※ 注意：請用 2B 鉛筆作答於答案卡，並先詳閱答案卡上之「畫記說明」。

單選題　共 50 題　每題 2 分（不倒扣）

1. Assuming the oligopeptide ALPHAHELICKS forms one continuous α-helix, the carbonyl oxygen of the glutamic acid residue is hydrogen bonded to the amide nitrogen of:
(A) leucine. (B) isoleucine. (C) cysteine. (D) lysine. (E) serine.

2. Which type of columns are affected by the ionic charge, shape, substrate-binding strength of a protein, **respectively**?
(A) Gel filtration, Affinity chromatography, Cation or anion exchange.
(B) Affinity chromatography, Gel filtration, Cation or anion exchange.
(C) Cation or anion exchange, Gel filtration, Affinity chromatography.
(D) Gel filtration, Cation or anion exchange, Affinity chromatography.
(E) Cation or anion exchange, Affinity chromatography, Gel filtration.

3. If a protein with the sequence FEWPRQVDMARINE is treated with chymotrypsin, what will the products be?
(A) F, EW, and PRQVMARINE. (B) FE, WPRQVD, and MARINE.
(C) FEWPR, QVDMAR, and INE. (D) FEWPRQVDM and ARINE.
(E) Chymotrypsin will not cleavage this protein.

4. Quaternary structure is associated with the relative orientation of one polypeptide to another polypeptide in a multisubunit protein. Which of the following bond forces is (are) important in quarternary structure:
(A) Disulfide bonds. (B) Hydrogen bonds.
(C) Hydrophobic attraction. (D) Both hydrogen bonds and hydrophobic attraction.
(E) All of these are important in quarternary structure.

5. First order kinetics means:
(A) The rate of a reaction is independent of the amount of reactant measured.
(B) The rate of the reaction varies directly with the amount of reactant measured.
(C) The rate of the reaction varies with the square of the amount of the reactant measured.
(D) More information is needed to answer this question.
(E) None of these is correct.

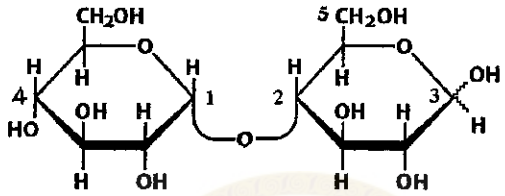
6. The K_M expression is equal to:
(A) $(k_1 + k_2) / k_{-1}$. (B) $(k_{-1} + k_2) / k_{-1}$. (C) $(k_1 + k_{-1}) / k_2$. (D) k_{-1} / k_1.
(E) All of these depend on the reaction.

7. Non-competitive inhibitors have this effect:
(A) Modifying the K_M value.
(B) Changing the value for V_{max}.
(C) Interfering with substrate binding.
(D) This type of inhibitor both changes the V_{max} and interferes with substrate binding.
(E) All of these are correct.

見背面

8. Which of the following descriptions is **correct**, regarding to the use of the enzyme glucose oxidase to determine the concentrations of glucose in blood?
   (A) Glucose is reduced to give glucono-δ-lactone.
   (B) The reaction produces oxygen in company with glucono-δ-lactone.
   (C) The reaction requires hydrogen peroxide as the oxidant.
   (D) Glucose is oxidized to give glucono-δ-lactone.
   (E) Glucose is oxidized to give glucuronic acid

9. The following molecular structure is the disaccharide maltose. Which position could be oxidized by the use of Fehling's reagent?



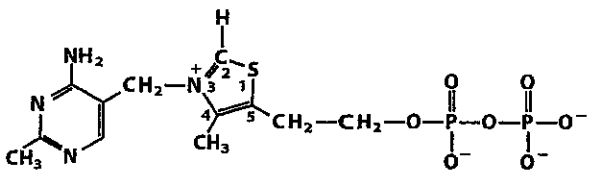
Maltose

   (A) No. 1.　(B) No. 2.　(C) No. 3.　(D) No. 4.　(E) No. 5.

10. Which of the following descriptions is **correct**, regarding to O-linked and N-linked glycans?
   (A) N-linked glycans have an α-linked glycosidic bond linked to Gln residue of peptides or proteins.
   (B) N-linked glycans have a β-linked glycosidic bond linked to Asn residue of peptides or proteins.
   (C) N-linked glycans have an α-linked glycosidic bond linked to Asn residue of peptides or proteins.
   (D) O-linked glycans have a β-linked glycosidic bond linked to Ser/Thr residue of peptides or proteins.
   (E) O-linked glycans have an α-linked glycosidic bond linked to Asn residue of peptides or proteins.

11. Regarding to the double reciprocal plots (1/V vs. 1/[S]) of competitive inhibition, which of the following descriptions is **correct**?
   (A) All the lines are parallel.
   (B) All the lines have a common intercept at 1/V axis.
   (C) All the lines have a common intercept at 1/[S] axis.
   (D) All the lines are intersecting at one point that is located at the second quadrant (第二象限).
   (E) All the lines are intersecting at one point that is located at the third quadrant (第三象限).

12. Thiamine pyrophosphate (TPP), derived from vitamin B1, is a coenzyme of pyruvate decarboxylase. Regarding to the functional role of TPP, which atom will be converted into a nucleophile?



Thiamine pyrophosphate (TPP)

   (A) No. 1.　(B) No. 2.　(C) No. 3.　(D) No. 4.　(E) No. 5.

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13. Pyruvate carboxylase is the enzyme to catalyze the transformation from pyruvate to oxaloacetate. Which of the following descriptions is **correct** with respect to the reaction mechanism?
    (A) Pyruvate first reacts with ATP to form acyl-phosphate.
    (B) The cofactor biotin is covalently attached to the enzyme through an amide linkage to theside-chain of a Glu residue.
    (C) The reaction occurs in two phases, which take place at two different sites. At catalytic site 1, bicarbonate ion is converted to CO_2 at no expense of ATP.
    (D) At catalytic site 2, CO_2 is released from biotin and then reacts with pyruvate, forming oxaloacetate.
    (E) None of the above.

14. Regarding to the Pentose Phosphate Pathway of glucose oxidation, which of the following descriptions is **correct**?
    (A) Entry of glucose 6-phosphate either into glycolysis or into the pentose phosphate pathway is largely determined by the relative concentrations of NAD^+ and NADH.
    (B) Entry of glucose 6-phosphate either into glycolysis or into the pentose phosphate pathway is largely determined by the relative concentrations of $NADP^+$ and NADPH.
    (C) NADH provides reducing power for biosynthetic reactions.
    (D) The first reaction is the conversion of glucose 6-phosphate to ribose 5-phosphate, in which NADPH is consumed to generate $NADP^+$.
    (E) None of the above.

15. In the glycolytic pathway, there is an isomerization of glucose 6-phosphate to fructose 6-phosphate occurs two steps before the C-C bond cleavage reaction between C3 and C4 to produce two three-carbon sugars. Where would the bond cleavage occur if there is no preceding isomerization?
    (A) Without isomerization, bond cleavage would occur between C2 and C3.
    (B) Without isomerization, bond cleavage would occur between C3 and C4.
    (C) Without isomerization, bond cleavage would occur between C4 and C5.
    (D) Without isomerization, bond cleavage would occur between C5 and C6.
    (E) Without isomerization, bond cleavage would occur between C1 and C2.

16. Which of the following compound is **not** involved in the glyoxylate cycle?
    (A) acetyl-CoA.　(B) isocitrate.　(C) malate.　(D) oxaloacetate.　(E) succinyl-CoA.

17. Which of the following reaction is **not** reversible?
    (A) The reaction from glucose 6-phosphte to fructose 1,6-bisphosphate.
    (B) The reaction from glyceraldehyde 3-phosphate to 1,3-bisphosphoglycerate.
    (C) The reaction from phospho(enol)pyruvate to pyruvate.
    (D) The reaction from 2-phosphoglycerate to phospho(enol)pyruvate.
    (E) The reaction from fructose 1,6-bisphosphate to dihydroxyacetone phosphate and glyceraldehyde 3-phosphate.

見背面

18. Which of the following compounds is **not** derived from fatty acid?
(A) prostaglandin. (B) leukotriene. (C) eicosinoid. (D) thromboxane. (E) cholesterol.

19. What description about fatty acid degradation is **incorrect**?
(A) Acyl-CoA is transferred through the mitochondrial inner membranes by forming acyl-carnitine.
(B) 18-carbon fatty acid produces 9 acetyl-CoA, 8 $FADH_2$, and 8 NADH.
(C) 2.5 moles of ATP are produced for each mole of NADH that enters the electron transportation chain.
(D) NADH is produced by the reaction of acyl-CoA dehydrogenase.
(E) Totally 120 ATP can be produced from the 18-carbon fatty acid.

20. What description about fatty acid biosynthesis is **correct**?
(A) The carboxylation of acetyl-CoA to malonyl-CoA utilizes thiamine pyrophosphate as cofactor.
(B) NADH is consumed.
(C) A *cis*-double bond intermediate is formed.
(D) The synthesis starts from methyl end.
(E) It occurs in the mitochondrial matrix.

21. Which of the following statements about enzyme reactions is **incorrect**?
(A) When $\Delta G < 0$, the reaction can spontaneously occur.
(B) Enzyme as a catalyst of a reaction S -> P can not change the equilibrium constant K (=[P]/[S]).
(C) Weak binding interactions between the enzyme and the substrate provide a substantial driving force for enzymatic catalysis.
(D) $\Delta G^{\ddagger}$ must be lowered by about 7.5 kJ/mol to accelerate a first-order reaction by a factor of 10.
(E) Specificity of an enzyme is the ability to discriminate between a substrate and a competing molecule.

22. Which of the following statements about enzyme inhibitors is **incorrect**?
(A) A competitive inhibitor binds at the same site as the substrate.
(B) An uncompetitive inhibitor binds both free enzyme and ES complex.
(C) A competitive inhibitor causes increase of the substrate K_M value.
(D) An uncompetitive inhibitor causes decrease of the substrate K_M value.
(E) A mixed inhibitor causes decrease of the V_{max}.

23. Which of the following statements about enzyme activity regulation is **incorrect**?
(A) Allosteric enzymes function through covalent binding of regulatory compounds.
(B) In some multiple enzyme systems, the regulatory enzyme specifically inhibited by the end product of the pathway is called "feedback inhibition".
(C) Phosphorylation form of the glycogen phosphorylase is more active.
(D) Glycogen synthase is inactivated by phosphorylation of specific Ser residues.
(E) Some enzymes are activated by proteolytic cleavage of their precursors called zymogens.

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24. In triacylglyceros, the glycerol and the fatty acid moieties is joined covalently in a:
(A) phosphodieaster bond. (B) amide bond. (C) ether bond. (D) ester bond.
(E) *N*-β-glycosyl bond.

25. Which of the following best describes the cholesterol molecule?
(A) Nonpolar, charged. (B) Nonpolar, uncharged. (C) Amphipathic. (D) Polar, charged.
(E) Polar, uncharged.

26. Which of the following statements about catabolism and biosynthesis of fatty acids is **false**?
(A) In mammals, β oxidation of fatty acids occurs in both mitochondria and peroxisomes, whereas in plant cells, the major site of β oxidation is not mitochondria but peroxisomes.
(B) The immediate precursor of the added carbons in the fatty acid elongation system of vertebrate cells is acetyl-CoA.
(C) Fatty acid biosynthesis uses NADPH, whereas β oxidation uses NAD^+ as electron carrier.
(D) The products of β oxidation can directly enter the citric acid cycle for further oxidation.
(E) Carboxylation reaction is required to complete the oxidation of odd-number fatty acids.

27. Which of these statements about the composition of biological membranes is **false**?
(A) The fluidity of a lipid bilayer will be increased by increasing temperature.
(B) Triacylglycerols are not commonly found in membranes.
(C) The bilayer is stabilized by covalent bonds between neighboring phospholipid molecules.
(D) The ratio of lipid to protein varies widely among cell types in a single organism.
(E) Sterol lipids are common in human cell plasma membranes.

28. The following fatty acid, in which the indicated carbon is labeled with ^{14}C, is fed to an animal: $^{14}CH_3(CH_2)_{13}COOH$. After a period of time for fatty acid β oxidation, the label would most likely be recovered in:
(A) propionyl-CoA. (B) beta-hydroxy butyryl-CoA. (C) both acetyl-CoA and propionyl-CoA.
(D) palmitoyl-CoA. (E) acetyl-CoA.

29. Which of the following descriptions is **false**?
(A) In the mammalian synthesis of urea, the carbon atom of urea is derived from mitochondrial HCO_3^-.
(B) Glycine can be degraded through the enzyme D-amino acid oxidase in humans.
(C) In liver mitochondria, glutaminase catalyzes the reaction to release the amino group from glutamine; the products are glutamate and ammonia.
(D) Most amino acids are metabolized in the liver; however, the three amino acids with branched side chains (leucine, isoleucine, and valine) are oxidized as fuels primarily in muscle, adipose, kidney, and brain, as these tissues contain an aminotransferase absent in liver.
(E) The conversion of alanine to pyruvate requires more than one step.

見背面

30. Excess ammonia generated in most extrahepatic tissues is converted to ____, which passes to the liver:
(A) glutamate. (B) glutamine. (C) alanine. (D) pyruvate. (E) aspartate.

31. The coenzyme involved in a transaminase reaction is:
(A) biotin phosphate. (B) nicotinamide adenine dinucleotide phosphate ($NADP^+$).
(C) pyridoxal phosphate (PLP). (D) cytochrome P450. (E) tetrahydrofolate.

32. Which one of the following amino acids is critical for glutathione to function as a redox buffer in cells?
(A) glycine. (B) methionine. (C) glutamine. (D) glutamate. (E) cysteine.

33. Which of the following statements is **correct**?
(A) B form DNA is a left-handed helix; Z-form DNA is a right-handed helix.
(B) In the Watson-Crick model of DNA structure (now called B-form DNA) G–C pairs share two hydrogen bonds.
(C) In the Watson-Crick model of DNA structure, both strands run in the same direction, $5' \rightarrow 3'$; they are parallel.
(D) When a solution of DNA is heated slowly until the t_m is reached, the DNA molecules are completely denatured at this temperature.
(E) In denaturation of a nucleic acid duplex at neutral pH, the stability of a DNA-RNA hybrid duplex is greater than a DNA-DNA double helix with a comparable sequence.

34. In the biosynthesis of nucleotides, the immediate precursor of thymidylate (dTMP) is:
(A) dUMP. (B) dCMP. (C) dAMP. (D) ATP. (E) dGMP.

35. Certain nucleotide bases in DNA molecules are enzymatically methylated. In all known DNA *methylation reactions the methyl group donor is:*
(A) *S*-adenosylmethionine. (B) N^5,N^{10}-methylenetetrahydrofolate.
(C) N^5-methyltetrahydrofolate. (D) HCO_3^-. (E) acetyl-CoA.

36. Which of the following functional groups play the critical role in the reaction catalyzed by ribonucleotide reductase?
(A) acetyl group. (B) carbonyl group. (C) hydorxyl group. (D) thiol group.
(E) amino group.

37. Which of the following descriptions is **false**:
(A) The linking number (*Lk*) of a closed-circular DNA molecule can be changed only by breaking one or both strands.
(B) The linking number (*Lk*) of a closed-circular DNA molecule can be changed by topoisomerase.
(C) Topoisomerases always change the linking number in increments of 1.
(D) Two forms of a closed-circular DNA molecule that differ only in a topological property such as their linking number (*Lk*) are referred to as topoisomers.
(E) If the specific linking difference (σ) of a closed-circular DNA molecule is –0.05, that means the number of helical turns is decreased by 5% in the DNA molecule.

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38. Eukaryotic and prokaryotic ribosomes can be compared in all these ways, **except**:
(A) Both have large and small subunits.
(B) Eukaryotic ribosomes are larger.
(C) Both contain the same number of RNA molecules.
(D) Eukaryotic ribosomes contain more proteins.
(E) All of these statements are accurate comparisons.

39. The universal features of DNA replication include:
(A) Release of PPi from a nucleoside triphosphate. (B) Synthesis from the 5' end to the 3' end.
(C) Base pairing of A to T and G to C. (D) Use of a primer.
(E) All of these describe DNA synthesis.

40. All the following statements describe the general mechanism of RNA synthesis, **except:**
(A) The DNA strands become separated during synthesis.
(B) Synthesis of RNA is a very accurate process.
(C) The template strand is read in the 3'→5' direction.
(D) All 4 ribonucleotides are required.
(E) All of these describe RNA synthesis.

41. In prokaryotic RNA synthesis:
(A) the rate of incorporation of nucleotides is constant throughout the elongation process.
(B) the ρ (rho) protein is always required for termination.
(C) a unique series of three bases leads to termination.
(D) inverted-repeat sequences in the DNA being transcribed can lead to termination.
(E) All of these.

42. Phosphorylation of the CTD of RNA polymerase II occurs during which phase of transcription?
(A) initial binding to the promoter. (B) conversion from the closed complex to the open complex.
(C) termination of transcription. (D) All of the above. (E) None of the above.

43. The genetic code is said to be degenerate. This means that:
(A) each codon codes for more than one amino acid.
(B) each anticodon can interact with many different triplet sequences in the mRNA, which may differ in any or all of the three nucleotides.
(C) many of the amino acids are coded for by different codons.
(D) the code is universally used by virtually all species.
(E) None of the above.

44. Forensic uses of DNA to identify victims or criminals exploit the following trait in DNA:
(A) Footprinting. (B) DNA with proteins bound moves slower in gel electrophoresis.
(C) Site directed mutations. (D) Differences in sizes of DNA fragments (RFLPs).
(E) None of the above.

見背面

45. I am performing a reaction, A —> B, with $\Delta G^{o'}$ = -5000 kJ/mol. I start the reaction with 10 mM A and no B. After allowing the reaction to proceed for 24 hrs at room temperature and atmospheric pressure, I analyze a sample of the reaction mix to find I now have 8 mM A and 2 mM B. Which of the following conclusions should I make?
(A) The reaction has reached equilibrium.
(B) I should come back again later; equilibrium has not yet been reached.
(C) The formation of B from A is thermodynamically unfavorable, so I should find another starting material to make B.
(D) I must've screwed up; there's no way I could get that result with that $\Delta G^{o'}$.
(E) None of the above.

46. Isomers of sugars in which the position of ketone and aldehyde groups have been changed are called:
(A) anomers. (B) diastereoisomers. (C) enantiomers. (D) epimers.
(E) None of the above.

47. Which of the following is **not** a reducing sugar?
(A) *glucose.* (B) *fructose.* (C) *maltose.* (D) *sucrose.* (E) *lactose.*

48. Cellulose is indigestible to most animals because:
(A) animals do not have the enzymes needed to hydrolyze ester linkages between the monomer units.
(B) animals do not have the enzymes needed to hydrolyze the α-glycosidic linkages between the monomer units.
(C) animals do not have the enzymes needed to hydrolyze the β-glycosidic linkages between the monomer units.
(D) its molecular weight is too high for it to be degraded by enzymes.
(E) None of the above.

49. The fate of pyruvate produced during glycolysis depends primarily on the availability of:
(A) NAD^+ to keep the pathway going. (B) ADP for conversion to ATP.
(C) molecular oxygen. (D) coenzyme A for further metabolism of pyruvate.
(E) phosphoric acid for the synthesis of ATP.

50. The order of compounds in the conversion of glucose to pyruvic acid is as follows: (PEP = phosphoenolpyruvate)
(A) Fructose-*bis*phosphate, fructose-6-phosphate, 1,3-phosphoglyceric acid, 3-phosphoglyceric acid, PEP.
(B) Fructose-6-phosphate, fructose-*bis*phosphate, 1,3-phosphoglyceric acid, 3-phosphoglyceric acid, PEP.
(C) Fructose-6-phosphate, fructose-*bis*phosphate, PEP, 1,3-phosphoglyceric acid, 3-phosphoglyceric acid.
(D) Fructose-6-phosphate, fructose-*bis*phosphate, 3-phosphoglyceric acid, 1,3-phosphoglyceric acid, PEP.
(E) Fructose-*bis*phosphate, fructose-6-phosphate, 3-phosphoglyceric acid, 1,3-phosphoglyceric acid, PEP.

試題隨卷繳回