

Section A Multiple Choice Questions

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|------|-------|-------|-------|-------|
| 1. B | 6. A | 11. C | 16. D | 21. B |
| 2. A | 7. A | 12. D | 17. C | 22. A |
| 3. B | 8. C | 13. C | 18. D | 23. B |
| 4. D | 9. D | 14. B | 19. D | 24. B |
| 5. C | 10. B | 15. A | 20. C | 25. D |

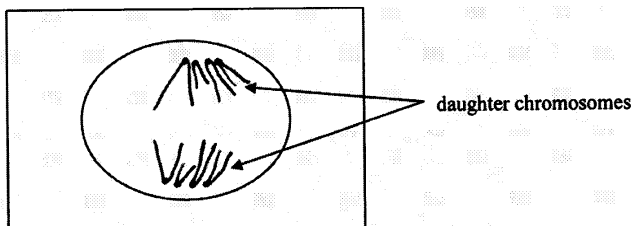
(Note: Question 3 – segregation can also occur in meiosis II as well as meiosis I.)

Section B Short Answer

Question 1 (9 marks)

- a. i. Mitosis (1 mark)
 ii. G₁, S, G₂ (1 mark)

b.



(1 mark – drawing)
 (1 mark – label)

- c. i. X – 7.2 pg
 – DNA doubles in S (= synthetic period) when chromosomes replicate. (1 mark)
 ii. Y – 7.2 pg
 – DNA has already doubled in interphase so cell still has 7.2 pg at metaphase of mitosis. (1 mark)
 iii. Z – 3.6 pg
 – cell has undergone cytokinesis so daughter cell has half the amount of DNA. (1 mark)
 d. No – chromosomes are in homologous pairs (1 mark) therefore this must be a cell undergoing meiosis. (1 mark)

Question 2 (6 marks)

- a. **Circle** around 1, 2 and 6. (½ mark)
 Recessive (½ mark) as two parents without myopia (1 and 2) have a child with myopia (6). (1 mark)
 b. **Box** around 3, 4 and 11 **or** 6, 7 and 14. (½ mark)
 Autosomal. (½ mark) If it was sex-linked, the affected mothers 4 and 6 would have all affected sons and they do not. (1 mark)
 c. M = normal sight, m = myopia (½ mark)
 Female (22) mm × MM → all Mm – all children with normal sight (½ mark)
 Female (19) Mm × MM → ½ Mm and ½ MM – all children with normal sight (½ mark)
 Therefore – disagree with female (24) as both females 22 and 19 have offspring with normal sight (½ mark)

Question 3 (5 marks)

- a. i. (1) YySs × (2) YySs (1 mark)
 ii. **Either** – 5 white long haired offspring (yyss) therefore parents must be:
 • Yy × Yy to produce yy (white hair) offspring (1 mark)
 • Ss × Ss to produce ss (long hair) offspring (1 mark) **or**
 • 17 yellow, 38 cream, 19 white is ratio of 1:2:1, so cream parents Yy × Yy (1 mark) **and**
 • 58 short and 19 long is a ratio of 3:1, so short hair parents Ss × Ss (1 mark)
 b. i. yySs or yySS × yyss **or** yyS- × yyss (test cross) (1 mark)
 ii. An environmental factor (for example: temperature, chemicals, trauma). (1 mark)

Question 4 (6 marks)

- a. i. Undifferentiated somatic cells (which are multipotent) (1 mark)
 ii. These cells were known to transform into bone cells if appropriate growth factors were added. (1 mark)
 b. Formation of new cells by mitosis. (1 mark)
 c. So there is no rejection of “nonself” cells as they have the same surface antigens. (1 mark)
 d. Early embryo cells are very undifferentiated that is, not yet affected by any factors to initiate differentiation. (1 mark)
 e. Any one of:
 • killing embryos to obtain stem cells
 • cost – only available to the wealthy
 • **or** any other reasonable suggestion. (1 mark)

Question 5 (7 marks)

- a. i. Continuous. (1 mark)
ii. Two or more genes contribute to the phenotype and result in a combined effect to produce a range of phenotypes for the characteristic. (1 mark)
iii. Any one of: thickness of shell; patterns on shell; colour of shell; mass of dog-whelk; **or** any other reasonable suggestion. (1 mark)
- b. i. Natural selection. (1 mark)
ii. Variation in thickness of shell of dog-whelks in population on sheltered shores. (1 mark)
Crab predators are more likely to eat those with thinner shells and those with thicker shells more likely to survive and reproduce. (1 mark)
Offspring inherit the genes for thicker shell so over time the thicker-shelled whelks become more common in the population. (1 mark)

Question 6 (7 marks)

- a. i. Reproducing animals in enclosed areas under controlled conditions. (1 mark)
ii. To increase populations numbers of endangered species. (1 mark)
- b. i. They were too closely related. (1 mark)
ii. The imported giraffe needs to be genetically different from the Melbourne giraffe. (1 mark)
- c. Any two of: no need for quarantine of a large animal; don't need to rely on animals mating; avoid problems of lack of interest in breeding by pairs; reduced cost in transporting and caring for another animal; **or** any other reasonable suggestion. (2 marks)
- d. Both can cause changes in allele frequencies. (1 mark)

Question 7 (10 marks)

- a. Foramen magnum further forward. (1 mark)
- b. **Any two of:** larger brain case (cranium) like humans; reduced eye brow ridges – smaller than chimpanzee; even teeth more like humans; **or** any other reasonable suggestion. (2 marks)
- c. i. Human-like individual that walks upright. (1 mark)
ii. *Homo sapiens* **or** any other *Homo* species.
Homo erectus
Homo habilis
Neanderthal man ($2 \times \frac{1}{2} = 1$ mark)
- d. i. Sedimentary rock. (1 mark)
ii. Using radioisotope dating (for example: potassium/argon, definitely **not** carbon dating. (1 mark)
- e. i. Divergent evolution. (1 mark)
ii. Differences in ancestral population exist. ($\frac{1}{2}$ mark)
Ancestral population separated, for example, by mountain range. ($\frac{1}{2}$ mark)
Different selective pressures on isolated populations, resulting in different genes being selected. ($\frac{1}{2}$ mark)
When populations come together they are reproductively isolated so different species. ($\frac{1}{2}$ mark)