

系所組別：熱帶植物科學研究所

考試科目：生物化學

考試日期：0220 · 節次：2

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Choose the best answer (60分, 每題3分)

- The bacterium *E. coli* requires simple organic molecules for growth and energy—it is therefore a:
A) chemoautotroph. B) chemoheterotroph. C) lithotroph.
D) photoautotroph. E) photoheterotroph.
- Hydrophobic interactions make important energetic contributions to:
A) binding of a hormone to its receptor protein.
B) enzyme-substrate interactions.
C) membrane structure.
D) three-dimensional folding of a polypeptide chain.
E) All of the above are true.
- Of the 20 standard amino acids, only ___ is not optically active. The reason is that its side chain _____.
A) alanine; is a simple methyl group B) glycine; is a hydrogen atom
C) glycine; is unbranched D) lysine; contains only nitrogen
E) proline; forms a covalent bond with the amino group
- Which of the following generalizations concerning motor proteins is correct?
A) They convert chemical energy into kinetic energy.
B) They convert chemical energy into potential energy.
C) They convert kinetic energy into chemical energy.
D) They convert kinetic energy into rotational energy.
E) They convert potential energy into chemical energy.
- Enzymes are potent catalysts because they:
A) are consumed in the reactions they catalyze.
B) are very specific and can prevent the conversion of products back to substrates.
C) drive reactions to completion while other catalysts drive reactions to equilibrium.
D) increase the equilibrium constants for the reactions they catalyze.
E) lower the activation energy for the reactions they catalyze.
- Starch and glycogen are both polymers of:
A) fructose. B) glucose 1-phosphate. C) sucrose. D) α -D-glucose. E) β -D-glucose.
- Which of the following is *not* true of all naturally occurring DNA?
A) Deoxyribose units are connected by 3',5'-phosphodiester bonds.
B) The amount of A always equals the amount of T.
C) The ratio A+T/G+C is constant for all natural DNAs.
D) The two complementary strands are antiparallel.
E) Two hydrogen bonds form between A and T.
- Certain restriction enzymes produce cohesive (sticky) ends. This means that they:
A) cut both DNA strands at the same base pair.
B) cut in regions of high GC content, leaving ends that can form more hydrogen bonds than ends of high AT content.
C) make a staggered double-strand cut, leaving ends with a few nucleotides of single-stranded DNA protruding.
D) make ends that can anneal to cohesive ends generated by any other restriction enzyme.
E) stick tightly to the ends of the DNA they have cut.
- Biological waxes are all:
A) trimesters of glycerol and palmitic acid.
B) esters of single fatty acids with long-chain alcohols.
C) trimesters of glycerol and three long-chain saturated fatty acids.
D) sphingolipids.
E) none of the above.
- When a bacterium such as *E. coli* is shifted from a warmer growth temperature to a cooler growth temperature, it compensates by:
A) increasing its metabolic rate to generate more heat.
B) putting longer-chain fatty acids into its membranes.
C) putting more unsaturated fatty acids into its membranes.
D) shifting from aerobic to anaerobic metabolism.
E) synthesizing thicker membranes to insulate the cell.

(背面仍有題目,請繼續作答)

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11. Steroid hormone response elements (HREs) are _____, which, when bound to _____, alter gene expression at the level of _____.
- intron sequences; activated hormone receptor; translation
 - nuclear proteins; hormone; transcription
 - plasma membrane proteins; hormone; transcription
 - sequences in DNA; receptor-hormone complex; replication
 - sequences in DNA; receptor-hormone complex; transcription
12. When a mixture of glucose 6-phosphate and fructose 6-phosphate is incubated with the enzyme phosphohexose isomerase (which catalyzes the interconversion of these two compounds) until equilibrium is reached, the final mixture contains twice as much glucose 6-phosphate as fructose 6-phosphate. Which one of the following statements is best applied to this reaction outlined below?
- ($R = 8.315 \text{ J/mol}\cdot\text{K}$; $T = 298 \text{ K}$)
- | | |
|---------------------|----------------------|
| Glucose 6-phosphate | fructose 6-phosphate |
|---------------------|----------------------|
- ΔG° is incalculably large and negative.
 - ΔG° is -1.72 kJ/mol .
 - ΔG° is zero.
 - ΔG° is $+1.72 \text{ kJ/mol}$.
 - ΔG° is incalculably large and positive.
13. The conversion of 1 mol of fructose 1,6-bisphosphate to 2 mol of pyruvate by the glycolytic pathway results in a net formation of:
- 1 mol of NAD^+ and 2 mol of ATP.
 - 1 mol of NADH and 1 mol of ATP.
 - 2 mol of NAD^+ and 4 mol of ATP.
 - 2 mol of NADH and 2 mol of ATP.
 - 2 mol of NADH and 4 mol of ATP.
14. Gluconeogenesis must use "bypass reactions" to circumvent three reactions in the glycolytic pathway that are highly exergonic and essentially irreversible. Reactions carried out by which three of the enzymes listed must be bypassed in the gluconeogenic pathway?
- Hexokinase
 - Phosphoglycerate kinase
 - Phosphofructokinase-1
 - Pyruvate kinase
 - Triosephosphate isomerase
- 1, 2, 3
 - 1, 2, 4
 - 1, 4, 5
 - 1, 3, 4
 - 2, 3, 4
15. During seed germination, the glyoxylate pathway is important to plants because it enables them to:
- carry out the net synthesis of glucose from acetyl-CoA.
 - form acetyl-CoA from malate.
 - get rid of isocitrate formed from the aconitase reaction.
 - obtain glyoxylate for cholesterol biosynthesis.
 - obtain glyoxylate for pyrimidine synthesis.
16. The glycerol produced from the hydrolysis of triacylglycerides enters glycolysis as:
- glucose.
 - glucose-6-phosphate.
 - dihydroxyacetone phosphate.
 - pyruvate.
 - glyceryl CoA.
17. Which of these amino acids can be directly converted into a citric acid cycle intermediate by transamination?
- Tyrosine
 - serine
 - threonine
 - glutamic acid
 - proline
18. Oxidative phosphorylation and photophosphorylation share all of the following *except*:
- chlorophyll.
 - involvement of cytochromes.
 - participation of quinones.
 - proton pumping across a membrane to create electrochemical potential.
 - use of iron-sulfur proteins.

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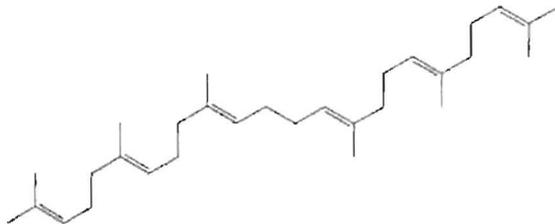
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19. The three subcellular organelles involved in the phosphoglycolate salvage pathway are:

- A) endoplasmic reticulum, chloroplast, and mitochondrion.
 - B) nucleus, endoplasmic reticulum, and chloroplast.
 - C) golgi apparatus, chloroplast, and mitochondrion.
 - D) mitochondrion, peroxisome, and chloroplast.
 - E) peroxisome, endoplasmic reticulum, and chloroplast.
20. An important intermediate in the biosynthetic pathway to aromatic amino acids is:
- A) benzoic acid. B). lactate. C) orotate. D) α -ketoglutarate. E) shikimate.

Applying what you known (40分, 每題10分)

1. Shown below is a molecule of squalene. Draw lines to indicate the junctions between the isoprene units.



2. What are histones and what is their principal role in chromatin structure and epigenetics?

3. Compare transcription and reverse transcription in terms of the following characteristics:

- (a) direction of polynucleotide synthesis
- (b) nature of template
- (c) nature of primer
- (d) incorporated nucleotides

4. Describe principles of two of the next-generation sequencing methods.