每小題 2 分，請用 2B 鉛筆作答於答案卡，並先詳閱答案卡上之「畫記說明」。

1. The function of the eukaryotic DNA replication factor PCNA (*p*roliferating *c*ell *n*uclear *a*ntigen) is similar to that of the β-subunit of bacterial DNA polymerase III in that it:
   A) Participates in DNA repair
   B) Facilitates replication of telomeres
   C) Has a 3′ → 5′ proofreading activity
   D) Increases the speed but not the processivity of the replication complex
   E) Forms a circular sliding clamp to increase the processivity of replication

2. The 5′ → 3′ exonuclease activity of *E. coli* DNA polymerase I is involved in:
   A) Sealing of nicks by ligase action
   B) Formation of Okazaki fragments
   C) Proofreading of the replication process
   D) Removal of RNA primers by nick translation
   E) Formation of a nick at the DNA replication origin

3. The role of the Dam methylase is to:
   A) Remove a methyl group from thymine
   B) Replace a mismatched nucleotide with the correct one
   C) Add a methyl group to uracil, converting it to thymine
   D) Remove a mismatched nucleotide from the template strand
   E) Modify the template strand for recognition by repair systems

4. In homologous recombination in *E. coli,* the protein that assembles into long, helical filaments that coat a single-strand region of DNA is:
   A) Histone
   B) RecA protein
   C) DNA methylase
   D) RecBCD enzyme
   E) DNA polymerase

5. Which amino acid has an unusual side-chain that includes the nitrogen of the amino group attached to the α-carbon?
   A) Asparagine
   B) Proline
   C) Tryptophan
   D) Tyrosine
   E) Histidine

6. Human blood plasma contains about 7% protein. These plasma proteins have pK values close to 4 or 5. In the test tube, these proteins will form an insoluble precipitate after all of the following treatments except
   A) Boiling the serum for 5 minutes
   B) Adding sodium chloride to a concentration of 35%
   C) Adjusting the pH to 4.5
   D) Boiling the serum with 6 N hydrochloric acid for 10 hours
   E) Mixing one volume of plasma with two volumes of pure alcohol

見背面

7. The molecule 2,3- bisphosphoglycerate (BPG) is present in red blood cells, in which it binds noncovalently to hemoglobin. Which functional groups in hemoglobin can make the strongest noncovalent interactions with BPG at a pH value of 7.0?
   A) Sulfhydryl groups
   B) Alcoholic hydroxyl groups
   C) Hydrocarbon groups
   D) Amino groups
   E) Carboxyl groups

8. In sickle cell hemoglobin, a Glu is mutated to a _____. This causes the formation of _____ between hemoglobin molecules, ultimately forming large aggregates.
   A) Arg; salt bridges
   B) Cys; disulfide bonds
   C) Val; hydrophobic interactions
   D) Pro; disrupted α-helix, resulting in several H-bonds and salt bridges
   E) None of the above

9. Which of the following statements about the reactions of glycolysis is correct?
   A) Glucose -1:6-bisphosphate is split into glyceraldehyde-3-phosphate and dihydroxyacetone phosphate
   B) Fructose-1:6-bisphosphate is split into glyceraldehyde-3-phosphate and dihydroxyacetone phosphate
   C) Fructose-6-phosphate is split into glyceraldehyde-3-phosphate and dihydroxyacetone phosphate
   D) Glucose-6-phosphate is isomerized to fructose-1:6-bisphosphate
   E) None of the above

10. Which one of the following molecules donates a phosphate group to ADP to produce ATP in the reactions of glycolysis?
   A) Glucose-6-phosphate
   B) Phosphoenolpyruvate
   C) Fructose-6-phosphate
   D) Fructose-1,6-bisphosphate
   E) None of the above

11. Which of following is an anomeric pair?
   A) α-D-glucose and β-L-glucose
   B) α-D-glucose and β-D-glucose
   C) α-D-glucose and α-D-fructose
   D) α-D-glucose and α-L-glucose
   E) None of the above

12. Which of the following is NOT glycosoaminoglycan?
   A) Heparin
   B) Hyaluronan
   C) Chondroitin sulfate
   D) Keratan sulfate
   E) None of the above

接次頁

13. Which description of the function of lipids listed below is wrong?
A) The main biological function of lipids is to store energy
B) Lipids form structural components of the cell membrane
C) Lipids form messenger and signaling molecules
D) Lipids can easily be stored in the body and work as a source of energy
E) None of above (all are correct)

14. Lipoproteins are important in lipid transport. Which molecule listed below is NOT a component of lipoproteins?
A) Free cholesterol
B) Triacylglycerol
C) Albumin
D) Phospholipid
E) Apo C

15. Which mechanism listed below is NOT involved in alternative mRNA precursor processing?
A) Selective splicing
B) Alternative 5' donor site
C) Alternative 3' acceptor site
D) Alternative polyadenylation site
E) None of the above (all are wrong)

16. In the nomenclature of restriction enzymes, like *BamHI,* please answer what " ***B*** " means.
A) Genus
B) Species
C) Strain
D) The order of discovery
E) Isoform

17. Which of the following statement for the lambda phage switching between lytic and lysogenic pathways is NOT correct.
A) As long as the cI gene is expressed, lambda phage keeps in the prophage state
B) cI repressor binds to the OR1 to inhibit the expression of cro gene
C) cI repressor cleaves itself and can not form dimer, which is required for the repressor activity
D) After UV irradiation, RecA binds to ssDNA and cleaves cI repressor, then lambda phage is switched to lytic pathway
E) RecA possesses co-protease activity

18. Which of the following statement for the regulation of eukaryotic gene transcription is NOT correct.
A) The promoter region, enhancer and repressor are the *Cis*-elements for transcription
B) Histone modifications (Epigenetics) involve in the chromatin structure changes and gene regulation
C) Methylation on deoxycytidine of CpG island causes the inactivation of gene expression
D) Antibodies are generated through the loss of genomic information
E) One transcription factor can regulate multiple genes

見背面

19. Which of the following statement for the control of the regulatory transcription factors is NOT correct.
    A) Specific synthesis of transcription factors
    B) Covalent modifications of protein (such as isoprenylation)
    C) Receptor and ligand binding (such as glucocorticoid receptor and its ligand)
    D) Availability of functional factor in nucleus
    E) Dimerization with active partner (such as Jun and Fos)

20. Which of the following technique can NOT be used for mRNA quantitation.
    A) Southern blot analysis
    B) Reverse transcription-quantitative polymerase chain reaction (real-time PCR)
    C) cDNA microarray
    D) Direct RNA sequencing
    E) Next generation sequencing (NGS)

21. Which of the following post-translational modification is common for protein to target to the plasma membrane?
    A) Acetylation
    B) Phosphorylation
    C) Ubiquitination
    D) Farnesylation
    E) Methylation

22. How many membrane-spanning domains do G-protein coupled receptors possess?
    A) 1
    B) 3
    C) 5
    D) 7
    E) 9

23. Which of the following receptor family mediates bi-directional (both inside-out and outside-in) signaling?
    A) G-protein coupled receptors
    B) Gated ion channels
    C) Integrins
    D) Nuclear Receptors
    E) Receptor Tyrosine Kinase

24. Which of the following hormone has the longest half-life in serum?
    A) Thyroxine (T4)
    B) Thromboxane A2
    C) Thyrotropin-Releasing Hormone (TRH)
    D) Thyroid-Stimulating Hormone (TSH)
    E) They have the same half-life

接次頁

25. Which of the following enzymes can generate H_2O after the completion of their catalyzed reactions?
A) Glyceraldehyde 3-phosphate dehydrogenase and Glutathione peroxidase
B) Glutamate dehydrogenase and Glutathione reductase
C) Glutamate dehydrogenase and Glutaminase
D) Cytochrome C oxidase and Cytochrome P450
E) Glucose 6-phosphate dehydrogenase and Galactose epimerase

26. Which of the following reactions can produce succinate as a product?
A) α-ketoglutarate dehydrogenase
B) Succinate dehydrogenase
C) Phenylalanine hydroxylase
D) Tryptophanase
E) Proline hydroxylase

27. Which of the following enzymes can produce oxaloacetate?
A) Malate dehydrogenase and Pyruvate carboxylase
B) Fumarase and Citrate lyase
C) Aconitase and Pyruvate dehydrogenase
D) Succinate dehydrogenase and Citrate synthase
E) Pyruvate dehydrogenase and Aspartate aminotransferase

28. Which of the following enzymes can move a trisaccharide from one branch to the other in glycogen metabolism?
A) Glycogen phosphorylase
B) Debranching enzyme
C) Glucan transferase
D) Branching enzyme
E) Glycogen lyase

29. Which of the following enzymes is important to catalyze xylulose 5-phosphate to generate glyceraldehyde 3-phosphate?
A) Xylulose 5-phosphate reductase
B) Transketolase
C) Xylulose 5-phosphate phosphatase
D) Xylulose 5-phosphate 3-epimerase
E) Transaldolase

30. Which of the following amino acid(s) can form a covalent bond in or between proteins?
A) Cysteine only
B) Methionine and cysteine
C) Glutamate and cysteine
D) Lysine and cysteine
E) Tryptophan and cysteine

見背面

31. Which of the following compounds is generated from bilirubin by fecal flora?
A) Biliverdin
B) Urobilinogen
C) Uroporphyrinogen I
D) Uroporphyrinogen III
E) Coproporphyrinogen

32. Which of the followings is not a function of pyridoxal phosphate?
A) Transamination
B) Racemization
C) Decarboxylation
D) Citrullination
E) Deamination

33. About membrane proteins, which of the followings is correct?
A) Type I integral membrane proteins have COOH-terminus outside the cells
B) Symporters move solutes against electrochemical gradients
C) Antiporters use ATP to move solutes against electrochemical gradients
D) GPI-anchor is added to membrane proteins on the cytosol-facing ER membrane
E) Sodium/potassium ATPase is phosphorylated during its ion-pumping cycle

34. Which of the diseases is not due to a defect in the urea cycle?
A) Hyperammonemia
B) N-acetylglutamate synthase deficiency
C) Phenylketonuria
D) Hyperargininemia
E) Homocitrullinuria

35. About lipid bilayer, which of the followings is correct?
A) Membrane rafts can be detected with atomic force microscopy based on electrostatic interaction between the cantilever and the membrane surface
B) Outer monolayer share exact lipid constituents as the inner membrane
C) Phosphatidylcholine serves as an eat-me signal in apoptotic cells
D) Cholesterol makes the membrane fluid
E) Flippase moves lipids from outer to inner monolayer

36. Which of the following compounds can mediate inflammation, pain, induce sleep, and also regulate blood coagulation?
A) Prostaglandin E_2
B) Leukotrienes
C) Thromboxane A_2
D) Lipoxins
E) All are right

接次頁

37. The 5′ terminus of mRNA is usually "capped" by a
A) Methylguanosine triphosphate
B) 7-methylguanosine triphosphate
C) 5-methylcytidine
D) 2-methyladenosine
E) None of them.

38. Which one of the following descriptions is **WRONG**?
A) Caffeine is a trimethylxanthine
B) Theophylline is a dimethylxanthine
C) Theobromine is the hypoxanthine derivative of cocoa
D) Theobromine and theophylline are similar but lack the methyl group at N-1 and at N-7, respectively
E) All are wrong

39. Amino acids can be catabolized to intermediates for carbohydrate biosynthesis. Which one of the following reactions is **WRONG**?
A) Asparagine and aspartate form oxaloacetate
B) Glutamine and glutamate form a-ketoglutarate
C) Tyrosine and phenylalanine form fumarate
D) Proline, arginine and histidine form succinyl-CoA
E) All are wrong

40. To increase the rates of chemical reactions, enzymes in theory should bind most tightly to ……..
A) Substrates
B) Reaction intermediates
C) Transition state
D) Products
E) All of the above

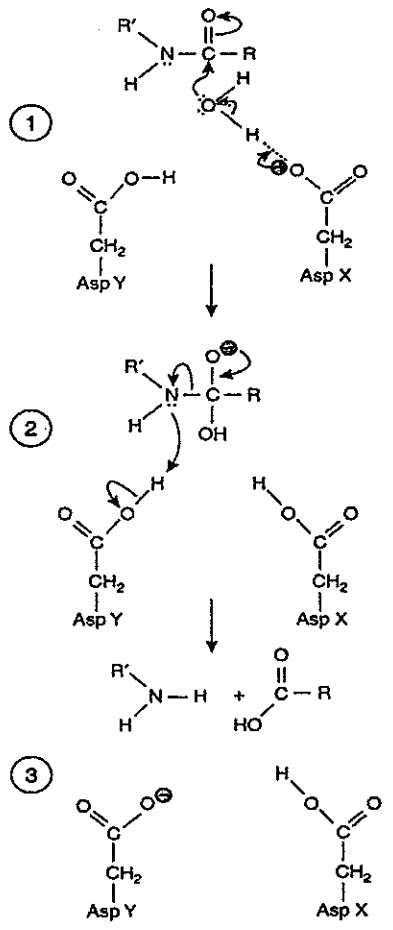
41. Which of the following classes of enzymes can catalyze the movement of molecules across a cell membrane?
A) Transferase
B) Translocase
C) Oxidoreductase
D) Lyase
E) Ligase

42. Which of the following statements regarding "uncompetitive inhibition" is correct?
A) An uncompetitive inhibitor binds to the active site of an enzyme
B) The structure of an uncompetitive inhibitor must resemble the substrate of its targeting enzyme
C) K_M of an enzyme-catalyzed reaction increases in the presence of uncompetitive inhibitors
D) V_{max} of an enzyme-catalyzed reaction increases in the presence of uncompetitive inhibitors
E) The effect of an uncompetitive inhibitor can be observed even at high substrate concentration

見背面

43. The attached figure shows the catalytic mechanism of a protease. According to this figure, what is the catalytic function of Asp X as shown in step 1?

A) Acid
B) Base
C) Oxidant
D) Reductant
E) Proton donor



44. According to the Michaelis-Menton equation, what is the substrate concentration for the initial velocity (V_o) of an enzymatic reaction to reach 0.9 V_{max}?

A) 8 K_M
B) 9 K_M
C) 10 K_M
D) 11 K_M
E) 12 K_M

45. The $K_{0.5}$ of an allosteric enzyme decreases in the presence of a ……

A) Positive allosteric effector
B) Negative allosteric effector
C) Competitive inhibitor
D) Substrate analog
E) Product analog

46. In a typical enzyme kinetic experiment, most of the factors are held constant except for …..

A) Ionic strength of the reaction buffer
B) Total enzyme concentration
C) pH of the reaction buffer
D) Substrate concentration
E) Temperature

接次頁

47. In translation elongation, which molecule is required for translocation?
A) EF-Tu
B) EF-G
C) miRNA
D) EF-Ts
E) IF-2

48. A silent mutation will cause:
A) An early stop in protein translation
B) A wrong amino-acid residue
C) Frame shift
D) Abnormal protein conformation
E) None of above

49. In eukaryotes, phosphorylation can happen on which amino-acid residue:
A) Alanine
B) Lysine
C) Tyrosine
D) Proline
E) None of above

50. The protein targeting of a transmembrane protein requires:
A) NLS sequence
B) KDEL sequence
C) mannose 6-phosphate
D) N-terminal signal sequence
E) GPI anchor

試題隨卷繳回