銘傳大學 96 學年度研究所碩士班招生考試

生物科技學系碩士班

第二節

分子生物學試題

（限用答案本作答）

一、填空題（每題 2 分，滿分 60 分，請在答案紙上作答，盡量以一行一個答案爲原則。）

1. According to what hypothesis, a gene is a length of DNA that codes for a single amino acid chain? (1)
2. Eukaryotic DNA combines with basic protein molecules called histones to form structures known as (2). It is the basic structural subunit of chromatin.
3. In eukaryotic cells, the term (3) refers to cells acquiring new genetic information by receiving exogenous DNA.
4. (4) is an enzyme that uses a template of single-stranded RNA to generate a double-stranded DNA copy.
5. (5) is an enzyme that cleaves bonds within a nucleic acid chain; it may be specific for RNA or for single-stranded or double-stranded DNA.
6. A (6) (transposable element) is a DNA sequence able to insert itself (or a copy of itself) at a new location in the genome, without having any sequence relationship with the target locus.
7. The translation initiation of prokaryotes involves binding of a 30S ribosomal subunit to the initiation site of an mRNA. This binding depends on base pairing between a short RNA sequence called the (7) just upstream of the initiation codon and a complementary sequence at the 3'-end of the 16S rRNA..
8. (8) is the process of excising introns from RNA and connecting the exons into a continuous mRNA.
9. An (9) is a sequence of DNA consisting of triplets that can be translated into amino acids starting with an initiation codon and ending with a termination codon.
10. A (10) is an RNA that has catalytic activity such as Group I Introns which undertake self-splicing by transesterification.
11. Trypanosomatid mitochondria (kinetoplastids) encode incomplete mRNAs that must be edited before they can be translated. This process changes the sequence of RNA following transcription. This RNA process is called (11).
12. Ultraviolet (UV) radiation cross-links adjacent pyrimidines on the same DNA strand, forming (12). This DNA damage blocks DNA replication because the replication machinery cannot tell which bases to insert.
13. (13) describes the technique in which double-stranded RNA is introduced into cells to eliminate or reduce the activity of a target gene; the introduced RNA sequences are complementary to the target gene. The technique works because of the ability of double-stranded RNA sequences to trigger degradation of the mRNA of the gene.
14. (14) is an antibiotic that terminates protein synthesis by mimicking a tRNA and becoming linked to the nascent protein chain.
15. The (15) is a unit of the genome in which DNA is replicated. Each contains an origin for initiation of replication.
16. The third base of a codon is allowed to move slightly from its normal position to form a non-Watson-Crick base pair with the anticodon. We call (16) Hypothesis. This allows the same aminoacyl-tRNA to pair with more than one codon.
17. (17) is the segment of the Ti plasmid of *Agrobacterium tumefaciens* that is transferred to the plant cell nucleus during infection. It carries genes that transform the plant cell.
18. A (18) is the DNA sequence between sites of transcription initiation and termination; may include more than one gene. From it, a primary transcript can be transcribed by RNA polymerase.
19. RNA polymerase consists of the core enzyme and (19) which is the subunit of bacterial RNA polymerase needed for initiation and is the major influence on selection of promoters.
20. Many DNA polymerases have the ability to remove an incorrectly inserted base at the end of a growing chain, an activity termed (20).
21. DNA replication requires a (21) which is an enzyme that uses energy provided by ATP hydrolysis to separate the strands of a nucleic acid duplex.
22. A (22) is an intermediate structure in homologous recombination, where the two duplexes of DNA are connected by the genetic material exchanged between two of the four strands, one from each

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duplex.

23. A DNA _(23)_ is an enzyme that changes the number of times the two strands cross each other in a closed DNA molecule (i.e. changes the topology of DNA). It does this by cutting the DNA, passing DNA through the break, and resealing the DNA.
24. _(24)_ is a DNA polymorphism (variation in sequence between individuals) caused by a change in a single nucleotide. This is responsible for most of the genetic variation between individuals.
25. Which *E. coli* enzyme is responsible for removal of RNA primers during DNA replication? _(25)_
26. _(26)_ is an enzyme that uses a template of single-stranded RNA to generate a double-stranded DNA copy.
27. _(27)_ is a conserved A • T-rich octamer found about 25 bp before the startpoint of each eukaryotic RNA polymerase II transcription unit; it is involved in positioning the enzyme for correct initiation.
28. An _(28)_ is a cis-acting sequence that increases the utilization of some eukaryotic promoters, and that can function in either orientation and in any location (upstream or downstream) relative to the promoter.
29. An activator is a protein that stimulates the expression of a gene, typically by acting at a promoter to stimulate RNA polymerase binding. In eukaryotes, the sequence to which it binds in the promoter is called a _(29)_.
30. A gene _(30)_ is a process in which a gene function is eliminated, usually by replacing most of the coding sequence with a selectable marker in vitro and transferring the altered gene to the genome by homologous recombination.

二、簡答題（共 40 分）

1. 何謂分子生物學的“中心信條 central dogma”？該信條描述了遺傳訊息的特徵。（6 分）
2. 一個去氧核醣核苷酸(deoxyribonucleotide)分子由那三個部分組成。（6 分）
3. 在真核細胞內新合成的 mRNA transcript 稱爲 heterogeneous nuclear RNA (hn RNA)，在其具有完全功能之前必須經過那些修飾作用。（6 分）
4. 真核生物有那三種形式的 RNA 聚合酶(RNA polymerases)？在細胞中這三種 RNA 聚合酶辨認不同的啓動子，分別負責轉錄何種基因？（6 分）
5. 某生自特定生物樣品純化得到一種具有 protease activity 的蛋白質，根據這項實驗結果，你認爲某生應該繼續進行那些實驗，以獲得該 protease 的基因。（6 分）
6. 前提一：某一真核生物基因在染色體上具有若干個 introns。
   前提二：該基因的 DNA 序列已知。
   前提三：該基因爲一個編碼基因，即 a protein-encoding gene。
   請簡要設計一個實驗流程，說明如何選殖出該基因，以便可以利用一般的蛋白質表達系統作出該基因的產物。（10 分）

試題完