

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. A mutant strain of yeast possesses a mutation in the *nda2* gene, resulting in no production of  $\alpha$ 1 tubulin. As a result, these cells would most likely
  - A. not duplicate their chromosomes.
  - B. not enter M phase.
  - C. not enter S phase.
  - D. keep the nuclear membrane intact.
  - E. have little or no spindle formation.
2. Numerous *Xenopus* cells were exposed to various amounts of ultraviolet light. Some of the resulting cells were observed to lack nucleoli. As a result, one would expect that the cell could not
  - A. perform cellular respiration.
  - B. replicate its DNA.
  - C. perform photosynthesis.
  - D. synthesize rRNA.
  - E. none of the above
3. Cancer treatments often involve chemicals that arrest DNA synthesis. The cancer cells are more directly affected than noncancer cells because
  - A. DNA synthesis does not occur in noncancerous cells.
  - B. DNA synthesis occurs differently in noncancerous cells.
  - C. treatment with these chemicals results in the cancerous cells regaining control over the cell cycle.
  - D. DNA synthesis occurs less frequently in the noncancerous cells.
  - E. DNA synthesis occurs less frequently in the cancerous cells.
4. Cyclins modulate the progression of cells through the cell cycle by
  - A. directly activating G proteins.
  - B. inducing synthesis of constitutively active forms of growth cell receptors.
  - C. activating protein kinases that are critical regulators of cell division.
  - D. phosphorylating histones.
  - E. increasing the production of DNA polymerases.
5. The biological role of restriction enzymes is to:
  - A. aid recombinant DNA research.
  - B. degrade foreign DNA that enters a bacterium.
  - C. make bacteria resistant to antibiotics.
  - D. restrict the damage to DNA by ultraviolet light.
  - E. restrict the size of DNA in certain bacteria.
6. The PCR reaction mixture does *not* include:
  - A. all four deoxynucleoside triphosphates.
  - B. DNA containing the sequence to be amplified.
  - C. DNA ligase.
  - D. heat-stable DNA polymerase.
  - E. oligonucleotide primer(s).

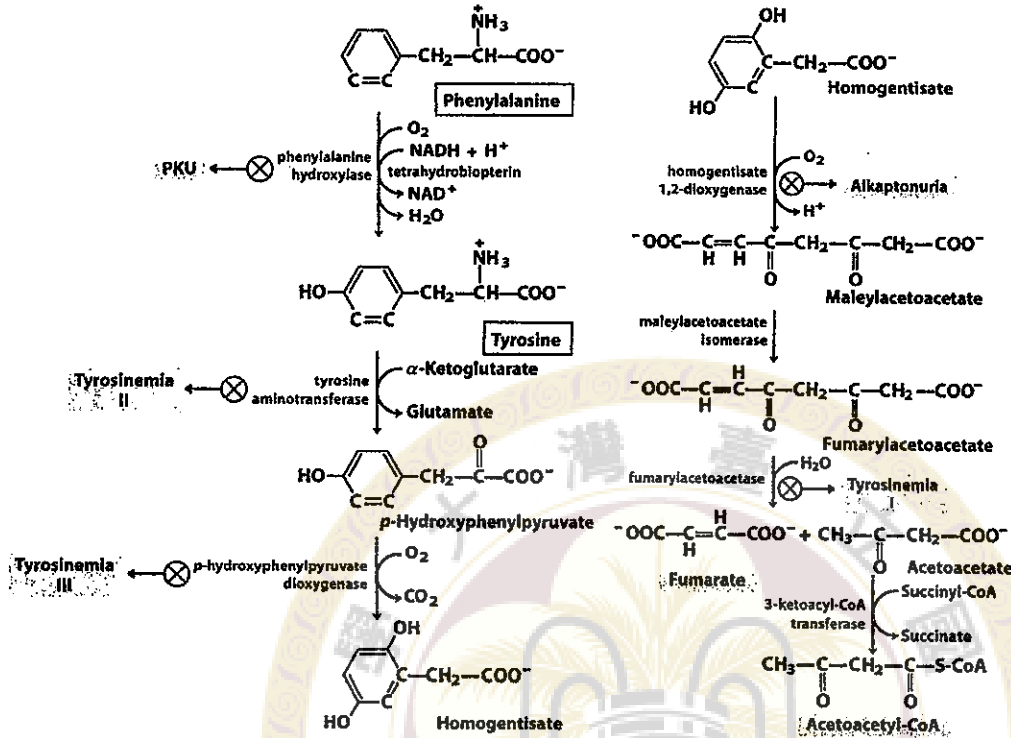
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7. Please select which following hormone does not interact with its receptor on the plasma membrane.  
A. Epinephrine B. Glucagon C. Insulin D. Prostaglandin E. Testosterone
8. Please select which following nucleic acid sequence is critical for the translation of prokaryotes.  
A. CAAT box B. C-rich sequence C. Kozak's sequence D. Shine-Dalgano sequence E. TATA box
9. Please select which following enzyme contains ribozyme activity.  
A. RNase A B. RNase D C. RNase H D. RNase L E. RNase P
10. Please select which following sugar residue on the plasma membrane is critical for the infection and release of influenza virus.  
A. Fucose B. Glucose C. GluNAc D. Mannose E. Sialic acid
11. For amino acids with neutral R groups, at any pH below the pI of the amino acid, the population of amino acids in solution will have:  
A. a net negative charge.  
B. a net positive charge.  
C. no charged groups.  
D. no net charge.  
E. positive and negative charges in equal concentration.
12. An octapeptide composed of four repeating glycylalanyl units has:  
A. one free amino group on an alanyl residue.  
B. one free amino group on an alanyl residue and one free carboxyl group on a glycyl residue.  
C. one free amino group on a glycyl residue and one free carboxyl group on an alanyl residue.  
D. two free amino and two free carboxyl groups.  
E. two free carboxyl groups, both on glycyl residues.
13. In a conjugated protein, a prosthetic group is:  
A. a fibrous region of a globular protein.  
B. a nonidentical subunit of a protein with many identical subunits.  
C. a subunit of an oligomeric protein.  
D. a part of the protein that is not composed of amino acids.  
E. synonymous with "protomer"
14. When oxygen binds to a heme-containing protein, the two open coordination bonds of  $\text{Fe}^{2+}$  are occupied by:  
A. one O atom and one amino acid atom.  
B. one  $\text{O}_2$  molecule and one amino acid atom.  
C. one  $\text{O}_2$  molecule and one heme atom.  
D. two O atoms.  
E. two  $\text{O}_2$  molecules.
15. The anaerobic conversion of 1 mol of glucose to 2 mol of lactate by fermentation is accompanied by a net gain of:  
A. 2 mol of ATP and 2 mol of NADH  
B. 2 mol of ATP  
C. 1 mol of ATP and 1 mol of NADH  
D. 2 mol of NADH  
E. 1 mol of NADH

16. Which one of the following molecules in Glycolysis donates a phosphate group to ADP to produce ATP?
- glucose-6-phosphate
  - phosphoenolpyruvate
  - fructose-6-phosphate
  - fructose-1,6-bisphosphate
  - glucose-1-phosphate
17. In what form does the product of glycolysis enter the TCA cycle?
- Pyruvate
  - Glucose
  - NADH
  - Acetyl-CoA
  - Succinate
18. Which 3-carbon molecule is a final product of Glycolysis?
- phosphoglyceraldehyde
  - pyruvate
  - 2-phosphoglycerate
  - 3-phosphoglycerate
  - Citrate
19. Which of the following has highest content of oleic acid ( $\omega 9$ , C18:1)?
- soybean oil
  - lard
  - butter
  - olive oil
  - palm oil
20. Which of the following has highest melting point?
- stearic acid (C18:0)
  - oleic acid ( $\omega 9$ , C18:1)
  - linoleic acid ( $\omega 6$ , C18:2)
  - $\gamma$ -linolenic acid ( $\omega 6$ , C18:3)
  - $\alpha$ -linolenic acid ( $\omega 3$ , C18:3)
21. Arachidonic acid can be synthesized from linoleic acid through
- $\Delta^5$  desaturation  $\rightarrow$   $\Delta^6$  desaturation  $\rightarrow$  elongation
  - $\Delta^5$  desaturation  $\rightarrow$   $\Delta^4$  desaturation  $\rightarrow$  elongation
  - $\Delta^6$  desaturation  $\rightarrow$  elongation  $\rightarrow$   $\Delta^5$  desaturation
  - $\Delta^4$  desaturation  $\rightarrow$  elongation  $\rightarrow$   $\Delta^5$  desaturation
  - $\Delta^5$  desaturation  $\rightarrow$  elongation  $\rightarrow$   $\Delta^6$  desaturation
22. Which of the following statements is true?
- Apo-AI is an activator of acyl-CoA:cholesterol acyl-transferase.
  - Apo-CIII is an activator of lipoprotein lipase.
  - Very low density lipoprotein (VLDL) can be converted to low density lipoproteins (LDL) by hormone sensitive lipase.
  - Chylomicron remnants are uptaken into the liver through binding of Apo-E to the LDL-receptor and to the LDL-receptor related protein (LRP).
  - HDL contains ApoB-48 but not Apo-B100.

23. The  $k_{cat}$  and  $K_M$  for enzyme X are  $2000 \text{ sec}^{-1}$  and  $0.1 \text{ M}$ , respectively. What is the initial velocity ( $V_0$ ) of this reaction when the substrate concentration is  $0.1 \text{ M}$  and the total concentration of enzyme X is  $0.002 \text{ M}$ ?
- A.  $6.0 \text{ M/sec}$   
B.  $4.0 \text{ M/sec}$   
C.  $2.0 \text{ M/sec}$   
D.  $1.0 \text{ M/sec}$   
E.  $0.5 \text{ M/sec}$
24. Which of the following is NOT classified as an enzyme
- A. ribosome B. proteasome C. spliceosome D. lysosome E. ribozyme
25. S-adenosylmethionine is a biological carrier of (I).  
ATP is a biological carrier of (II).  
FADH<sub>2</sub> is a biological carrier of (III).
- A. I: amino group, II: phosphate, III: nicotinamide  
B. I: adenosine, II: carboxylate, III: hydrogen atom  
C. I: methyl group, II: adenosine, III: electron  
D. I: amino group, II: carboxylate, III: hydrogen atom  
E. I: methyl group, II: phosphate, III: electron
26. You hypothesize that a newly purified enzyme may function as a serine protease. Which one of the following findings is NOT a useful proof of your hypothesis?
- A. This enzyme can be inhibited by metal chelator EDTA.  
B. A covalent bond between the enzyme and the substrate is transiently formed during catalysis.  
C. Structural analysis shows that this enzyme contains the Asp-His-Ser catalytic triad.  
D. This enzyme hydrolyzes polypeptides.  
E. The catalytic activity of this enzyme is pH-dependent.
27. What following condition of human liver gluconeogenesis will be activated at
- A. high concentrations of lipid in blood  
B. high concentrations of bilirubin in blood  
C. high concentrations of bezoate in blood  
D. low concentrations of uroporpyrin in urine  
E. low concentrations of glucose in blood.
28. What enzyme in human makes the regeneration of one AMP to ATP need two units of energy released from ATP to ADP?
- A. ATP synthetase B. protein phosphatase C. pyrophosphatase D. fructose 2,6-bisphosphatase  
E. 6-phosphofructokinase-2.
29. What enzyme catalyzes a non-oxidative reaction?
- A. cytochrome P450 B. complex I C. glucose 6-phosphate dehydrogenase D. transaldolase  
E. L-gulonolactone oxidase.
30. What type of cells heme catabolism occurs at?
- A. liver epithelial cells  
B. spleen reticuloendothelial cells  
C. bone marrow osteoblasts  
D. bone marrow fibroblasts  
E. bone marrow granulocyte.

31-34 The following diagram depicts phenylalanine and tyrosine degradation pathway and the enzymes involved. It also includes metabolic diseases when the enzymes are defect.



31. Tyrosinemia means

- A. High tyrosine concentration in the blood
- B. Low tyrosine concentration in the blood
- C. High tyrosine concentration in the urine
- D. Low tyrosine concentration in the urine
- E. None of above

32. Which of the following enzyme defect will cause tyrosinemia I ?

- A. Tyrosine aminotransferase
- B. Phenylalanine hydroxylase
- C. Homogentisate 1,2 deoxygenase
- D. Fumarylacetoacetase
- E. 3-ketoacyl-CoA transferase

33. Accumulation of which of the following metabolite will cause black urine?

- A. α-ketoglutarate
- B. Homogentisate
- C. Maleylacetoacetate
- D. p-hydroxyphenolpyruvate
- E. Fumarate

34. Phenolalanine is a \_\_\_\_\_ amino acid.

- A. Ketogenic
- B. Glucogenic
- C. Ketogenic and glucogenic
- D. None of above

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35. Which one of the following descriptions as to aspartate transcarbamoylase (ATCase) is right?
- A. ATCase catalyzes the first reaction to purine biosynthesis.
  - B. ATCase can be inhibited by cytidine triphosphate.
  - C. ATCase can be inhibited by adenosine triphosphate.
  - D. All are right.
  - E. All are wrong.
36. Which one of the following enzymes can be activated by diacylglycerol?
- A. MAP kinase
  - B. Protein A
  - C. Protein C
  - D. Tyrosine kinase
  - E. All of them.
37. Three enzymes are involved in the attachment of ubiquitin to proteins. Which one of the following statements is true?
- A. E1 is an activating enzyme.
  - B. E2 is a transferase.
  - C. E3 is a ligase.
  - D. All are right.
  - E. All are wrong.
38. Oxidative decarboxylation of pyruvate is mediated by pyruvate dehydrogenase complex, which requires some cofactors such as
- A. NAD<sup>+</sup>, nicotinamide adenine dinucleotide
  - B. FAD, flavin adenine dinucleotide
  - C. TDP, thiamin diphosphate
  - D. All are right.
  - E. All are wrong.
39. Transfer RNA (tRNA) functions in
- A. transcription
  - B. translation
  - C. protein degradation
  - D. DNA synthesis
  - E. electron transport.
40. Messenger RNA (mRNA) is mainly produced by
- A. RNA polymerase I
  - B. RNA polymerase II
  - C. RNA polymerase III
  - D. reverse transcriptase
  - E. ligase.
41. Targeting a protein to proteasome-mediated degradation requires
- A. lipid modification
  - B. methylation
  - C. acetylation
  - D. glycosylation
  - E. ubiquitination.
42. Glycosylation of proteins occurs in
- A. nucleus and nucleolus
  - B. lysosome and peroxisome
  - C. ER and Golgi apparatus
  - D. mitochondrion,
  - E. cytosol.
43. Which of the following chemicals could bind G protein-coupled receptor (GPCR)?
- A. vitamin D
  - B. tyrosine
  - C. TNF- $\alpha$
  - D. estradiol
  - E. carotene

44. Which of the following assays can be optimized for determining hormone concentration in the blood precisely?
- A. polymerase chain reaction
  - B. luciferase assay
  - C. polyacrylamide gel electrophoresis
  - D. radioimmunoassay
  - E. isoelectric focusing
45. Please select one compound that could bind directly to nuclear receptor and regulate gene functions.
- A. NAD
  - B. GTP
  - C. thyroxine
  - D. vitamin E
  - E. selenium
46. Which of the following toxic compounds can inhibit ion channels in human?
- A. ouabain
  - B. saxitoxin
  - C. cholera toxin
  - D. botulinum toxin
  - E. phorbol ester
47. Which one is correct for the following descriptions about RNA polymerase (Pol).
- A. RNA Pol I and III found and function in nucleoplasm
  - B. rRNA mainly synthesis by RNA Pol I in the nucleoplasm
  - C. U6 snRNA and 5.8S RNA synthesized by RNA Pol III
  - D. snRNAs are synthesized by RNA Pol II
  - E. 7 SL RNA is synthesized by RNA Pol III involved in protein synthesis in the nucleoplasm
48. Which glycosaminoglycan is free of protein core
- A. Chondroitin sulfate
  - B. Dermatan sulfate
  - C. Hyaluronic acid
  - D. Heparan sulfate
  - E. Keratin sulfate
49. Integrin can bind to which peptide below?
- A. AKAEKAA
  - B. AKGEAAA
  - C. AKADGAA
  - D. ARGDSAA
  - E. ARGESAA
50. Mitosis and meiosis accomplish segregation of the replicated DNA to two or more daughter cells. Which of the following is characteristic of both mitosis and meiosis?
- A. correct centrosomal duplication is required
  - B. The resulting cells are diploid (2n).
  - C. The resulting cells are haploid (1n).
  - D. Spindle fibers attach to chromosomes at their kinetochores. Chiasmata form between chromosome arms.
  - E. All of above are not correct