

國立中央大學104學年度碩士班考試入學試題

所別：生命科學系碩士班 分子與細胞生物組(一般生) 科目：分子生物學 共 4 頁 第 / 頁
生命科學系碩士班 分子與細胞生物組(在職生)

本科考試禁用計算器

*請在答案卷(卡)內作答

I. Multiple choices (80%): Please choose the one alternate that best answers the question or completes the sentence.

- The 5' -CAP of an mRNA is formed by _____.
(a) 7-methyl guanine (b) 5-methyl adenine (c) 2-acetyl cytosine (d) 7-methyl uridine
- Agrobacterium cells carrying ____ inserted with interested gene can infect plant cells and express the interested gene in the target cells.
(a) T7 plasmid (b) phage DNA (c) PCDNA3 vectors (d) T-DNA plasmids
- The short DNA fragments found in the lagging strand of a replicating DNA are called as ____ fragments.
(a) Yamanaka (b) Okazaki (c) Thomas (d) Obokata
- The enzyme _____ synthesizes multiple repeated sequences at the ends of linear chromosomes to protect them from replicative senescence.
(a) telomerase (b) DNA polymerase (c) RNA polymerase (d) DNA primase
- The enzyme _____ promotes eukaryotic homologous recombination.
(a) RecA (b) CRE recombinase (c) Flippase (d) Rad51
- The _____ transposon is an example of DNA-only transposon.
(a) *P-element* (b) L1 (c) *Ty1* (d) *Alu*
- The _____ method/assay can be used to identify DNA sequences bound by transcription factors to the resolution of each base.
(a) EMSA (b) CHIP (c) Footprinting (d) RT-PCR
- Single strand circular progeny DNAs can be produced by _____ mode of DNA replication.
(a) θ (b) bidirectional (c) rolling circle (d) λ
- The separation of double strand DNA during replication is triggered by _____.
(a) helicase (b) primase (c) topoisomerase (d) DNA polymerase δ
- The most common DNA damage caused by UV radiation is creation of _____.
(a) truncation (b) deletion (c) purine dimers (d) pyrimidine dimers
- RuvC functions to ____ during prokaryotic homologous recombination
(a) synthesize DNA (b) create heteroduplex (c) push branch migration (d) resolve holiday junction
- To avoid being recognized as broken ends, the ends of linear chromosomes _____.
(a) form T-loops (b) become blunt ends
(c) form chromosome conjugates (d) are bound by DNA polymerase
- The factor PCNA functions as a ____ during DNA replication.
(a) DNA polymerase (b) primase (c) Heliase (d) sliding clamp
- Double strand breaks (DSB) of DNA at G0 phase are most likely repaired by _____.
(a) nonhomologous end-joining (b) Strand-directed repair (c) Mismatch repair (d) Bas excision repair

參考用

國立中央大學104學年度碩士班考試入學試題

所別：生命科學系碩士班 分子與細胞生物組(一般生) 科目：分子生物學 共 4 頁 第 2 頁
生命科學系碩士班 分子與細胞生物組(在職生)

本科考試禁用計算器

*請在答案卷(卡)內作答

15. Continued from question 14, what will happen if DSB happens during S phase?
(a) nonhomologous end-joining (b) Nucleotide excision repair
(c) Mismatch repair (d) Homologous recombination
16. Mutations happened at the ____ will result in RFLP.
(a) promoter (b) enhancer (c) terminator (d) restriction site
17. The insertion and excision of a Tn3 transposon will leave a ____ in the target DNA.
(a) direct repeat (b) inverted repeat (c) restriction site (d) stop codon
18. The ends of a retrovirus genome are arranged as ____.
(a) direct repeats (b) LTRs of inverted sequence (c) directly repeated LTRs (d) short inverted repeats
19. Nucleosomes are ____.
(a) found in all organisms (b) formed by DNA and histones
(c) assembled only during transcription (d) the places where ribosome assembled
20. Deamination of cytosine will generate a ____ base.
(a) G (b) A (c) T (d) U
21. A variation that does not involve a change in DNA sequence but can be passed from one generation to another is a(n) ____.
(a) enhancer trap (b) replication origin (c) epigenetic condition (d) mutant chromosome
22. All of the following are associated with the formation of a functional miRNA except
(a) lack of an open reading frame (ORF). (b) 5' GTP cap and 3' poly A tail.
(c) stem-loop structures. (d) translation on ribosomes.
23. Mutations introduced into reporter constructs are used to study
(a) the DNA sequences that are important for regulating gene expression levels.
(b) the effects on cell function of expression of heterologous proteins.
(c) colorimetric assays.
(d) protein protein interactions.
24. A *cis*-acting DNA sequence that modulates the basal rate of transcription of a gene is termed a(n) ____.
(a) initiator (b) activator (c) promoter (d) enhancer
25. Zinc-finger peptide motifs are responsible for what aspect of protein function?
(a) kinase activity (b) DNA binding (c) mRNA splicing (d) methylation
26. How are complex processes such as sporulation, synthesis of flagella, and nitrogen fixation that require the transcription of multiple sets of genes regulated in bacteria?
(a) Multiple operons are simultaneously induced.
(b) Cascades of sigma factors synthesized in a temporal order, allow the turning on of successive sets of genes.
(c) The end product of one operon is used as an inducer of the next operon in sequence.
(d) There are single operons consisting of many genes for each of these processes.



國立中央大學104學年度碩士班考試入學試題

所別：生命科學系碩士班 分子與細胞生物組(一般生) 科目：分子生物學 共 4 頁 第 3 頁
生命科學系碩士班 分子與細胞生物組(在職生)

本科考試禁用計算器

*請在答案卷(卡)內作答

27. As a general principle of gene regulation through operons, regulatory genes encode
- (a) trans-acting proteins that interact with cis-acting DNA elements.
 - (b) cis-acting proteins that interact with cis-acting DNA elements.
 - (c) cis-acting proteins that interact with trans-acting DNA elements.
 - (d) trans-acting proteins that interact with trans-acting DNA elements.
28. In the regulation of the *trp* operon, tryptophan acts as a(n) _____.
- (a) repressor (b) attenuator (c) activator (d) corepressor
29. The transition from transcriptional initiation to elongation involves
- (a) binding of sigma factor. (b) release of sigma factor.
 - (c) release of RNA polymerase from DNA. (d) binding of RNA polymerase to DNA.
30. A tRNA that recognizes a nonsense codon and inserts an amino acid where protein synthesis should have stopped is called a(n) _____.
- (a) nonsense tRNA (b) suppressor tRNA (c) revertant tRNA (d) excision tRNA
31. In the modification of eukaryotic mRNA, a "cap" consisting of a/an _____ and a tail consisting of _____ are usually added to the transcript.
- (a) acetyl group, multiple cytosines (b) multiple guanines, methyl group
 - (c) multiple thymines, acetyl group (d) methyl group, multiple adenines
32. RNA molecules that can act as enzymes and catalyze specific biochemical reactions are known as _____.
- (a) donors (b) splice acceptors (c) ribozymes (d) tRNAs
33. The retroviruses, including HIV, are unique because they do reverse
- (a) replication. (b) transcription. (c) splicing. (d) translation.
34. There are _____ usually found in the genetic code.
- (a) 3 start codons and 1 stop codon (b) 2 start codons and 2 stop codons
 - (c) 1 start codon and 3 stop codons (d) 0 start codons and 4 stop codons
35. The appearance of a novel phenotype resulting from the substitution of a single base pair might be due to
- (a) change in the amino acid sequence only.
 - (b) change in the amount of protein expressed.
 - (c) alteration in a gene that codes for a nontranslated RNA.
 - (d) All of the choices are possible consequences of a single base pair substitution.
36. The ribosome has three distinct sites E, P and A. During elongation of a protein, in which site is the growing peptide chain found?
- (a) E site
 - (b) P site
 - (c) A site
 - (d) Any site, it makes not difference.

參考用

國立中央大學104學年度碩士班考試入學試題

所別：生命科學系碩士班 分子與細胞生物組(一般生) 科目：分子生物學 共 4 頁 第 4 頁
生命科學系碩士班 分子與細胞生物組(在職生)

本科考試禁用計算器

*請在答案卷(卡)內作答

37. When bacteria are grown in the presence of lactose,
- (a) cAMP-CRF protein binds upstream of the promoter and increases transcription through recruitment of RNA polymerase.
 - (b) cAMP-CRF protein is bound to lactose and is active and activates transcription through physical interference with the repressor.
 - (c) the lac repressor is bound to allolactose, is now inactive and unable to bind the operon; thereby allowing RNA polymerase access to initiate transcription.
 - (d) the lac repressor is bound to allolactose, is now inactive and unable to bind the operon; thereby allowing CAP protein access to the promoter and increasing the rate of transcription.
38. In the lac operon, which region of the operon does the repressor bind?
- (a) Promoter
 - (b) Operator
 - (c) cAMP-CRF binding site
 - (d) +1 start of transcription
39. TFIID is one of the basal transcription factors to bind the promoter during the assembly of the pre-initiation complex, which of the following statements about TFIID is **FALSE**?
- (a) TFIID distorts the DNA duplex when it binds.
 - (b) TFIID binds the TATA box in promoters.
 - (c) TFIID binds the DNA only after basal transcription factors have bound the promoter region.
 - (d) TFIID binds Inr and DPE elements in promoters.
40. A characteristic of RNA polymerase in humans that is different from bacterial RNA polymerase is
- (a) that in humans, there are three distinct nuclear RNA polymerases and only one in bacteria.
 - (b) that in bacterial RNA polymerase is directly recruited to the promoter but in human RNA polymerase is recruited to a pre-initiation complex.
 - (c) that in human RNA polymerase many additional transcription factors must bind the promoter first before RNA polymerase is recruited; whereas in bacteria only the sigma factor is required.
 - (d) All the above are characteristics of RNA polymerase that differ between human and bacteria.

II. Essay questions (20%): Please answer the following question as sufficient as you can.

1. Please define chromosome, plasmid, BAC vector, and YAC vector. (5 %)
2. Please describe the mechanism by which a retroviral genome becomes double strand DNA. (5 %)
3. Eukaryotes have three RNA polymerases. What are they and what does each do? (3 %)
4. Why is the lactose operon not induced in the presence of both lactose and glucose? (2 %)
5. What is CPSF? & its functions? (5 %)

注意:背面有試題