

1. 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).
  
2. In the laboratory, recombinant plasmids are commonly introduced into bacterial cells by:
  - A) electrophoresis – a gentle low-voltage gradient draws the DNA into the cell.
  - B) infection with a bacteriophage that carries the plasmid.
  - C) microinjection.
  - D) mixing plasmids with an extract of broken cells.
  - E) transformation – heat shock of the cells incubated with plasmid DNA in the presence of  $\text{CaCl}_2$ .
  
3. 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.
  
4. It is correct to say that DNA supercoiling cannot:
  - A) be induced by strand separation.
  - B) be induced by underwinding of the double helix.
  - C) form if there is Z-DNA structure present.
  - D) occur if a closed-circular, double-stranded DNA molecule has a nick.
  - E) result in compaction of the DNA structure.
  
5. The main reason that separated proteins on an SDS-PAGE gel is:
  - A) negative charge on protein
  - B) protein shape
  - C) protein density
  - D) protein molecular weight
  - E) resistant to protein mobility.
  
6. Which is the amino acid that delivers nitrogen wastes from most tissues to the liver for catabolism?
  - A) glutamate
  - B) glutamine
  - C) alanine
  - D) aspartate
  - E) asparagine.

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7. Which of the phospholipid is found in the outer layer facing extracellular space of a lipid bilayer?
- A) phosphatidyl choline
  - B) phosphatidyl ethanolamine
  - C) phosphatidyl serine
  - D) phosphatidic acid
  - E) phosphotidyl inositol.
8. Which of the following is NOT considered branched amino acid?
- A) valine
  - B) leucine
  - C) isoleucine
  - D) proline
  - E) 2-aminoisobutyric acid.
9. Which of the following polymerases is inhibited by  $\alpha$ -amanitin?
- A) DNA-dependent RNA polymerase I
  - B) DNA-dependent RNA polymerase II
  - C) RNA-dependent RNA polymerase
  - D) Reverse transcriptase
  - E) Telomerase
10. Which of the following choices is belonged to *cis*-element of eukaryotic transcriptional regulation?
- A) TATA box
  - B) Pribnow box
  - C) GC box binding protein SP1
  - D) CAAT box binding protein CTF
  - E) Repressor
11. Small nuclear RNA (snRNA) U2 bound to which part of the primary transcripts for RNA splicing?
- A) Transcriptional start site
  - B) 5' splice site
  - C) 3' splice site
  - D) Branch point encompassing the A site
  - E) Polyadenylation signal
12. 1,6-allolactose binds to which of the following choices to induce the transcription of lactose operon in *E. coli*?
- A) Operator
  - B) Promoter for regulatory gene
  - C) Promoter for *lac* operon
  - D) *lac* repressor
  - E) Catabolite gene activator protein (CAP)

13. Apolipoprotein CII (Apo-CII) deficiency is usually associated with
- A) hypercholesterolemia
  - B) hypocholesterolemia
  - C) hyperglycemia
  - D) hypoglycemia
  - E) hypertriglyceridemia
14. Which of the following is not required for synthesis of palmitic acid from acetyl-CoA?
- A) acetyl-CoA carboxylase
  - B) fatty acid synthase
  - C) elongase
  - D) NADPH
  - E) Biotin
15. Which of the following is responsible for the reverse cholesterol transport?
- A) VLDL
  - B) IDL
  - C) LDL
  - D) HDL
  - E) Chylomicron
16. Which of the following is not elevated in the plasma after fasting for 48 hours?
- A) acetone
  - B) acetoacetate
  - C) D-3-hydroxybutyrate
  - D) free fatty acid
  - E) glucose
17. Which of the following is not a reducing sugar?
- A) Lactose
  - B) Maltose
  - C) Sucrose
  - D) Glucose
  - E) None of the above
18. Which of the following enzymes is **NOT** required to metabolize galactose?
- A) Galactokinase
  - B) UDP-galactose-4-epimerase
  - C) UDP-galactose-1-epimerase
  - D) Galactose-1-phosphate uridylyltransferase
  - E) None of the above

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19. A three-month-old baby is diagnosed with pyruvate dehydrogenase complex deficiency. Which of the following coenzyme is **NOT** required by this enzyme complex to convert pyruvate to acetyl-CoA?
- A) Thiamine pyrophosphate
  - B) Nicotinamide adenine dinucleotide
  - C) Lipoamide
  - D) Flavin adenine dinucleotide
  - E) None of the above
20. The following enzymes involved in the citric acid cycle are all reversible except
- A) Succinyl-CoA synthetase
  - B) Succinic dehydrogenase
  - C) Fumarase
  - D) Citrate synthase
  - E) None of the above
21. Which of the following statements about aromatic amino acids is correct?
- A) All are strongly hydrophilic.
  - B) Histidine's ring structure results in its being categorized as aromatic or basic, depending on pH.
  - C) On a molar basis, tryptophan absorbs more ultraviolet light than tyrosine.
  - D) The major contribution to the characteristic absorption of light at 280 nm by proteins is the phenylalanine R group.
  - E) The presence of a ring structure in its R group determines whether or not an amino acid is aromatic.
22. Proteins may be separated according to size by
- A) Isoelectric focusing
  - B) Affinity chromatography
  - C) Ion exchange chromatography
  - D) Molecular exclusion chromatography
  - E) Reverse phase HPLC
23. Hemoglobin and myoglobin both have, are, can, or do all of the following except
- A) highly  $\alpha$  helical
  - B) bind one molecule of heme per globin chain
  - C) subunits that provide hydrogen bonds to and nonpolar interaction with other subunits
  - D) bind heme in a hydrophobic pocket
  - E) bind one O<sub>2</sub> per heme
24. A protein has one transmembrane domain composed entirely of  $\alpha$ -helical secondary structure. Which of the following amino acids would you expect to find in the transmembrane domain?
- A) Proline
  - B) Glutamate
  - C) Lysine
  - D) Leucine
  - E) Arginine

25. How  $\text{Ca}^{++}$  can increase the enzymatic activity of phosphorylase for glycogen metabolism?
- A)  $\text{Ca}^{++}$  increases the activity of calmodulin-dependent protein kinase and then activate the enzymatic activity of phosphorylase
  - B)  $\text{Ca}^{++}$  increases the activity of calmodulin-dependent phosphatase and then activate the enzymatic activity of phosphorylase
  - C)  $\text{Ca}^{++}$  increases the activity of calmodulin-dependent protein kinase and then regulates glycogen synthase kinase activity, leading to up-regulation of phosphorylase activity
  - D)  $\text{Ca}^{++}$  binds to the  $\delta$  subunit of the phosphorylase kinase and then promotes the activity of phosphorylase
  - E)  $\text{Ca}^{++}$  inhibits the protein phosphatase 1 and increases increases the activity of calmodulin-dependent phosphatase and then the enzymatic activity of phosphorylase.
26. Which following condition we cannot observe any glucosuria syndrome?
- A) loss of function of pancreatic  $\beta$  cells
  - B) liver damage
  - C) insulin increases glucose tolerance
  - D) inherited defects in the kidney
  - E) none of the above.
27. In human body what compound cannot be used for glycine biosynthesis?
- A) choline
  - B) alanine
  - C) glyoxylate
  - D) serine
  - E) none of the above.
28. What following enzyme can generate ammonium ( $\text{NH}_3$ )?
- A) uroporphyrinogen I synthase
  - B) uroporphyrinogen II synthase
  - C) uroporphyrinogen III synthase
  - D) coproporphyrinogen oxidase
  - E) protoporphyrinogen oxidase.
29. Which one below is **not** the component of membrane?
- A) Lipid
  - B) Protein
  - C) Cholesterol
  - D) Sterol
  - E) None of above all
30. Phosphatidylinositol (PtdIns) is a small lipid to regulate diverse biological function. The activity/function of PtdIns can be modulated by kinases and phosphatases. The kinases-mediated phosphorylation is happening on hydroxyl positions of the inositol ring. Which position below is **not** the site for phosphorylation?
- A) 3 hydroxyl position
  - B) 4 hydroxyl position
  - C) 5 hydroxyl position
  - D) 3 and 4 hydroxyl positions
  - E) 6 hydroxyl position

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31. Which one below is **not** membrane-bound organelles/vesicles in cells?
- A) Giant unilamella vesicles (GUV)
  - B) Mitochondria
  - C) Late endosome
  - D) Chloroplast
  - E) Lysosome
32. Which one below is **not** the feature of signal-transducing systems?
- A) Specificity
  - B) Desensitization
  - C) Integration
  - D) Amplification
  - E) None of above all
33. In G-protein coupled receptors what subunit binds to GTP and has GTPase activity?
- A) Alpha
  - B) Beta
  - C) Gamma
  - D) Delta
  - E) Epsilon
34. All G-protein coupled receptors are?
- A) 1 membrane-spanning receptors
  - B) 5 membrane-spanning receptors
  - C) 7 membrane-spanning receptors
  - D) 10 membrane-spanning receptors
  - E) 13 membrane-spanning receptors
35. What enzyme converts ATP into cAMP?
- A) ATPase
  - B) Cyclic nucleotide phosphodiesterase
  - C) Adenylate cyclase
  - D) Serine kinase
  - E) All of the above
36. Phosphatidylinositol 4,5-bisphosphate (PIP<sub>2</sub>) is cleaved into what secondary messengers?
- A) IP<sub>3</sub> (inositol triphosphate) and DAG (diacylglycerol).
  - B) IP<sub>3</sub> and NO (nitric oxide)
  - C) Calcium and DAG
  - D) NO and DAG
  - E) All of the above

37. In protein translation, release factors are required in which stage:

- A) activation of amino acids.
- B) initiation.
- C) elongation.
- D) termination.
- E) protein folding.

38. For targeting nuclear proteins, nuclear localization sequences are recognized by:

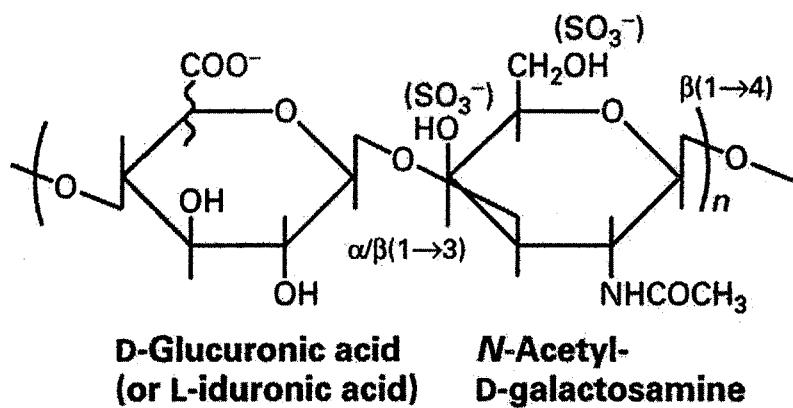
- A) SRP.
- B) proteasome.
- C) Ion channels.
- D) microtubule.
- E) importin.

39. In genome, a silent mutation in protein coding region will lead to:

- A) a wrong amino acid incorporated into protein.
- B) premature termination.
- C) no change of amino acid sequence.
- D) a frame shift.
- E) initiation failure.

40. Which molecule can catalyze the formation of peptide bond?

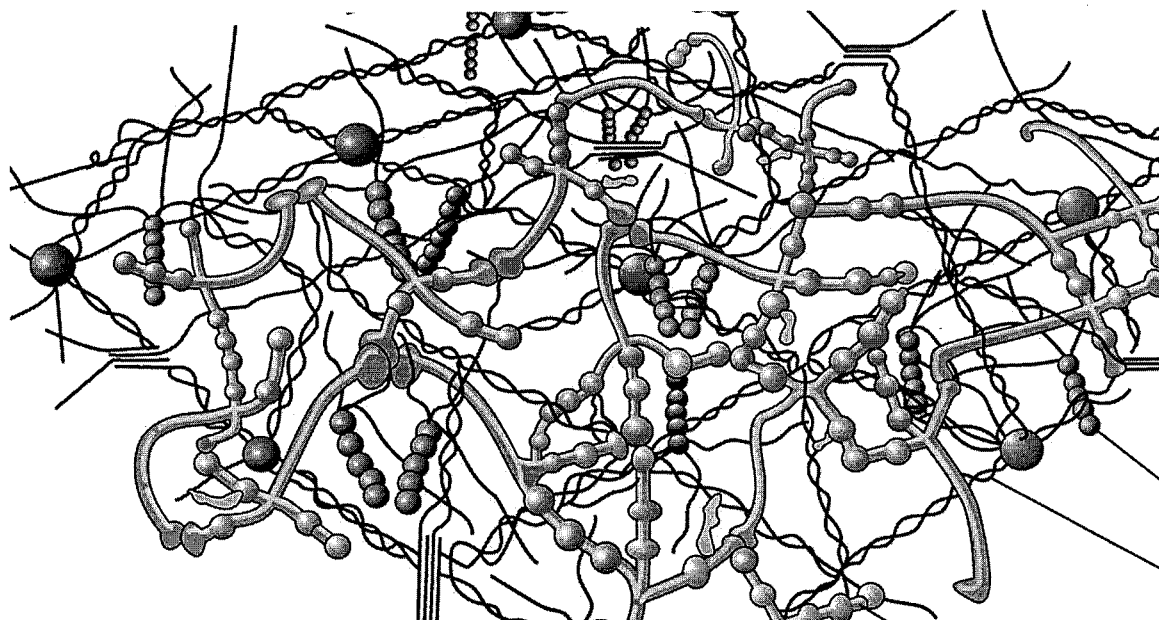
- A) ribosomal RNA.
- B) transfer RNA.
- C) micro RNA.
- D) messenger RNA.
- E) initiation factors.



41. Which descriptions about the sugar polymer above are corrects:

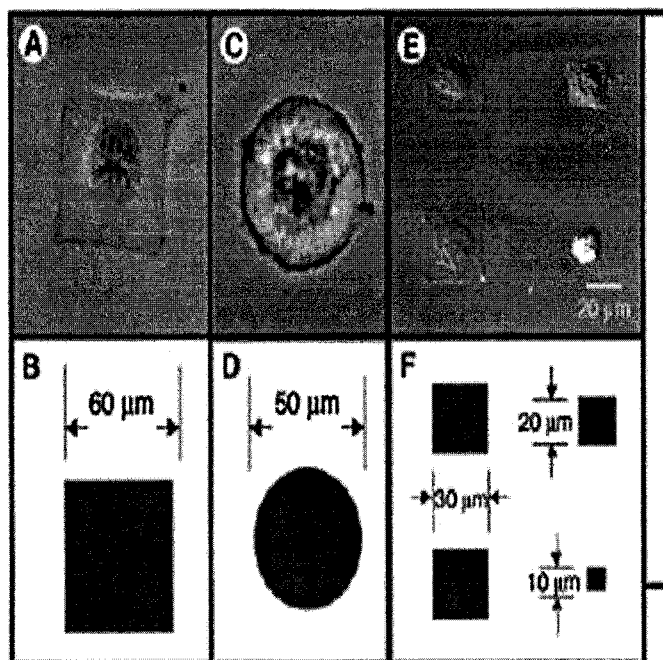
- A) Proteoglycan
- B) Glycosaminoglycan
- C) Hyaluronan
- D) Chondroitin sulfate
- E) repulsive(inhibitory) signal for neurite out growth

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42. Which descriptions about the mosaic structure above are corrects:

- A) cell membrane
- B) most components can be degraded by DNase or RNase
- C) basement membrane
- D) containing type 4 collagen, laminin, perlecan.
- E) containing type I collagen, laminin, fibronectin



(43-44) Two questions set about the NIH3T3 cells were grown on the fibronectin coated on gold micropattern chip as the above figure:

43. Which ECM receptor is critical for NIH3T3 cells grown on the chip?

- A) L-selectin
- B) E-cadherin
- C) I-CAM
- D)  $\alpha 5 \beta 1$
- E)  $\alpha 3 \beta 1$



44. which descriptions of the growth pattern are correct:

- A) fibronectin decide the growth pattern (round or circle)
- B) anchorage-dependent growth
- C) anchorage-independent growth
- D) 20  $\mu\text{m}$  square is the minimum area for cells growth
- E) 10  $\mu\text{m}$  square is the minimum area for cells growth

45. According to the Michaelis–Menten equation, the  $V_{\text{max}}$  and  $K_m$  of an enzymatic reaction can be deduced by plotting

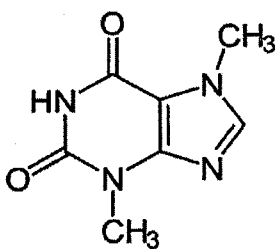
- A) substrate concentration vs time
- B) initial velocity vs time
- C) product concentration vs time
- D) initial velocity vs product concentration
- E) initial velocity vs substrate concentration

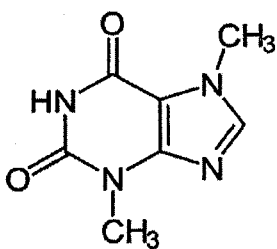
46. The reaction “A  $\longleftrightarrow$  B” is most likely catalyzed by a(an)

- A) Oxidoreductase
- B) Transferase
- C) Isomerase
- D) Ligase
- E) hydrolase

(47-49)Theophylline, which can function as a competitive nonselective phosphodiesterase inhibitor, is a drug used in therapy for respiratory diseases, such as asthma.

47. Which of the following descriptions as to theophylline is **RIGHT**?



- A)  The structure left is theophylline.
- B) Theophylline is a trimethylxanthine.
- C) Theophylline is the hypoxanthine derivative of tea.
- D) Theophylline is similar with caffeine but lack the methyl group at N-1 of the heterocycle.
- E) None of them.

48. Continue the above, a phosphodiesterase inhibitor can

- A) raise intracellular cyclic adenosine monophosphate (cAMP).
- B) reduce intracellular cAMP.
- C) raise intracellular AMP.
- D) reduce intracellular CMP.
- E) none of them.

49. Continue the above, which of the following descriptions as to cAMP is **RIGHT**?

- A) 3',5'-cyclic AMP.
- B) The intracellular cAMP concentration is three orders of magnitude below that of ATP.
- C) cAMP can serve as the second messengers in hormonally regulated events.
- D) all are right.
- E) none of them.

50.  $\text{CH}_3(\text{CH}_2)_5\text{CH}=\text{CH}(\text{CH}_2)_9\text{COOH}$  is an unsaturated fatty acid, which of the following nomenclature names is **RIGHT** for it?

- A)  $\omega$ 3, C18:1
- B)  $\omega$ 5, C18:1
- C)  $\omega$ 7, C18:1
- D)  $\omega$ 9, C18:1
- E)  $\omega$ 11, C18:1.

試題隨卷繳回