九十三學年度 生科院甲組 、生科院（結構生物學程）甲組 碩士班入學考試

科目 分子生物學 科號 0805、1104 共 4 頁第 1 頁 *請在試卷【答案卷】內作答

Part I. Fill in the blanks in questions 1 and 2

1. Name the enzymatic activity of the following protein/complex: (10 points)

Protein/Complex	Enzymatic Activity
Anaphase-promoting complex	A
Cdc25	B
MutH	C
DnaB	D
TGFβ receptors	E

2. Fill in the word(s) from following given options (G-Z) (9 points)
由所提供的選項(G-Z) 填入合適的 '字' 到答案卷

(1). (A) the telomerase gene in cancer cells or administer a drug that (B) telomerase would be a potential treatment for cancer.

(2). DNA replication in E. coli (and in other organisms) is (C) .

(3). The *E. coli* mismatch repair system recognizes the (D) strand by its (E) on GATC sequence.

(4). Branch migration of Holiday junction during recombination of DNA strands would need to have enzyme (F) .

(G) RuvC	(H) RuvA	(I) RecA	(J) parental
(K) RuvB	(L) SSB	(M) Turn off	(N) induces
(O) inhibits	(P) semidiscontinuous	(Q) discontinuous	(R) continuous
(S) methylated cytosine	(T) acetylated adenine	(U) acetylated cytosine	(V) methylated adenine
(W) nonparental	(X) Turn on	(Y) UVABC	(Z) nonparental

Part II. Answer the following questions (questions 3 to 16)

3. What is the effect of heparin on RNA polymerase? (2 points)

4. Please explain the difference between operons and regulons. (2 points)

5. What are the unique features of U6 SnRNA that distinguish it from other SnRNA involved in splicing. (2 points)

6. What is the function of dimethyl sulfate (DMS)? (2 points)

7. Which of the eukaryotic general transcription factors has helicase activity? (2 points)

8. Please define or explain antirepression and activation of transcription. (4 points)

9. TBP is a TATA binding protein. Explain why is TBP still required for transcription of TATA-less promoters. (4 points)

10. Please describe two possible effects on transcription when TATA is deleted. (4 points)

11. Please describe two ways that activators can overcome the effect of nucleosome on transcription. (4 points)

12. Please describe how can poly(A) tail increase the stability of mRNA. (4 points)

13. Ultraviolet rays have comparatively (a) high energy (b) low energy in comparison with gamma and x-rays (you will choose one answer from "a or b" here), (1 point)

    13a) What major damage on DNA would produce after ultraviolet ray exposure? (2 points)

    13b) How are these damages repaired? (2 points)

14. Compare the essential factors in translation initiation between prokaryotes and eukaryotes. (8 points)

15. Explain the principle of site-direct mutagenesis, and describe a method to carry out this process. (6 points)

16. Describe a method for analyzing genome-wide mRNA expression. (6 points)

Part III. Choose a correct answer from each of the following questions (questions 17 to 29, 2 points for each question)

17. Which of the following DNA molecules has the highest Tm value?
    (A) AGCTGCTGGCATACGCATCGTCA
    (B) CAGACCTACTTCTGGACGTCGGC
    (C) ACATGGCAAGTGTTCAAGACAGT
    (D) TCTATCCGCGATTCTAATCTCTG

18. Which of the following molecules does NOT contain a catalytic RNA?
(A) Group I intron
(B) RNase H
(C) RNase P
(D) 23S rRNA

19. The instrument commonly used in the post-genomic era to identify the gene product is
(A) DNA auto sequencer
(B) Oligonucleotide synthesizer
(C) Peptide synthesizer
(D) Mass spectrometer

20. Which of the following antibiotics blocks prokaryotic transcription initiation?
(A) Ampicillin
(B) Puromycin
(C) Rifampicin
(D) Tetracycline

21. The inhibitor of which of the following enzymes does NOT affect SARS coronavirus?
(A) Reverse transcriptase
(B) 3CL protease
(C) Helicase
(D) RNA polymerase

22. Which of the following DNA molecules possesses left-handed helix?
(A) A form DNA
(B) B form DNA
(C) E form DNA
(D) Z form DNA

23. Which of the following methods can be applied to determine the pI values of proteins in bacterial cell lysate?
(A) X-Ray crystallography
(B) Immunoprecipitation
(C) Two-dimensional gel electrophoresis
(D) Fluorescence microscopy

24. Which of the following methods does NOT separate molecules by size?
(A) Affinity column chromatography
(B) Agarose gel electrophoresis
(C) Gel filtration chromatography
(D) SDS-PAGE

25. Which of following enzymes cleaves only single-stranded nucleotides?
(A) RNase H
(B) Restriction enzyme *Eco*RI
(C) Klenow fragment
(D) S1 nuclease

26. Which of following methods can NOT be employed to study DNA-protein interaction?
(A) DMS footprinting
(B) Filter binding
(C) Northern blotting
(D) Gel mobility shift

27. DNA polymerase I in *E. coli* has proofreading activity, because it processes
(A) 5′→ 3′ endonuclease activity
(B) 3′→ 5′ endonuclease activity
(C) 5′→ 3′ exonuclease activity
(D) 3′→ 5′ exonuclease activity
(E) all of above

28. At the end of replication, circular bacterial chromosomes form catenanes that are decatenated by
(A) topoisomerase I
(B) topoisomerase II
(C) topoisomerase III
(D) topoisomerase IV
(E) all of above

29. RecA appeared in
(A) DNA recombination
(B) RNA transcription
(C) Protein translation
(D) all of above
(E) none of above