

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：0226，節次：3

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)

- Which of the statements about ribosomal genes is incorrect?
  - They have a higher GC content compared to other nuclear genes.
  - They have a different base composition compared to other nuclear genes.
  - There are no repetitive sequences.
  - They are found in the nucleolus.
  - They are transcribed by RNA polymerases I and III.
- An experiment is planned to study the effect of reducing the transcription of the myosin gene. Which of the following inhibitors would be useful in this study?
  - $\alpha$ -amanitin
  - DMS
  - heparin
  - ammonium sulfate
  - none of the choices are correct.
- Predict a possible effect of deleting the enhancers region of the polymerase I gene.
  - reduced transcription of ribosomes
  - reduction in the production of most hnRNAs
  - reduction in the amount of rRNA made
  - reduction in the production of Rpb1
  - reduction in the production of Rpb2
- An electrophoretic mobility shift assay (EMSA) was conducted to check for the binding of TFIIB to a segment of a DNA promoter region. Which of the following approaches could be used to confirm that TFIIB is indeed binding?
  - Use an antibody to TFII and check for a supershift by EMSA.
  - Complete TFIIB binding with TFIID.
  - Conduct a nuclear run-off assay.
  - Use an antibody to TFII and check for a supershift by EMSA and complete TFIIB binding with TFIID are correct.
  - Complete TFIIB binding with TFIID and conduct a nuclear run-off assay are correct.

(背面仍有題目,請繼續作答)

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5. You are planning an experiment to look at the specific binding of the TBP to the promoter. Which of the following would be a suitable negative control for this experiment?
- A. a DNA sequence made with multiple cytosines
  - B. a DNA strand containing the TATA box linked to multiple adenine
  - C. a DNA strand containing the TATA box linked to multiple guanines
  - D. a DNA sequence made with multiple cytosines and a DNA strand containing the TATA box linked to multiple adenine
  - E. a DNA sequence made with multiple cytosines, a DNA strand containing the TATA box linked to multiple adenine, a DNA strand containing the TATA box linked to multiple guanines
6. Predict the consequence of blocking the action of TFIIF.
- A. the DAB complex will not form.
  - B. TFIIA will not bind to TFIID.
  - C. Polymerase may not bind to the DAB complex.
  - D. the DAB complex will not form and TFIIA will not bind to TFIID are correct.
  - E. TFIIA will not bind to TFIID and polymerase may not bind to the DAB complex are correct.
7. 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
8. Which of the following approaches would you use to loosen the interaction of histone with DNA in an extract that you have prepared?
- A. methylate the DNA
  - B. methylate the histone
  - C. acetylate the histones
  - D. phosphorylate the histones
  - E. phosphorylate the DNA

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9. Select the feature that is not true of the GAL4 protein.
- A. contains six cysteines
  - B. contains zinc fingers
  - C. contains zinc ions in the DNA binding motif
  - D. contains  $\alpha$ -helix
  - E. is a member of zinc-containing family
10. 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.
11. Some transcription factors, such as \_\_\_\_\_ can act as both antirepressors and transcription activators.
- A. GAL4
  - B. Rad6
  - C. SIR2
  - D. RAP1
  - E. HP1
12. Which of the following splicing factors is required for the correct 3' splice site selection?
- A. SC35
  - B. Slu7
  - C. U11
  - D. SF2
  - E. SRp55

(背面仍有題目,請繼續作答)

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13. 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.
14. Which of the following is **NOT** a function of the mRNA Cap?
- A. protects the mRNA from degradation
  - B. enhances translatability of the mRNA
  - C. enhances transport of the mRNA to the cytoplasm
  - D. enhances splicing of the mRNA
  - E. helps regulate expression of the mRNA
15. Poly(A) polymerase can be found in the \_\_\_\_\_ of a cell.
- A. nucleus
  - B. cytoplasm
  - C. lysosomes
  - D. nucleus and cytoplasm
  - E. nucleus and lysosomes
16. Which of the following enzymes is not involved in RNA interference?
- A. Dicer
  - B. Slicer
  - C. Argonaute
  - D. Argonaute2
  - E. RNase P
17. The Shine-Dalgarno sequence can be found in
- A. mRNA.
  - B. tRNA.
  - C. 5S rRNA.
  - D. 16S rRNA.
  - E. 30S ribosome.

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18. Which of the following eukaryotic transcription factors is homologous to the prokaryotic transcription factor IF2?
- A. eIF1A
  - B. eIF2B
  - C. eIF3
  - D. eIF4G
  - E. eIF5B
19. Which of the following molecules does not resemble a tRNA molecule?
- A. tmRNA
  - B. RRF
  - C. puromycin
  - D. suppressor tRNA
  - E. EF-Tu
20. The *Ds* transposable element of maize cannot transpose on its own because it lacks
- A. transposase.
  - B. inverted repeats.
  - C. origin of replication.
  - D. antibiotic resistance.
  - E. Tn10.
21. Which of the following is not necessary for retroviral insertion into the host genome?
- A. RNA polymerase II
  - B. retroviral *pol* gene
  - C. viral protease
  - D. RNase H
  - E. reverse transcriptase
22. Which of the following enzymes is used to search for CpG islands?
- A. *EcoRI*
  - B. *HindIII*
  - C. *HpaII*
  - D. *PvuI*
  - E. *BamHI*

(背面仍有題目,請繼續作答)

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23. Which of the following features is common to DNA, RNA, and proteins?
- A. They contain amino acids.
  - B. They contain nucleotides.
  - C. They contain uracil.
  - D. They are polymers.
  - E. They are found in vesicles.
24. Which of the following subunits of DNA polymerase III holoenzyme is referred to as the "sliding clamp"?
- A.  $\alpha$
  - B.  $\beta$
  - C.  $\gamma$
  - D.  $\chi$
  - E.  $\theta$
25. Which of the following techniques is not used to quantify the level of gene expression?
- A. southern blotting
  - B. northern blotting
  - C. S1 mapping
  - D. RNase protection
  - E. nuclear run-off
26. If you want to compare the similarity between two DNA sequences. Which of the following bioinformatics method can be used?
- A. blastp
  - B. blastn
  - C. blastx
  - D. Match
  - E. apriori

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27. The C-value paradox can be explained by
- A. the number of cytosine and guanine in DNA.
  - B. the number of mutations in each gene.
  - C. the amount of noncoding DNA in an organism.
  - D. the number of extra genes in the genome.
  - E. hyperchromic shift.
28. Double stranded break formation in mitotic recombination is followed by 3' → 5' exonuclease digestion of 3' ends at the break to yield 5' overhangs.
- A. True
  - B. False
29. Compare to animals, in plants miRNA complementarity to its mRNA target is nearly perfect.
- A. True
  - B. False
30. The noncoding strand of a gene is the same as the antisense strand.
- A. True
  - B. False
31. SNPs or single nucleotide polymorphisms may help physicians design patient specific drug treatment programs.
- A. True
  - B. False
32. Genome size is a good indication of the number of genes it contains, the larger the genome the greater the number of genes.
- A. True
  - B. False
33. A transversion is a mutation in the genetic code that changes a purine to a pyrimidine.
- A. True
  - B. False

(背面仍有題目,請繼續作答)

34. Cellular mRNA levels often correlate more closely with transcription rate than with transcript stability.
- A. True
  - B. False
35. Chromatin immunoprecipitation (ChIP) can be used to study chromatin methylation in yeast cells.
- A. True
  - B. False

二、 SHORT ESSAY 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 and allows for blue/white screening for a clone that contain an insert.
2. What is the difference between reverse transcriptase PCR (RT-PCR) and standard RCR? For what purpose would you use RT-PCR?
3. How will you design a crop plant resistance to salt stress using Ti plasmid to transfer a gene that only express when plant subject to salt stress?
4. What is posttranscriptional control of gene expression by RNA interference?
5. Describe the rationale how Barbara McClintock discovered the first transposable elements by studying mutation and reversion of purple pigment formation in maize.
6. Compare and contrast the techniques used in, and information obtained in, transcriptomes and proteomics.