單選題 (please select the best answer)
Each of these 50 questions worth 2 points.

Part I
1. The average diameter of a DNA molecule is:
   a) 0.5 nm   b) 4 nm   c) 20 nm   d) 100 nm   e) 500 nm

2. The major absorption wavelength of a DNA is
   a) 260 nm   b) 450 nm   c) 880 nm   d) 1200 nm   e) 1500 nm

3. Sucrose consists of glucose and ___ monosaccharides.
   a) fructose   b) glucose   c) galactose   d) arabinose

4. Gln is the three letter symbol for which amino acid?
   a) Glycine   b) Glutamine   c) Glutamate   d) Leucine

5. The structure on the left is a(n)__________, and the structure on the right is a(n)__________.
   a) lipid, polypeptide   b) carbohydrate, lipid
   c) carbohydrate, amino acid   d) nucleotide, amino acid

6. Total hydrolysis of this lipid yields one glycerol, two fatty acids, one phosphate and one polar alcohol group:
   a) ceramide.   b) glycerolphospholipid.   c) sphingomyelin.   d) triacylglycerol.

7. A nucleotide is made up of
   a) nitrogen base-fatty acid-sugar   b) nitrogen base-sugar -phosphate
   c) nitrogen base-amino acid-sugar   d) nitrogen base- amino acid-phosphate
8. The nucleotide ________ is found only in DNA, whereas ________ is found only in RNA.
   a) thymine; adenosine  b) adenosine; uracil
   c) cytosine; guanine   d) thymine; uracil

9. Catalysts do which of the following?
   a) Increase the amount of products by slowing the reverse reaction
   b) Decreases the amount of free energy of the products
   c) Increase the rate of reactions by lowering the activation energy
   d) Keep the products segregated from the reactants

10. According to scientists, how long has life been evolving on the planet earth?
    a) 6000 years  b) 10 billion years  c) 30 million years  d) 3.5 billion years

11. Anything that is made or destroyed in a biological system is done so by what type of protein?
    a) catalyst  b) enzyme  c) transport  d) motility

12. DNA sequences, such as ACGT, are sometimes written without directionality. When this happens it is assumed that the sequence means which of the following?
    a) 5'-'ACGT-3'  b) 3'-'ACGT-5'  c) 5'-'TGCA-3'  d) 5'-'TGCA-5'

13. New proteins are synthesized from amino acids which are attached to what type of RNA?
    a) snRNA  b) mRNA  c) tRNA  d) rRNA

14. Within a single strand of DNA or RNA, each nucleotide base is linked by a
    a) H-bond  b) peptide bond  c) sugar-phosphate ester bond  d) none of these

15. Water molecules tend to stick to each other because of:
    a) ionic bond  b) H-bond  c) covalent bond  d) magnetic attraction

16. A lipid molecule is composed of glycerol and fatty acid molecules in a ratio of
    a) 1:1  b) 1:2  c) 1:3  d) 1:4
17. Fatty acids are generally found in ___, and sphingolipids are generally found in ___ within a living organism.
   a) bilayers, micelles  b) micelles, micelles
c) micelles, bilayers  d) bilayers, bilayers

18. Which of the following would you most likely to find only in animal cells?
   a) lipid       b) cellulose   c) glycogen    d) protein

19. What is a protein’s most important feature with respect to its function?
   a) its size       b) its amino acid sequence
c) the kinds of fatty acid it includes   d) its nucleotide sequence

20. Disulfide bond formation is an example of ___ of proteins.
   a) translation  b) posttranslational modification
c) transcription d) posttranscriptional modification

21. Proteins with very high carbohydrate content (85-95%) are called ___
   a) proteoglycan b) cellbiose    c) arabinose d) glycoprotein

22. Which of the following describes tertiary (3r) structure?
   a) amino acid sequence b) a-helices and b-sheet
c) positions of all atoms within the protein d) interaction of subunits

23. Myoglobin is used for the purpose in our bodies?
   a) transport oxygen b) storage of oxygen
c) store genetic information d) muscle contraction

24. The noncovalent interaction which results in double-stranded DNA and "stem-loop" structures within RNA is ___
   a) H-bonding b) hydrophobic interactions
c) sugar-phosphate ester bond d) ionic bond

25. Cholesterol is an example of what special class of lipids?
   a) steroids b) sphingolipids c) fatty acids d) glycerophospholipids
Part II
1. The enzyme hexokinase, which catalyzes the following reaction, is inhibited by
   \[ \text{Glucose + ATP} \rightarrow \text{glucose-6 phosphate + ADP} \]
   (1) Glucose  (2) Glucose-1-phosphate
   (3) Glucose-6-phosphate  (4) Pyruvate

2. In gluconeogenesis, phosphoenolpyruvate is formed from the reaction of
   \[ \text{__________ and GTP.} \]
   (1) Acetyl-CoA  (2) Malate
   (3) Oxaloacetate  (4) Pyruvate

3. Adipose tissue cannot resynthesize triacylglycerols from glycerol released during
   lipolysis because adipocytes lack
   \[ \text{__________.} \]
   (1) Hormone-sensitive lipase  (2) Glycerol kinase
   (3) Glycerol phosphate dehydrogenase  (4) Triacylglycerol synthase

4. Ketone bodies are exported from liver for use by other tissues. Such property is
   due to liver containing low levels of the enzyme that synthesizes acetoacetyl-CoA
   from \[ \text{__________.} \]. Which one of the following compounds is not true?
   (1) Acetoacetate  (2) ATP
   (3) CoA-SH  (4) Acetyl-CoA

5. Muscle lacks the enzyme \[ \text{__________.} \], so glucose phosphates derived from
   glycogen cannot be converted to glucose and released from the tissue.
   (1) Glucose-1-phosphatase  (2) Glucose-6-phosphatase
   (3) Fructose-1-phosphate  (4) Fructose-6-phosphate

6. Insulin actions on glucose level in the blood. Which of the following descriptions
   about effects of the hormone is not true?
   (1) Increase permeability to glucose  (2) Decrease glycogen synthesis
   (3) Decrease lipolysis  (4) Increase Glycolysis

7. Formation of mevalonate is a major step in the biosynthesis of cholesterol.
   \[ \text{__________.} \] regulates the overall pathway of cholesterol biosynthesis and
   catalyzes the precursors to produce mevalonate.
   (1) Cytochrome P450  (2) HMG-CoA reductase
   (3) Mevalonate transferase  (4) Squene monoxygenase

8. Nitric oxide (NO\(^\cdot\)) is a signal-transducing agent in vasodilation of endothelial
   vascular cells and underlying smooth muscle. Which of the following amino acid
   could be a precursor of NO\(^\cdot\) ?
   (1) Arginine  (2) Aspartate  (3) Glutamate  (4) Lysine
9. In the kinetics of enzymatic catalysis of \( E + S \leftrightarrow ES \), which of the following equations is true?

(1) \( V = V_{\text{max}} [S] / (K_M + [S]) \)  
(2) \( V = K_M [S] / (V_{\text{max}} + [S]) \)  
(3) \( V = (K_M + [S]) / V_{\text{max}} [S] \)  
(4) \( V = (V_{\text{max}} + [S]) / K_M [S] \)

10. There are two sub processes of photosynthesis, including ________ and ________ reactions.

(1) CO₂, H₂O  
(2) ATP, HADPH  
(3) Chloroplast, Mitochondria  
(4) Light, Dark

11. Overall reaction of photosynthesis, \( 6 \text{CO}_2 + 6 \text{H}_2\text{O} \rightarrow \text{C}_2\text{H}_12\text{O}_6 + 6 \text{O}_2 \), how many photons must be absorbed?

(1) 30  
(2) 36  
(3) 42  
(4) 48

12. What of the following steroid receptors is bound by RU486? The action blocks the events essential to implantation of a fertilized ovum in the uterus.

(1) Estrogen  
(2) FSH  
(3) LH  
(4) Progesterone

13. During anaerobic glycolysis in animals, pyruvate is reduced to ________ by NADH.

(1) Lactate  
(2) Acetyl-CoA  
(3) Glucose  
(4) Oxaloacetate

14. Upon activation by a receptor, a G protein exchanges bound GDP for GTP, rather than phosphorylating GDP that is already bound. In the process, a class of protein factors called ________ assists in the exchange of GDP and GTP.

(1) GTPase-activating proteins  
(2) Guanine nucleotide exchange factors  
(3) GDP kinase triggers  
(4) GDP phosphorylation enhancers

15. During aerobic glycolysis, a net of ______ ATP and ______ NADH are produced from one molecule of dietary glucose.

(1) 1, 1  
(2) 1, 2  
(3) 2, 1  
(4) 2, 2

16. Major inhibitors of the citric acid cycle are ________ and ________.

(1) NAD⁺, ATP  
(2) NADH, ADP  
(3) NAD⁺, ADP  
(4) NADH, ATP
17. In the respiratory chain, electron shuttle between Complex I or Complex II and Complex III is ____________.
   (1) Cyt aa3  (2) Cyt b  (3) Cyt c  (4) Coenzyme Q

18. Lipases hydrolyze triglycerides (triacylglycerols) to glycerol and ____________.
   (1) Acetyl-CoA  (2) fatty acid  (3) Lactate  (4) Pyruvate

19. ____________ is reacted with the fatty acid acyl group to allow transport across the inner mitochondrial membrane during the β-oxidation of fatty acids.
   (1) Acetyl-CoA  (2) CoASH  (3) Carnitine  (4) Pyruvate

20. The β-oxidation of the 16-carbon fatty acid, palmitate, will result in 8 molecules of ____________ and ____________.
   (1) Acetyl-CoA, Fatty acid  (2) ATP, NADPH
   (3) NADH, FADH₂  (4) Acetyl-CoA, ATP

21. Excess cholesterol level within the cell inhibits the synthesis by ____________ and ____________.
   (1) Cholesterol, acetyl-CoA  (2) Cholesterol, Mevalonate
   (3) LDL receptor, acetyl-CoA  (4) LDL receptor, Cholesterol

22. ____________ involve the exchange of an amino and a carbonyl on the α-carbons. This reaction is catalyzed by a group of enzymes called ____________ which require a pyridoxal phosphate cofactor.
   (1) Amino-isomerases  (2) Amino-hydrolases
   (3) Amino-reductases  (4) Amino-transfereases

23. Which of the following enzymes can phosphorylate nucleosides to nucleoside monophosphates in the salvage synthesis of nucleotides?
   (1) Phosphoribosyl transferases  (2) Nucleotidases
   (3) Nucleoside kinases  (4) Phosphorylases

24. Which of the following diseases is not a clinical disorder on the purine metabolism?
   (1) Diabetes  (2) Lesch-nyhan syndrome
   (3) Immunodeficiency (scid)  (4) Gout

25. Initially, ammonia is condensed with CO₂ and phosphate to form ____________ which can be condensed with ornithine in the urea cycle.
   (1) Arginine  (2) Carbamoyl phosphate  (3) Citrate  (4) Urea