

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
(學位在職生)

單選題 (每題 2 分; 共 80 分)

1. Which assay is an *in vivo* test for DNA-protein interaction? (a) filter binding (b) gel mobility shift (c) Southern blot (d) DNase footprinting (e) dimethylsulfate (DMS) footprinting (f) yeast one-hybrid test.
2. About an operon, which of the following elements is least possible included in its sequence? (a) open reading frames (b) promoter (c) operator (d) inducer (e) initiator (f) terminator
3. Which description is **incorrect** about "blue/white screening" in cloning experiments? (a) It involves *LacZ* activity (b) The cloning vector alone will make the transformants turn blue (c) The vector with target gene inserted will make the transformants turn white (d) IPTG is usually added to the selection medium (e) The color of the transformants depends on the size of the target gene inserted (f) pBR322 cannot be used as a vector in blue/white screening.
4. There are 3 types of RNA polymerases and each targets specific genes in eukaryotic cells. How do they choose their target genes? (a) by chance (b) random collision (c) RNA polymerase binds intron first (d) accessory factors bind promoter then RNA polymerase binds intron (e) RNA polymerase recognize promoter followed by binding of accessory factors (f) Accessory factors recognize promoters and then recruit RNA polymerase to the promoter.
5. How does a RNA polymerase stop transcription after finish its work on target gene?
(a) intrinsic terminator causes termination of transcription
(b) Rho-dependent terminator causes termination of transcription
(c) Poly (A) cause separation of RNA polymerase and its DNA template.
(d) The actual termination sites is different from the 3' end of mRNA in eukaryotic cells.
(e) All of the above mechanisms are true.
(f) None of the above mechanisms are true.
6. Which method is commonly used for protein identification? (a) Southern blot (b) Northern blot (c) Western blot (d) 5'-RACE (e) S1 nuclease mapping (f) Nuclear run-on assay.
7. Which of the following mechanisms is employed by *lambda* phage to ensure that its delayed early genes are transcribed after early genes? (a) anti-initiation (b) anti-termination (c) terminator initiation (d) transcription activation (e) alternative initiator. (f) alternative splicing
8. Choose the correct description about the genetic code. (a) According to wobble hypothesis, at least 3 tRNAs are required for each codon family (b) There are two codons specified for Met (c) Codon-anticodon pairing involves wobbling at the third position of the anticodon (d) G in 3rd position of anticodon pairs with C or U in 1st position of codon (e) A single aa-tRNA recognizes only one codon (f) There is only one codon for Trp
9. The elements of a gene are listed as below: (1) Initiator (2) promoter (3) Start codon (4) stop codon (5) terminator. What is their most possible arrangement in a gene when you are reading from 5'-3'? (a) 1-2-3-4-5 (b) 1-3-2-4-5 (c) 5-4-3-2-1 (d) 2-1-3-4-5 (e) 4-2-3-1-5 (f) 3-1-2-4-5

注意：背面有試題

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
(學位在職生)

10. Which genetic codon codes for methionine in eukaryotes? (a) AGT (b) TTT (c) TAG (d) ATG (e) AAA (f) CAC
11. Which of the following factors is a Zinc finger motif-containing transcription factor? (a) C-Jun (b) steroid receptor (c) C-Fos (d) MyoD (e) TFIIA (f) none of the above
12. What is the biochemical property of "prion", the causing agent of mad cow disease? (a) ribozyme (b) polypeptide (c) polynucleotide plus polypeptide (d) polydeoxynucleotide plus polypeptide (e) lipid plus polydeoxynucleotide (f) siRNA.
13. DNA in eukaryotes is packaged in chromatin. Which of the following statements about chromatin structure and the status of a gene is true?
 - (a) euchromatin is usually associated with active genes
 - (b) heterochromatin is usually associated with active genes
 - (c) chromatin structure has nothing to do with transcriptional activity
 - (d) Modification of chromatin components will always lead to gene activation.
 - (e) Chromatin structure is unchangeable
 - (f) None of the above is true
14. Which genome does not follow Chargaff's rule? (a) *Candida albicans* (b) Bacteriophage T4 (c) *Drosophila* (d) *Saccharomyces cerevisiae* (e) *E. coli* (f) HIV.
15. When eukaryotic chromatin is digested with proper amount of micrococcal nuclease, a ladder of 200 bp will normally show up on agarose gel. Why?
 - (a) authentic enzyme recognition sites are separated 200 bp on naked DNA.
 - (b) DNA is broken intrinsically every 200 bp
 - (c) Nucleosomes are wrapped up in 200, 400, and 600 bp of DNA
 - (d) Nucleosomes are linked by 200 bp of DNA.
 - (e) DNA in chromatin is exposed every 200 bp
 - (f) Random collision.
16. Which of the following proteins is **not** essential for lagging strand synthesis? (a) DNA ligase (b) DNA polymerase III (c) DNA polymerase I (d) Primase (e) single-stranded DNA binding protein (f) ribonuclease H.
17. What can the foot-printing experiment be used for?
 - (a) Identifying protein-protein interaction
 - (b) Identifying protein-DNA interaction *in vivo*
 - (c) Localizing a protein in a cell
 - (d) Localizing a mRNA
 - (e) Identifying the binding sites of a protein on DNA *in vitro*
 - (f) Confirming parents and children relationship
18. Which of the following biochemical activities does **not** belong to *E. coli* DNA topoisomerase II? (a) It is inhibited by novobiocin (b) It cuts two DNA strands at a time (c) The linking number change is 2 per reaction (d) It needs GTP for activity (e) It can relax positive supercoils (f) It is also called

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
(學位在職生)

DNA gyrase.

19. What molecules are in a nucleosome? Please choose from the following molecules: (1) coiling DNA (2) H2A (3) H2B (4) H3 (5) H4 (6) Nuclear matrix
(a) 1-2-3-4-5-6 (b) 1-2-4-5-6 (c) 2-3-4-5-6 (d) 1-2-3-4-5 (e) 1-2-3-4
(f) none of the above
20. Which of the following statements regarding the action of the DNA uracil repair system is incorrect? (a) Uracil-DNA N-glycosylase removes uracil arising through deamination of cytosine (b) Involves nick translation (c) Needs DNA ligase (d) Needs DNA gyrase (e) Removes misincorporated uracil.
21. Which of the following experiments can be used to demonstrate the binding of a transcription factor to its target DNA sites *in vivo*?
(a) electrophoresis mobility shift assay
(b) immunoprecipitation
(c) Western blot
(d) GST-pulldown
(e) Northern blot
(f) SDS PAGE
22. Which of the following statements about PCR is incorrect? (a) It needs two primers (b) It needs a single- or double-stranded DNA as template (c) It needs a thermostable DNA polymerase (d) Taq is an enzyme commonly used in PCR (e) RNA is a suitable template for PCR (f) It includes 3 basic steps: denaturation, annealing, and extension.
23. About eukaryotic and prokaryotic RNA polymerase, which of the following statements is true?
(a) There is only one type of RNA polymerase in eukaryotes
(b) Multiple types of RNA polymerase are found in a prokaryotic cells
(c) Sigma factor is essential to the function of eukaryotic RNA polymerase
(d) Prokaryotic RNA polymerase can recognize promoter by itself
(e) Eukaryotic RNA polymerase can recognize promoter by itself
(f) TFIID is essential to the recruitment of all RNA polymerases in eukaryotic cells.
24. Enterovirus type 71 contains a positive-strand RNA genome. Which of the following descriptions about its genome replication is correct? (a) It requires a DNA-dependent DNA polymerase (b) It requires an RNA-dependent RNA polymerase (c) Its replication enzyme has a high proofreading activity (d) Its replication enzyme uses tRNA as a primer (e) Its replication enzyme also exists in healthy human blood (f) Its replicative form is double strand DNA.
25. Which of the following factor is required for the assembly of all eukaryotic transcriptional machinery on promoter?
(a) RNA polymerase II (b) RNA polymerase III (c) TFIID (d) TBP (e) TFIIB (f) CBP coactivator
26. Cordycepin is an antibiotic that (a) Inhibits bacterial transcription initiation (b) Inhibits bacterial

注意：背面有試題

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
(學位在職生)

- translation initiation (c) Inhibits eukaryotic transcription initiation (d) Inhibits eukaryotic translation initiation (e) Is 3'-deoxyadenosine (f) Intercalates between adjacent G-C base pairs
27. T_ΨC loop is generally found in (a) mRNA (b) rRNA (c) tRNA (d) hnRNA (e) snRNA (f) DNA.
28. Eukaryotic DNA polymerase γ is involved in (a) Leading strand DNA synthesis (b) Lagging strand DNA synthesis (c) Nuclear DNA repair (d) Mitochondrial DNA replication (e) Chloroplast DNA replication (f) Chloroplast DNA repair.
29. Which of the following factor is required for the assembly of all eukaryotic transcriptional machinery on promoter? (a) RNA polymerase II (b) RNA polymerase III (c) TFIID (d) TBP (e) TFIIB (f) CBP coactivator
30. What DNA-binding motif is commonly used in the lambda phage repressor and tryptophan repressor? (a) Zinc finger (b) bHLH (c) Leucine zipper (d) Helix-turn-helix (e) Simple alpha helix (f) None of the above
31. Which of the following experiments can be used to identify protein-protein interaction? (a) yeast two-hybrid assay (b) mammalian two-hybrid assay (c) GST-pulldown assay (d) Co-immunoprecipitation assay (e) All of the above (f) None of the above
32. DNA is synthesized in which of the following directions? (a) In the 5'→3' direction on the leading strand and 3'→5' direction in the lagging strand (b) In the 3'→5' direction on the leading strand and the 5'→3' direction on the lagging strand (c) In the 3'→5' direction on both strands (d) In the 5'→3' direction on both DNA strands (e) The direction differs depending on the genes being duplicated (f) None of the above are correct.
33. Which of the following statements about translation in *E. coli* is **incorrect**? (a) with a speed of ~ 15 codons per sec (b) IF1 and IF3 promote dissociation of 70S ribosome (c) IF2 helps attach initiator tRNA to the P site (d) EF-Tu carries tRNA into the A site (e) EF-G facilitates translocation (f) EF-Ts participates in recharging EF-Tu with ATP.
34. Which of the following descriptions about translation initiation in prokaryotes is **incorrect**? (a) Translation always starts with AUG (b) The initiator codon with its bound tRNA^{Met} aligns with the P site of the 30S ribosomal subunit (c) The initiator tRNA normally carries N-formylmethionine (d) All prokaryotic proteins are synthesized with the same N-terminal residue, N-formylmethionine (e) In most cases the formyl group is removed during chain elongation (f) For many proteins the first methionine is cleaved off after translation.
35. Which of the following methods is commonly used to determine the concentration of DNA? (a) sequencing (b) ultracentrifugation (c) SDS-PAGE (d) Northern blot (e) Bradford method (f) absorbance at 260 nm.
36. Which of the following descriptions about *E. coli* DNA replication is **incorrect**? (a) DNA replication is faster than transcription (b) DNA replication is faster than translation (c) Each chromosome has only one replication origin (d) DNA replication is bi-directional (e) It requires less than an hour to complete *E. coli* genome replication (f) It uses tRNA as a primer.
37. Which of the following is not a general transcription factor? (a) TFIIB (b) TFIID (c) TFIIA (d)

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
(學位在職生)

TFIIIC (e) Sp1 (f) TFIIF

38. Which of the following mechanisms is involved in the activation of *trp* operon genes?
(a) anti-initiation (b) anti-termination (c) terminator initiation (d) transcriptional activation
(e) alternative initiator. (f) anti-attenuation
39. When thyroid hormone receptors bind to the response elements on the regulatory region of target genes in the absence of its cognate ligand, which of the following events will most possibly incur?
(a) nothing will happen
(b) thyroid hormone receptors without any ligand will not bind to DNA
(c) Coactivators will be recruited to activate target gene expression.
(d) Coactivators will be recruited to repress target gene expression
(e) Corepressor will be recruited to activate target gene expression
(f) Corepressor will be recruited to repress target gene expression
40. A graduate student accidentally cloned a cDNA from an economically important animal whose genomic sequence has not been resolved. The sequence of this cDNA can be summarized as below:
5'-cgcatagataataatcgccagg**ATG**ccg.....ggccgggtattctcatt**TAA**ggcaggttctta-3'
The start and stop codons are shown in bold capital. If he/she likes to amplify the coding region of this gene, which of the following PCR primer sets will work for him/her?
(a). 5'-cgccagg**ATG**ccg-3'/ 5'-ttctcatt**TAA**ggcaggttctta-3
(b). 5'-gccggtc**CTA**cggc -3'/ 5'-ttctcatt**TAA**ggcaggttctta-3
(c). 5'-cgccagg**ATG**ccg-3'/ 5'-aaa**ATT**ccgtccaagaat -3
(d). 5'-gccggtc**CTA**cggc -3'/ 5'-aaa**ATT**ccgtccaagaat -3
(e). 5'-aaa**ATT**ccgtccaagaat -3'/ 5'-ttctcatt**TAA**ggcaggttctta-3
(f). 5'-cgccagg**ATG**ccg-3'/ 5'-taagaacctgcc**TAA**aatgagaa -3

二、簡答題(每題五分;共 20 分)

1. Describe the biochemical activities of Klenow fragment
2. How can a Gram positive bacterium incorporate glutamine into a polypeptide chain?
3. Describe the components of a functional bacteria RNA polymerase.
4. Please define the common elements of a bacteria gene promoter.