國立中央大學 110 學年度碩士班考試入學試題

所別： 生命科學系 碩士班 生物醫學組(一般生)
生命科學系 碩士班 生物醫學組(在職生)

科目： 分子生物學

本科考試禁用計算器

＊請在答案卷(卡)內作答

I. Multiple choice questions (60%): Please choose the **one** alternative that best answers the question or complete the sentence.

1. Skin cells and neuron cells in an individual show very distinct morphology and function, but they carry identical genome. How can this occurs?

A. Different mutations occur in different cell types; B. Different parts of genome are lost in different cell types; C. Different sets of genes are expressed in different cell types; D. Different chromosomes are inactivated in different cell types.

2. The group of enzymes involving the extending the telomere and prevention of chromosome shorting during DNA replication is called

A. primases; B. helicases; C. topoisomerases; D. telomerases.

3. Hybrid dysgenesis refers to the fact that in Drosophila a cross between a P male and an M female produce offspring that are

A. dead; B. wingless; C. daughterless; D. sterile.

4. If 15% of the bases in a region of the human genome are cytosine, what percentage in that region are thymidine?

A. 15%; B.35%; C.65%; D.85%.

5. DNA ligase is essential for

A. homologous recombination, Okazaki fragments joining, and mismatch DNA repair;

B. primer synthesis, nonhomologous end-joining, and nucleotide excision DNA repair;

C. mismatch DNA repair, nonhomologus end-joining, and nucleotide excision DNA repair;

D. retrotransposon transposition, mismatch DNA repair, and gene conversion.

6. In order to identify the coding regions of a genome, name functional annotation, the following methods have been developed to study gene expression in whole genome scale, except

A. RT-PCR; B. DNA microarrays; C. serial analysis of gene expression; D. RNA-seq.

7. The initiation of a gene transcription can be achieved by

A. removing the activator; B. removing the repressor; C. removing RNA polymerase;

D. removing DNA polymerase

8. Gene conversion may occur when

A. the cell fails to detect small deletion on the chromosomes.

B. the cell fails to repair the replication slippage.

C. the cell fails to repair mismatch before DNA is replicated.

D. the cell fails to use the identical DNA sequence to repair DNA damage.

注意:背面有試題

國立中央大學110學年度碩士班考試入學試題

所別： 生命科學系 碩士班 生物醫學組(一般生)
生命科學系 碩士班 生物醫學組(在職生)

科目： 分子生物學

本科考試禁用計算器

＊請在答案卷(卡)內作答

9. The following genomic features have been used as genetic markers to map disease causing locus, except

A. single nucleotide polymorphisms B. restriction fragment length polymorphisms

C. microsatellites D. copy number variations

10. 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. reverse transcriptase

11. The following features may contribute to the yield of several products from a single gene, except

A. RNA alternative splicing B. Post-transcriptional modification

C. RNA editing D. piRNA interaction

12. Which of the following protein domains is involved in the regulation of genes influencing segment identity?

A. Homeodomain; B. bHLH; C. Zinc-finger; D. Leucine zipper.

13. Which of the following proteins interacts DNA directly in a sequence-specific manner?

A. Histones; B. Polymerases; C. Single-stranded binding proteins; D. Transcription factors

14. The regulation of gene expression in time and tissue-specific manner may be achieved by the following factors, except

A. Presence or absence of a transcription factor

B. Concentration of several transcription factors

C. Deletion of TATA box

D. Combination of transcription factor binding sites in an enhancer

15. What are the following mechanisms contributing the differential gene expression in two daughter cells divided from one mother cell? I. Asymmetric localization of transcription factor before cell division; II. Different combinations of transcription factor in two daughter cells; III. Random mutations occur in the mother cell

A. I and II; B. I, II, and III; C. only III; D. only I

16. Which of the following enzymes mediate the homologous recombination in bacteria?

A. RecA B. RuvC C. Rad51 D. DNA polymerase γ

17. The provirus DNA of HIV retrovirus can be found in the ___.

A. mitochondria B. host cell cytoplasm C. viral particle D. host cell chromosomes

18. Which of the following sequences is a possible site where DNA-only transposon left the chromosome via the cut-and-paste mechanism?

A. ATAGCCATAGCC B. ATAGCCCCGTAT C. GGATTC D. GAATTC

注意：背面有試題

國立中央大學 110 學年度碩士班考試入學試題

所別： 生命科學系 碩士班 生物醫學組(一般生)
生命科學系 碩士班 生物醫學組(在職生)

科目： 分子生物學

本科考試禁用計算器

＊請在答案卷(卡)內作答

19. The both ends of a linear chromosome are organized into independent ___ structure.

A. Rolling circle B. T-loop C. holiday junction D. stem-loop

20. The enzyme ___ performs the charging of amino acid to its cognate tRNAs.

A. aminoacyl-transferase B. small ribosome C. large ribosome D. aminoacyl-tRNA synthetase

21. During initiation of translation, ribosome small subunit carry ___ -tRNA in its P-site.

A. serine B. methionine C. cysteine D. alanine

22. The amino acid ___ is not found in polypeptides of eukaryotic cells.

A. fMet B. Cys C. Phe D. Ala

23. The Kozak sequence in the mRNA is recognized by the _____ for translation.

A. eIF4G B. IF2 C. U1 snRNP D. ribosome small subunit

24. During heme starvation, the initiation factor eIF2α is ___ to repress translation.

A. methylated B. glycosylated C. phosphorylated D. acetylated

25. The wobble position of the codon ACG is ___.

A. A B. C C. G D. AC

26. Puromycin is an antibiotic targeting ___.

A. DNA replication B. transcription C. translation D. nuclear import

27. The immediate early genes of λ phage include ___.

A. CRO B. O C. P D. QR

28. During anti-termination of λ phage, the *nut* site is bound by ___.

A. NusG B. NusA C. CRO D. N

29. The transcription factor ___ functions as a transcriptional activator in *lac* operon.

A. CRO B. CAP-cAMP C. α D. σ

30. The best resolution between DNAs of 3kb and 5kb in electrophoresis will be on ___ gel.

A. 3% agarose B. 0.8% agarose C. 10% SDS PAGE D. 15% SDS PAGE

II. Essay questions (40%): Please answer the questions as sufficient as you can.

1. Briefly describe the proteins that participate in DNA replication and their function. (10%)
2. Explain the phenomenon of dosage compensation and X inactivation. (10%)
3. Please describe the mechanism of CRISPER-Cas9 mediated gene editing. (7%)
4. How will you do to clone the *p53* gene coding sequence into the *EcoR*I site of the pCDNA3.1 vector for expression in mammalian cells? (6%)
5. Please describe the transposition of a retrotransposon. (7%)