

國立高雄大學 103 學年度研究所碩士班招生考試試題

科目：分子生物學
考試時間：100 分鐘

系所：生命科學系
本科原始成績：100 分

是否使用計算機：是

一、單選題(80%，每題 2 分)

1. 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.
2. Which of the following is true about the holoenzyme in an open complex in bacteria?
 - A). The DNA is bound mainly to the sigma-subunit.
 - B). There no interaction between the sigma factor and the -10 region.
 - C). There are two Na⁺ ions in the core enzyme .
 - D). Region 2.4 of the sigma-factor binds to the -35 region.
 - E). The DNA is bound mainly to the sigma-subunit and there no interaction between the sigma factor and the -10 region are both true.
3. Which of the following is true about the regulation of the trp operon in *E. coli*?
 - A). An aporepressor is involved.
 - B). A corepressor is involved.
 - C). Attenuation is one of the mechanism of control.
 - D). Negative control is involved.
 - E). All of the choices are true.
4. Which of the following explains the events in late stage of T4 infection in bacteria?
 - A). The host sigma factor specifies transcription of genes.
 - B). There is a high level of transcription of host genes.
 - C). Host polymerase holoenzyme directs transcription.
 - D). The host core enzyme participates in transcription conjunction with phage-encoded specificity factors.
 - E). All of the choices are correct.
5. Which of the following conditions does not lead to a change in gene expression patterns in bacterial cells?
 - A). sporulation
 - B). heat shock
 - C). nutrient availability

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- D). nitrogen deprivation
E). none of the choices are correct.
6. Which of the following techniques would you use if you are designing an experiment to look at cooperativity of repressor binding to DNA?
A). S1 mapping
B). DNAase I footprinting
C). in vitro mutagenesis
D). S1 mapping and in vitro mutagenesis
E). none of the choices are correct.
7. Select the correct statement about enhancers
A). They are proteins that promote transcription of RNA.
B). They stimulate the binding of repressor to DNA.
C). They bind protein factors and stimulate transcription.
D). They are nonpromoter protein elements.
E). None of the choices is correct.
8. Which of the following is not a part of the core class II promoter?
A). TATA box
B). upstream element
C). BRE
D). DPE
E). Inr
9. Predict a possible effect of deleting the enhancers region of the polymerase I gene.
A). reduced transcription of ribosomes
B). reduction in the production of most hnRNAs
C). reduction in the amount of rRNA made
D). reduction in the production of Rpb1
E). reduction in the production of Rpb2
10. The following are features of TAFII250:
A). contains DNase I domain.
B). is a histone acetyltransferase.
C). is a protein kinase.
D). contains DNase I domain and is a histone acetyltransferase.
E). is a histone acetyltransferase and is a protein kinase.
11. Determine which of the following would most likely lead to a dramatic reduction in transcription.

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- 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.
12. What is the effect on the activity of RNA polymerase I if TAFII250 is deleted from the promoter?
- A). Polymerase I will not form the preinitiation complex.
 - B). Phosphorylation of the DNA-binding domain will be impaired.
 - C). Elongation will be slowed.
 - D). Polymerase I will not form the preinitiation complex and phosphorylation of the DNA-binding domain will be impaired are correct.
 - E). None of the choices is correct.
13. Which of the following are typical features of transcriptional activators?
- A). transcription-activation domain
 - B). DNA-binding domain
 - C). kinase domain
 - D). transcription-activation domain and DNA-binding domain
 - E). transcription-activation domain and kinase domain.
14. 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
15. One way to prevent the activation of certain cells by a growth factor is to
- A). block phosphorylation of the cytoplasmic domain of the receptor.
 - B). block dimerization of the receptor.
 - C). block phosphorylation on the extracellular domain.
 - D). block phosphorylation of the cytoplasmic domain of the receptor and block dimerization

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- of the receptor.
E). block phosphorylation of the cytoplasmic domain of the receptor and block phosphorylation on the extracellular domain.
16. The Histone Code states that the
- A). primary sequence of the histone proteins never changes over time.
 - B). combination of histone modification on a given nucleosome near a gene's control region affects the efficiency of transcription of that gene.
 - C). combination of histone modification on a given nucleosome near a gene's control region affects the efficiency of transcription of all the nearby genes.
 - D). lysines are the only amino acids found in histones that can be acetylated and deacetylated.
 - E). histones are found in all living cells.
17. Which of the following is not a general feature of DNA replication?
- A). semiconservative
 - B). semidiscontinuous
 - C). bidirectional
 - D). conservative
 - E). none of the above
18. The _____ model proposes that a site-specific DNA-binding protein binds to a DNA sequence called a replicator.
- A). replicon
 - B). enhancer
 - C). repressor
 - D). inducer
 - E). none of the above
19. Bacterial DNA polymerase III holoenzyme catalyzes _____ strand synthesis.
- A). leading
 - B). lagging
 - C). leading and lagging
 - D). oriC
 - E). none of the above
20. Telomerase is a _____.
- A). restriction enzyme
 - B). protease
 - C). reverse transcriptase
 - D). exonuclease

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- E). none of the above
21. Which of the following processes was used to locate the gene responsible for Huntington disease?
- A. shot-gun cloning
 - B. positional cloning
 - C. genome sequencing
 - D. SAGE
 - E. proteomics
22. "Snurps" are composed of
- A. RNA.
 - B. protein.
 - C. DNA.
 - D. RNA and protein.
 - E. DNA and RNA.
23. The catalytic center of the spliceosome appears to include
- A. Mg^{2+} .
 - B. U2 and U6 snRNP.
 - C. the branch point region of the intron.
 - D. Mg^{2+} and the branch point region of the intron.
 - E. Mg^{2+} , U2, and U6 snRNP, and the branch point region of the intron.
24. In which of the following organisms is trans-splicing of mRNA known to occur?
- A. trypanosomes
 - B. yeast
 - C. bacteria
 - D. mammals
 - E. plants
25. Which of the following processes occurs posttranscriptionally?
- A. Cap addition
 - B. Poly(A) addition
 - C. adenosine deamination
 - D. promoter clearance
 - E. unwinding
26. The Shine-Dalgarno sequence can be found in
- A. mRNA.
 - B. tRNA.

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- C. 5S rRNA.
D. 16S rRNA.
E. 30S ribosome.
27. Which of the following is not part of the 30S initiation complex?
A. IF1, IF2, and IF3
B. 5S rRNA
C. 16S rRNA
D. amino-acyl tRNA
E. mRNA
28. Which of the following antibiotics does not inhibit protein synthesis by binding to the ribosome?
A. chloroamphenicol
B. streptomycin
C. tetracycline
D. erythromycin
E. ampicillin
29. Which of the following statements is not true concerning the genetic code?
A. It is an almost universal code.
B. It is a "comma-less" code.
C. It is an overlapping code.
D. It is capable of wobble base pairing.
E. It is a triplet code.
30. Which of the following are the three naturally occurring stop codons?
A. UAG, UAA, UGG
B. UGA, UGG, UAG
C. UAA, AUU, GUU
D. UAG, UAA, UGA
E. UAA, UUA, GGA
31. The crystal structure of IF1 bound to the 30S ribosomal subunit shows that IF1 binds to the _____ of the ribosome.
A. E site
B. P site
C. A site
D. allosteric site
E. S15 protein

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32. Which of the following is not used in a Sanger chain termination reaction?
- A. ddATP
 - B. ddCTP
 - C. ddGTP
 - D. ddUTP
 - E. ddTTP
33. The SELEX method is used for which of the following?
- A. discover short RNA sequence that interact with other molecules
 - B. assay transcriptional levels abundant aptamers
 - C. evaluate transcribed regions of DNA
 - D. discover new mutations in rRNA sequences
 - E. none of the choices are correct.
34. Which of the following is used to study the interaction of proteins with DNA?
- A. S1 nuclease protection
 - B. DNase-1 footprinting
 - C. DNA fingerprinting
 - D. southern analysis
 - E. northern blotting
35. Rapid purification of proteins based on size can best be done using
- A. cation-exchange chromatography.
 - B. ion-exchange chromatography.
 - C. native gel electrophoresis.
 - D. 2-D gel electrophoresis.
 - E. gel filtration.
36. In molecular biology all of the following methods can detect small traces of radioactivity except
- A. liquid scintillation counting.
 - B. autoradiography.
 - C. x-ray film.
 - D. phosphorimaging.
 - E. spectrophotometry.
37. What is the RACE technique?
- A. screening a genomic library
 - B. extending incomplete cDNA sequences
 - C. generating polynucleotide probes

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- D. rapid amplification of genomic DNA
- E. screening a genomic library and generating polynucleotide probes

38. 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.

39. Which of the following would be the substance of choice to destroy the DNA in a solution?

- A. ribonuclease
- B. trypsin
- C. chymotrypsin
- D. deoxyribonuclease
- E. none of the choices are correct.

40. Rapid cooling of DNA following heating at high temperature will cause

- A. the strands to break.
- B. rapid renaturation of the strands.
- C. the strands to remain separated.
- D. the double helix to form rapidly.
- E. mismatching between the strands.

二、名詞解釋:(20%，每題4分)

- 1.Hormone responsive element (HRE)
- 2.chi sites (in bacteria genome)
- 3.DNA microarray
- 4.Polyadenylation signal
- 5.Real-time PCR