

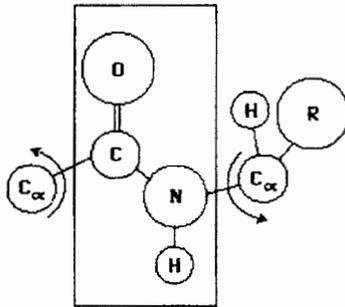
系所組別：熱帶植物科學研究所

考試科目：生物化學

考試日期：0224，節次：2

※ 考生請注意：本試題不可使用計算機 請勿在本試題紙上作答，否則不予計分
Choose the best answer (60 分，每題 2 分)

1. If heat energy is absorbed by the system during a chemical reaction, the reaction is said to be:
A) at equilibrium. B) endergonic. C) endothermic. D) exergonic. E) exothermic.
2. A compound has a pK_a of 7.4. To 100 mL of a 1.0 M solution of this compound at pH 8.0 is added 30 mL of 1.0 M hydrochloric acid. The resulting solution is pH:
A) 6.5 B) 6.8 C) 7.2 D) 7.4 E) 7.5
3. Amino acids are ampholytes because they can function as either a(n):
A) acid or a base. B) neutral molecule or an ion. C) polar or a nonpolar molecule.
D) standard or a nonstandard monomer in proteins. E) transparent or a light-absorbing compound.
4. In the diagram below, the plane drawn behind the peptide bond indicates the:



- A) absence of rotation around the C—N bond because of its partial double-bond character.
B) plane of rotation around the C —N bond.
C) region of steric hindrance determined by the large C=O group.
D) region of the peptide bond that contributes to a Ramachandran plot.
E) theoretical space between -180 and $+180$ degrees that can be occupied by the ϕ and ψ angles in the peptide bond.
5. The amino acid substitution of Val for Glu in Hemoglobin S results in aggregation of the protein because of _____ interactions between molecules.
A) covalent B) disulfide C) hydrogen bonding D) hydrophobic E) ionic
6. Which one of the following statements is true of enzyme catalysts?
A) They bind to substrates, but are never covalently attached to substrate or product.
B) They increase the equilibrium constant for a reaction, thus favoring product formation.

(背面仍有題目,請繼續作答)

- C) They increase the stability of the product of a desired reaction by allowing ionizations, resonance, and isomerizations not normally available to substrates.
- D) They lower the activation energy for the conversion of substrate to product.
- E) To be effective they must be present at the same concentration as their substrates.
7. Which of the following is *not* a reducing sugar?
- A) Fructose B) Glucose C) Glyceraldehyde D) Ribose E) Sucrose
8. An example of a glycerophospholipid that is involved in cell signaling is:
- A) arachidonic acid. B) ceramide. C) phosphatidylinositol.
- D) testosterone. E) vitamin A (retinol).
9. A hydropathy plot is used to:
- A) determine the water-solubility of a protein.
- B) deduce the quaternary structure of a membrane protein.
- C) determine the water content of a native protein.
- D) extrapolate for the true molecular weight of a membrane protein.
- E) predict whether a given protein sequence contains membrane-spanning segments.
10. The force that drives an ion through a membrane channel depends upon:
- A) the charge on the membrane. B) the difference in electrical potential across the membrane.
- C) the size of the channel. D) the size of the ion. E) the size of the membrane.
11. The reaction $\text{ATP} \rightarrow \text{ADP} + \text{P}_i$ is an example of a(n) _____ reaction.
- A) homolytic cleavage B) internal rearrangement C) free radical
- D) group transfer E) oxidation/reduction
12. The anaerobic conversion of 1 mol of glucose to 2 mol of lactate by fermentation is accompanied by a net gain of:
- A) 1 mol of ATP. B) 1 mol of NADH. C) 2 mol of ATP. D) 2 mol of NADH. E) none of the above.
13. There is reciprocal regulation of glycolytic and gluconeogenic reactions interconverting fructose-6-phosphate and fructose-1,6-bisphosphate. Which one of the following statements about this regulation is *not* correct?

- A) Fructose-2,6-bisphosphate activates phosphofructokinase-1.
- B) Fructose-2,6-bisphosphate inhibits fructose-1,6-bisphosphatase.
- C) The fructose-1,6-bisphosphatase reaction is exergonic.
- D) The phosphofructokinase-1 reaction is endergonic.
- E) This regulation allows control of the direction of net metabolite flow through the pathway.

14. Which of the following is *not* true of the citric acid cycle?

- A) All enzymes of the cycle are located in the cytoplasm, except succinate dehydrogenase, which is bound to the inner mitochondrial membrane.
- B) In the presence of malonate, one would expect succinate to accumulate.
- C) Oxaloacetate is used as a substrate but is not consumed in the cycle.
- D) Succinate dehydrogenase channels electrons directly into the electron transfer chain.
- E) The condensing enzyme is subject to allosteric regulation by ATP and NADH.

15. Saturated fatty acids are degraded by the stepwise reactions of oxidation, producing acetyl-CoA. Under aerobic conditions, how many ATP molecules would be produced as a consequence of removal of each acetyl-CoA?

- A) 2 B) 3 C) 4 D) 5 E) 6

16. The amino acids serine, alanine, and cysteine can be catabolized to yield:

- A) fumarate. B) pyruvate. C) succinate. D) α -ketoglutarate. E) none of the above.

17. Uncoupling of mitochondrial oxidative phosphorylation:

- A) allows continued mitochondrial ATP formation, but halts O_2 consumption.
- B) halts all mitochondrial metabolism.
- C) halts mitochondrial ATP formation, but allows continued O_2 consumption.
- D) slows down the citric acid cycle.
- E) slows the conversion of glucose to pyruvate by glycolysis.

18. All are true of photorespiration *except*:

- A) It is driven by light. B) It oxidizes substrates to CO₂. C) It produces O₂.
D) It results from a lack of specificity of the enzyme rubisco. E) It results in no fixation of carbon.

19. The synthesis of both glycerophospholipids and triacylglycerols involves:

- A) CDP-choline. B) CDP-diacylglycerol. C) phosphatidate phosphatase.
D) phosphatidic acid. E) phosphoethanolamine.

20. An amino acid that does *not* derive its carbon skeleton, at least in part, from oxaloacetate is:

- A) aspartate. B) lysine. C) methionine. D) proline. E) threonine.

21. In Eucaryotic, DNA are packaged to a high degree of structure, chromosome. Which is the correct packing order?

- A) histone --> core DNA -->nucleosomes-->fiber-->chromatin-->chromosome
B) core DNA-->histone-->nucleosomes-->fiber-->chromatin-->chromosome
C) core DNA--> nucleosomes --> histone --> chromatin --> fiber -->chromosome
D) core DNA-->histone--> fiber --> nucleosomes -->chromatin-->chromosome

22. Which is the correct feature of Eukaryotic genome?

- A) There is a correlation between the quantity of DNA and the complexity of the organism.
B) Most DNA in mammalian or plant is single-copy with little duplicate sequences.
C) One reason for the large size of eukaryotic genome is that most genes contain introns, which may serve as loci for alternative splicing.
D) In many cases, a gene family exists to code for different variants of the same type of proteins that may be evolved from mutation of different genes.

23. Which statement about the cell cycle in eukaryotes is NOT true?

- A) In G₁ phase, the cells contain two copies of each chromosome, the normal diploid state of a cell
B) During S phase, the DNA is replicated and form chromatin structures.
C) During G₂ phase, the spindle forms and each chromosome aligns independently for separation
D) During cytokinesis, chromatids have been separated into two cells and the nuclear envelope reforms

24. Which statement regarding DNA replication is correct?

- A) DNA polymerase binds to a fixed origin template and catalyzes replication starting from the 3' hydroxyl of a DNA deoxyribonucleotide residue on a primer strand
- B) The Okazaki fragment of the lagging strand is synthesized 3'-->5' toward replication fork and initiated by a short DNA primer
- C) The helicase-catalyzed unwinding of parental DNA strands is ATP-independent
- D) DNA polymerase I only contains polymerase activity and is mainly assigned for nucleotide incorporation during replication
25. Processing of a primary mRNA transcript in a eukaryotic cell does not normally involve:
- A) attachment of a long poly(A) sequence at the 3' end.
- B) conversion of normal bases to modified bases, such as inosine and pseudouridine.
- C) excision of intervening sequences (introns) and joining of exons.
- D) methylation of one or more guanine nucleotides at the 5' end.
26. Which statement is NOT correct?
- A) Promoter recognition is a rate-limiting step for transcription and requires a consensus sequence, usually TA rich
- B) RNA polymerase transcribes the DNA template in a 5'-->3' direction and is regulated by site-specific binding protein, repressors and activators.
- C) During initiation of translation in Eukaryotes, the correct attachment of mRNA to ribosome is determined by the 5' cap near the 5' end of each mRNA.
- D) The genetic code for mRNA translation is redundant and completely universal in all organisms and organelles.
27. Which of the following is true about the sorting pathway for proteins in eukaryotic cells?
- A) The signal sequence for plasma membrane targeting is added to the protein in a posttranslational modification reaction located in the rough ER.
- B) The newly synthesized signal peptide always located at their carboxyl termini.
- C) The signal recognition particle (SRP) will recognize the synthesized signal peptide and docking the whole complex to the rough ER for further processing.
- D) When targeting to mitochondria, the signal peptide is cleaved off inside the mitochondria by signal peptidase.
28. Biosynthesis of cytosolic protein in Eukaryotes is a complex event. During elongation of protein synthesis, the growing polypeptide chain is covalently attached to the ___ in the P-site in the ribosomal rRNA complex. The new amino acid will be

brought to the ___site with the matched anticodon for further peptide bond formation. These processes require energy from ___hydrolysis.

- A) tRNA, A, ATP B) tRNA, A, GTP C) rRNA, A, GTP D) rRNA, E, ATP

29. What is the major function of RNA polymerase II?

- A) transcription of most structural genes and some small nuclear RNAs
B) transcription and processing of the major ribosomal RNA genes
C) locates in chloroplast and transcribes chloroplast-specific genes
D) transcription of transfer RNA and 5S ribosomal RNAs

30. Which statement about epigenetic mechanisms of gene regulation is NOT true?

- A) the definition is that gene expression is regulated by changes in the genome but not mutation in DNA sequences.
B) The effect is non-heritable and reversible.
C) it can be induced by repeated DNA sequences or chromosomal location.
D) Cytosine methylation of DNA is one the classic epigenetic changes in gene expression

