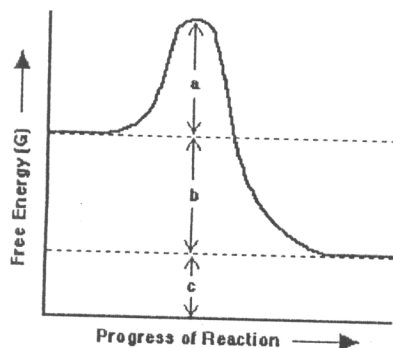


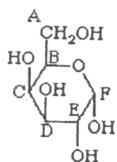
A、單選題：(40%，每題 2 分)

1. How many NAD^+ are needed in the conversion of glucose to pyruvate?
A. 1
B. 2
C. 3
D. 4
2. Which of the following designates the conversion from fructose 6-phosphate to fructose 1,6-biphosphate?
A. gluconeogenesis
B. fructoseogenesis
C. glycolysis
D. fructolysis
3. How many ATPs are produced in the oxidation of palmitoyl-CoA to eight molecules of acetyl-CoA?
A. 16
B. 20
C. 24
D. 28
4. Which is the RU486 compound analog?
A. nucleotide
B. steroid
C. carbohydrate
D. peptide
5. Which ion tends to spontaneously across the outermembrane in an animal cell?
A. K^+
B. Na^+
C. Ca^{2+}
D. Cl^-
6. The following figure shows changes in free energy (G) during the course of a chemical reaction. Examine the double-headed arrows (a, b, c) in the figure. Indicate which arrow would be affected by enzyme catalysis (A) a (B) b (C) c (D) a+b.



7. The pK_a values of lysine are 2.18 for α -carboxylic group, 8.95 for α -amino group, and 10.53 for amino acid side chain. What is the charge on lysine at pH 6.3?
A. -1 B. 0 C. +1 D. +2

8. Which name most completely describes this cyclic acetal form?
 A. α -D-Galactofuranose B. β -D-Galactofuranose
 C. α -D-Galactopyranose D. β -D-Galactopyranose



9. Type of "chemical force" or bond that may drive the interaction between lipophilic drugs and biological membrane lipids:
 A. covalent B. electrostatic C. hydrophobic D. hydrogen
10. General functions of polysaccharides in humans are as:
 A. storage forms of sugars, such as glycogen, and as building materials for cells.
 B. storage forms of proteins such as starch, and as building materials for cells.
 C. storage forms of lipids such as glycogen, and as monomers of nucleic acids.
 D. storage forms of lipids such as starch, and as monomers of carbohydrates.
11. Which of the following function has not been identified for an intron?
 A. endonuclease B. reverse transcriptase
 C. polymerase D. maturase
12. Which of the statement is false?
 A. Autonomous replication sequence (ARS) elements in yeast appear to contain multiple copies of an 11- nucleotide core consensus sequence clustered within a region about 100 nucleotides.
 B. Two distinct types of DNA polymerases are needed in eukaryotes: DNA polymerase alpha on the lagging strand and DNA polymerase delta on the leading strand.
 C. Replication forks in bacteria and eukaryotic cells travel at the same rate, indicating that the packaging of DNA into chromatin does not hinder the replication process.
 D. Chromosomal regions are replicated in large units, and different regions of each chromosome are replicated in a reproducible order.
13. Which of the statement is true?
 A. The two X chromosomes in a female mammalian cell, only one of which is active, are replicated at the same time during S phase.
 B. Like most proteins, histones are synthesized continuously throughout interphase, but they are deposited on DNA to make new chromatin only during S phase.
 C. When an S-phase cell is fused with a G₂-phase cell, DNA synthesis is induced in the G₂ nucleus; when an S-phase cell is fused with a G₁-phase cell, however, the G₁ nucleus is not stimulated to synthesize DNA.
 D. In the living cell chromatin usually adopts the extended "beads-on-a-string" form.
14. Which of the statement is true?
 A. Each chromosome contains a single long DNA molecule.
 B. In genes from higher eukaryotes, introns are usually larger and more numerous than exons. relatively small
 C. Histones are relatively small proteins with a very high proportion of negatively charged amino acids.
 D. Nuclease-hypersensitive sites in chromatin are located in the linker DNA as well as nucleosomes.

15. Which of the statement is false?
- A. In order to bind to a promoter and initiate transcription, all three RNA polymerases in eukaryotes require a TATA sequence in the DNA and several general transcription factors.
 - B. The DNA between the enhancer and the promoter loops out to allow the proteins bound to the enhancer to interact directly either with one of the general transcription factors or with RNA polymerase itself.
 - C. Unlike eukaryotes, which use three different RNA polymerases, prokaryotes use only one type of core RNA polymerase molecule but modify it with different sigma subunits.
 - D. As much as 5% of the coding capacity of a mammalian genome may be devoted to the synthesis of proteins that serve as regulators of gene transcription.
16. Glucokinase is also regulated by insulin in liver, but not via phosphorylation. How is this regulation accomplished?
- (A) Via increased transcription of the gene encoding this enzyme
 - (B) Via allosteric regulation by fructose-2,6-bisphosphatase
 - (C) Activation by association with IRS-1
 - (D) An inhibitory subunit of the enzyme dissociates after binding Camp
17. The terminal electron acceptor during mitochondrial respiration:
- (A) H_2O
 - (B) NAD^+
 - (C) FAD
 - (D) O_2
18. N^5 -methyl tetrahydrofolate (THF) and methyl- B_{12} are both cofactors in the reaction that produces:
- (A) methionine
 - (B) thymidylate
 - (C) methylmalonyl CoA
 - (D) inosine monophosphate
19. Which molecule is not the precursor in the phospholipid synthesis
- (A) diacylglycerol
 - (B) choline
 - (C) N-acetylneuraminic acid
 - (D) ethanolamine
20. To which receptor does epinephrine bind in order to stimulate phosphorylation of glycogen synthase, glycogen phosphorylase, PFK-2/FBPase-2 bifunctional enzyme, and pyruvate kinase?
- (A) alpha-1
 - (B) alpha-2
 - (C) beta
 - (D) glucagons

B、複選題：(30%，每題3分，全對才給分)

1. Which of the following statements are correct?
- A. The cell cycle has three stages.
 - B. Cyclin-dependent protein kinases (CDKs) regulate cell division by phosphorylating critical proteins.
 - C. The activity of a CDK is strikingly affected by phosphorylation and dephosphorylation of two critical residues in the protein.
 - D. The specific protein inhibitors bind to and inactivate specific CDKs.

C、簡答題：(30%，每題 5 分)

1. Describe what and how products are produced from one turn of the citric acid cycle.
2. What are the evidences that DNA is coiled in arrays of chromosomes?
3. Please draw and explain the two types of active transport.
4. Based on the data in the following figure, estimate the maximal velocity (V_m) and the Michaelis-Menten constant (K_m) for alkaline phosphatase.

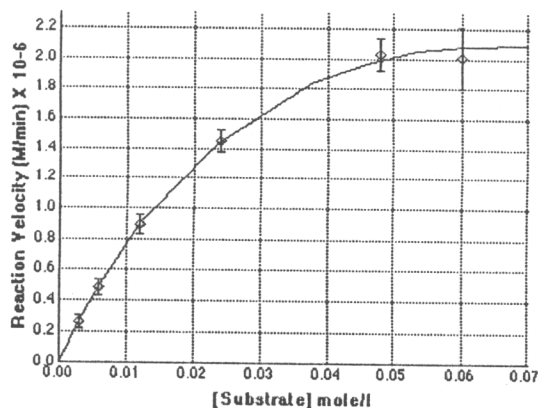


Figure. Substrate concentration-velocity curve for alkaline phosphatase based on means and error bars from five replicate groups. Enzyme concentration in all reactions was 1.5 mg/100 ml.

5. Draw the triacylglycerol composed of glycerol and lauric acid.
Lauric Acid = $\text{CH}_3(\text{CH}_2)_{10}\text{CO}_2\text{H}$, Glycerol = $\text{CH}_2\text{OHCHOHCH}_2\text{OH}$ Metabolism is controlled in several ways. What are they?
6. What are the sources of ring atoms in purine and pyrimidine synthesis?