



METABOLISM

PAST PAPERS

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Meta 2019 make – up

1) OTC deficiency and UMP synthase deficiency can result in one of the following condition:

- a. Megaloblastic anemia
- b. Orotic aciduria
- c. Albinism
- d. Hyperammonemia
- e. hyperphenylalaninemia

Answer: b

2) Regarding Glutathione, which statement is CORRECT?

- a. Its level in RBC is maintained in the oxidized form.
- b. Has an —SH group.
- c. The level of the reduced form is high in G6PD-deficient RBCs.
- d. It is a dipeptide consisting of glutamate and cysteine.
- e. Is converted to the oxidized form in a reaction catalysed by glutathione peroxidase.

Answer: e

3) Which statement is CORRECT considering ATP generation in the electron transport chain?

- a. The F₀ piece of the ATP synthase binds ADP and Pi tightly before ATP synthesis occurs.
- b. The F₀ piece of the ATP synthase is composed of three subunits.
- c. The F₁ piece of the ATP synthase is composed of 6 subunits.
- d. The flow of protons from the intermembranous space toward the mitochondrial matrix is considered the driving force for ATP generation.
- e. Entry of protons occurs through the F₁ piece into the mitochondrial matrix.

Answer: d

4) Calcium calmodulin complex activates :

- a. protein kinase A
- b. phosphodiesterase

- c. hexokinase
- d. glycogen synthase
- e. phosphorylase kinase

Answer: e

- 5) Production of oxaloacetate from pyruvate
- a. is accompanied by release of CO₂
 - b. proceeds by reversible isomerization reaction
 - c. is oxidation reduction reaction
 - d. results in substrate level phosphorylation
 - e. occurs during gluconeogenesis

Answer: e

- 6) Enoyl CoA isomerase:
- a. is required in the oxidation of fatty acids with odd number of carbons
 - b. catalyzes an irreversible reaction
 - c. is required for oxidation of unsaturated fatty acids
 - d. is a cytosolic enzyme
 - e. catalyzes a rate limiting step in oxidation of fatty acid

Answer: c not sure

- 7) Which of the following enzymes is correctly paired with the effect of its allosteric effector?
- a. Muscle glycogen phosphorylase is inhibited by 5'-AMP
 - b. Phosphofructokinase is inhibited by fructose-2,6-bisphosphate
 - c. Phosphofructokinase is inhibited by ATP
 - d. Hexokinase is activated by glucose-6-phosphate
 - e. Glycogen phosphorylase is activated by glucose-6-phosphate

Answer: c

- 8) The product of acetyl CoA carboxylase inhibits
- a. entrance of acyl CoA into the mitochondria
 - b. HMG CoA reductase
 - c. esterification of cholesterol in the cell
 - d. glycerol phosphate shuttle

e. pyruvate carboxylation

Answer: a

9) The two nitrogen atoms in urea are derived directly from:

- a. Glutamine and Ammonia
- b. Asparagine and Glutamine
- c. Aspartate and Glutamine
- d. Glycine and Glutamine
- e. Glutamate and Glutamine

Answer: c

10) The beta type glycosidic bond connecting C1 to C4 is cleaved during digestion by

- a. Sucrase.
- b. Lactase.
- c. Isomaltase.
- d. Maltase.
- e. Sucrase/isomaltase.

Answer: b

11) Regarding urea cycle, which of the following statements is NOT CORRECT :

- a. Urea cycle enzyme are induced by high protein diet or starvation
- b. N-acetyl glutamate is an activator of urea cycle
- c. Urea nitrogen atoms are derived indirectly from glutamate
- d. Urea formation takes place in liver only
- e. Urea cycle just like TCA cycle takes place completely in the mitochondria

Answer: e

12) When lipoproteins are separated by electrophoresis, the fastest class in moving towards the anode is

- a. HDL
- b. IDL
- c. LDL
- d. Chylomicrons

e. VLDL

Answer: a

13) The consumption of 1 mole of glucose by glycolysis in red blood cell produces a net of :

- a. 2 moles of lactate and 3 moles of ATP.
- b. 2 moles of lactate and 1 mole of ATP.
- c. 2 moles of pyruvate, 2 moles of NADH and 2 moles of ATP.
- d. 2 moles of lactate, 2 moles of NADH and 2 moles of ATP.
- e. 2 moles of lactate and 2 moles of ATP.

Answer: e

14) Which of the following best predicts the result of raising the pH of an equilibrium mixture for the reaction ($\text{ATP} + \text{H}_2\text{O} \rightleftharpoons \text{ADP} + \text{P}_i + \text{H}^+$)?

- a. No answer is true
- b. The concentration of ADP decreases
- c. The concentration of ADP increases
- d. The concentration of water increases
- e. The concentration of ATP increases

Answer: c

15) Carbamoyl phosphate synthetase (which is NOT TRUE):

- a. Is required for pyrimidine synthesis
- b. Is found in the cytosol
- c. Is required for purine synthesis
- d. Is found in the mitochondria
- e. Is required for urea synthesis

Answer: c

16) Porphobilinogen synthase (delta-aminolevulinic acid dehydratase): I. is the rate limiting step in heme synthesis. II. Is inhibited by lead. III. requires pyridoxal (vitamin B6) phosphate for activity. IV. is present in the cytosol.

- a. IV only
- b. I and III

- c. II and IV
- d. I, II, and III
- e. All answers are true

Answer: c

17) Inositol triphosphate is produced from phosphatidyl inositol bisphosphate in a reaction catalyzed by....

- a. Phospholipase A2
- b. Phospholipase C
- c. Lipoprotein lipase
- d. Inositol bisphosphate kinase
- e. Acetylcholine esterase

Answer: b

18) The reaction catalyzed by ceramidase produces

- a. sphingosine
- b. sphingomyelin
- c. phosphocholine
- d. ganglioside
- e. cerebroside

Answer: a

19) If an individual has a vitamin B6 deficiency, which one of the following amino acids could still be synthesized and be considered nonessential?

- a. Tyrosine
- b. Cysteine
- c. Serine
- d. Alanine
- e. Aspartate

Answer: a

20) Which of the following statements regarding the production of acetoacetate from acetyl CoA is correct?

- a. three moles of coenzyme A are produced per one mole of acetoacetate.

- b. occurs when oxaloacetate level is high in the cell.
- c. acetone in an intermediate .
- d. the process occurs in the mitochondria of liver cells.
- e. is active in the process of high insulin/glucagon ratio.

Answer: a

21) Which of the following would be expected to occur after acute alcohol ingestion?

- a. An increase in the ratio of NAD⁺/NADH ratio
- b. Lactic Acidosis
- c. Increased fatty acid oxidation
- d. Increase in fatty acid oxidation.
- e. An increase in gluconeogenesis.

Answer: b

22) Regarding Glucose 6- phosphatase

- a. It's deficiency in the muscle results in one of the glycogen storage diseases.
- b. Is a mitochondrial enzyme
- c. Is found in liver but not in muscle.
- d. Is a common enzyme to both glycogen synthesis and gluconeogenesis.
- e. It catalyzes a reaction by which glucose is produced along with ATP production from ADP.

Answer: c

23) After performing a serum electrophoresis, you noticed a dramatic increase in alpha-1, alpha-2, beta, and gamma globulin bands on the gel but not albumin. This would indicate:

- a. Analbuminemia
- b. Kidney failure
- c. Inflammation
- d. Liver cirrhosis
- e. Multiple myeloma

Answer: a

24) Arrange the following intermediates of cholesterol synthesis pathway in the correct order. 1. Mevalonate, 2. Lanosterol, 3. HMG CoA, 4. Squalene

- a. 1>>3>>4>>2
- b. 3>>1>>4>>2
- c. 3>>4>>2>>1
- d. 1>>2>>3>>4
- e. 1>>3>>2>>4

Answer: b

25) Protoporphyrin IX is: I. Intermediate in heme synthesis.
II. Intermediate in heme degradation

- a. I only
- b. II only
- c. Both I and II
- d. Neither I or II

Answer: a

26) A decrease in which of the following proteins will result in deposits of copper in the lens of the eyes, liver, skin and kidneys?

- a. Albumin
- b. Transferrin
- c. Prealbumin
- d. CRP
- e. Ceruloplasmin

Answer: e

27) Ubiquitin proteosomal degradation system targets the following molecules:

- a. Intracellular soluble protein
- b. Membrane receptors
- c. Extracellular matrix proteins
- d. All other cellular molecules except proteins
- e. Anchored membrane proteins

Answer: a

- 28) Sorbitol is a six carbon poly alcohol that
- a. is produced from glucose by oxidation
 - b. can be converted to fructose
 - c. is produced in galactokinase deficiency
 - d. is an intermediate in galactose production
 - e. can be cleaved to produce two glycerol molecules

Answer: b

- 29) Synthesis of palmitic acid from acetyl CoA requires:
- a. 16 molecules of NADPH
 - b. 8 ATP
 - c. 8 molecules of water
 - d. bicarbonate for conversion of acetyl CoA to malonyl CoA
 - e. 7 NADH and 7 FADH₂

Answer: d

- 30) The reaction that produces ATP in glycolysis is accompanied by production of ...
- a. glyceraldehyde 3-phosphate
 - b. phosphoenolpyruvate
 - c. 3-phosphoglycerate
 - d. dihydroxyacetone phosphate
 - e. 1,3 bisphosphoglycerate

Answer: c

- 31) One of the following enzymes requires Biotin
- a. Pyruvate dehydrogenase
 - b. Acetyl CoA carboxylase
 - c. Transketolase
 - d. Pyruvate decarboxylase
 - e. Glycerate bisphosphate mutase

Answer: b

- 32) Which of the following does occur during oxidative decarboxylation of Isocitrate?
- a. Oxidation of FAD

- b. The use of lipoic acid
- c. Release of CO₂ molecule
- d. Reduction of NADH
- e. Oxidation of 2 thiol groups

Answer: e

33) Uncoupling in mitochondria refers to:

- a. Enhancing proton pumping toward the inter-membranous space
- b. Increasing the ATP energy output of the mitochondria
- c. Enhancing electron movement within inner membrane complexes
- d. Decreasing the pH value inside the mitochondrial matrix
- e. Decreasing the heat content within the cell

Answer: d

34) Which of the following enzymes of nucleotide metabolism is correctly paired with its pharmacologic inhibitor?

- a. Xanthine oxidase-probenecid
- b. Ribonucleotide reductase-5-fluorouracil
- c. Thymidylate synthase-allopurinol
- d. Dihydrofolate reductase-methotrexate
- e. Inosine monophosphate dehydrogenase-hydroxyurea

Answer: d

35) TCA cycle efficiency is approximately (%):

- a. 90
- b. 70
- c. 35
- d. 25
- e. 10

Answer: a

36) Prealbumin represents:

- a. A band that runs faster on gel electrophoreses
- b. All answers are true
- c. An acute phase protein

- d. Inactive form of albumin
- e. A higher molecular weight protein compared to albumin

Answer: a

37) All vitamins are essential. However, one of the following vitamins can be produced in sufficient amounts if one of the essential amino acids is present in good amounts.

- a. Tryptophan
- b. Methionine
- c. Riboflavin
- d. Niacin
- e. Biotin

Answer: d

38) The biochemical reaction $A \rightleftharpoons B$ has a very large and positive ΔG ($\Delta G \gg 1$) under physiological conditions. Which of the following is the best estimate for the equilibrium constant K_{eq} ?

- a. $K_{eq} < 1$
- b. No answer is true
- c. $K_{eq} = 0$
- d. $K_{eq} \gg 1$
- e. $K_{eq} > 1$

Answer: a

39) Which of the following statements regarding introduction of double bond at carbon 9 of palmitic acid is correct?

- a. is catalyzed by acyl CoA dehydrogenase.
- b. produces oleic acid.
- c. produces omega-6 fatty acid.
- d. O_2 and NADPH are needed.
- e. is accompanied by reduction of FAD.

Answer: d not sure

40) The reaction in electron transport chain that involves a redox reaction using oxygen as the oxidizing agent is catalyzed by:

- a. NADH dehydrogenase complex

- b. Complex II
- c. Succinate dehydrogenase complex
- d. Coenzyme Q-Cytochrome c oxidoreductase
- e. Cytochrome c oxidase

Answer: e

- 41) Which of the following regarding protein digestion is true?
- a. Free amino acids are the only form that is taken up by intestinal cells
 - b. Trypsin is the common activator of all pancreatic zymogens
 - c. Trypsin can only be activated through autocatalytic activation
 - d. Pepsin can only be activated through autocatalytic activation
 - e. High pH value in the stomach helps in hydrolysis of some proteins

Answer: b

- 42) The main purpose of pentose phosphate pathway in glucose metabolism is to:
- a. Increase NAD^+/NADH ratio
 - b. Supply energy
 - c. Supply NADPH
 - d. Provide an alternative pathway when glycolysis fails
 - e. Provide a mechanism to utilize the carbon skeleton of excess amino acids

Answer: c

- 43) Which of the following is TRUE considering TCA cycle?
- a. NADH acts as a feedback inhibitor molecule for the 4 dehydrogenases
 - b. All enzymes are allocated within the mitochondrial matrix
 - c. All reactions are exergonic in their nature
 - d. The release of CoA results in energy used to form GTP and citrate
 - e. There are two oxidation steps, both involve decarboxylation

reactions

Answer: e not sure

44) The substrates for the production of glycerol phosphate in the adipose tissue are....

- a. Glycerol + ATP
- b. 3-phosphoglycerate and NADPH
- c. Pyruvate + ATP
- d. Dihydroxyacetone phosphate and NADH
- e. Glycerol + GTP

Answer: d

45) Fructose 2,6 bisphosphate...

- a. it is synthesized from fructose 1,6 bisphosphate by mutase enzyme.
- b. it is an inhibitor of glycolysis.
- c. it is a common intermediate in glycolysis and gluconeogenesis.
- d. its synthesis is increased by a high insulin / glucagon ratio.
- e. it is an activator of gluconeogenesis.

Answer: d

46) The first step in fructose metabolism is phosphorylation to fructose 1-phosphate. The next step is:

- a. Phosphorylation to fructose 1,6 bisphosphate.
- b. Formation of UDP fructose.
- c. Reduction to sorbitol phosphate.
- d. Isomerization to glucose 1-phosphate.
- e. Cleavage by aldolase B.

Answer: e

47) Which of the following statements regarding prostaglandin E2 is correct?

- a. it is a dicarboxylic acid.
- b. its structure contain five membered ring.
- c. it is the parent compound of other prostaglandins.
- d. it has a net zero charge at pH 7.

e. it contains an amino group.

Answer: b

48) Lactating mammary glands in a woman on galactose free diet can produce lactose through:

- a. Epimerization of glucose-1- phosphate
- b. Oxidation of galactitol to galactose
- c. Epimerization of UDP-glucose
- d. Isomerization of glucose-1- phosphate by phosphohexose isomerase
- e. Epimerization of glucose

Answer: c

49) Which of the following statements regarding hormone-sensitive lipase is correct?

- a. it is a pancreatic enzyme
- b. it is activated by protein phosphatase
- c. The active form is produced by cAMP dependent process
- d. it is an extracellular enzyme
- e. it is activated by insulin

Answer: c

50) All the following statements regarding the digestion of triacylglycerol with short chain fatty acids (4-6 carbons) are correct EXCEPT. (Choose the INCORRECT)

- a. they can be digested by an acid stable enzyme.
- b. their digestion can proceed in patients with pancreatic lipase deficiency.
- c. they can be digested by a lipase secreted from the tongue.
- d. their digestion can start before they reach small intestine.
- e. their digestion does require bile salts.

Answer: e

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