acid concentration, variations are dependent on time of the day.
C. Blood collection performed after heavy muscular activity may result to a decrease in concentration

D. After intensive sun exposure, blood collection may increases the result.

_____92. The urea content of the blood is derived from the blood urea nitrogen level by multiplying the latter by a factor of:

A. 0.46   B. 2.14   C. 0.64   D. 2.41

_____93. These reagents are added to stabilize the color formed by the condensation of diacetyl with urea to form the chromogen diazine in the diacetyl monoxime method:

1. thiosemicarbazide   3. Fe
2. 2-oxoglutarate   4. ammonium heparinate

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____94. For the differentiation of renal acute renal failure from renal acute renal failure from prerenal acute renal failure and postrenal acute renal failure, the urea/creatinine ratio can be used as a diagnostic criterion in addition to the clinical symptoms. Which of the following statements are correct when a normal protein intake of healthy people of approximately 1g/kg body weight/day is true?

1.   35, if both are determined in mmol/L
2.   25, if the determination is performed in mg/dL
3.   12, if urea is determined as BUN and if both are determined in mg/dL
4.   15, if urea is determined as BUN and if both are determined in mmol/L

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____95.   The diacetyl monoxime method is relatively unspecific. Which of the following substances are measured as well?

1. creatinine   2. allantoin   3. arginine   4. glucose

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

CLINICAL ENZYMOLOGY

_____96. Which of the following enzymes has the longest half-life?

A. CK-MM   B. ALP   C. Lipase   D. LD5

_____97. Which of the following CK isoenzymes has the longest half-life?

A. CK-MM   B. CK-MB   C. CK-BB   D. CK4

_____98.   In enzymology, one international unit is the quantity of enzyme which catalyzes one micromole of substrate per minute. The catalytic enzyme activity of a sample is expressed in:

A.   Units per liter   C. kilounits per liter
B.   Milliunits per liter   D. all of these

_____99. Type 1 macroenzymes have been described for the following diagnostically relevant enzymes, except:

1.   ALT   2. ALP   3. ACP   4. AST

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____100. These are individual-specific enzyme forms which are coded by allelic genes. The multiple forms of an enzyme are inherited according to Mendelian laws.
A. Isoenzymes   C. Alleloenzymes
B. Macroenzymes type 1   D. Macroenzymes type 2

_____101. Enzyme important in the diagnosis of organophosphate poisoning and liver parenchymal damage:
A. LD   B. Cholinesterase   C. CK   D. GGT

_____102. Enzyme important for the diagnosis of liver parenchymal damage, myocardial infarction, hemolysis, ineffective erythropoiesis, lymphoma:
A. ALT   B. AST   C. LD   D. CK

_____103. Which of the following enzyme patterns is correct in severe cardiac muscle damage with cell necrosis:
A. CK>LDH>AST>ALT   C. AST>ALT>CK>LDH
B. LDH>CK>ALT>AST   D. ALT>CK>LDH>AST

_____104. Which of the following enzyme patterns is correct in severe skeletal muscle damage with cell necrosis:
A. CK>LDH>AST>ALT   C. AST>ALT>CK>LDH
B. LDH>CK>ALT>AST   D. ALT>CK>LDH>AST

_____105. Which of the following enzyme ratios is used for the differentiation between acute alcoholic hepatitis and acute viral hepatitis:
A. GGT/AST   C. AST/ALT
B. LD/CK   D. GGT/GLD

_____106. The increase in ALP is particularly marked in people of Lewis-positive blood group:
A. A   B. B   C. AB   D. O

_____107. Which enzyme decreases markedly with age in men while increases with age are measured in women:
A. ALP   B. ALT   C. AST   D. CK

_____108. Alcoholism leads to increased activities of:
1. GGT   2. ALT   3. AST   4. GLD
A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____109. Which of the following diseases can cause a decrease in total ALP?
1. Pituitary dwarfism   3. Malnutrition
2. Liver metastases   4. Rickets
A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____110. Which of the following migration patterns is correct in the anodal separation of serum ALP at an alkaline pH on cellulose acetate strip?
A. placental ALP>liver ALP>bone ALP>intestinal ALP>bile duct ALP
B. bile duct ALP>liver ALP> bone ALP> intestinal ALP> placental ALP
C. liver ALP>bone ALP> bile duct ALP> intestinal ALP> placental ALP
D. intestinal ALP>liver ALP>placental ALP> bile duct ALP> bone ALP

_____111. Which form of ALP can be differentiated on the basis of the greater inhibition of its activity by L-phenylalanine, lesser inhibition by homoarginine and its resistance to heat when heated at 65C for 10minutes?

A. Placental   B. liver   C. bone   D. bile duct

_____112. This form of ALP is thought to be a multienzyme plasma membrane complex or a complex of the liver isoenzyme with lipoprotein X. This multiple form of ALP is found in cholestatic and metastatic liver disease even when total ALP is still normal.

A. Liver ALP   C. High-molecular mass ALP
B. Germ cell ALP   D. intestinal ALP

_____113. This form of ALP is not normally found in the serum of healthy people and detectable in patients with seminoma of the testes, ovarian carcinoma, pituitary tumors and thymic tumors.

A. Liver ALP   C. High-molecular mass ALP
B. Germ cell ALP   D. intestinal ALP

_____114. This form of ALP is produced by the enterocytes and released into the blood in large quantities, particularly in B and O secretors.

A. Liver ALP   C. High-molecular mass ALP
B. Germ cell ALP   D. intestinal ALP

_____115. This is a multiple ALP form which is biochemically a heterodimer of placental ALP and intestinal ALP. It is found in hepatocellular carcinoma and renal cell carcinoma.

A. Placental ALP   C. Bone ALP
B. Kasahara ALP   D. germ cell ALP

_____116. Which of the following are inhibitors of ALP?
     1. Citrate   2. Oxalate   3. EDTA   4. Heparin

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____117. Which of the following drugs can decrease ALP activity?
A. Oral contraceptives   C. Valproic acid
B. Allopurinol   D. oxacillin

_____118. In amylase assays, which of the following are measured as end products?
     1. 2-chloro-4-nitrophenol   3. 4-nitrophenol
     2. P-nitrophenyl maltoheptaoside   4. Maltotetraose

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____119. In neonates, the amylase measured consists only of:
A. Salivary isoenzyme   C. both salivary and pancreatic
B. Pancreatic isoenzyme   D. none of these

_____120. Which of the following methods are used for ACE measurement?
     1. Liberman   2. Neels   3. Ryan   4. Silverstein

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____121. Which of the following substrates are used in ACE measurement?
     1. Benzoylglycine   3. Furylacrylic acid
     2. Hippuryl-histidyl-lecuine   4. Benzoyl-glycyl-glycine

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____122. An increased ACE activity is seen in:
  A. Sarcoidosis   C. Endothelial dysfunction
  B. Toxic lung damage   D. Hypothyroidism
_____123. Which of the following can reduce/inhibit ACE activity?
  1. EDTA   2. Captopril   3. Enalapril   4. Zinc chelators
      A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
      B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct
_____124. What is the EC number of AST?
      A. 2.6.1.1   B. 2.6.1.2   C. 3.1.1.7   D. 3.1.1.6
_____125. De Ritis ratio for differentiation between mild liver damage and severe liver disease is:
  A. GGT/AST   B. AST/ALT   C. AST/LD   D. LD/GGT
_____126. This ratio is used as indicator of cholestasis and alcoholic liver damage.
  A. GGT/AST   B. AST/ALT   C. AST/LD   D. LD/GGT
_____127. Which of the following methods are used for cholinesterase determination?
  1. Inhibition test with dibucaine   3. Ro 2-0683
  2. Determination of fluoride number   4. Photometric rate assay
      A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
      B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct
_____128. Which of the following chemicals is/are associated with decrease in cholinesterase activity?
  A. Muscle relaxants   C. Carbamate esters
  B. Organophosphate esters   D. all of these
_____129. Determination of acylcholine acylhydrolase for evaluation of liver function is usually performed using what substrate?
  A. Glycine   C. choline
  B. Phosphate   D. nitroanilide
_____130. CK catalyzes the reversible transfer of the phosphate group from creatine phosphate to Mg-ADP. The resulting Mg-ATP is determined in a combined optical test using what as coenzyme?
  A. Glucose-6-phosphate dehydrogenase   C. Hexokinase
  B. Oxidase   D. Adenylate kinase
_____131. A CK-MB fraction of more than 6% of the total CK activity is regarded as diagnostic for:
  A. Myocardial infarction   C. Skeletal muscle damage
  B. Muscular dystrophy   D. Secondary myopathies
_____132. Which of the following findings can indicate the presence of macro CK?
  A. Elevated total CK with a CK-MB fraction >25%
  B. Elevated total CK with a CK-BB fraction >6%
  C. Elevated total CK with a CK-MM fraction >5%
  D. Elevated total CK with a CK-MiMi fraction >10%
_____133. The variant of CK with higher molecular mass formed when CK is bound by specific immunoglobulins:
  A. Macro CK type 1   C. CK-MiMi
  B. Macro CK type 2   D. CK-MT or CKMito

_____134. Which enzyme is specific for liver and bile duct and an increase of this enzyme is considered as one of the most sensitive indicators of hepatobiliary disease?
       A. Cholinesterase   C. CK
       B. GGT   D. AST

_____135. Differentiation between jaundice of hepatic or cholestatic origin can be based on ALT activity and the:
       A. AST/ALT ratio   C. GGT/ALT ratio
       B. GGT/AST ratio   D. ALT/ALP ratio

_____136. Which enzyme is used with aminotransferases and mean cellular volume of erythrocytes as indicators of excessive alcohol consumption?
       A. Cholinesterase   C. GLD
       B. GGT   D. AST

_____137. Which of the following anticoagulants may lead to falsely low GGT activity?
       1. Citrate   2. Oxalate   3. Flouride   4. Heparin
       A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
       B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____138. This is the only enzyme which cleaves significant amount of gluthathione.
       A. Cholinesterase   C. GLD
       B. GGT   D. AST

_____139. A (ALT + AST)/GLD ratio of <20 is seen in:
       1. Obstructive jaundice   3. Metastatic liver disease
       2. Biliary cirrhosis   4. Acute hypoxic liver damage
       A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
       B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____140. A (ALT + AST)/GLD ratio of >50 is seen in:
       1. Acute episodes of chronic liver diseases
       2. Acute viral hepatitis
       3. Cholestatic hepatic diseases
       4. Acute alcoholic hepatitis
       A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
       B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____141. These reagents can be added to the LD assay mixture as a selective inhibitor of the LD isoenzymes containing M sub-units so that only LD-1, which is composed of four H units, is measured.
       1. Nitroanilide   3. Ro-0683
       2. 1,6 hexanediol   4. Sodium perchlorate
       A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
       B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____142. Which LD isoenzyme has the highest migration rate?
       A. LD1   B. LD2   C. LD4   D. LD5

_____143. In agarose gel, this Ld isoenzyme migrates to the cathode:
       A. LD1   B. LD2   C. LD4   D. LD5

_____144. In cellulose acetate electrophoresis the LD isoenzyme fractions are made visible by coupling the enzymatically formed pyruvate with:
       A. NAD   C. tetrazolium salt

B. NADH   D. Sodium perchlorate

_____145. This ratio is used to differentiate between prehepatic jaundice caused by hemolysis or dyserythropoiesis from hepatic jaundice.
    A. ALT/AST ratio   C. LD/CK ratio
    B. LD/AST ratio   D. CK/AST ration

_____146. Anodic LD isoenzyme pattern is associated with:
    1. Muscular dystrophy   3. Renal infarction
    2. Germ cell tumor   4. Cardiac muscle damage
    A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
    B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____147. Which anticoagulant should not be used in LD assay?
    A. Oxalate   B. Flouride   C. both   D. neither

_____148. Which of the following conditions can falsely increase LD measurement?
    A.   Blood sample collection after exercise
    B. Use of capillary serum
    C. Use of hemolyzed samples
    D. All of these

_____149. At a mean activity of 165U/L, hemolysis of 0.8g hb/L leads to an LD increase of:
    A. 36%   B. 58%   C. 360%   D. 12%

_____150. Which of the following Ld isoenzymes is not seen mainly in Duchenne muscular dystrophy?
    A. LD1   B. LD2   C. LD3   D. LD5

_____151. The most reliable method for lipase determination is the kinetic, automatic titration of oleic acid released from an emulsion of triolein or pure olive oil by enzymatic hydrolysis with sodium hydroxide at what pH?
    A. 8.6   B. 6.5   C. 9.0   D. 8.4

_____152. As ACP is released from erythrocytes, a hemoglobin concentration of 3.4g/L in serum may increase ACP by:
    A. 50%   B. 40%   C. 30%   D. 20%

_____153. ACP is unstable at pH above 7.0 and the pH of plasma or serum is adjusted to 4-5 by the addition of:
    A. 10% acetic acid(20uL/mL)   C. both
    B. Sodium bisulfate 5mg/mL serum   D. neither

_____154. Which of the following diseases are associated with elevations of ACP in serum?
    1. Prostatic carcinoma   3. Paget's disease
    2. Multiple myeloma   4. Gaucher's disease
    A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
    B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____155. Without acidification, ACP activity is decreased up to:
    A. 20% in 3h   C. 50% in 2h
    B. 20% in 2h   D. 5% in 2 h

_____156. This protein participates in the uptake and the intracellular transport of the long-chain fatty acids in the cardiomyocytes.
    A. Cardiac troponin (cTnT)   C. myoglobin

B. Heart fatty acid binding protein(H-FABP) D. natriuretic peptide

_____157. This myofibrillar protein of the heart muscle is released from the myocardium following injury and is used in the late diagnosis and monitoring of the course of acute myocardial infarction.
A. Cardiac troponin (cTnT)   C. myoglobin
B. Heart fatty acid binding protein(H-FABP) D. natriuretic peptide

_____158. This is a specific cardiospecific marker used to assess chronic or subacute graft rejection after heart transplantation.
A. Cardiac troponin (cTnT)
B. cardiac troponin I (cTnI)
C. Heart fatty acid binding protein(H-FABP)
D. glycoprotein phosphorylase isoenzyme BB (GPBB)

_____159. This is highly sensitive to ischemia of cardiomyocytes so that the clinical sensitivity of its measurement for diagnosing an acute coronary syndrome is higher than that of other cardiac markers.
A. Cardiac troponin (cTnT)
B. cardiac troponin I (cTnI)
C. Heart fatty acid binding protein(H-FABP)
D. glycoprotein phosphorylase isoenzyme BB (GPBB)

_____160. This is the most important natriuretic peptide of the ventricles and it is a more sensitive and more specific indicator of ventricular overload.
A. Atrial natriuretic peptide   C. brain natriuretic peptide
B. Cyclic guanosine monophosphate   D. CNP

BILIRUBIN

_____161. In this method of bilirubin determination, unconjugated and conjugated bilirubin interact with a specific charged polymer called mordant and the concentrations of B_u and B_c are calculated from the measured reflection densities and the predetermined molar reflectivities of the two bilirubin species at two wavelengths and use of simultaneous equations.
A. Jendrassik-Grof   C. Multi-layer film slide technology
B. Enzymatic method   D. Direct spectrophotometry

_____162. This enzyme is used to oxidize bilirubin to biliverdin:
A. Bilirubin reductase   C. Bilirubin oxidase
B. Bilirubin diglucoronidase   D. Bilirubin dehydrogenase

_____163. Which of the following statements about unconjugated bilirubin is not correct?
A. It is practically insoluble in water at physiologic pH and body temperature
B. In plasma, it is present in a folded structure or so-called Z-Z(trans) conformation loosely bound to albumin
C. It is transported in plasma loosely bound to albumin
D. It is covalently bound to albumin

_____164. Which measurement is a better criterion for the differential diagnosis of jaundice?
   A. Conjugated bilirubin
   B. Unconjugated bilirubin
   C. Delta bilirubin
   D. Total bilirubin

_____165. In adults and older children, hyperbilirubinemia causes jaundice if bilirubin value is >2.5mg/dL, whereas in infants, jaundice is seen if bilirubin values is greater than:
   A. 2.5mg/dL   B. 3.0mg/dL   C. 3.5mg/dL   D. 4.0mg/dL

_____166. What classification of hyperbilirubinemia is caused by ineffective erythropoiesis?
   A. Prehepatic jaundice
   B. Intrahepatic jaundice
   C. Posthepatic jaundice
   D. none of these

_____167. What classification of hyperbilirubinemia is caused by medication-induced parenchymal and cholestatic liver damage as well as hepatic involvement in other primary diseases?
   A. Prehepatic jaundice
   B. Intrahepatic jaundice
   C. Posthepatic jaundice
   D. none of these

_____168. Which of the following conditions are associated with unconjugated hyperbilirubinemias?
   1. Crigler-Najjar syndrome
   2. Dubin-Johnson syndrome
   3. Gilbert's syndrome
   4. Rotor syndrome
      A. only 1 and 3 are correct
      B. only 2 and 4 are correct
      C. only 1,2, and 3 are correct
      D. 1,2,3 and 4 are correct

_____169. Which of the following conditions are associated with conjugated hyperbilirubinemias?
   1. Crigler-Najjar syndrome
   2. Dubin-Johnson syndrome
   3. Gilbert's syndrome
   4. Rotor syndrome
      A. only 1 and 3 are correct
      B. only 2 and 4 are correct
      C. only 1,2, and 3 are correct
      D. 1,2,3 and 4 are correct

_____170. Which of the following statements about bilirubin is true?
      A. A decline in unconjugated bilirubin is a sensitive indicator of recovery
      B. An increase in delta bilirubin suggests a protracted disease course
      C. An increase of conjugated bilirubin >10% of total bilirubin suggest a hepatogenic cause
      D. In the differentiation of prehepatic to hepatic jaundice, a LD/AST ratio of >2 is suggestive of hemolytic jaundice.

_____171. Per gram of degraded hemoglobin, how much bilirubin is produced?
      A. 3mg   B. 15mg   C. 34mg   D. 51mg

_____172. Approximately how much bilirubin are synthesized daily due to physiological breakdown of blood?
   A. 100mg   B. 150mg   C. 200mg   D. 250mg

_____173. The normal daily urobilinogen excretion in the urine is:
      A. 1-2mg   B. 2-4mg   C. 5-10mg   D. 1gm

_____174. What is the half-life of delta bilirubin?
      A. 2 days   B. 8 days   C. 12 days   D. 18 days

_____175. This is used to induce a rise of unconjugated bilirubin by activating hemoxygenase and increase spleenic unconjugated bilirubin production.
A. Nicotinic acid
B. Trichloroethylene
C. sulfobromophthalein
D. dichlorobenzol

_____176. This is a laboratory evaluation system for severity of cirrhosis.
A. Sulfobromophthalein
B. Child-Pugh
C. Nicotinic acid test
D. Fasting

_____177. This chronic form of conjugated hyperbilirubinemias is characterized by deficient leukotriene elimination into the bile and therefore leukotrienes are excreted renally.
A. Crigler-Najjar syndrome
B. Dubin-Johnson syndrome
C. Gilbert's syndrome
D. Rotor syndrome

_____178. In case of intensive sun irradiation, bilirubin values decreases by up to:
A. 10% after 1 hour
B. 20% after 1 hour
C. 30% after 1 hour
d. 50% after 1 hour

_____179. Bilirubin at room temperature, protected from light exposure is stable for:
A. 1 day   B. 2 days   C. 3 days   D. 4 days

_____180. Which bilirubin is measured to assess success following invasive measures to remove cholestasis?
A. Conjugated bilirubin
B. Unconjugated bilirubin
C. Delta bilirubin
D. Total bilirubin

ELECTROLYTES

_____181. Which of the following statements about serum calcium is not correct?
A. Free or ionized calcium accounts for 50% of total calcium
B. Protein bound calcium most of which is bound to globulins with only small portion bound to albumin.
C. Complex-bound calcium is bound to phosphates, citrate and bicarbonate.
D. The protein-bound calcium accounts for 45% of the total calcium.

_____182. Acidosis or a pH decrease, after the blood sample has been collected, causes a rise in ionized calcium because of the metabolic activity of the blood cells, a pH decrease by 0.1 leads to a reciprocal increase of ionized calcium by approximately:
A. 0.05mmol/L
B. 0.10mmol/L
C. 0.15mmol/L
D. 0.20mmol/L

_____183. Alkalosis or a rise in pH, after the blood collection, causes a decrease in ionized calcium due to the elimination of:
A. Oxygen
B. Hydrogen
C. Carbon dioxide
D. Chloride

_____184. This term refers to a state with serum total calcium concentration of typically >14 mg/dL that is associated with symptoms such as volume depletion, metabolic encephalopathy and gastrointestinal symptoms. As soon as the hypercalcemia has been eliminated, the symptoms disappear.

A. Primary hyperparathyroidism
B. familial hypocalcemuric hypercalcemia
C. hypercalcemic crisis
D. Milk-alkali syndrome

_____185. Pseudohypoparathyroidism represents a group of states with end-organ resistance to PTH. Which of the following statements about pseudohypoparathyroidism is not correct?
A. In type 1a, the gene that encodes the G protein is defective
B. In type 1b, the PTH receptor is defective.
C. In type 2, the urinary excretion of cAMP is increased in these patients.
D. Type 1 is characterized by a defect at a locus before the synthesis of cAMP while type 2 is associated with a defect at a locus beyond the synthesis of cAMP.

_____186. Which of the following diseases may cause hypercalcemia?
    A. Liver cirrhosis   C. chornic renal failure
    B. Addison's disease   D. acute pancreatitis

_____187. Which of the following diseases may cause hypocalcemia?
    A.   Pseudohypoparathyroidism   C. Sarcoidosis
    B. Multiple myeloma   D. Primary hyperparathyroidism

_____188. Which formula is correct when adjusting total calcium if the albumin concentration is 4g/dL?
A. Corrected calcium(mg/dL) = measured Ca (mg/dL)-albumin(g/dL) + 4.0
B. Corrected calcium(mg/dL) = albumin(g/dL) - measured Ca (mg/dL) + 4.0
C. Corrected calcium(mg/dL) = measured Ca (mg/dL)+albumin(g/dL) / 4.0
D. Corrected calcium(mg/dL) = measured Ca (mg/dL)-albumin(g/dL) / 4.0

_____189. How much increase in total calcium is anticipated in the case of a change from supine to a standing position?
    A. 4.6%   B. 1.7%   C. 12%   D. 5.4%

_____190. How much increase in ionized calcium is anticipated in the case of a change from supine to a standing position?
    A. 4.6%   B. 1.7%   C. 12%   D. 5.4%

_____191. Which of the following enzymes are used for phosphate measurement?
    1. Purine-nucleoside phosphorylase   3. Sucrose phosphorylase
    2. Xanthine oxidase   4. Phosphoglucomutase

    A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
    B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____192. What is the molar ratio of HPO_4/H_2PO_4?
    A. 1:1   B. 1:2   C. 1:3   D. 1:4

_____193. Which of the following conditions are associated with hypophosphatemia?
    1. Bodybuilding   3. Oncogenic osteomalacia
    2. Alcoholism   4. Diabetic ketoacidosis

    A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
    B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____194. In the phosphate clearance test, the interval time for collection of two urine and blood samples is:

A. 30 mins   B. 60 mins   C. 90 mins   D. 120 mins

_____195. The percentage tubular reabsorption of phosphate, TRF%, is a test identical to the determination of the phosphate clearance but in addition this substance is measured in urine and serum:

A. Inulin   B. Urea   C. Creatinine   D. Macroglobulin

_____196. This is also called the renal phosphorous threshold which describes the maximal phosphate concentration in the glomerular filtrate below which all of the filtered phosphate is reabsorbed in the tubules.

A. TRF%   C. TmP

B. C_{cr} D. C_p

_____197. Transcellular fluid constitutes how much percentage of the total body water?

A. 7.5%   B. 15%   C. 20%   D. 45%

_____198. Interstitial fluid constitutes how much percentage of the total body water?

A. 7.5%   B. 15%   C. 20%   D. 45%

_____199. The extracellular fluid volume is directly dependent on total body:

A. Sodium   B. Phosphate   C. Calcium   D. Potassium

_____200. The regulatory systems of the water balance between the ICF and ECF also referred to as tonicity are:

1. ADH concentration in plasma
2. Thirst and water intake
3. Renal capacity
4. Urea concentration in plasma

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____201. An ECFV decline by >5% causes a reversible decrease in renal blood flow. This results in:

1. The reduction of GFR
2. Increase in the secretion of ADH
3. The activation of the rennin-angiotensin-aldosterone system
4. A rise in the filtration fraction.

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____202. Prerenal acute renal failure is associated with:

1. Oliguria and a urine osmolality of >600mosmol/kg water
2. A disproportional increase of urea as compared to creatinine in plasma
3. A urinary sodium concentration of <10mmol/L
4. A reduction of the fractional sodium excretion to <1%

A. only 1 and 3 are correct   C. only 1,2, and 3 are correct
B. only 2 and 4 are correct   D. 1,2,3 and 4 are correct

_____203. The reference method for sodium and potassium ions:

A. Flame photometry   C. Ion Selective Electrode
B. Potentiometry   D. Enzymatic-spectrophotometric

_____204. Which of the following conditions is not associated with hyponatremia?

A. Renal tubular acidosis   C. Salt-losing nephritis
B. Congestive heart failure   D. Diabetes insipidus

_____205. Which of the following conditions is associated with hyponatremia with an ECFV excess and high total body sodium?
A. Liver cirrhosis   C. Hypothyroidism
B. Pancreatitis   D. Salt-losing nephritis

_____206. The end color in mercurimetric titration method for chloride using diphenylcarbazone as indicator.
A. Green   C. Purple
B. Blue   D. Red

_____207. The chloride ions react with mercuric thiocyanate which together with iron ions forms what color of complex products?
A. Green   C. Purple
B. Blue   D. Red

_____208. The anion gap in the plasma or serum refers to the difference between the most prevalent cations and anions. It is calculated according to this equation:
A. Anion gap = sodium – chloride – bicarbonate
B. Anion gap = potassium + sodium – chloride
C. Anion gap = sodium – potassium – chloride
D. Anion gap = sodium – chloride

_____209. The sodium concentration in erythrocytes is one tenth of that in plasma. Given, a preexisting sodium concentration of 140 mmol/L, a hemolysis of 5g/L cause a decrease in concentration of:
A. 0.2%   C. 0.5%
B. 0.4%   D. 1.2%

_____210. What is the end color in the determination of chloride using mercury thiocyanate?
A. Purple   C. red
B. Yellow   D. blue

_____211. Bartter's symdrome is a congenital disorder wherein there is a defect in chloride absorption in the cortical part of the ascending limb of the loop of Henle and is characterized by the presence of:
A. Metabolic acidosis   C. hyporeninemic
B. Hypokalemia   D. hypoaldosteronism

_____212. Which of the following renal tubular acidosis type and characteristic do not match?
A. Type 1 RTA: distal renal tubular acidosis
B. Type 2 RTA: proximal renal tubular acidosis
C. Type 3 RTA: impaired reabsorption of bicarbonate in the proximal tubule
D. Type 4 RTA: found in patients with progressive renal failure

_____213. In adults, polyuria is associated with a urine volume >2.5 to 3L/24 hour or an excretion rate of greater than:
A. 5 mL per min   C. 10 mL per min
B. 2 mL per min   D. 0.5 mL per min

_____214. In conditions with hyponatremia, the renal sodium excretion as well as the chloride excretion are a measure for the ECFV status. Accordingly:
A. Patients with hyponatremia and a decreased ECFV have renal sodium excretion of <20 mmol/L

B. Patients with hyponatremia and a normal ECFV have a renal sodium excretion of >20 mmol/L

C. Renally induced sodium losses are associated with excretion of >20 mmol/L.

D. All of these are correct

_____215. This is a test for the determination of the excreted fraction of glomerularly filtered sodium and is a measure for the tubular absorption of sodium and an effective test for the differential diagnosis of acute, oliguric renal failure.

A. Anion gap   C. urine pH
B. Fractional excretion of sodium   D. Sodium-selective ISE

_____216. In hyperkalemia, a potassium excretion:

A. > 40 mmol/L is indicative of a renal cause
B. < 40 mmol/L is indicative of extrarenal cause
C. > 40 mmol/L is indicative of extrarenal cause
D. < 40 mmol/L is indicative of renal and extrarenal cause

_____217. Which of the following is associated with Type IV RTA?

A. Plasma potassium: > 5.5, anion gap in urine positive, urine pH: <5.5
B. Plasma potassium: > normal, anion gap in urine positive, urine pH: >5.5
C. Plasma potassium: normal, anion gap in urine negative, urine pH: >5.5
D. Plasma potassium: normal, anion gap in urine positive, urine pH: <5.5

_____218. Which of the following is associated with type 1 RTA?

A. Plasma potassium: > 5.5, anion gap in urine positive, urine pH: <5.5
B. Plasma potassium: > normal, anion gap in urine positive, urine pH: >5.5
C. Plasma potassium: normal, anion gap in urine negative, urine pH: >5.5
D. Plasma potassium: normal, anion gap in urine positive, urine pH: <5.5

_____219. Which of the following is associated with gastrointestinal bicarbonate loss and high urinary ammonia excretion?

A. Plasma potassium: > 5.5, anion gap in urine positive, urine pH: <5.5
B. Plasma potassium: > normal, anion gap in urine positive, urine pH: >5.5
C. Plasma potassium: normal, anion gap in urine negative, urine pH: >5.5
D. Plasma potassium: normal, anion gap in urine positive, urine pH: <5.5

_____220. Which of the following is associated with interstitial renal disease?

A. Plasma potassium: > 5.5, anion gap in urine positive, urine pH: <5.5
B. Plasma potassium: > normal, anion gap in urine positive, urine pH: >5.5
C. Plasma potassium: normal, anion gap in urine negative, urine pH: >5.5
D. Plasma potassium: normal, anion gap in urine positive, urine pH: <5.5

BLOOD GASES

_____221. This parameter is defined as the amount of strong acid or strong base needed to titrate extracellular fluid to pH 7.4 at a pCO_2 of 40mmHg and at 37C.

A. Standard bicarbonate   C. Base excess
B. cHCO$_3$ D. anion gap

_____222.