國立彰化師範大學 97 學年度碩士班招生考試試題

系所：生物技術研究所碩士班　　科目：生物化學

☆☆請在答案紙上作答☆☆　　

Section 1: Multiple choices. (70%)

Please choose **the best answer** for each question. (2.5 % for each question)

1. All of the following functions of an enzyme are true EXCEPT:

(a) Enzymes help to catalyze nearly all metabolic reactions.
(b) Enzyme activity is sensitive to enzyme and substrate concentration.
(c) Enzymes are sensitive to temperature and pH changes.
(d) An increased activity of an enzyme increases the amount of energy produced.
(e) Enzymes are used as a catalyst to increase reaction rates many orders of magnitude.

2. Which functional group is **not** found in amino acids?

(a) H—N amino
(b) C=O carbonyl
(c) H—S thiol
(d) H—O alcohol
(e) P—O phosphoryl

3. The specific site on the enzyme where _____ binds and catalysis occurs is called the _____ site.

(a) Coenzyme; substrate
(b) Substrate; active
(c) Coenzyme; regulatory
(d) Regulatory; active
(e) None of the above

4. A definition of *pH* is:

(a) The negative logarithm to the base 10 of the hydrogen ion concentration.
(b) The power of H.
(c) $pH = -\ln_e[H^+]$.
(d) H is enthalpy, the heat energy at constant temperature, pressure, and volume.
(e) $pK_A = -\log_{10}[K_A]$

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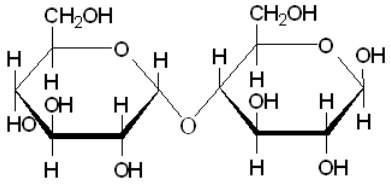
5. Structure of compound Z is a _____

(a) disaccharide name lactose
(b) monosaccharide name lactose
(c) disaccharide name galactose
(d) disaccharide name maltose
(e) disaccharide name sucrose



compound Z

6. Which of the following definitions **correctly** identifies the common name of the compound Z in question #5 ?

(a) Gal (β1→4) Fru
(b) Glc (α1→4) Glc
(c) Gal (α1→4) Glc
(d) Fru (α1→β2) Fru
(e) (Glc α1→4 Glc)$_n$

7. What is the sequence of organelles that a secreted protein would have passed through on its journey out of a cell?

(a) Mitochondria, Golgi apparatus, cell membrane.
(b) Cell membrane, mitochondria, Golgi apparatus.
(c) Rough endoplasmic reticulum, Golgi apparatus, cell membrane.
(d) Golgi apparatus, rough endoplasmic reticulum, cell membrane.

8. Which of the following is correct for a reaction with $\Delta G^\circ = 0$

(a) Is in equilibrium.
(b) Proceeds in the direction of substrates
(c) Proceeds in the direction of products
(d) $K_{eq}<0$
(e) $K_{eq}=1$

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9. A peptide bond is generated by removing the elements of water from

(a) an acid and an alcohol
(b) an aldehyde and an alcohol
(c) an acid and an amino group
(d) two acids
(e) all of the above

10. If an enzyme has a high Km for a substrate, this means

(a) it will have a low Vmax with that substrate
(b) the enzyme has a low affinity for the substrate
(c) the enzyme has a high affinity for the substrate
(d) the reaction will not be spontaneous
(e) the substrate does not bind to the active site

11. What is the overall entropy change when a salt, such as NaCl, is dissolved in water?

(a) cannot predict
(b) no significant change
(c) decrease
(d) increase

12. Which of the following are examples of exergonic processes?

(a) protein synthesis and oxidation of carbohydrates
(b) protein synthesis and active transport
(c) active transport and oxidation of carbohydrates
(d) oxidation of fats and of carbohydrates

13. Svedberg units (S), characterizes a sedimenting particle on the basis of

(a) size only
(b) shape only
(c) neither size nor shape
(d) both size and shape

14. The Tm for melting the double helix is:

(a) The temperature at which the helix starts to open.
(b) The energy needed to melt the DNA.
(c) The temperature at which the helix is completely open.
(d) The midpoint of the range over which the helix denatures.

15. Replication of eukaryotic DNA

(a) must be controlled to coordinate with the cell cycle
(b) must occur faster than replication of prokaryotic DNA
(c) takes place during mitosis
(d) takes place twice during each cell cycle

16. In eukaryotic, but not prokaryotic, DNA replication

(a) histone biosynthesis must take place
(b) a primer is needed on the lagging strand only
(c) topoisomerases are required
(d) there is only one origin of replication

17. Which of the following is not a structural motif encountered in DNA-binding proteins?

(a) β barrel
(b) leucine zipper
(c) zinc finger
(d) helix-turn-helix

18. The following modifications often occur after polymerization of RNA, **except**:

(a) Addition of phosphate to the bases.
(b) Methylation of bases.
(c) Removal of bases from the polymer.
(d) Addition of bases to the polymer.

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19. Degradation of proteins

(a) happens randomly
(b) tends to target proteins with basic amino acid residues at their N-terminal ends
(c) always requires ubiquitinylation of proteins to be degraded
(d) frequently makes use of proteasomes

20. Which statement about "chitin" is **not** correct?

(a) A linear homopolysaccharide
(b) With all the residues linked in β(1→4) glycosidic bonds
(c) The monomer is β-D-glucose
(d) Is a major structural component of the exoskeletons of invertebrates
(e) It also occurs in cell walls of algae, fungi, and yeast

21. In glycolysis pathway, which enzyme catalyzes the first ATP synthesis?

(a) D-glyceraldehyde-3-phosphate dehydrogenase
(b) Phosphoglycerate kinase
(c) phosphoglyceromutase
(d) Enolase
(e) Pyruvate kinase

22. Which statement about "Citric cycle" is **not** correct ?

(a) Succinate to fumarate was catalyzed by Succinate dehydrogenase
(b) Citrate to Isocitrate was catalyzed by Aconitase
(c) α-ketoglutarate to Succinyl-CoA was catalyzed by Succinyl-CoA synthetase
(d) Occurred in mitochondria
(e) ATP and NADH can inhibit citrate synthase

23. Tay-Sachs disease is an inborn error of lipid metabolism that the catabolism of gangliosides is blocked, which enzyme was missed in this disease?

(a) hexosaminidase A
(b) Phospho-ethanolamine cytidylyltransferase
(c) 1,2-diacylglycerol phospho-ethanolamine transferase
(d) HMG-CoA synthase

(e) Acyl-CoA dehydrogenase

24. Which is **not** a precursor for the biosynthesis of cholesterol?

(a) Squalene
(b) Mevalonate
(c) Acetyl-CoA
(d) phosphoethanolamine
(e) Isoprene

25. Which is **not** true about ribulose-1,5-bisphosphate carboxylase/oxygenase (Rubisco)?

(a) It catalyzed the first reaction of the Calvin cycle
(b) It is probably one of the most abundant proteins in nature
(c) It consists of 8 large subunits and 8 small subunits
(d) It is located on the stromal side of the thylakoid membrane
(e) All the subunits were encoded by nuclear genes

26. Following amino acid were come from common precursor **except** ?

(a) Lysine
(b) Leucine
(c) Isoleucine
(d) methionine
(e) Asparagine

27. Which is essential amino acid in human?

(a) Asparagine
(b) Cysteine
(c) Leucine
(d) Proline
(e) Tyrosine

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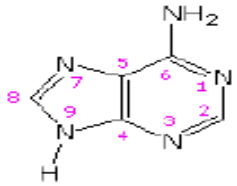
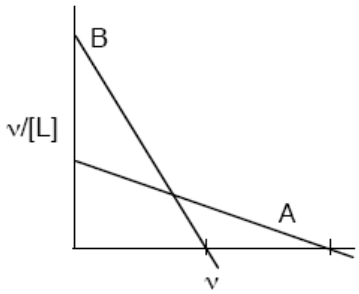
28. Following figure is a purine structure, which is **not** correct about purine biosynthesis ?



(a) N1 was come from aspartate
(b) N3 was come from glutamine
(c) N9 was come from glutamine
(d) C5 was come from glycine
(e) C6 was come from glycine

Section 2 : Short Answer (30%)

1. Ligand binding data from two different receptors that bind the same ligand are plotted on a Scatchard plot to the right. Indicate which receptor, A, B or neither, binds ligand with higher affinity. Briefly justify your answer. (5 %)



2. Please describe the mechanism and application of the RNA interference. (5 %)

3. Please describe the Genome, Transcriptome, Proteome and Metabolome. (5 %)

4. What is “Cori cycle” ? Please draw a figure to explain. (5 %)

5. “One of the great tragedies about being human is that it is far too easy to gain weight and far too difficult to lose it”. Please explain why is human so hard to lose weight by biochemical concept and provide your suggestion to improve it. (5 %)

6. Please described the role of pyridoxal phosphate (PyrP) in transamination reaction during amino acids biosynthesis. (5 %)