

科目：生物化學 適用：生醫所生醫組

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

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I. Choice (40 points, 2 points each)

1. An ionotropic receptor:
 - a. Allows ions to pass through a membrane pore.
 - b. Is connected to G-proteins.
 - c. Responds only to excitatory amino acids.
 - d. Produces a slow response to stimulation.
2. Aspirin is a pain-relieving and anti-inflammatory mediator because it inhibits prostaglandin synthesis by:
 - a. Inhibiting fatty-acid-specific lipxygenase activity.
 - b. Inhibiting fatty-acid-specific cyclo-oxygenase activity.
 - c. Inhibiting fatty-acid-specific hydroperoxidase activity.
 - d. All of the above.
3. G-protein-coupled receptors have:
 - a. Single-pass transmembrane domains.
 - b. Seven transmembrane domains.
 - c. Seven subunits.
 - d. Seven single-pass transmembrane domains.
4. β -adrenergic receptors are coupled to:
 - a. G_s -stimulated adenylate cyclase activity.
 - b. G_i -mediated inhibition of adenylate cyclase.
 - c. G_s -subunits.
 - d. G_i -stimulated adenylate cyclase activity.
5. Which of the following methods of regulating gene expression is common?
 - a. Use of alternative promoters.
 - b. Post-translational cleavage.
 - c. RNA editing.
 - d. Multigenic transcription units.
6. An amino acid is attached to the tRNA via:
 - a. Hydrogen bonds.
 - b. Ester bonds.
 - c. Amide bonds.
 - d. Glycosidic bonds.
7. During protein synthesis, the newly synthesized peptide
 - a. Is covalently bound to DNA.
 - b. Is covalently bound to the 5' end of mRNA.
 - c. Is covalently bound to the small rRNA subunit.
 - d. Is covalently bound to the end of tRNA.

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8. Which of the following is essential for gene transcription?
- a. RNA polymerase.
 - b. DNA methylase.
 - c. A CAAT box.
 - d. Glucocorticoids.
9. Charging of a tRNA molecule with the correct amino acids is dependent on:
- a. The anticodon loop.
 - b. The variable loop.
 - c. The codon of the mRNA.
 - d. An aminoacyl synthetase specific for that tRNA.
10. Which of the following statements is true of anti-thrombin?
- a. Cofactor for the anticoagulant drug.
 - b. Inactivates coagulation factor VIII.
 - c. Inactivates coagulation factor X.
 - d. Congenital deficiency causes excessive bleeding.
11. Which of the following statements is **not** true of thrombin?
- a. It stimulates platelet aggregation.
 - b. Its formation is reduced by warfarin.
 - c. Its formation is reduced in patients with protein C deficiency.
 - d. Congenital deficiency causes excessive bleeding.
12. Which of the following enzymes are involved in the digestion and absorption of protein?
- a. Trypsinogen.
 - b. Amylase.
 - c. Phospholipase A₂.
 - d. Pepsin.
13. Di- and tripeptides are absorbed by the intestinal epithelial cell by a process of:
- a. Passive diffusion.
 - b. Na⁺-dependent carrier-mediated system.
 - c. H⁺-dependent carrier-mediated system.
 - d. Surface membrane-directed hydrolysis and absorption of amino acids.
14. Which of the following statements is **not** true of plasma fibrinogen?
- a. Low levels prolong the skin bleeding time.
 - b. Low levels prolong the thrombin time.
 - c. Binds to the platelet receptor Gp Ib/IX.
 - d. Low levels follow thrombolytic therapy.

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15. Which one of the following reduces oxygen to water?
- a. Q-cytochrome c reductase.
 - b. ATP synthase.
 - c. TCA cycle.
 - d. Cytochrome c oxidase.
16. Which of the following statements about membrane lipids is **not** true?
- a. Membrane structure can be modeled by phospholipids bilayers or liposomes.
 - b. Phospholipids are amphipathic compounds.
 - c. Flip-flop movement of phospholipids is catalyzed by an energy-dependent enzyme called flippase.
 - d. Compared with unsaturated fatty acid, saturated fatty acids have lower melting points and are more fluid.
17. Which of the following is associated with the process of fat digestion?
- a. Increased production of surfactants.
 - b. Stimulation of carbohydrate digestive enzymes.
 - c. Hydrolysis of triglycerides to 1-monoacyl-glycerol.
 - d. Increased acid production and change in blood pH.
18. Succinate is added to a suspension of freshly isolated mitochondria in phosphate buffer. Respiration starts when ADP is added at point (A), stops on addition of unknown compound at point (B), but begins again when DNP is added at point (C). What is the most likely identity of the compound added at (B)?
- a. Oligomycin.
 - b. Cyanide.
 - c. Rotenone.
 - d. Malate.
19. The digestion of carbohydrates is:
- a. Associated with increased uptake of glycerol by the intestinal epithelial cell.
 - b. Associated with increased osmolality of the gut lumen fluid.
 - c. Associated with decreased osmolality of the gut lumen fluid.
 - d. Initiated by enzymes secreted by the gastric mucosa.
20. Which of the following is **not** true regarding mitochondrial cytochromes?
- a. They all contain heme groups.
 - b. Iron must remain in the ferrous state for them to function in electron transport.
 - c. All are bound to protein components.
 - d. They are found in complexes III, IV, and cytochrome c, but not complexes I and II.

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II. Assay (60 points)

1. Dietary citric acid can enter mitochondria and be oxidized in the TCA cycle. Explain how citric acid continues an anaplerotic compound. (5 pts) Also, why malate shuttle is important in fatty acids synthesis? (5 pts)
2. Describe two alternative routes for synthesis of phosphatidylcholin, phosphatidylethanolamine, and phosphatidylserine. (10 pts)
3. (a) Explain β -oxidation, α -oxidation, and ω -oxidation (5 pts). (b) Why hydrogenated fatty acids are not good for health? (5 pts)
4. The maximum *in vivo* rate of transcription is about 45 nucleotides per second in *E. Coli*. On this basis, calculate the length of time required for transcription of the gene for (a) the inactive monomer of the *lac* repressor (360 amino acids) (5 pts); (b) a protein composed of 800 amino acid residues (5 pts).
5. Calculate the net yield of ATP molecules per molecule of glycerol for the following catabolic sequences. Assume that the reactions occur under aerobic conditions with participation of the glycerol phosphate shuttle. (a) glycerol to pyruvate (5 pts); (b) glycerol to acetyl CoA. (5 pts)
6. Explain the Q cycle (10 pts).