

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：0224，節次：3

※ 考生請注意：本試題不可使用計算機

請勿在本試題紙上作答，否則不予計分

一、 DEFINITION OF THE FOLLOWING TERMS 解釋名詞 (two points for each question.每題2分) (20%)

1. intron
2. ribosomal RNA (rRNA)
3. Wobble hypothesis
4. transposon
5. nucleosome
6. restriction enzyme
7. enhancer
8. zinc finger
9. bioinformatics
10. Western blot

二、 SIMPLE-CHOICE QUESTIONS 單選題 (1~22 two points for each question; 23~28 one point for each question. 第1~22題，每題2分; 第23~28題，每題1分)(50%)

(以A、B、C、D、E五種選項作答，其餘一律不計分)

1. Which of the following statements is **NOT** true concerning homologous recombination?
 - A. It can be intramolecular.
 - B. It can be bimolecular.
 - C. Only one cross-over event can occur.
 - D. It results in genetic variation.
 - E. It is a reciprocal event.

2. Which of the following is a technique used for genomic functional profiling?
 - A. DNA microchips
 - B. RNAi analysis
 - C. SAGE
 - D. transcription activation
 - E. RFLP

(背面仍有題目,請繼續作答)

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：0224，節次：3

※ 考生請注意：本試題不可使用計算機

3. Which of the following techniques was developed by Velculescu and colleagues to determine which genes are expressed in a given tissue?
- A. DNA microarray
 - B. DNA microchips
 - C. SAGE
 - D. RFLP
 - E. deletion analysis
4. _____ are homologous genes that have evolved from gene duplication within a species.
- A. Orthologs
 - B. Paralogs
 - C. Conservation
 - D. Conjugation
 - E. none of the choices are correct
5. 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
6. 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

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：0224，節次：3

※ 考生請注意：本試題不可使用計算機

7. Which of the following repair mechanisms is a damage bypass mechanism, not an actual repair mechanism?
- A. DNA photolyase
 - B. base excision repair
 - C. nonhomologous end joining
 - D. mismatch repair
 - E. recombination repair
8. Insertion of a Group II intron of a particular gene into an intronless version of that same gene is called _____.
- A. retrohoming
 - B. pseudo-genes
 - C. migration
 - D. homeostasis
 - E. none of the choices are correct
9. The correct folding of proteins in the cell is accomplished with the help of _____.
- A. proteasome.
 - B. molecular chaperones.
 - C. glyoxysome.
 - D. ribosome.
 - E. none of the choices are correct
10. Trypanosome mitochondria contain two types of circular DNA linked together into large networks. These mitochondria are called
- A. maxicircles
 - B. kinetoplasts
 - C. leucoplasts
 - D. plastids
 - E. maxi-mitochondria

(背面仍有題目,請繼續作答)

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：0224，節次：3

※ 考生請注意：本試題不可使用計算機

11. miRNA synthesis involves the cleavage of the double stranded stem portion of a precursor RNA by the enzyme _____.
- A. Drosha
 - B. Dicer
 - C. RISC
 - D. AGO
 - E. none of the choices are correct
12. Which of the following regions on calf-thymus poly(A) polymerase has been shown experimentally **NOT** to be necessary for its activity *in vitro*?
- A. RNA binding domain
 - B. polymerase module
 - C. nuclear localization signals
 - D. serine/threonine rich regions
 - E. All domains are necessary.
13. Which of the following complexes found in the spliceosome cycle is mismatched with its snRNP(s)?
- A. commitment complex: U6/U4
 - B. A complex: U1 and U2
 - C. B1 complex: all snRNPs
 - D. B2 complex: U2, U5 and U6
 - E. I complex: U2, U5 and U6
14. Which of the following histone proteins is the most highly conserved from one organism to another?
- A. H1
 - B. H2A
 - C. H2B
 - D. H3
 - E. H4

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：0224，節次：3

※ 考生請注意：本試題不可使用計算機

15. An experiment is planned to look at the effect of blocking the thyroid hormone receptor. Which of the following is a good technique to employ?
- A. phosphorylation
 - B. methylation
 - C. ubiquitination
 - D. sumoylation
 - E. all of the choices are correct.
16. A mixture of TAF was purified and separated on an SDS-PAGE gel. Select the correct order in which they will appear from the top to the bottom of the gel.
- A. TAF_{II}150, TAF_{II}110, TAF_{II}40, TAF_{II}60, TAF_{II}80, TAF_{II}250
 - B. TAF_{II}150, TAF_{II}110, TAF_{II}80, TAF_{II}60, TAF_{II}40, TAF_{II}250
 - C. TAF_{II}600, TAF_{II}110, TAF_{II}40, TAF_{II}150, TAF_{II}80, TAF_{II}250
 - D. TAF_{II}250, TAF_{II}150, TAF_{II}110, TAF_{II}80, TAF_{II}60, TAF_{II}30
 - E. TAF_{II}30, TAF_{II}110, TAF_{II}40, TAF_{II}60, TAF_{II}80, TAF_{II}250
17. 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.
18. Which of the following would be effective in blocking the transcription from the *lac* operon in the presence of permease?
- A. antibody to RNA polymerase
 - B. antibody to the repressor protein
 - C. mutation in the operator
 - D. an antibody to β -galactosidase
 - E. both antibody to RNA polymerase and mutation in the operator

(背面仍有題目,請繼續作答)

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：0224，節次：3

※ 考生請注意：本試題不可使用計算機

19. Which of the following enzymes cannot catalyze the formation of a phosphodiester bond?
- endonuclease
 - RNA polymerase
 - DNA polymerase
 - ligase
 - none of the choices are correct
20. What is the RACE technique?
- screening a genomic library
 - extending incomplete cDNA sequences
 - generating polynucleotide probes
 - rapid amplification of genomic DNA
 - screening a genomic library and generating polynucleotide probes
21. Which of the following is the best way to determine the base content of DNA?
- density gradient centrifugation
 - gel electrophoresis
 - spectrophotometry
 - x-ray diffraction
 - deoxyribonuclease treatment
22. A new mutant cell line was developed and was found to be defective in polymerase III activity. Which of the following is likely to be observed in this cell line?
- There will be an overabundance of secreted proteins.
 - Splicing function is impaired.
 - There will be an overproduction of 7 SL RNA.
 - There will be an overabundance of secreted proteins and splicing function is impaired are correct.
 - There will be an overabundance of secreted proteins, splicing function is impaired, and there will be an overproduction of 7 SL RNA are correct.
23. Experimental evidence has shown that it is necessary for the promoter and the enhancer to be on the same chromosome in order to function together.
- True
 - False

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：0224，節次：3

※ 考生請注意：本試題不可使用計算機

24. The estimated total number of genes in the *Arabidopsis* genome is 30,000-35,000.
- A. True
B. False
25. Antibiotic resistance in bacteria can be transferred using insertion sequences.
- A. True
B. False
26. The control regions of actively transcribed genes usually contain methylated CpG islands.
- A. True
B. False
27. Phosphorylation of eukaryotic initiation factors can play both an inhibitory and stimulatory role in translational control of gene expression.
- A. True
B. False
28. rRNA genes are transcribed as large precursor molecules and then spliced to produce the mature rRNAs.
- A. True
B. False

三、 SHORT ESSAY 簡答題(Five points for each question.每題5分)(30%)

1. What is the difference between reverse transcriptase PCR (RT-PCR) and standard PCR? For what purpose would you use RT-PCR?
2. Describe the principle and method used in making a transgenic plant using Ti plasmid.
3. Describe principle of the yeast two-hybrid assay.
4. Proper function of messenger RNAs requires capping and polyadenylation. Please explain the function capping at the 5'-end of a pre-mRNA.
5. What is posttranscriptional control of gene expression by RNA interference?
6. What do you know about next-generation sequencing technology?