



National  
Qualifications  
SPECIMEN ONLY

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**SQ25/H/02**

**Human Biology  
Section 1 — Questions**

Date — Not applicable

Duration — 2 hours and 30 minutes

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Instructions for the completion of Section 1 are given on *Page two* of your question and answer booklet SQ25/H/02.

Record your answers on the answer grid on *Page three* of your question and answer booklet.

Before leaving the examination room you must give your question and answer booklet to the Invigilator; if you do not you may lose all the marks for this paper.

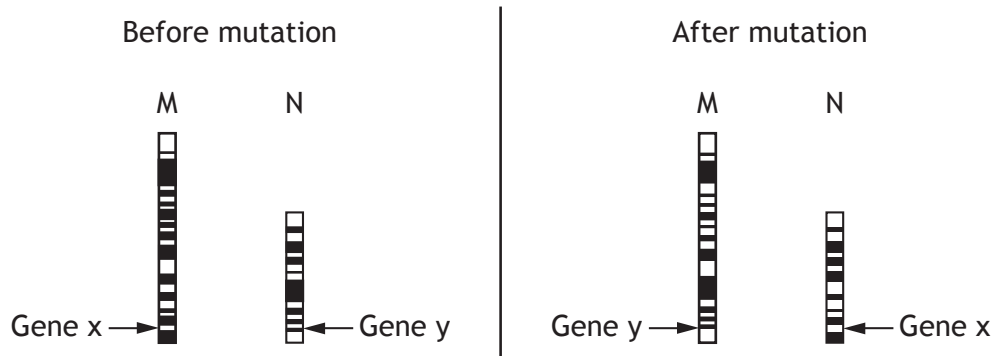


\* S Q 2 5 H 0 2 \*

SECTION 1 — 20 marks

Attempt ALL questions

1. The diagram below shows two chromosomes, M and N, before and after a chromosomal mutation.



The form of mutation that has taken place is a

- A translocation
  - B duplication
  - C insertion
  - D deletion.
2. Amplification of DNA by PCR commences with 1000 DNA molecules in the reaction tube. How many DNA molecules would be present after four cycles of PCR?
- A 4000
  - B 8000
  - C 16000
  - D 32000
3. Which of the following statements about slow twitch muscle fibres is correct?
- A They cannot sustain contractions for as long as fast twitch muscle fibres.
  - B They have many more mitochondria than fast twitch muscle fibres.
  - C They are better for activities like weightlifting and sprinting than fast twitch muscle fibres.
  - D They store fuel mainly as glycogen while fast twitch muscle fibres store fuel as fat.

4. The table below contains information about four semen samples.

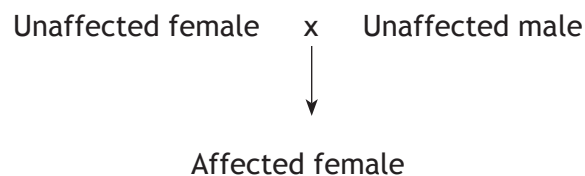
|   | <i>Semen sample</i> |    |    |    |
|---|---------------------|----|----|----|
|   | A                   | B  | C  | D  |
| Number of sperm in sample (millions/cm <sup>3</sup> ) | 40                  | 30 | 20 | 60 |
| Active sperm (%)                                      | 50                  | 60 | 75 | 40 |
| Abnormal sperm (%)                                    | 30                  | 65 | 10 | 70 |

Which semen sample has the highest number of active sperm?

5. In which of the following situations might a fetus be at risk from Rhesus antibodies produced by the mother?

|   | <i>Father</i>   | <i>Mother</i>   |
|---|-----------------|-----------------|
| A | Rhesus positive | Rhesus negative |
| B | Rhesus positive | Rhesus positive |
| C | Rhesus negative | Rhesus negative |
| D | Rhesus negative | Rhesus positive |

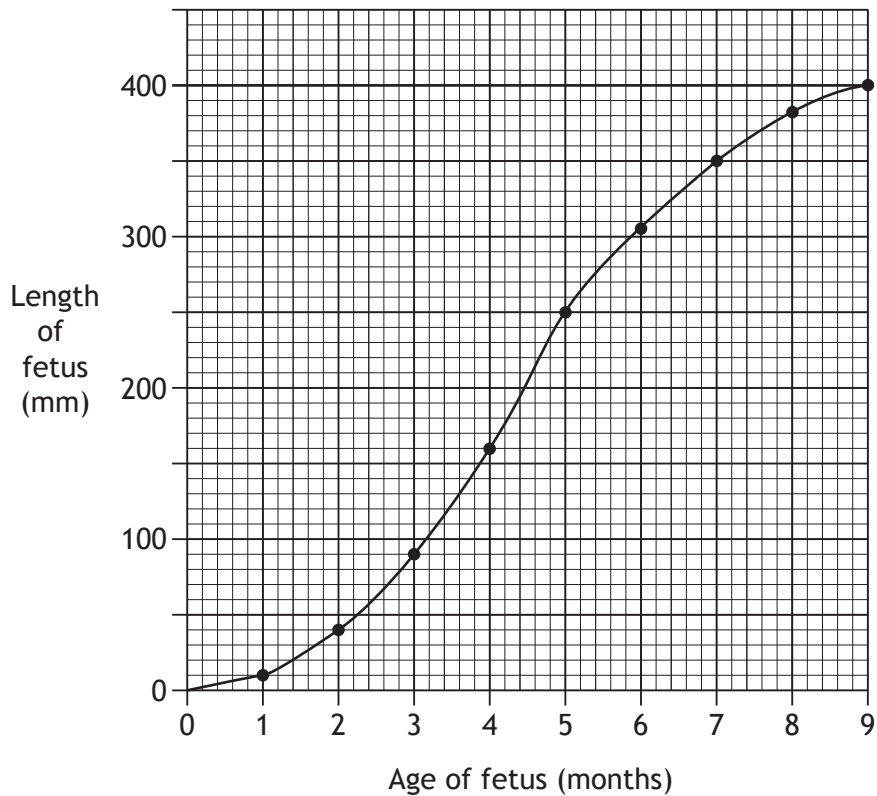
6. The family tree below shows the pattern of inheritance of a genetic condition.



The allele responsible for this condition is both

- A sex-linked and recessive
- B sex-linked and dominant
- C autosomal and recessive
- D autosomal and dominant.

7. The graph below shows the growth, in length, of a human fetus.



What is the percentage increase in length of the fetus during the final four months of pregnancy?

- A 33.3%
- B 60.0%
- C 62.5%
- D 150.0%

8. Cystic fibrosis is a genetic condition caused by an allele that is not sex-linked. A child is born with cystic fibrosis despite neither parent having the condition. The parents are going to have a second child.

What is the percentage chance this child will have cystic fibrosis?

- A 75%
- B 67%
- C 50%
- D 25%

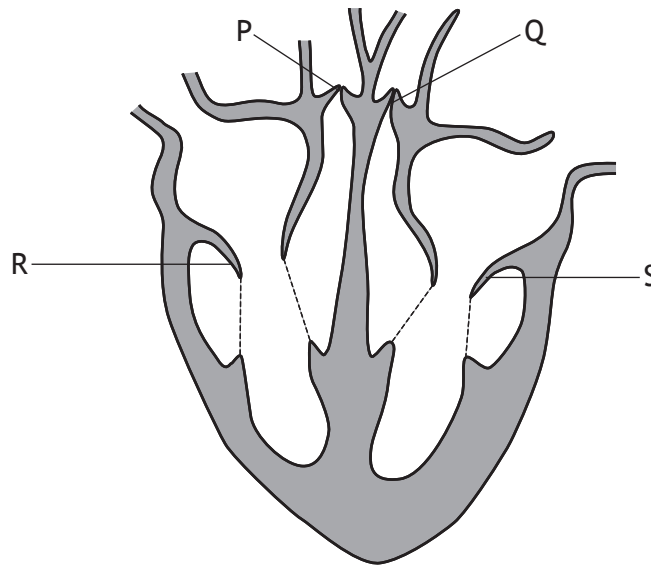
9. The duration of the stages in an individual's cardiac cycle are shown in the table below.

| <i>Stage</i>        | <i>Duration (s)</i> |
|---------------------|---------------------|
| Diastole            | 0.4                 |
| Atrial systole      | 0.1                 |
| Ventricular systole | 0.3                 |

What is the heart rate of this individual?

- A 48 beats per minute
- B 75 beats per minute
- C 80 beats per minute
- D 150 beats per minute

10. The diagram below shows a cross-section of the heart.



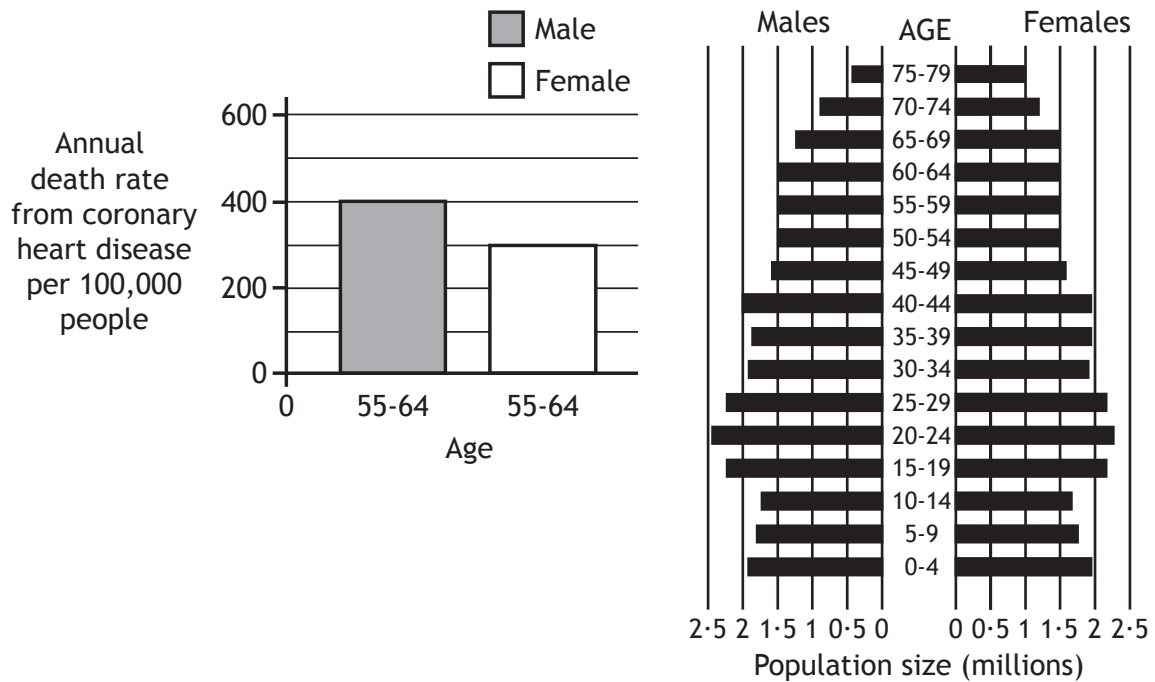
Which of the following statements describes the movement of the valves during ventricular systole?

- A Valves P and Q open and valves R and S close
- B Valves P and R open and valves Q and S close
- C Valves P and Q close and valves R and S open
- D Valves P and R close and valves Q and S open

11. Which of the following statements about lipoprotein is correct?

- A LDL transports cholesterol from body cells to the heart
- B LDL transports cholesterol from body cells to the liver
- C HDL transports cholesterol from body cells to the heart
- D HDL transports cholesterol from body cells to the liver

12. The graphs below contain information about the population of Britain.



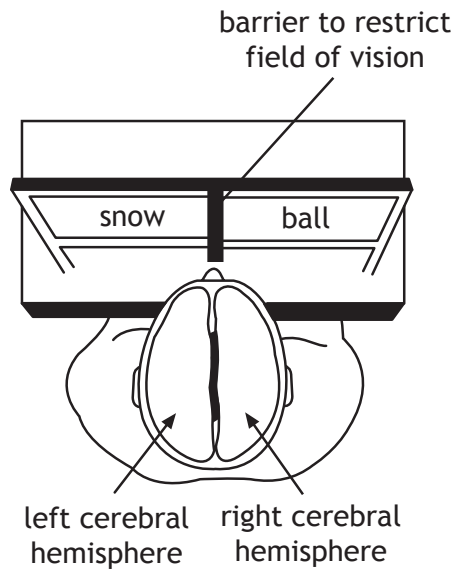
The number of British women between 55 and 64 years of age who die from coronary heart disease annually is

- A 300
- B 4500
- C 9000
- D 21000.

13. The transformation of information into a form that memory can accept is called

- A shaping
- B retrieval
- C encoding
- D storage.

14. The diagram below shows a test on a man who had a damaged corpus callosum. This meant that he could no longer transfer information between his right and left cerebral hemispheres.



Some of the functions of each hemisphere are described in the table below.

| <i>Left cerebral hemisphere</i>      | <i>Right cerebral hemisphere</i>    |
|--------------------------------------|-------------------------------------|
| processes information from right eye | processes information from left eye |
| controls language production         | controls spatial task co-ordination |

The man was asked to look straight ahead and then the words “snow” and “ball” were flashed briefly on the screen as shown.

What would the man say that he had just seen?

- A Snow
- B Ball
- C Snowball
- D Nothing

15. Which of the following statements about the action of recreational drugs on brain neurochemistry is correct?
- A Desensitisation results from an increase in the number of neurotransmitter receptors due to the use of drugs that are agonists
  - B Desensitisation results from an increase in the number of neurotransmitter receptors due to the use of drugs that are antagonists
  - C Sensitisation results from an increase in the number of neurotransmitter receptors due to the use of drugs that are agonists
  - D Sensitisation results from an increase in the number of neurotransmitter receptors due to the use of drugs that are antagonists
16. An investigation was carried out to determine how long it takes students to learn to run a finger maze.  
A blindfolded student was allowed to run the maze on ten occasions.  
The results are given in the table below.

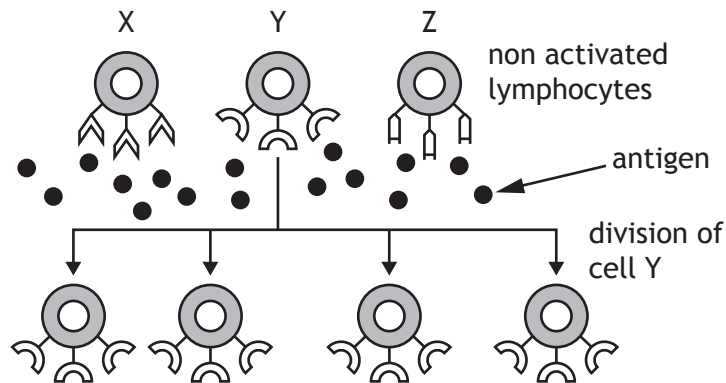
| Trial | Time (s) |
|-------|----------|
| 1     | 23       |
| 2     | 20       |
| 3     | 26       |
| 4     | 12       |
| 5     | 18       |
| 6     | 10       |
| 7     | 6        |
| 8     | 7        |
| 9     | 6        |
| 10    | 6        |

- Which of the following changes to the investigation would make the results more reliable?
- A Allowing other students to try to run the maze ten times.
  - B Allowing the same student some additional trials on the same maze.
  - C Changing the shape of the maze and allowing the same student to repeat ten trials.
  - D Recording the times to one decimal place.



17. Which of the following is not part of the inflammatory response?
- A Vasodilation
  - B Release of histamine
  - C Production of antibodies
  - D Increased capillary permeability

18. The diagram below represents clonal selection in lymphocytes.



What stimulates the division of cell Y?

- A The presence of lymphocytes X and Z
  - B The presence of an antigen in the blood
  - C The binding of antibodies to receptors on the cell membrane
  - D The binding of antigens to receptors on the cell membrane
19. Two groups of subjects were used when carrying out clinical trials of a vaccine. One group was given the vaccine while the other group was given a placebo. The purpose of the placebo was to
- A reduce experimental error
  - B ensure a valid comparison can be made
  - C allow a statistical analysis of the results to be made
  - D ensure that researchers are unaware who has been vaccinated.

20. The table below contains data about a worldwide infection in 2009.

|   | <i>Number of adults</i> | <i>Number of children</i> |
|---|-------------------------|---------------------------|
| Had this infection at the start of 2009 | $30.8 \times 10^6$      | $2.5 \times 10^6$         |
| Contracted this infection during 2009   | $2.2 \times 10^6$       | $0.4 \times 10^6$         |
| Died from this infection during 2009    | $1.6 \times 10^6$       | $0.2 \times 10^6$         |

How many people in the world had this infection at the start of 2010?

- A  $35.9 \times 10^6$
- B  $34.1 \times 10^6$
- C  $33.3 \times 10^6$
- D  $31.5 \times 10^6$

**[END OF SECTION 1. NOW ATTEMPT THE QUESTIONS IN SECTION 2 OF YOUR QUESTION AND ANSWER BOOKLET.]**