※ 請勿在本試題紙上作答，否則不予計分。

工.單選題 (Simple Choice Questions): 共 25 題, 每題 2 分

1 Cross-phosphorylation is possible when two receptor proteins

A) are cleaved.
B) dimerize.
C) are internalized into organelles.
D) All of the above.
E) None of the above.

2 Advantages of using second messengers in signal transductions include:

A) the signal can be amplified by making many second messengers.
B) second messengers can freely diffuse to other sites within the cell.
C) a few common second messengers can be used in multiple signaling pathways.
D) All of the above.
E) None of the above.

3 When a molecule moves from a concentration of 10^{-4} M to 10^{-2} M, is the process spontaneous, at equilibrium, or does it require an input of energy?

A) at equilibrium
B) input of energy required
C) spontaneous
D) All of the above.
E) None of the above.

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D) All of the above.
E) None of the above.

5 Blood clotting cascades are controlled by

A) zymogen activation.
B) phosphorylation.
C) allosteric activation.
D) All of the above.
E) None of the above.

(背面仍有題目,請繼續作答)

6 The Gibbs free energy of activation in enzymatic catalysis reaction is

A) the difference between the substrate and the transition state.
B) the difference between the substrate and the product.
C) the difference between the product and the transition state.
D) All of the above.
E) None of the above.

7 When substrate concentration is much greater than K_M, the rate of catalysis is almost equal to

A) K_d. B) k_{cat}. C) V_{max}. D) All of the above. E) None of the above.

8 Two-dimensional electrophoresis is a combination of what two sequential techniques?

A) isoelectric focusing and affinity chromatography
B) ion-exchange chromatography and SDS-PAGE
C) SDS-PAGE and isoelectric focusing
D) isoelectric focusing and SDS-PAGE
E) isoelectric focusing and ion-exchange chromatography

9 Which of the following techniques can be used to determine or estimate the molecular weight of proteins?

A) MALDI-TOF
B) Gel permeation chromatography
C) SDS-PAGE
D) All of the above
E) None of the above

10 A technique used to identify proteins after gel electrophoresis, which employs antibodies in the detection process.

A) None of these.
B) Southwestern Blot
C) Western Blot
D) Southern Blot
E) Northern Blot

11 The use of synthetic peptides includes

A) use as antigens for making antibodies.

B) drugs.

C) "hooks" used in purification.

D) All of the above.

E) a and c.

12 Name three amino acids that are positively charged at a neutral pH.

A) lys, arg, and his

B) his, arg, and cys

C) cys, arg, and met

D) lys, arg, and pro

E) arg, glu, and his

13 Why is the peptide bond planar?

A) Bulky side chains prevent free rotation around the bond.

B) It contains partial double-bond character, preventing rotation.

C) Hydrogen bonding between the NH and C=O groups limits movement.

D) None of the above.

E) All of the above.

14. Pyruvate dehydrogenase complex catalyze the pyruvate to acetyl-CoA, which it requires several coenzymes (cofactors) for function such as following compounds except?

A) Biotin.

B) Flavin adenine dinucleotide (FAD).

C) Lipoic acid.

D) Thiamine pyrophosphate (TPP).

15. Following which molecules are the possible products when the long-chain odd-number fatty acids are completely oxidized and cleaved in tissues:

A) Acetyl-CoA.

B) Propionyl-CoA.

C) Succinyl-CoA.

D) Oleoyl-CoA.

（背面仍有題目,請繼續作答）

16. Following which enzyme is not involved in urea production from ammonia?

A) Carbamoyl phosphate synthetase I.
B) Ornithine transcarbamoylase.
C) Arginase.
D) Ureasuccinate synthetase.

17. Following which statements are correct regarding the protein complexes in mitochondrial electron-transfer chain except?

A) Complex I catalyze e^- transfer from NADH to ubiquinone.
B) Complex II catalyzes e^- transfer from NADPH to ubiquinone.
C) Complex III carries e^- from ubiquinone to cytochrome c.
D) Complex IV transfers e^- from cytochrome c to O_2.

18. Following which molecule is the immediate donor of glucose residues in the reaction catalyzed by glycogen synthase for glycogen synthesis:

A) Glucose 6-phosphate.
B) Glucose 1-phosphate.
C) UDP-glucose.
D) Fructose 6-phosphate

19. Following which statements are corrects regarding cholesterol biosynthesis in vertebrate except?

A) It takes place in the liver.
B) HMG-CoA reductase is the major point of regulation on the pathway to cholesterol.
C) HMG-CoA synthase is the enzyme of committing step to the synthesis of cholesterol.
D) Glucagon and insulin can regulate cholesterol biosynthesis.

20. Glutamine synthetase is responsible for assimilation of NH_4^+ into glutamate, and is a primary regulatory point in nitrogen metabolism. Following which compounds can down-regulated the activities of glutamine synthetase in *E. coli* except?

A) Glycine.
B) Alanine.
C) Tryptophan.
D) Sucrose.

21. Nitric oxide (NO) plays an important role in a range of physiological processes such as neurotransmission, blood clotting, and the control of blood pressure, following which compound is the precursor for the biosynthesis of nitric oxide?

A) Ornithine.
B) Arginine.
C) Adenine.
D) Lysine.

22. The formation of mRNA 5' cap requires following which enzymes except?

A) Phosphohydrolase.
B) Guanyltransferase.
C) Guanine-7-methyltransferase.
D) Polyguanylate polymerase.

23. Following which statements are correct regarding the Klenow fragment of DNA polymerase I except?

A) It retains polymerization activity.
B) It retains proofreading activity.
C) It retains 3' to 5' exonuclease activity.
D) It retains 5' to 3' exonuclease activity.

24. Following which statements are correct regarding the topoisomerases except?

A) They play important roles in DNA replication and packaging.
B) They play important roles in DNA transcription.
C) The enzymes can break one of the two or both DNA strands.
D) They do not change the linking number of DNA.

25. Following which elements are usually required for constructing a yeast artificial chromosome (YAC) except?

A) Centromere.
B) Transposable element
C) Autonomouse replication sequence (ARS).
D) Telomere.

（背面仍有題目,請繼續作答）

II. 簡答題 (Short Essay): 共 10 題, 每題 5 分

1. In muscle tissue, the rate of conversion of glycogen to glucose-6-phosphate is determined by the ratio of phosphorylase a (active) to phosphorylase b (less active). What happens to the rate of glycogen breakdown if a muscle preparation containing glycogen phosphorylase is treated with: (a) phosphorylase kinase and ATP; (b) phosphorylase phosphatase; (c) epinephrine?

2. Cellular respiration can be studied in isolated mitochondria by measuring oxygen consumption under different condition. If high concentration of sodium malonate (0.01 M) is added to actively respiring mitochondria that are using pyruvate as fuel source, respiration soon stops and a metabolic intermediate accumulates.
   (a) What is the intermediate and its structure?
   (b) Explain why it accumulates.
   (c) Explain why oxygen consumption stops.
   (d) Aside from removing the malonate, how can this inhibition of respiration be overcome? Please explain.

3. Please describe or draw the two general strategies to form the phosphodiester bond of phospholipids!

4. Please define the properties of DNA strands at the replication fork in *E. coli*!

5. Please describe or draw the processes of the formation of the initiation complex during protein synthesis in *E. coli*.

6. What is the relationship between breast cancer, and Her 2 (a membrane protein that is very similar to the EGF receptor), and anti-Her2 monoclonal antibody?

7. Why is it dangerous to eat puffer fish (河豚) that are not properly prepared?

8. Many enzymes are regulated by either covalent modification or proteolytic activation. Why is covalent modification advantageous when compared to proteolytic activation?

9. What are transition state analogs? Why is advantageous to use transition state analogs to design inhibitors of an enzyme?

10. What functional role does the "distal histidine" play in the function of myoglobin and hemoglobin?