請勿在本試題紙上作答，否則不予計分

Part I: single-choice question (70%)

1. The general definition of an endonuclease is an enzyme that
   A. hydrolyzes a nucleotide from both termini of an oligonucleotide
   B. hydrolyzes a nucleotide from only the 5'-end of an oligonuleotide
   C. binds to a specific sequence of nucleotides
   D. hydrolyzes a phosphodiester bond located in the interior of a polynucleotide

2. A nucleosome
   A. has histones in contact with the minor groove of the DNA
   B. is a irregularly repeating structure of DNA and histone proteins
   C. has a core of DNA with proteins wrapped around the outside
   D. uses only one type of histone per nucleosome

3. Which abbreviation is wrong
   A. Asp: Asparagine
   B. Cys: cysteine
   C. Lys: Lysine
   D. Ser: serine

4. Proteins are separated according to size by
   A. polyacrylamide gel electrophoresis
   B. molecular exclusion chromatography
   C. ion exchange chromatography
   D. reverse-phase HPLC

5. The description about telomerase are correct except
   A. it helps to replicate the ends of linear chromosome
   B. it is a reverse transcriptase
   C. it recognizes a A-rich single strand of DNA
   D. the RNA component acts as a template for the synthesis of DNA

6. Methylation of DNA usually
   A. enhances the transcription of gene is methylated
   B. prevents chromatin from unwinding

(背面仍有題目,請繼續作答)

C. inactivates DNA for transcription
D. increases the binding of transcription factors to DNA

7. Chaperones
A. bind to protein and enhance protein degradation
B. enhances aggregation of proteins into plaques
C. are required for the folding of proteins
D. maintain proteins in an unfolded state to allow passage through membrane

8. In the polymerase chain reaction (PCR)
A. the final product is single-strand DNA
B. the oligonucleotides in the reaction mixture is to act as primers for the synthesis of new DNA
C. the nucleotide sequence of DNA template must be known
D. the polymerase activity is sensitive to heat

9. Amino acid motifs are commonly found in transcription factors except
A. β sheet
B. zinc finger
C. helix-loop-helix
D. basic region-leucine zipper

10. The sequence in many promoter regions that is associated with methylation of DNA is
A. CG island
B. TATA box
C. CAAT box
D. CTD

11. Acetylation of histone can lead to chromatin decondensation by
A. inducing histone to interact with RNA polymerase
B. enhancing methylation of DNA
C. recruiting transcription factors to DNA
D. reducing the electrostatic attraction between histones and DNA

12. An enzyme can stimulate the rate of reactions by
A. binding very tightly to the product

B. binding very tightly to the substrate
C. preventing the reaction from the proceeding in the reverse direction
D. stabilizing the transition state

13. Types of lipid anchors for attachment of membrane proteins are correct except
A. myristoyl anchor
B. sphingomyelin anchor
C. thioester anchor
D. glycosylphosphatidylinositol anchor

14. Which one is a nuclear receptor?
A. receptor tyrosine kinase
B. vitamine D receptor
C. cytokine receptor
D. G protein-coupled receptor

15. Which of the following statement concerning membranes is correct?
A. lipid rafts are fixed in membranes
B. lipid composition of the two layers is the membrane equilibrate
C. an increase in the cholesterol content of a membrane reduces membrane fluidity
D. lipid transporters catalyze multi-directional movement of specific lipids from one layer to the other

16. The transporter system that maintains the Na^+ and K^+ gradients across the plasma membrane of cells
A. is a symport system
B. involves an enzyme that is an ATPase
C. moves Na^+ either into or out of the cell
D. hydrolyzeds ATP independently of the movement of Na^+ and K^+

17. The translocation of Ca^{2+} across a membrane involves all the following except
A. phosphorylation of the transporter
B. maintain [Ca^{2+}] very much higher in the cell than in extracellular fluid
C. activation of STIM-ORAI1 channel
D. active transport by Ca^{2+}-transporting ATPase

(背面仍有題目,請繼續作答)

18. Intercellular signaling that can communicate with another over long distances is called
    A. endocrine
    B. paracrine
    C. autocrine
    D. synaptic

19. Which one of mechanisms are involved in the termination of signaling from cell surface receptor
    A. modification the receptor so that it is inactive
    B. endocytosis of receptors
    C. reduction of agonist
    D. all of the above

20. When blood glucagon keeps in high level, which of the following hepatic enzyme activities falls?
    A. hexokinase
    B. fructose 1,6-bisphosphatase
    C. 6-phosphofructo-2-kinase
    D. adenyl kinase

21. Alcohol metabolism produces large amount of NADH which inhibit gluconeogenesis by
    A. blocking the electron transport chain
    B. inhibiting the malate-aspartate shuttle
    C. shifting the pyruvate-lactate equilibrium toward lactate
    D. stimulating the production of oxaloacetate form malate

22. Events are usually involved in the synthesis of triacylglycerols in adipose tissue except
    A. a reaction catalyzed by glycerol kinase
    B. addition of a fatty acyl CoA to a diacylglycerol
    C. hydrolysis of phosphatidic acid by a phosphatase
    D. reduction of dihydroxyacetone phosphate

23. Functional roles of phospholipids include all of the following except
    A. mediator of hypersensitivity and acute inflammatory reactions
    B. signal transduction
    C. cell-cell recognition
    D. activation of certain membrane enzyme

24. Prostaglandin synthase, a bifunctional enzyme,
    A. is inhibited by anti-inflammatory steroids
    B. contains both a cyclooxygenase and a peroxidase component
    C. produces PGG2 as the end product
    D. catalyzes the rate-limiting step of prostaglandin synthesis

25. Which one is not the essential amino acid?
    A. histidine
    B. arginine
    C. lysine
    D. methionine

26. Which one is required for heme biosynthesis?
    A. Cu^{2+}
    B. Zn^{2+}
    C. Ca^{2+}
    D. Fe^{2+}

27. The detection of the turnover of DNA comes from a measurement in urine of
    A. CO2
    B. β-alanine
    C. β-aminoisobutyrate
    D. cytidine

28. Which of the following would favor gluconeogenesis in the fasted state?
    A. citrate activation of acetyl-CoA carboxylase
    B. acetyl CoA activation of pyruvate carboxylase
    C. malonyl CoA inhibition of carnitine palmitoyltransferase I
    D. fructose 1,6-biphosphate stimulation of pyruvate kinase

29. All of the following statements about the process by which the hormone influences transcription are correct except
    A. the activated receptor-hormone complex searches for specific sequences on DNA called HREs (hormone receptor elements)

(背面仍有題目,請繼續作答)

B. the receptor-hormone complex is not activated until it is translocated to the nucleus
C. the hormone must be in the free state to cross the cell membrane
D. cytoplasmic receptors may be associated with heat shock proteins

30. All of the following are excitatory neurotransmitters except
A. dopamine
B. γ-aminobutyric acid (GABA)
C. acetylcholine
D. epinephrine

31. Telomerase
A. catalyzes the resynthesis of telomere regions
B. activity generally increase as an individual ages
C. activity is high during all stages of the carcinogenesis process
D. when present at a high level, leads to cell senescence

32. Peptidases involved in protein digestion
A. are synthesized in the stomach and pancreas as proenzymes
B. are all endopeptidases
C. must have a neutral pH
D. each have a different activator

33. Ascorbic acid may be associated with all of the following except
A. bone formation
B. wound healing
C. acute liver disease when taken in high doses
D. iron absorption

34. Which mechanism of repair is involved in ultraviolet light-induced human cell damage?
A. by a mechanism using an AP endonuclease
B. by base excision repair
C. by a mechanism using a MutH homolog
D. by nucleotide excision repair

35. The melting temperature of double stranded DNA

A. decreases with increasing guanine content
B. increases with increasing cytosine content
C. increases with decreasing guanine content
D. decreases with decreasing adenine content

Part II: short-answer question (30%)

1. Please describe mechanisms involved in the regulation of mRNA stability in cells? (5%)

2. How does elevation of cyclic AMP in cells lead to regulate transcription of certain genes? (5%)

3. Please list types of protein modification as you know. (5%)

4. Please take examples to define kinases and phosphatases. (5%)

5 . Please define the following terms and its purpose or function: (10%, 2% for each)
(a) small interfering RNA (siRNA)
(b) microarray
(c) DNA affinity precipitation assay (DAPA)
(d) enzyme-linked immunosorbent assay (ELISA)
(e) chromatin immunoprecipitation (ChIP)