1. 請將下列結構名稱，依基因 5'端至 3'端由左側排到右側：(8%)
(1) promoter
(2) transcription start site
(3) terminator
(4) translation start codon
(5) translation stop codon
(6) 5'-untranslation region
(7) 3'-untranslation region
(8) coding region

2. 請寫出染色體的特徵，並說明與細胞壽命的相關性。(6%)

3. 請寫出真核生物參與轉錄作用的 3 種 RNA polymerases 及其產物。(10%)

4. 請由發生的機制及造成的結果，分別說明 DNA 突變的種類。(8%)

5. 請問哪一種 transposon 為最簡單的 transposon？transposon 最早於哪一種生物中發現？transposon 的基本特徵有哪些？transposition 的機制為何？ (6%)

6. 請解釋下列名詞：(12%)
(1) hnRNA
(2) lagging strand
(3) peptidyl transferase
(4) polyribosome
(5) replisome
(6) spliceosome

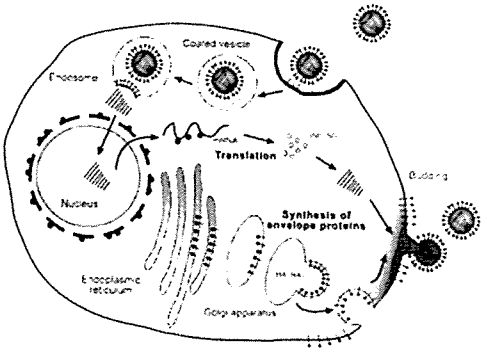
7. In guinea pigs, the allele for black fur (B) is dominant over the allele for brown (b) fur. A black guinea pig is crossed with a brown guinea pig, producing five F1 black guinea pigs and six F1 brown guinea pigs. (10%)
(1) How many copies of the black allele (B) will be present in each cell from an F1 black guinea pig at the following stages: G1, G2, metaphase of mitosis, metaphase I of meiosis, metaphase II of meiosis, and after the second cytokinesis following meiosis? Assume that no crossing over takes place.
(2) How many copies of the brown allele (b) will be present in each cell from an F1 brown guinea pig at the same stages? Assume that no crossing over takes place.

8. Match each term (1-8) with its correct definition (A-H). (8%)

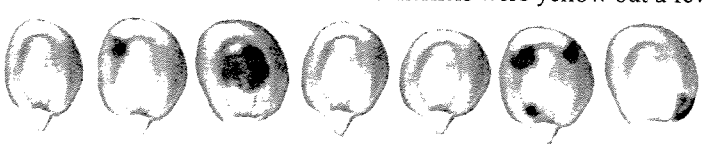
| | Term | | Definition |
|---|---|---|---|
| 1 | phenocopy | A | The percentage of individuals with a particular genotype that express the expected phenotype |
| 2 | pleiotrophy | B | A trait determined by an autosomal gene that is more easily expressed in one sex |
| 3 | polygenic trait | C | A trait determined by an autosomal gene that is expressed in only one sex |
| 4 | penetrance | D | A trait that is determined by an environmental effect and has the same phenotype as a genetically determined trait |
| 5 | sex-limited trait | E | A trait determined by genes at many loci |
| 6 | genetic maternal effect | F | The expression of a trait is affected by the sex of the parent that transmits the gene to the offspring |
| 7 | genomic imprinting | G | A gene affects more than one phenotype |
| 8 | sex-influenced trait | H | The genotype of the maternal parent influences the phenotype of the offspring |

9. In the pearl millet plant, color is determined by three alleles at a single locus: Rp1 (red), Rp2 (purple), and rp (green). Red is dominant over purple and green, and purple is dominant over green (Rp1 >Rp2>rp). Give the expected phenotypes and ratios of offspring produced by the following crosses: (10%)
(a) Rp1/Rp2 × Rp1/rp (b) Rp1/rp × Rp2/rp (c) Rp1/Rp2 × Rp1/Rp2 (d) Rp2/rp × rp/rp (e) rp/rp × Rp2/Rp2

10. (12%, 3% each)
(1) The subtypes of Influenza virus A are divided on the basis of 2 proteins, hemagglutinin (HA) and neuraminidase (NA), pleases explain the similarity and difference H5N8 and H5N2 according to the most updated news in Taiwan?
(2) Dose influenza virus belongs to retrovius (according to its life cycle)? Why?
(3) There are two types of H5N2, the new and old ones. What does that mean?
(4) In 2009, there was a new strain of H1N1 Influenza (called swine flu) arisen from the reassortment of genetic material from avian (禽), swine (pig), and human viruses. As we know, most humans are not easily infected by avian influenza. How then do DNA sequences from avian influenza become incorporated into human influenza?




11. A geneticist harvested an ear of open pollinated corn and examined the kernels. She found that most kernels were yellow but a few kernels with purple spots, as shown here. Give a possible explanation for the appearance of the purple spots in these otherwise yellow kernels, accounting for their different sizes. (10%)



試題隨卷繳回