

系所組別： 熱帶植物科學研究所

考試科目： 分子生物學

考試日期： 0220 · 節次： 3

※ 考生請注意：本試題 可 不可 使用計算機

一、SIMPLE-CHOICE QUESTIONS 單選題 (two points for each question.每題2分)(70%)
(以A、B、C、D、E五種選項作答，其餘一律不計分)

1. Some genes located on the same chromosome do not show perfect linkage because
 - A. they are too close together.
 - B. they are interrupted by other genes.
 - C. crossover events occur between homologous.
 - D. some genes are deleted.
 - E. too many alleles are present.
2. Which of the following statements is **not true** regarding genetic mapping?
 - A. Genes are arranged in a linear order on chromosomes.
 - B. Recombination occurs between chromosomes.
 - C. There is a mathematical relationship between the distance separating two genes and the recombination frequency.
 - D. Mapping is used to establish the location of genes relative to each other.
 - E. Mapping is used to determine the composition of a gene.
3. Who conducted the X-ray diffraction studies of DNA?
 - A. Franklin and Wilkins
 - B. Miescher and McClintock
 - C. Watson and Crick
 - D. Meselson and Stahl
 - E. Avery and Beadle
4. Which of the following would prevent the formation of a phosphoester bond in DNA?
 - A. removal of a nitrogen from one of the bases
 - B. removal of oxygen from carbon 2 of the sugar
 - C. removal of an oxygen from carbon 3 of the sugar
 - D. removal of the phosphate from the alpha position of the nucleoside triphosphate
 - E. removal of the phosphate at the beta position of the nucleoside triphosphate

(背面仍有題目,請繼續作答)

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5. Which of the following would result in a block of transcription of RNA?
- A. ATP
 - B. dCTP
 - C. dGTP
 - D. dTTP
 - E. none of the choices are correct.
6. Which of the following is not present in eukaryotes?
- A. aminoacyl-tRNA synthetase
 - B. Shine-Dalgarno sequence
 - C. peptidyl transferase
 - D. EF-Tu
 - E. methionyl-tRNA
7. In which of the following scenarios is a silent mutation least likely?
- A. change in a sequence in the 5' UTR
 - B. change in a sequence the 3' UTR
 - C. change in a sequence in an exon
 - D. change in the sequence in the promoter
 - E. change in a sequence in an intron
8. An experiment was designed to obtain nonspecific transcription from both strands of a DNA molecule. Which of the following strategies would be most effective in achieving this?
- A. Include the RNA holoenzyme in the reaction.
 - B. Use the core enzyme of RNA polymerase.
 - C. Enrich the preparation with sigma subunit.
 - D. Use intact DNA .
 - E. Include the RNA holoenzyme in the reaction and use the core enzyme of RNA polymerase are both effective.

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9. Place the following in the order that they occur during transcription initiation:
1 - formation of open complex; 2 - formation of closed complex;
3 promoter clearance; 4 - synthesis of about 10 nucleotides
- A. 1, 2, 3, 4
B. 2, 1, 4, 2
C. 2, 1, 2, 4
D. 3, 1, 2, 4
E. 3, 2, 1, 4
10. Which of the following are characteristic of intrinsic terminator elements?
- A. They contain an inverted repeat.
B. They contain a hairpin loop.
C. They contain several T's in the nontemplate strand of DNA.
D. Only They contain an inverted repeat and they contain a hairpin loop are correct.
E. They contain an inverted repeat, they contain a hairpin loop, and they contain several T's in the nontemplate strand of DNA are correct.
11. Which of the following factors is involved in proofreading during transcription?
- A. GreB
B. NusA
C. sigma-factor
D. rho-factor
E. none of the choices are correct.
12. Identify the allosteric protein.
- A. operator
B. repressor
C. promoter
D. β -galactosidase
E. permease

(背面仍有題目,請繼續作答)

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13. Which of the following plasmids could be used to restore inducible regulation of β -galactosidase in this mutant: $I^+ O^c Z Y^+ A^+$?
- A. $I^+ O^c Z Y^+ A^+$
 - B. $I^+ O^c Z Y A^-$
 - C. $I O^+ Z^+ Y^+ A^+$
 - D. $I O^c Z^+ Y^+ A^+$
 - E. Both $I^+ O^c Z Y^+ A^+$ and $I^+ O^c Z Y A^-$ are correct.
14. Which of the following is mostly likely to occur if the level of glucose is low in a bacterial cell?
- A. Cyclic-AMP levels will be depressed.
 - B. CAP will assist in stimulating transcription of the *lac* operon.
 - C. CRP activity will be inhibited.
 - D. Both Cyclic-AMP levels will be depressed and CRP activity will be inhibited are correct.
 - E. None of the choices is correct.
15. *O*, *P*, *S*, and *R* genes are part of the lambda phage genome. A new clone of lambda was constructed that lacked the *O* and *P* region. Which of the following would be observed if this new clone were used to infect bacteria?
- A. The clone would not enter the cell.
 - B. The clone would be destroyed by the bacterial host.
 - C. Replication of this would be impaired in the lytic phase.
 - D. A rapid burst of replication would occur.
 - E. The clone would not enter the cell and replication of this would be impaired in the lytic phase are correct.
16. Which of the following provided further evidence of the importance of specific amino acid in repressor binding?
- A. ethylation
 - B. methylation
 - C. DNA sequence data
 - D. genetic analysis
 - E. all of the choices are correct.

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17. One of the first steps in the Clone-by-Clone strategy is to map the genome using chromosomal markers. Which of the following is not a marker used to map a genome?
- A. YACs
 - B. RFLPs
 - C. VNTRs
 - D. STSs
 - E. ESTs
18. Genomic sequence information can be applied to study which of the following?
- A. evolution of genomes
 - B. function of genomes
 - C. structure of genomes
 - D. proteomics
 - E. all of the choices are correct.
19. DNA microarrays can be used to study
- A. the clustering of expression of genes in time and space.
 - B. the DNA sequence of multiple chromosomes.
 - C. the DNA sequence of multiple genomes.
 - D. chromosomal rearrangements.
 - E. chromosomal abnormalities.
20. Which of the following would probably not be a characteristic of the Tn3 transposon?
- A. inverted repeat sequences
 - B. antibiotic resistance gene(s)
 - C. resolvase gene
 - D. transposase gene
 - E. *orit* site
21. Which of the following is the most common type of histone modification?
- A. lysine ϵ -amino methylation
 - B. serine *o*-phosphorylation
 - C. lysine *n*-phosphorylation
 - D. histidine *n*-phosphorylation
 - E. acetylation

(背面仍有題目,請繼續作答)

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22. "Snurps" are composed of
- A. RNA.
 - B. protein.
 - C. DNA.
 - D. RNA and protein.
 - E. DNA and RNA.
23. Which of the following is a reasonable way to explain the ability of enhancers to act at a distance?
- A. The activator binds to an enhancer, changing the supercoiling state of the DNA and opening up the promoter to general transcription factors.
 - B. The activator binds to an enhancer, slides along the DNA until it encounters the promoter, and activates transcription.
 - C. An activator binds to an enhancer, creating loops in the DNA, which leads to the interaction of proteins at the promoter and activation of transcription.
 - D. An activator binds to an enhancer and a downstream segment to form a loop, which causes the protein to track toward the promoter and activate transcription.
 - E. All of the choices explanations are possible.
24. Which of the following processes occurs posttranscriptionally?
- A. Cap addition
 - B. adenosine deamination
 - C. Poly(A) addition
 - D. promoter clearance
 - E. unwinding
25. All of the following are true regarding homeodomains except
- A. they contain about 60 amino acids.
 - B. they resemble prokaryotic helix-turn-helix domains.
 - C. they are a class of DNA-binding proteins.
 - D. they may be involved in the regulation of development.
 - E. they are repressors.

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26. Put the following steps of prokaryotic translation initiation in the correct order.

- (1) Binding of IF1, IF2, and GTP to the 30S subunit.
- (2) Binding of IF3 to the 30S subunit.
- (3) Binding of the 50S subunit and loss of IF1 and IF3.
- (4) Dissociation of the 70S ribosome.
- (5) Formation of the 70S initiation complex by dissociation of IF2 and GTP hydrolysis.
- (6) Formation of the 30S initiation complex.

- A. 4,2,1,6,3,5
- B. 2,1,6,3,5,4
- C. 5,6,3,2,1,4
- D. 1,2,3,4,5,6
- E. 2,4,1,6,3,5

27. Which of the following characteristics is not a characteristic of a G protein?

- A. They bind GMP for activation.
- B. They have intrinsic GTPase activity.
- C. Binding of GTP activates their function.
- D. Cleavage of bound GTP to GDP inactivates them
- E. They cycle between three conformational states.

28. Which of the following is not a characteristic of prokaryotic single stranded DNA binding proteins?

- A. They are not essential for cell replication.
- B. They stimulate homologous DNA polymerase.
- C. They aid helicase action.
- D. They keep DNA strands from annealing.
- E. They bind more tightly to ssDNA than to dsDNA.

29. The most common type of DNA damage repair is

- A. excision repair.
- B. photoreactivation.
- C. suicide enzyme repair.
- D. DNA photolyase.
- E. proofreading repair.

(背面仍有題目,請繼續作答)

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30. Put the following steps of *E. coli* primosome assembly in the correct order.

- (1) Primase binds.
- (2) DnaA binds to *oriC* at *dnaA* boxes.
- (3) DnaB binds to the open complex.
- (4) DnaA, RNA polymerase, and HU protein melt the DNA.

- A. 2, 4, 1, 3
- B. 2, 4, 3, 1
- C. 4, 1, 2, 3
- D. 4, 2, 1, 3
- E. 3, 4, 1, 2

31. Molecular modeling of RuvA and a Holliday junction showed that they form a _____ that favors rapid branch migration.

- A. square planer conformation
- B. L-shape conformation
- C. clover leaf conformation
- D. D loop conformation
- E. Y-shape conformation

32. Protein crystals are used in x-ray diffraction studies because

- A. the molecules of proteins in a powder or solution are too loose.
- B. the diffraction power of a single protein molecule is too low.
- C. several molecules of proteins are in a crystal leading to strong diffraction patterns.
- D. the molecules of proteins in a powder or solution are too loose and the diffraction power of a single protein molecule is too low only.
- E. the molecules of proteins in a powder or solution are too loose, the diffraction power of a single protein molecule is too low, and several molecules of proteins are in a crystal leading to strong diffraction patterns.

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33. High-resolution analysis of the repressor-operator complex shows that
- A. the DNA is contacted by amino acid residues of the repressor through the major groove.
 - B. the DNA wraps around the helix but makes no contact with the major and minor grooves.
 - C. the amino acids are covalently bonded to DNA.
 - D. the DNA is contacted by amino acid residues of the repressor through the major groove and the DNA wraps around the helix but makes no contact with the major and minor grooves are correct.
 - E. the DNA is contacted by amino acid residues of the repressor through the major groove, the DNA wraps around the helix but makes no contact with the major and minor grooves, and the amino acids are covalently bonded to DNA are correct.
34. Which of the following are products of RNA polymerase II activity?
- A. tRNA
 - B. snRNA
 - C. hnRNA
 - D. tRNA and snRNA
 - E. snRNA and hnRNA
35. Determine which of the following would most likely lead to a dramatic reduction in transcription.
- A. absence of the TATA box
 - B. removal of some TAFs
 - C. removal of TAFII250
 - D. absence of the TATA box and removal of some TAFs
 - E. none of the choices are correct.

二、SHORT ASSAY EXAM QUESTIONS 簡答題(Five points for each question.每題5分)(30%)

1. Please describe the special features of a cloning vector that allows you to clone a DNA fragment for amplification of a DNA fragment and screen for clones that contain an insert.
2. If you want to amplify a DNA fragment with a pGEM-T vector with NcoI and PstI sites, how will you clone and amplify the gene.

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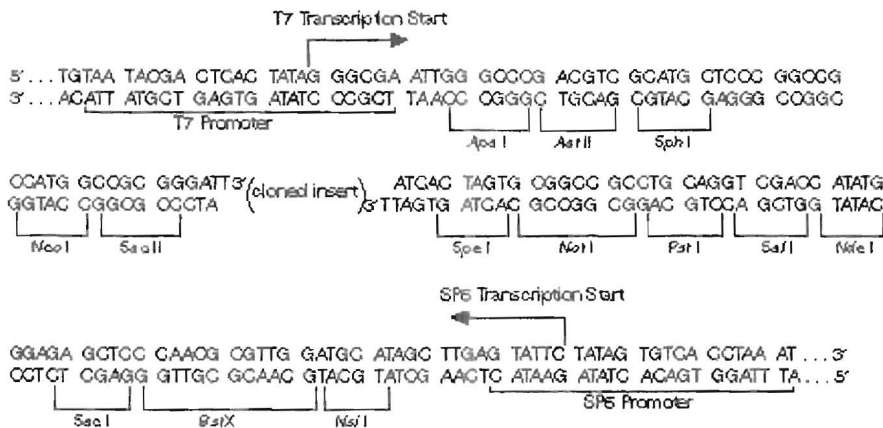


Figure 80. pGEM-T vector promoter and multiple cloning site sequence.

3. How the blue/white screening for recombinant plasmids work using vector pUC18 containing a multiple cloning site within a lacZ gene?
4. Outline the polymerase chain reaction (PCR) method for a given stretch of DNA.
5. What is the difference between reverse transcriptase PCR (RT-PCR) and standard PCR? For what purpose would you use RT-PCR?
6. Describe the method used in making a transgenic plant using Ti plasmid.