

國立成功大學

112學年度碩士班招生考試試題

編 號： 62

系 所： 熱帶植物與微生物科學研究所

科 目： 生物化學

日 期： 0207

節 次： 第 1 節

備 註： 不可使用計算機

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

I. Select the best answer (60 points):

1. Which of the following is *not* required in the synthesis of fatty acids?
 - A) Acetyl-CoA
 - B) Biotin
 - C) HCO_3^- (CO_2)
 - D) Malonyl-CoA
 - E) NADH
2. Which of these enzymes is *not* part of the Calvin cycle?
 - A) Aldolase
 - B) Glyceraldehyde 3-phosphate dehydrogenase
 - C) Phosphofructokinase-1
 - D) Ribulose-5-phosphate kinase
 - E) Transketolase
3. Almost all of the oxygen (O_2) one consumes in breathing is converted to:
 - A) acetyl-CoA.
 - B) carbon dioxide (CO_2).
 - C) carbon monoxide and then to carbon dioxide.
 - D) none of the above.
 - E) water.
4. Pyridoxal phosphate is a cofactor in this class of reactions:
 - A) acetylation.
 - B) desulfuration.
 - C) methylation.
 - D) reduction.
 - E) transamination.
5. The carbon atoms from a fatty acid with an odd number of carbons will enter the citric acid cycle as acetyl-CoA and:
 - A) butyrate.
 - B) citrate.
 - C) malate.
 - D) succinyl-CoA.
 - E) α -ketoglutarate.
6. The reaction of the citric acid cycle that produces an ATP equivalent (in the form of GTP) by substrate level phosphorylation is the conversion of:
 - A) citrate to isocitrate.

- B) fumarate to malate.
 - C) malate to oxaloacetate.
 - D) succinate to fumarate.
 - E) succinyl-CoA to succinate.
7. 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.
8. The steps of glycolysis between glyceraldehyde 3-phosphate and 3-phosphoglycerate involve all of the following *except*:
- A) ATP synthesis.
 - B) catalysis by phosphoglycerate kinase.
 - C) oxidation of NADH to NAD⁺.
 - D) the formation of 1,3-bisphosphoglycerate.
 - E) utilization of P_i.
9. Which of the following statements concerning receptor enzymes is correct?
- A) They are not usually membrane-associated proteins.
 - B) They contain an enzyme activity that acts upon a cytosolic substrate.
 - C) They contain an enzyme activity that acts upon the extracellular ligand.
 - D) They have a ligand-binding site on the cytosolic side of the membrane.
 - E) They have an active site on the extracellular side of the membrane.
10. Membrane proteins:
- A) are sometimes covalently attached to lipid moieties.
 - B) are sometimes covalently attached to carbohydrate moieties.
 - C) are composed of the same 20 amino acids found in soluble proteins.
 - D) diffuse laterally in the membrane unless they are anchored.
 - E) have all of the properties listed above.
11. Which of the following is *not* a fat-soluble vitamin?
- A) A
 - B) C
 - C) D
 - D) E
 - E) K

12. A major component of RNA but not of DNA is:
- A) adenine.
 - B) cytosine.
 - C) guanine.
 - D) thymine.
 - E) uracil.
13. Starch and glycogen are both polymers of:
- A) fructose.
 - B) glucose 1-phosphate.
 - C) sucrose.
 - D) α -D-glucose.
 - E) β -D-glucose.
14. One of the enzymes involved in glycolysis, aldolase, requires Zn^{2+} for catalysis. Under conditions of zinc deficiency, when the enzyme may lack zinc, it would be referred to as the:
- A) apoenzyme.
 - B) coenzyme.
 - C) holoenzyme.
 - D) prosthetic group.
 - E) substrate.
15. Which of the following enzymes is specific to glyoxysome?
- A) Catalase.
 - B) Isocitrate lyase
 - C) Peroxidase
 - D) PEP carboxylase
 - E) Superoxide dismutase
16. Which of the following statements about nitrogen fixation is **correct**?
- A) Cannot be found in unicellular organism.
 - B) Plants other than legume cannot fix nitrogen.
 - C) Leghemoglobin is the enzyme responsible for nitrogen fixation.
 - D) Nitrogen fixation is a high energy consuming process, so oxygen supply in the nodule is very important.
 - E) Hydrogen gas could be produced in nitrogen fixation.
17. Which of the following vitamins could be supplemented by having golden rice?
- A) Vitamin A
 - B) Vitamin B
 - C) Vitamin C
 - D) Vitamin D

E) Vitamin E

18. Which of the following amino acids is an essential amino acid?

A) Alanine.

B) Glutamate.

C) Glycine.

D) Histidine.

E) Serine.

19. Which of the following sugars is a monosaccharide?

A) Sucrose

B) Maltose

C) Galactose

D) Lactose

E) Glycogen

20. Which of the following statements is incorrect?

A) Exergonic reaction is a spontaneous reaction.

B) The free energy of the product is lower than the reactant in exergonic reaction.

C) ATP synthesis is an exergonic reaction.

D) The change of free energy (ΔG) is greater than zero in endergonic reaction.

E) Entropy is not the energy available to do work.

Applying what you know

1. If ice were denser than water, how would that affect life on earth? (10%)

2. What is meant by endosymbiotic association? How can this concept explain the evolution of eukaryotic cells that are capable of carrying out photosynthesis and/or aerobic metabolism? (10%)

3. What are the similarities and differences between respiration and photorespiration? (10%)

4. Some plants perform C3 photosynthesis and some perform C4 photosynthesis. Which type of the photosynthesis is more efficient? Why? (10%)