

**BIOLOGY  
HIGHER LEVEL  
PAPER 1**

Monday 17 May 2010 (afternoon)

1 hour

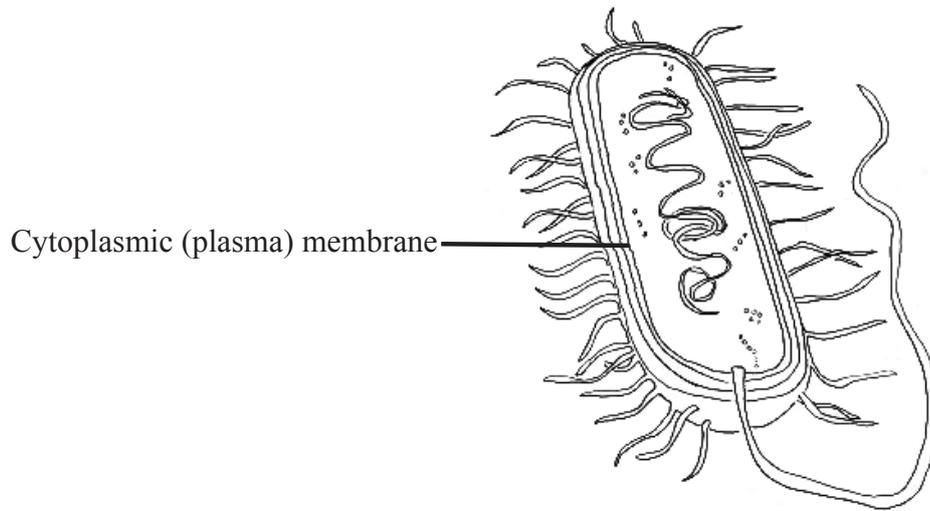
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**INSTRUCTIONS TO CANDIDATES**

- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.

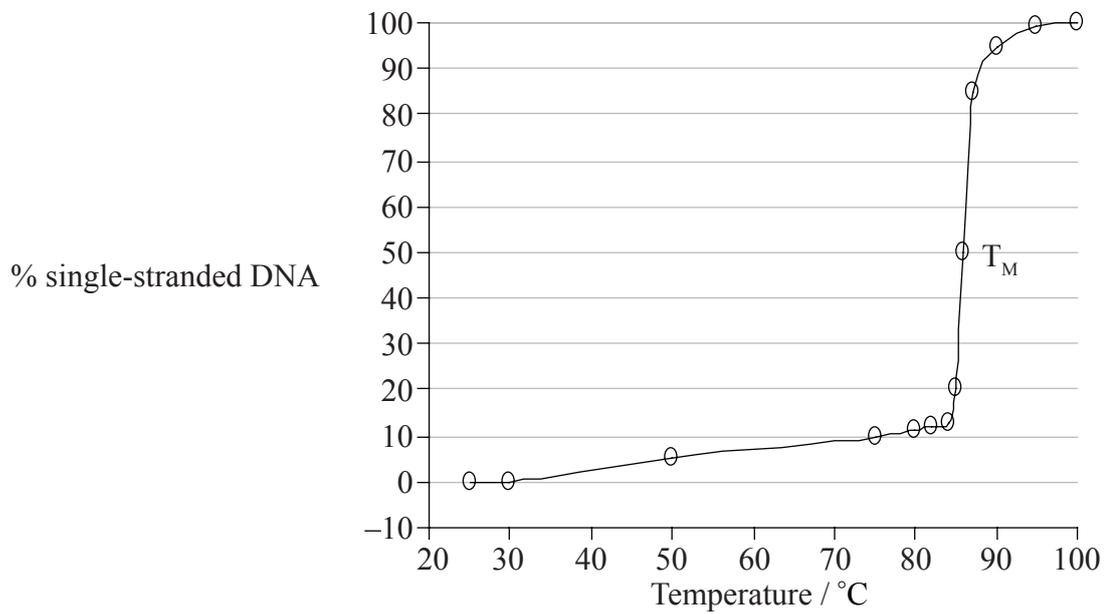
1. What does a small standard deviation signify?
  - A. The data is not correlated.
  - B. The data is widely spread around the mean.
  - C. The data shows a close relationship between two variables.
  - D. The data is clustered closely to the mean value.
  
2. In a cell, what is the effect of a large surface area to volume ratio?
  - A. Slower rate of exchange of waste materials
  - B. Faster heat loss
  - C. Faster rate of mitosis
  - D. Slower intake of food
  
3. How can cells in a multicellular organism differentiate?
  - A. They express some of their genes but not others.
  - B. They all have a different genetic composition.
  - C. Different cells contain a different set of chromosomes.
  - D. Different cells do not have some of the genes.

4. What is the function of the cytoplasmic (plasma) membrane of this bacterium?



- A. To produce ADP
  - B. To form the only protective layer preventing damage from outside
  - C. To control entry and exit of substances
  - D. To synthesize proteins
5. What happens during the G<sub>2</sub> stage of interphase?
- A. Homologous chromosomes pair
  - B. Synthesis of proteins
  - C. Homologous chromosomes separate
  - D. Replication of DNA
6. What is a role of sulfur in living organisms?
- A. Formation of proteins
  - B. Formation of carbohydrates
  - C. Formation of teeth
  - D. Transmission of nerve impulses

7. The graph below shows the effect of temperature on the separation of the strands in DNA to form single strands. The temperature at which 50% of the DNA is single-stranded is called the melting temperature ( $T_M$ ).



What do the results show?

- A. When the temperature reaches 85°C there are no more double-stranded DNA molecules.
- B. When the temperature reaches 85°C the DNA strands start separating rapidly.
- C. A  $T_M$  of 85°C means that DNA is not stable at room temperature (25°C).
- D. The separation of the DNA strands is directly proportional to the increase in temperature.

8. The table below shows the codons that determine different amino acids in protein translation.

First base in codon	Second base in codon				Third base in codon
	U	C	A	G	
U	Phe	Ser	Tyr	Cys	U
	Phe	Ser	Tyr	Cys	C
	Leu	Ser	—	—	A
	Leu	Ser	—	Trp	G
C	Leu	Pro	His	Arg	U
	Leu	Pro	His	Arg	C
	Leu	Pro	Gln	Arg	A
	Leu	Pro	Gln	Arg	G
A	Ile	Thr	Asn	Ser	U
	Ile	Thr	Asn	Ser	C
	Ile	Thr	Lys	Arg	A
	Met	Thr	Lys	Arg	G
G	Val	Ala	Asp	Gly	U
	Val	Ala	Asp	Gly	C
	Val	Ala	Glu	Gly	A
	Val	Ala	Glu	Gly	G

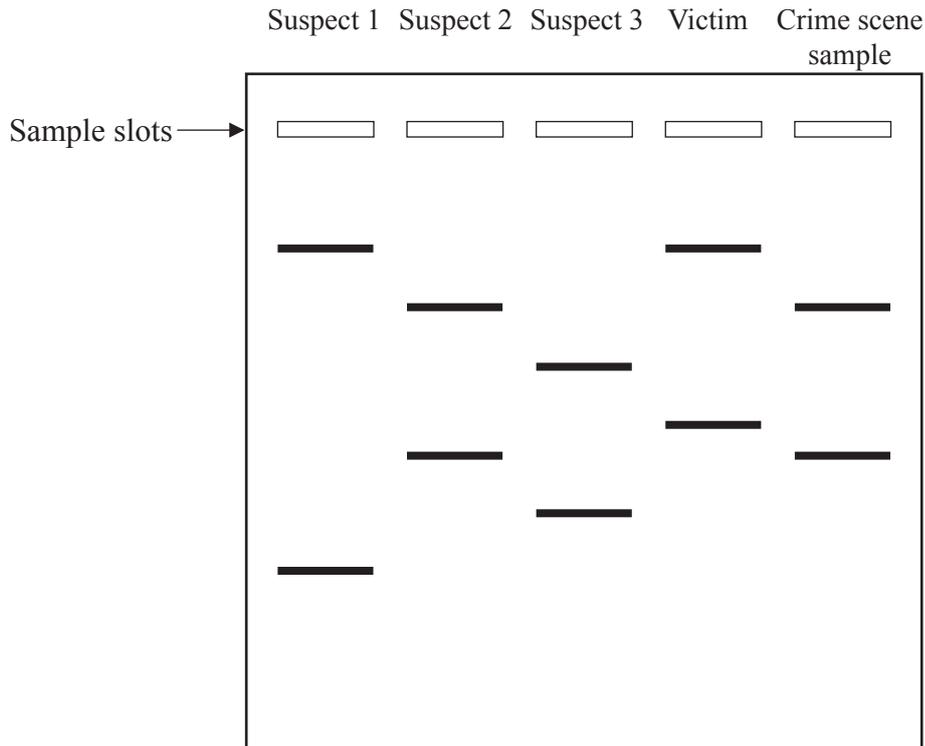
What is the sequence of the amino acids that is being translated from the following mRNA sequence?

5' AUGGGUGCUUAUUGGUA 3'

- A. Met-Pro-Arg-Ile-Thr
- B. Met-Cys-Ser-Tyr-Trp
- C. Met-Gly-Ala-Tyr-Trp
- D. Met-Gly-Tyr-Ala-Thr

9. Which of the following is a function of cellulose in plants?
- A. Storage of fat
  - B. Formation of mitochondria
  - C. Storage of energy
  - D. Formation of cell walls
10. Why is light important in photosynthesis?
- A. To produce ATP and split water molecules
  - B. To produce ADP needed to fix carbon dioxide
  - C. To activate the enzymes that fix carbon dioxide
  - D. To activate carbon dioxide molecules
11. Which of the following is the cause of sickle-cell anemia?
- A. Tryptophan is replaced by leucine.
  - B. Leucine is replaced by valine.
  - C. Glutamic acid is replaced by valine.
  - D. Lysine is replaced by glutamic acid.

12. The diagram below represents the results obtained in a DNA profile from a crime scene.

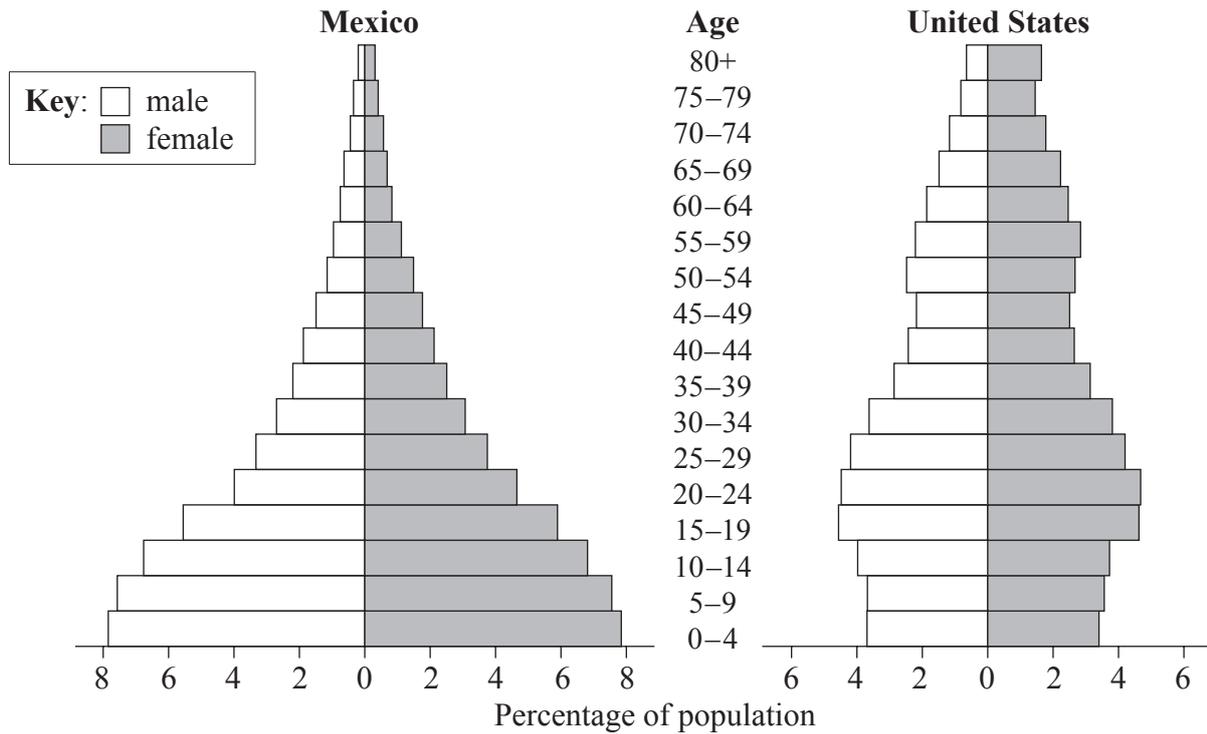


Suspect 2 is **most** likely to be the criminal because the band pattern coincides with that of the crime scene sample. What do these bands represent?

- A. DNA fragments
  - B. Genes
  - C. Chromosomes
  - D. Chromatids
13. What does the universal nature of the genetic code allow?
- A. Change of genetic code in the same species
  - B. Transfer of genes between species
  - C. Formation of clones
  - D. Infection by bacteria

14. What is a genetic test cross?
- A. Testing a suspected homozygote by crossing it with a known heterozygote
  - B. Testing a suspected heterozygote by crossing it with a known heterozygote
  - C. Testing a suspected homozygote by crossing it with a known homozygous dominant
  - D. Testing a suspected heterozygote by crossing it with a known homozygous recessive
15. Which of the following is a consequence of global temperature rise on arctic ecosystems?
- A. Increased rates of decomposition of detritus trapped in permafrost
  - B. Decrease of geographical range of habitats for temperate species
  - C. Decrease of pest species and increase of permafrost species
  - D. Increase of geographical range of habitats for permafrost species

16. What do the graphs below show?



- A. Population in the United States is increasing at a higher rate.
  - B. Infant death rate is high in both countries.
  - C. Males live longer than females in both countries.
  - D. Birth rate is higher in Mexico than in the United States.
17. What is a cause of the plateau phase in a population growth curve?
- A. Excess of food
  - B. Disease
  - C. Increase in prey
  - D. More space availability

18. Which phylum does the plant below belong to?

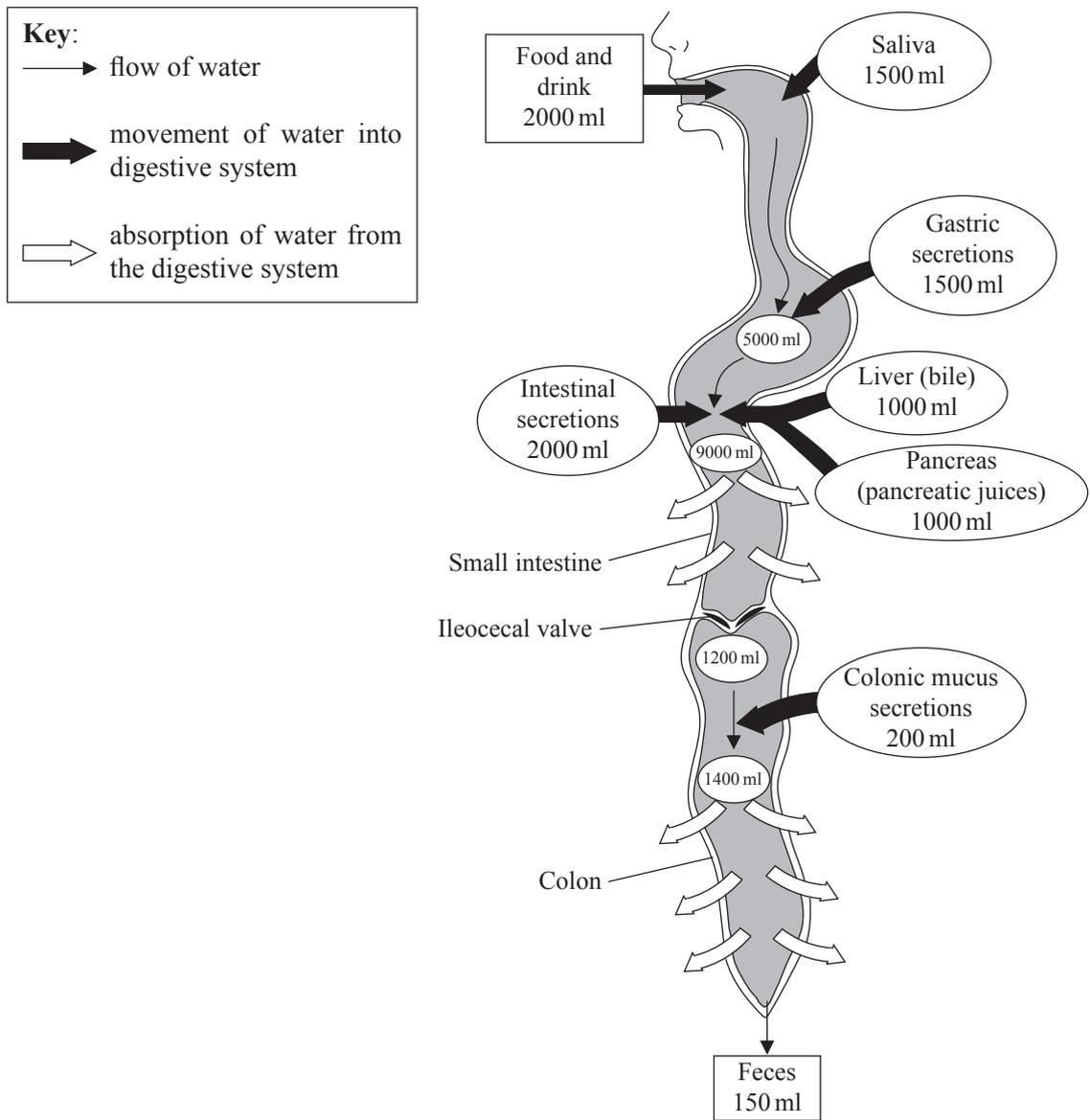


- A. Angiospermophyta
  - B. Bryophyta
  - C. Coniferophyta
  - D. Filicinophyta
19. Which of the following is a characteristic of platyhelminthes?
- A. Many pairs of legs
  - B. Flat body
  - C. Hard exoskeleton
  - D. Presence of cnidocytes

20. Which feature increases the absorption of glucose in the small intestine?
- A. Villi
  - B. Lacteal
  - C. Cilia
  - D. Goblet cells
21. What is a role of the pacemaker or sinoatrial node (SAN)?
- A. To initiate contraction of the ventricle
  - B. To pass the excitation through Purkinje fibres
  - C. To originate excitation in myogenic muscle
  - D. To cause the relaxation of the atria
22. Why are antibiotics effective against bacteria?
- A. They can produce specific antibodies.
  - B. They can engulf foreign matter.
  - C. They can block specific metabolic pathways.
  - D. They can act as a vaccine.

23. Which of the following features of the alveoli adapt them to gaseous exchange?
- I. Single layer of cells
  - II. Film of moisture
  - III. Dense network of capillaries
- A. I and II only
  - B. II only
  - C. II and III only
  - D. I, II and III

24. The diagram below shows water in the human body.

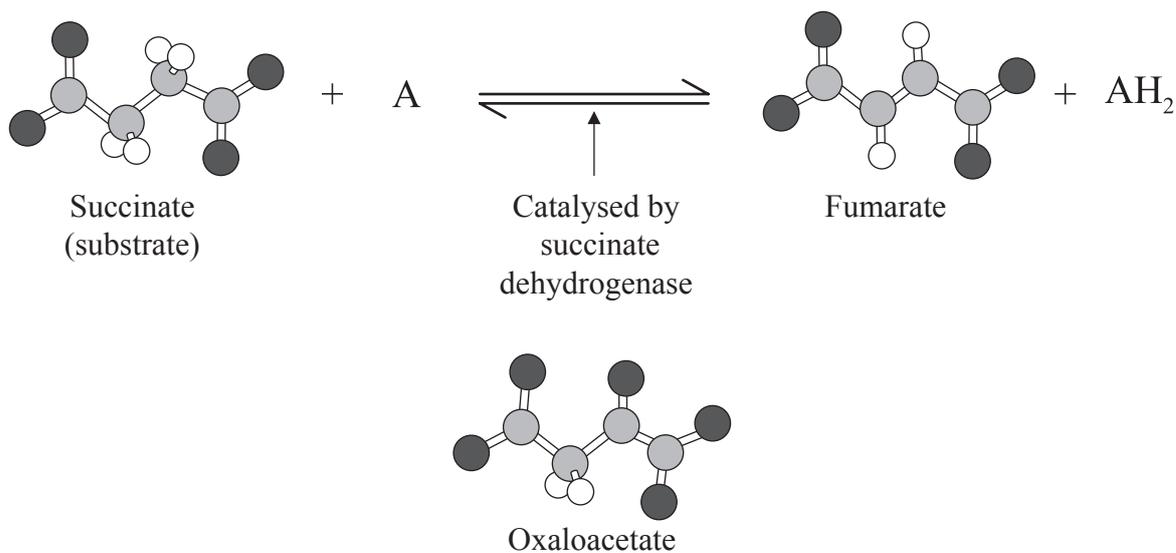


Where in the digestive system is the largest volume of water absorbed from?

- A. Colon
- B. Pancreas
- C. Small intestine
- D. Liver

25. Which of the following forms the nucleosome?
- A. DNA and histone molecules
  - B. DNA only
  - C. RNA and histone molecules
  - D. Histone molecules only
26. What happens during the formation of Okazaki fragments?
- A. DNA polymerase III adds nucleotides in the  $3' \rightarrow 5'$  direction.
  - B. DNA polymerase III adds nucleotides in the  $5' \rightarrow 3'$  direction.
  - C. DNA polymerase I adds nucleotides in the  $5' \rightarrow 3'$  direction.
  - D. RNA polymerase adds nucleotides in the  $3' \rightarrow 5'$  direction.

27. Why is oxaloacetate a competitive inhibitor?

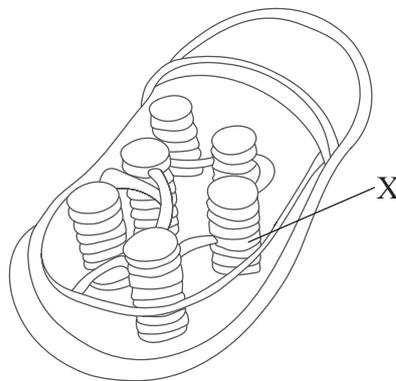


[Source: image from WK Purves, *et al.*, (2003) *Life: The Science of Biology*, 4, Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com)]

- A. It causes a conformational change to the active site.
  - B. It binds to the enzyme away from the active site.
  - C. It is structurally similar to succinate.
  - D. It is structurally similar to succinate dehydrogenase.
28. What is the link reaction in aerobic respiration?
- A. Pyruvate is carboxylated, acetyl reacts with coenzyme A, reducing NADH + H<sup>+</sup>
  - B. Pyruvate is decarboxylated, acetyl reacts with coenzyme A, forming NADH + H<sup>+</sup>
  - C. Pyruvate reacts with coenzyme A, forming NADH + H<sup>+</sup>
  - D. Pyruvate is decarboxylated, reacting with coenzyme A, reducing NADH + H<sup>+</sup>

29. What is chemiosmosis?
- A. Coupling of ATP synthesis to the electron transport and proton movement
  - B. Phosphorylation of glucose in the mitochondrial matrix
  - C.  $H^+$  ions moving down a concentration gradient into the mitochondrial matrix
  - D. Activation of ATPase in order to synthesize ATP

30. The diagram below shows the structure of a chloroplast.



What is the structure labelled X?

- A. Ribosome
- B. Stroma
- C. Inner membrane
- D. Thylakoid

31. Which of the following are characteristics of monocotyledonous plants?

- I. Parallel venation of leaves
- II. Floral organs in multiples of four
- III. Fibrous adventitious roots

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

32. How do mineral ions in the soil move to the root through the soil?

- A. Osmosis
- B. Mass flow of water
- C. Translocation
- D. Through phloem

33. Which hormone causes the closing of stomata?

- A. Abscisic acid
- B. Gibberellin
- C. Auxin
- D. Ethylene

34. What kind of inheritance does skin colour represent?

- A. Sex-linked (X-linked)
- B. Multiple alleles
- C. Systemic
- D. Polygenic

35. Which are the possible recombinants in a dihybrid test cross involving the linked genes  $\frac{JQ}{jq}$ ?

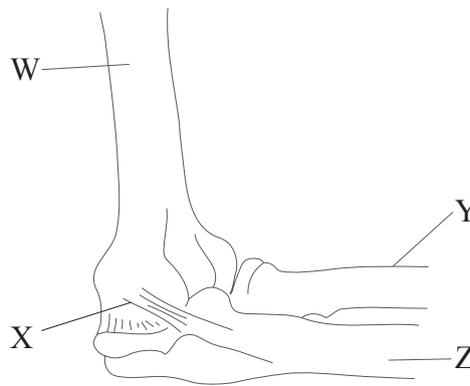
- A.  $\frac{JQ}{jq}$  and  $\frac{JQ}{Qq}$
- B.  $\frac{Jq}{Qq}$  and  $\frac{Qq}{JJ}$
- C.  $\frac{Jq}{jq}$  and  $\frac{jQ}{jq}$
- D.  $\frac{JQ}{jq}$  and  $\frac{Jq}{jQ}$

36. How can active immunity be acquired?

- A. By having the disease
- B. Injection of antibodies
- C. Through colostrum
- D. Via placenta

37. What are fused in the production of monoclonal antibodies?
- A. Tumour cells and T-cells
  - B. Tumour cells and B-cells
  - C. B-cells and T-cells
  - D. Antibodies and antigens

38. The diagram below shows the side view of the arm joint.



Which letter is pointing to the ulna?

- A. W
  - B. X
  - C. Y
  - D. Z
39. Which of the following best describes what happens in the glomerulus?
- A. Selective reabsorption of water and molecules by active transport
  - B. Ultrafiltration introduces water and other molecules into the capillaries
  - C. Regulation of salt balance leading to the production of urine
  - D. High blood pressure forces water and other molecules into the nephron

40. Which pair of statements best describes oogenesis and spermatogenesis?

	<b>Oogenesis</b>	<b>Spermatogenesis</b>
A.	Four eggs are produced per mitosis every 28 days	Millions of sperms are produced per mitosis
B.	Four eggs are produced per meiosis every 28 days	One sperm is produced per meiosis
C.	One egg is produced per mitosis every 28 days	Millions of sperms are produced per meiosis
D.	One egg is produced per meiosis every 28 days	Four sperms are produced per meiosis

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