

科目：生物化學

適用：應化系(生物醫學)

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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一、選擇題 (100%, 每小題 2%)

1. Which description about lipids in the following items is wrong? (1) Fat molecules are hydrophobic, but phospholipids are both hydrophobic and hydrophilic; (2) Phosphatidylcholine is the most common phospholipid in cell membrane; (3) Cholesterol makes cell membrane more rigid; (4) All lipids contain glycerol and fatty acid.
2. Which of the following molecules serve as the main structural component of biological membranes? (1) Phospholipid; (2) Steroid; (3) Glycolipid; (4) Glycoprotein.
3. About the relative abundance of intracellular substances, which one is correct? (1) Protein>RNA>phospholipid>DNA; (2) phospholipid>protein>RNA>DNA; (3) DNA>RNA>protein>phospholipid; (4) All of the above statements are not correct.
4. Which of the following descriptions about beta-oxidation of lipid is incorrect? (1) Lipid can be beta-oxidized in mitochondria; (2) Lipid can be beta-oxidized in peroxisome; (3) The end product of lipid beta-oxidation is pyruvate; (4) Chains with an odd-number of carbons are oxidized in the same manner as even-numbered chains, but the final products are propionyl CoA and acetyl CoA.
5. DNA carries negative charge in normal physiological condition because it contains: (1) ribose; (2) nitrogen base; (3) phosphate group; (4) All of the above.
6. Which combination about enzymes is different from the other three? (1) Kinase vs phosphatase; (2) DNase vs Protease; (3) Oxidase vs reductase; (4) Synthetase vs lyase.

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7. Which description in the followings about genes is wrong? (1) The genes in life are discontinuous. That means that genes are composed of exons and introns in each type of life; (2) The % of DNA region occupied by genes is very low in human genomic DNA; (3) A gene is defined as a DNA fragment able to produce a RNA; (4) The genes can be located at each one of the two DNA strands.
8. Which of the following descriptions about gene expression is wrong? (1) A set of three nucleotides able to produce an amino acid in mRNA is called a codon; (2) A set of three nucleotides able to produce an amino acid in DNA is called a code; (3) The three nucleotide sequences in tRNA recognizing the three nucleotides in mRNA is called an anticodon; (4) The protein that is able to turn on genes is called a promoter.
9. Which is correct about the description of human genetic materials? (1) The genetic materials are located in chromosomes which are composed of DNA only; (2) The loose DNA structure in interphase cells is called chromosome; (3) Human beings have about 10,000 genes; (4) There are about 3.2×10^9 nucleotides for human genomic DNA.
10. Which process is impossible in biology? (1) DNA \rightarrow RNA; (2) RNA \rightarrow Protein; (3) RNA \rightarrow DNA; (4) DNA \rightarrow protein.
11. Which enzyme is engaged in DNA synthesis for human cells? (1) DNA-dependent RNA polymerase; (2) DNA-dependent DNA polymerase; (3) RNA-dependent DNA polymerase; (4) All of above.
12. The two strands of a DNA molecule are held together by: (1) Glycosidic bonds; (2) Hydrogen bonds; (3) Peptide bonds; (4) Ester

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bonds.

13. Which description about a cell cycle of mammalian cells is correct? (1) A cell cycle is progressed from G1, G2, S to M in order; (2) The biggest cell size is observed in M phase; (3) G2 is the shortest phase; (4) DNA is replicated in S phase.
14. When a gene is turned off, which of the following statement is correct? (1) A chromatin remodeling complex may work to compact the local structure of a chromatin segment; (2) DNA may be methylated; (3) DNA may be acetylated; (4) Histone may be methylated.
15. Which description of DNA, RNA and protein is correct? (1) As to the order of the molecular weight of the building monomers of DNA, RNA and protein, deoxynucleotides > nucleotides > amino acids; (2) Human genomic DNA is double strand, mRNA can be single or double strand, protein can be consist of single or multiple polypeptide chains; (3) RNA is generally considered as the earliest biomolecule appeared on the earth; (4) The order of size of the three macromolecules when they have same number of building block or monomer is DNA=RNA < protein.
16. Which statement of ribosome is wrong? (1) Ribosome is both found in eukaryotic and prokaryotic cells; (2) Ribosome is consist of protein and RNA; (3) Ribosome is found in nucleus and cytosol; (4) Ribosome is a complicated structure used to make protein.
17. Upon chemical analysis, a particular protein was found to contain 1206 amino acids. How many codons are present in its corresponding mRNA? (1) 402; (2) 1206; (3) 603; (4) 3618.

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18. Which of the following technique is used to detect the expression of protein? (1) Northern blot; (2) Western blot; (3) Southern blot; (4) Finger printing.
19. The "quaternary structure" of a protein refers to (1) interactions among the side chains or R-groups of the amino acids; (2) the number and sequence of amino acids; (3) coiling due to hydrogen bonding between amino acids; (4) the combination of the protein complex with more than one protein.
20. Which of the following organisms is used as an experimental model? (1) Worm; (2) Yeast; (3) Bacteria; (4) All of them.
21. Plasma membrane allows the passage of (1) small and uncharged molecules; (2) small ions; (3) small and charged molecules; (4) large and hydrophobic molecules.
22. Disulfide bond (1) is formed between 2 charged amino acids ; (2) can be broken down by oxidizing agent; (3) is critical to the protein conformation; (4) all above are correct.
23. Which of the following substances can be used to reduce the expression level of a given gene? (1) siRNA; (2) shRNA; (3) Antisense DNA; (4) All of them.
24. Which instrument or technique can be used to determine protein structure? (1) X-ray crystallography; (2) Northern blot; (3) Flowcytometer; (4) HPLC.
25. Which amino acid is encoded by stop codon? (1) Methionine; (2) Histidine; (3) Glycine; (4) None.
26. Carbohydrates (1) possess the formula $C(H_2O)_n$; (2) can have carbon number from 1 to 9; (3) can be in straight chain or circular form; (4)

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all above are right.

27. Which description about the glucose polymers is correct? (1) Starch is the linear form of glucose polymer; (2) Glycogen is produced and stored in every cells; (3) Cellulose serves as a structural role in grass with alternate arrangement of D- and L-form glucose; (4) Glycogen, starch and cellulose can be digested by animals.
28. Which of the following molecules is not produced directly by TCA cycle is incorrect? (1) CO₂; (2) NADH; (3) GTP; (4) ATP.
29. (1) Cytochrome oxidase; (2) NADH reductase; (3) Succinate dehydrogenase; (4) Cytochrome b-c complex is the final enzyme complex in the electron transfer chain, consumes nearly all oxygen we breathe.
30. In the end of glycolysis, pyruvate is transformed to acetyl-CoA, which is then subjected to further oxidation to obtain more energy from the stored chemical bond. Where is the right place that pyruvate is catalyzed to become acetyl-CoA? (1) mitochondria matrix; (2) mitochondria inner membrane; (3) mitochondria intermembrane space; (4) cytosol.
31. Which of the following statements about enzyme is incorrect? (1) Enzymes lower the activation energy; (2) Enzymes convert substrates to products while remaining unchanged themselves; (3) An enzyme cannot change the equilibrium point for reactions; (4) Enzyme can be made of protein, lipid, and carbohydrate.
32. Which statement about metabolism in the following items is correct? (1) Metabolism contains the idea of synthesis and breakdown; (2) Most of food molecules are oxidized to break its C-H bond to release

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- the stored energy; (3) Living cells do not follow the second law of thermodynamics, and that means that cells obtain energy to keep their structure complicated and functional; (4) All the above are correct.
33. Which statement in the followings is wrong? (1) Condensation and hydrolysis are two opposite reactions; (2) NADPH and NADH are two important electron carriers; (3) The synthesis of most biopolymers requires energy input; (4) All the above are incorrect.
34. Which statement in the followings is incorrect? (1) Pyruvate cannot be broken down in the absence of oxygen; (2) The stepwise oxidation of sugars begins with glycolysis; (3) The controlled stepwise oxidation of sugars that occurs in cells preserves useful energy; (4) Phosphate bonds in different molecules may have different energy.
35. Which statement about acetyl-CoA in the followings is wrong? (1) Acetyl-CoA is produced mainly in mitochondria from sugars; (2) Fatty acids are also oxidized to acetyl-CoA; (3) Proteins cannot be converted to acetyl-CoA; (4) The citric acid cycle catalyzes the complete oxidation of the carbon atoms in acetyl-CoA.
36. Which one is right about the order of cytoskeleton diameter?
(1) Microtubule > Intermediate filament > Microfilament;
(2) Microtubule > Microfilament > Intermediate filament;
(3) Microfilament > Microtubule > Intermediate filament;
(4) Intermediate filament > Microtubule > Microfilament.
37. (1) Enzyme; (2) Gold particle; (3) Fluorescent dye; (4) All of them can be conjugated to antibodies to detect the expression pattern of a protein.
38. According to the International Union of Biochemistry and Molecular

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- Biology, how many categories of enzyme are classified? (1) 5; (2) 6; (3) 7; (4) 8.
39. Which of the followings amino acids is encoded by the AUG? (1) Methionine; (2) Serine; (3) Glutamic acid; (4) None.
40. Which of the following amino acids carry positive charge? (1) Aspartic acid; (2) Glycin; (3) Histidine; (4) Tyrosine.
41. Which of the following description is not correct regarding DNA and RNA? (1) DNA is generally more stable than RNA; (2) The secondary structure of RNA generally is more complicated than that of DNA; (3) both of DNA and RNA can serve as genetic materials in living world; (4) Based on the observation that RNA is synthesized from DNA, it is generally believed that DNA should appear in the world earlier than RNA.
42. 1.8% of glucose is equivalent to (1) 10 M; (2) 1 M; (3) 100 mM; (4) 10 m M.
43. One nanogram is equivalent to (1) 10^{-3} gram; (2) 10^{-6} gram; (3) 10^{-9} gram; (4) 10^{-12} gram.
44. Which biological substance in the followings is not a polymer? (1) Glycogen; (2) Cholesterol; (3) Nucleic acids; (4) Collagen fiber.
45. Which of the following descriptions about electron transfer chain is incorrect? (1) Protons are pumped into mitochondrial interspace when high energy electrons are transferred along electron transfer chain; (2) Protons flow back to mitochondrial matrix, leading to the generation of ATP through ATP synthase; (3) Cytochrome oxidase is the final enzyme complex in the electron transfer chain, consumes nearly all oxygen we breathe; (4) The electron transfer chain takes place in

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anaerobic condition.

46. The following equation ($G = \text{glucose}$): $G + G + G \rightarrow G-G-G + 2H_2O$,
is an example of (1) ionic bond formation; (2) peptide bond formation;
(3) a condensation reaction; (4) a hydrolysis reaction.
47. Which description in the followings is a common characteristic of a
denatured protein? (1) More soluble in water; (2) Non-functional; (3)
Lower nutritional value; (4) More stable.
48. How many protein coding genes do human beings have according to
current estimation? (1) 20000-30000; (2) 30000-50000; (3)
50000-100000; (4) Above 100000.
49. Which molecule in the followings is the common metabolite of sugar
and lipid? (1) Acetyl-CoA; (2) Pyruvate; (3) Lactate; (4) Glycerol.
50. How many amino acids are commonly found in human cells? (1) 10;
(2) 20; (3) 30, (4) 40.

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