

※ 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」。

**Question 1~3**

an experimenter generates a library of plasmids containing 10-15 kilobase (kb) inserts from the genome of a *ium* by partially digesting the bacterial genomic DNA with *EcoRI* and cloning the resulting fragments into the *EcoRI* site of a plasmid vector. The experimenter must then identify the plasmids containing the *purB* gene. To do this, 5 of the plasmids from the library were digested with *EcoRI* and the digests were separated by gel electrophoresis (Figure 1). In a second experiment, the same 5 plasmids were analyzed by PCR using primers derived from sequences internal to *purB* and electrophoresis was performed on the PCR products (Figure 2). Both gels were stained with ethidium bromide to visualize the DNA.

Figure 1. Electrophoresis of digests

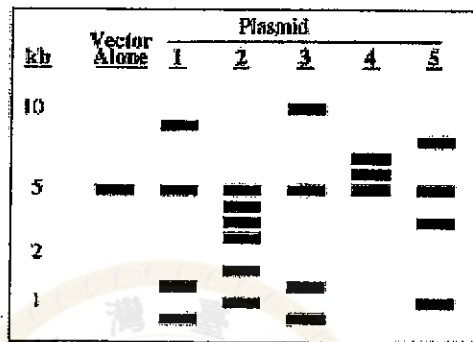
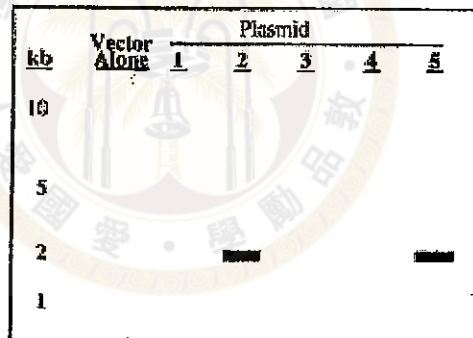


Figure 2. Electrophoresis of PCR products



The inserts in which of the following pairs of plasmids may overlap?

- (A) 3 with 4 only
- (B) 3 with 5 only
- (C) 1 with 2 and 3 with 4 only
- (D) 1 with 3 and 2 with 5 only
- (E) All of the inserts may overlap.

Which of the following methods would NOT be a useful alternative to using PCR to determine which plasmids contain *purB*?

- (A) Testing for complementation of a *purB* auxotroph
- (B) Sequencing the inserts
- (C) Hybridizing the plasmids with a probe complementary to *purB*
- (D) Mapping each plasmid with several restriction enzymes
- (E) Footprinting with DNase

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The part of *purB* complementary to the *purB* primers is contained in which of the following plasmids?

- (A) 2 only
- (B) 5 only
- (C) 2 and 5 only
- (D) 1, 3, and 4 only
- (E) 1, 2, 3, 4, and 5

**Question 4~5**

An *in vitro* system is used to study replication of a viral DNA genome that is a double-stranded, covalently closed circle. The location of the sites for the restriction endonuclease *Mbol* on this DNA are shown in Figure 1. Replication reactions are carried out using viral DNA as a template, extracts of infected cells as a source of enzymes, and other exogenous nucleotides (dGTP, dCTP, dATP, dTTP, and ATP), all of which are labeled with <sup>32</sup>P. The reaction products are digested with *Mbol*, analyzed by agarose gel electrophoresis, and visualized by autoradiography, producing the results shown in lane 1 of Figure 2. The same reaction is carried out in the presence of increasing concentrations of nonradioactive 2', 3'-dideoxyGTP (ddGTP), and the results are shown in lanes 2-4. (Note: only full-length restriction fragments are shown.)

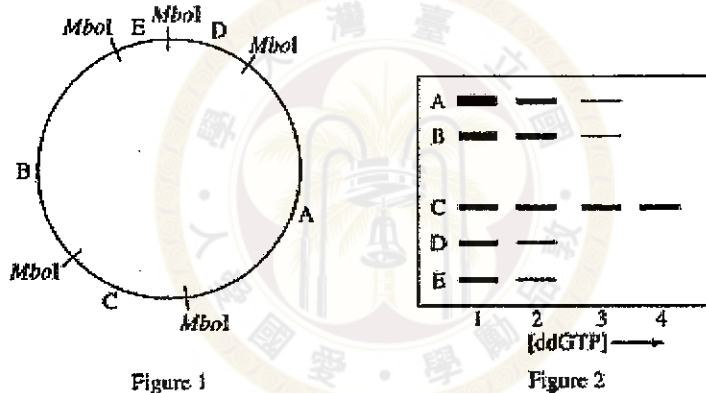


Figure 1

Figure 2

The specific activity of the DNA fragments in Figure 2 is defined as <sup>32</sup>P disintegrations per minute per microgram of DNA. Which of the following best describes the relative specific activities of the fragments in lane 1?

- (A) Fragment A has the highest specific activity, followed by B, C, D and E.
- (B) Fragment E has the highest specific activity, followed by D, C, B, and A.
- (C) The specific activity depends on the order in which the fragments were replicated.
- (D) All fragments have the same specific activity.
- (E) The relative specific activities vary from experiment to experiment.

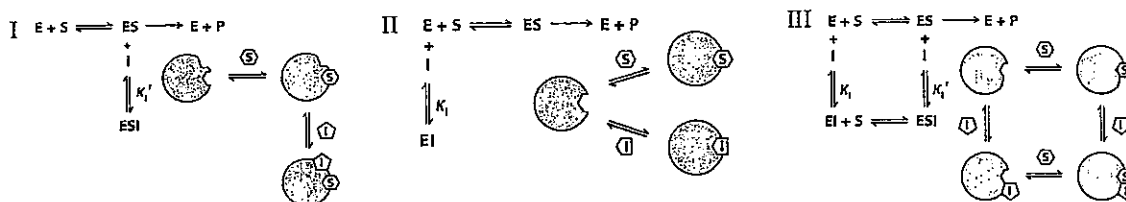
The data in Figure 2 indicate that the origin of replication of this DNA is in fragment

- (A) A
- (B) B
- (C) C
- (D) D
- (E) E

6. Which following compound can be oxidized by mitochondrial Complex II? (A) glycerol 3-phosphate (B) Fumarate (C) Succinate (D) malate (E) succinyl-CoA.
7. When glycogenesis occurs, what will happen? (A) The protein molecular mass of glycogenin will increase. (B) Glucose will be conjugated together. (C) Glucose will be degraded and metabolized to pyruvate. (D) Gluconeogenesis will increase (E) Pentose phosphate pathway will generate more products.
8. Which one is not involved in protein degradation? (A) aminopeptidase (B) carboxypeptidase (C) ubiquitin (D) proteosome (E) nucleosome.
9. Which compound is not an amphibolic intermediate? (A) malate (B) succinyl-CoA (C) fumarate (D) citrate (E) oxaloacetate.
10. Which one is not a source for glycine biosynthesis in human liver? (A) choline (B) serine (C) glyoxylate (D) arginine (E) glutamate.
11. Which of the following statements regarding enzyme is false:  
(A) Some RNA molecules can function as enzymes.  
(B) Enzymes reduce activation energy by binding tightly to the substrate.  
(C) A single enzyme molecule can catalyze the formation of many products.  
(D) Enzymes are stereospecific catalysts.  
(E) Enzyme activity can be regulated.
12. At very high substrate concentration, the reaction rate of an enzyme-catalyzed reaction will "saturate" (that is, the reaction rate reaches a maximum). Why?  
(A) At high substrate concentration, the change in free energy of the reaction decreases.  
(B) The reaction has reached equilibrium.  
(C) The rate of the reverse reaction increases at high substrate concentration.  
(D) Feedback inhibition.  
(E) All the enzyme molecules are bound to substrates.

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13. Which one of the following matches is correct?



- (A) I: uncompetitive inhibition; II: competitive inhibition; III: mixed inhibition.  
 (B) I: competitive inhibition; II: uncompetitive inhibition; III: mixed inhibition.  
 (C) I: mixed inhibition; II: uncompetitive inhibition; III: competitive inhibition.  
 (D) I: mixed inhibition; II: competitive inhibition; III: uncompetitive inhibition.  
 (E) I: noncompetitive inhibition; II: competitive inhibition; III: uncompetitive inhibition

14. In addition to NADH, what are the end products of glycolysis

- (A) CO<sub>2</sub> and H<sub>2</sub>O  
 (B) CO<sub>2</sub> and pyruvate  
 (C) CO<sub>2</sub> and lactate  
 (D) ATP and pyruvate  
 (E) pyruvate, lactate, and ATP

15. Which of the following statements regarding TCA cycle is true?

- (A) The initial reaction of TCA cycle involves the addition of a 2-carbon molecule to a 6-carbon molecule.  
 (B) TCA cycle occurs in cytosol.  
 (C) A single turn of the TCA cycle produces 1 ATP, 3 NADH, and 1 FADH<sub>2</sub>.  
 (D) A single turn of the TCA cycle involves 4 decarboxylation steps.  
 (E) None of the above.

16. Which of the following reagents is a reducing reagent?

- (A) PITC (B) thiourea (C) DTT (D) performic acid (E) ninhydrin

17. 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 6N hydrochloric acid for 10 hours.  
(E) Mixing one volume of plasma with two volumes of pure alcohol.
18. Which one of the following amino acids would be considered most polar?  
(A) Methionine (B) Serine (C) Isoleucine (D) Tryptophan
19. A peptide has the sequence Ile-Arg-Ser, This oligopeptide has a pI close to (A) 4.0  
(B) 5.0 (C) 6.0 (D) 8.0 (E) 10.0
20. A signal sequence has to be expected in the precursors of all the following proteins except  
(A) Ribosomal proteins  
(B) The sodium-potassium ATPase in the plasma membrane  
(C) Collagen in the extracellular matrix of connective tissues  
(D) Signal peptidase  
(E) Acid maltase, a lysosomal hrdrolase
21. How many turns of the fatty acid oxidation cycle are required for complete oxidation of arachidic acid to acetyl-CoA?  
(A) 8 turns (B) 9 turns (C) 10 turns (D) 11 turns
22. Which of the following enzymes is not required for synthesis of 20:4( $\omega$ -6) fatty acid from 18:2( $\omega$ -6) fatty acid?  
(A)  $\Delta^4$  desaturase (B)  $\Delta^5$  desaturase (C)  $\Delta^6$  desaturase (D) elongase
23. Inherited defect in Apo-CII lead to a increase of plasma  
(A) cholesterol (B) phospholipid (C) free fatty acid (D) triacylglycerol
24. The structure of stearic acid(C18:0) is similar to the structure of  
(A) linoleic acid ( $\omega$ 6, C18:2)  
(B) -linoleic acid ( $\omega$ 3, C18:3)  
(C) *trans*-oleic acid ( $\omega$ 9, C18:1)  
(D) *cis*-oleic acid ( $\omega$ 9, C18:1)

25. In plasma, long-chain unesterified fatty acids are combined with  
(A) Apo B (B) Apo E (C) albumin (D) carnitine
26. Which of the following RNA has the highest percentage of modified bases  
(A) mRNA  
(B) rRNA  
(C) tRNA  
(D) HnRNA
27. Which of the following RNA contains a 7-methylguanosine triphosphate cap and a polyadenylate segment.  
(A)mRNA  
(B) rRNA  
(C) tRNA  
(D) small nuclear RNA
28. *E. coli* does not express  $\beta$ -galactocidase when its growth medium containing both lactose and glucose, because  
(A)CAP is not activated for DNA binding.  
(B)Glucose activates the expression of lac repressor.  
(C)Lac repressor can still bind to the *lac* operator sequence.  
(D)Glucose interferes with lactose binding with the *lac* repressor.
29. Coactivator protein influence eukaryotic gene expression by  
(A)binding to TATA box  
(B)interacting with RNA polymerase directly to enhance transcription  
(C)interacting with activators.  
(D)binding to cis-element in the promoter region.
30. Which of the following enzyme is most sensitive to  $\alpha$ -amanitin.  
(A) DNA polymerase III  
(B) RNA polymerase II  
(C) RNA polymerase III.  
(D) DNA polymerase I.

31. Which of the following modification does not usually occur in the mRNA processing of eukaryotes:

- (A) acetylation (B) capping (C) intron removal (D) exon joining  
(E) poly A addition.

32. Which of the following polymerase is required for the synthesis of rRNA in eukaryotes:

- (A) RNA polymerase I (B) RNA polymerase II (C) RNA polymerase III  
(D) reverse transcriptase (E) Taq DNA polymerase

33. Which of the following anticodon of tRNA is corresponding to methionine codon:

- (A) 5'AUG3' (B) 5'UAC3' (C) 5'UGC3' (D) 5'CAU3' (E) 5'CGU3'

34. Which of the following RNA sequence is complementary to the upstream sequence of start codon in prokaryotes for translation initiation:

- (A) 3' end of 5S rRNA (B) 5' end of 5.8S rRNA (C) 3' end of 16S rRNA  
(D) 5' end of 18S rRNA (E) 3' end of 23S RNA

35. Which of the following substitution is called transversion:

- (A) A to C  
(B) C to T  
(C) tryptophan codon to stop codon  
(D) nonsense codon to sense codon e. frame shifting

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(36-40) Please match the questions below with the answers on the right column.

36. \_\_\_\_\_. Viagra (sildenafil) inhibited enzyme
- (A) Janus kinase  
(B) Phosphorylase  
(C) Phospholipase  
(D) Phosphatase  
(E) Phosphodiesterase
37. \_\_\_\_\_. Synthesis of epinephrine
- (A) Src kinase  
(B) Phosphoinositide 3-kinase  
(C) Oxidoreductase  
(D) Synthase  
(E) Transferase
38. \_\_\_\_\_. Colera toxin
- (A) Ligase  
(B) Lyase  
(C) Phosphorylase  
(D) Phosphatase  
(E) Phosphodiesterase
39. \_\_\_\_\_. DNase
- (A) Phosphoinositide 3-kinase  
(B) Phosphorylase  
(C) Phospholipase  
(D) Phosphatase  
(E) Phosphodiesterase
40. \_\_\_\_\_. Interferon  $\gamma$  activated enzyme
- (A) Phosphatase  
(B) Phosphorylase  
(C) Phosphodiesterase  
(D) Janus kinase  
(E) Akt/PKB

試題隨卷繳回