

國立嘉義大學九十三年學年度

生物科技研究所碩士班招生考試試題

科目：生物化學

一、選擇題：50% (單選題，每題 2 分)

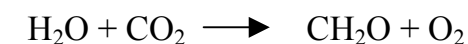
- In a conjugated protein, a prosthetic group is:
 - a part of the protein that is not composed of amino acids.
 - a fibrous region of a globular protein.
 - a subunit of an oligomeric protein.
 - synonymous with "protomer."
 - a nonidentical subunit of a protein with many identical subunits.
- In the binding of oxygen to myoglobin, the relationship between the concentration of oxygen and the fraction of binding sites occupied can best be described as:
 - hyperbolic.
 - sigmoidal.
 - linear with a positive slope.
 - linear with a negative slope.
 - random.
- Enzymes are potent catalysts. They:
 - drive reactions to completion while other catalysts drive reactions to equilibrium.
 - are consumed in the reactions they catalyze.
 - are very specific and can prevent the conversion of products back to substrates.
 - increase the equilibrium constants for the reactions they catalyze.
 - lower the activation energy for the reactions they catalyze.
- Which of the following amino acid residues is not a point of oligosaccharide attachment in glycoproteins?
 - Thr.
 - Gly.
 - Ser.
 - Asn.
- A lipid derived from isoprenoid precursors is:
 - palmitate.
 - cholesterol.
 - arachidonate.
 - prostaglandin G₂.
 - sphingosine.
- 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:
 - citrate to isocitrate.
 - succinyl-CoA to succinate.
 - succinate to fumarate.
 - fumarate to malate.
 - malate to oxaloacetate.
- The role of hormone-sensitive triacylglycerol lipase is to:
 - hydrolyze lipids stored in the liver.
 - hydrolyze triacylglycerols stored in adipose tissue.
 - hydrolyze membrane phospholipids in hormone-producing cells.
 - synthesize triacylglycerols in the liver.
 - synthesize lipids in adipose tissue.
- Almost all of the oxygen (O₂) one consumes in breathing is converted to:
 - carbon dioxide (CO₂).
 - carbon monoxide and then to carbon dioxide.
 - water.
 - acetyl-CoA.
 - none of the above.
- All of the following are considered "weak" interactions in proteins except:
 - van der Waals forces.
 - hydrogen bonds.
 - ionic bonds.
 - peptide bonds.
 - hydrophobic interactions.
- In hemoglobin, the transition from T state to R state (low to high affinity) is triggered by:
 - subunit association.
 - subunit dissociation.
 - Fe²⁺ binding.
 - heme binding.
 - oxygen binding.
- In competitive inhibition, an inhibitor:
 - binds at several different sites on an enzyme.
 - binds reversibly at the active site.
 - binds only to the ES complex.
 - binds covalently to the enzyme.
 - lowers the characteristic V_{max} of the enzyme.
- When the linear form of glucose cyclizes, the product is a(n):
 - glycoside.
 - hemiacetal.
 - anhydride.
 - lactone.
 - oligosaccharide.
- The hydrolysis of ATP has a large negative G^o; nevertheless the molecule is stable in solution. This stability is due to:
 - resonance stabilization.
 - entropy stabilization.
 - the hydrolysis reaction having a large activation energy.
 - ionization of the phosphates.
 - the hydrolysis reaction being endergonic.

14. The anaerobic conversion of 1 mol of glucose to 2 mol of lactate by fermentation is accompanied by a net gain of:
- 1 mol of ATP.
 - 2 mol of ATP.
 - 1 mol of NADH.
 - 2 mol of NADH.
 - none of the above.
15. Which of the following is not an intermediate of the citric acid cycle?
- oxaloacetate.
 - citrate.
 - α -ketoglutarate.
 - succinyl-CoA.
 - acetyl-CoA.
16. Which of these is able to cross the inner mitochondrial membrane?
- fatty acyl-CoA.
 - malonyl-CoA.
 - acetyl-CoA.
 - fatty acyl-carnitine.
 - None of the above can cross.
17. Uncoupling of mitochondrial oxidative phosphorylation:
- halts all mitochondrial metabolism.
 - slows down the citric acid cycle.
 - allows continued mitochondrial ATP formation, but halts O_2 consumption.
 - halts mitochondrial ATP formation, but allows continued O_2 consumption.
18. Which of the following substrates cannot contribute to net gluconeogenesis in mammalian liver?
- alanine.
 - palmitate.
 - α -ketoglutarate.
 - glutamate.
 - pyruvate.
19. Amino acid residues commonly found at the end of β turn are:
- Ala and Gly.
 - Pro and Gly.
 - two Cys.
 - hydrophobic.
 - those with ionized R groups.
20. In a plot of $1/V$ against $1/[S]$ for an enzyme-catalyzed reaction, the presence of a competitive inhibitor will alter the:
- V_{max} .
 - intercept on the $1/V$ axis.
 - intercept on the $1/[S]$ axis.
 - curvature of the plot.
 - pK of the plot.
21. V_{max} for an enzyme-catalyzed reaction:
- generally increases when pH increases.
 - increases in the presence of a competitive inhibitor.
 - is unchanged in the presence of a uncompetitive inhibitor.
 - is twice the rate observed when the concentration of substrate is equal to the K_m .

- E) is limited only by the amount of substrate supplied.
22. A lipid derived from isoprenoid precursors is:
- palmitate.
 - cholesterol.
 - arachidonate.
 - prostaglandin G_2 .
 - sphingosine.
23. The precursors of DNA and RNA synthesis in the cell all contain:
- ribose.
 - deoxyribose.
 - adenine.
 - 3 phosphates.
 - 3 sugars.
24. The main function of the pentose phosphate pathway is to:
- supply energy.
 - give the cell an alternative pathway should glycolysis fail.
 - supply NADH.
 - provide a mechanism for the utilization of the carbon skeletons of excess amino acids.
 - supply pentoses and NADPH.
25. The glyoxylate cycle is:
- an alternative path of glucose metabolism in cells that do not have enough O_2 .
 - the most direct way of providing the precursors for synthesis of nucleic acids (e.g., ribose).
 - defective in people with phenylketonuria.
 - a means of using acetate for both energy and biosynthetic precursors.

二、簡答題 : (10%)

Photosynthesis in plant could be presented as a simple reaction as follow:



- Which product will be labeled with radioactive O^{18} , if the reaction is performed using H_2O^{18} .
- Why ?

三、申論題 : (40%)

- Dehydrogenase usually binds NAD^+ as a cofactor, what is the chemical structure of NAD^+ ? Could you describe the function of two main parts of NAD^+ structure? (15%)
- Give three reasons to explain the complexity of the polysaccharide structure of glycoprotein is much higher than those of proteins and DNA biopolymers. (10%)
- Glutathione (γ -glutamyl-L-cysteinylglycine; GSH) is a tripeptide biomolecules. It participates in many cellular reactions. Besides some cellular redox reactions, antioxidation and detoxication are two among the important activities of GSH. Please describe these reactions. (15%)