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GRADE 12

**LIFE SCIENCES P1
VERSION 2 (OLD CONTENT) FOR PART-TIME CANDIDATES
NOVEMBER 2011**

MARKS: 150

TIME: 2½ hours

This question paper consists of 14 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in the ANSWER BOOK.
3. Start the answer to EACH question at the top of a NEW page.
4. Number the answers correctly according to the numbers used in this question paper.
5. Present your answers according to the instructions of each question.
6. ALL drawings should be done in pencil and labelled in blue or black ink.
7. Only draw diagrams or flow charts when asked to do so.
8. The diagrams in this question paper are NOT all drawn to scale.
9. Do NOT use graph paper.
10. You may use a non-programmable calculator, protractor and compass.
11. Write neatly and legibly.

SECTION A**QUESTION 1**

1.1 Various possible options are provided as answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.5) in the ANSWER BOOK, for example 1.1.6 D.

1.1.1 The particular position of a gene on a chromosome is called ...

- A a locus.
- B an allele.
- C genetics.
- D homologous.

1.1.2 Which of the following statements are characteristic of DNA?

- (i) Double-stranded helix
 - (ii) Sugar molecule is ribose
 - (iii) Found in the nucleus
 - (iv) Constant amount normally found in all the somatic cells of a particular species
- A (i), (ii) and (iii) only
 - B (i), (ii) and (iv) only
 - C (i), (iii) and (iv) only
 - D (i), (ii), (iii) and (iv)

1.1.3 Menstruation starts when the production of ...

- A progesterone is at its maximum.
- B oestrogen is at its maximum.
- C oestrogen and progesterone decreases.
- D luteinising hormone is at its maximum.

1.1.4 The difference between nucleic acids and nucleotides is that ...

- A nucleic acids are building blocks of nucleotides.
- B nucleotides are building blocks of nucleic acids.
- C nucleotides are larger than nucleic acids.
- D nucleic acids are found in the nucleus and nucleotides are found in the cytoplasm.

1.1.5 Which ONE of the following statements about identical twins is CORRECT?

- A They have different sets of genes.
- B They are formed from a single fertilised ovum that splits into two cells.
- C They may be of different sexes.
- D They are formed from two separate ova.

(5 x 2) (10)

1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (1.2.1 to 1.2.7) in the ANSWER BOOK.

1.2.1 The genetic crossing of two organisms in which two pairs of contrasting characteristics are studied

1.2.2 The structure containing enzymes at the tip of a sperm cell that makes contact with the egg cell during fertilisation

1.2.3 A genetic disorder in which the person lacks the ability to produce the pigment melanin

1.2.4 The period from fertilisation to birth

1.2.5 The process of finding a desirable gene, isolating it and then moving it into the cells of another organism

1.2.6 The process by which the DNA molecule makes a copy of itself

1.2.7 An arrangement of black bars representing DNA fragments that can be used to determine whether people are related

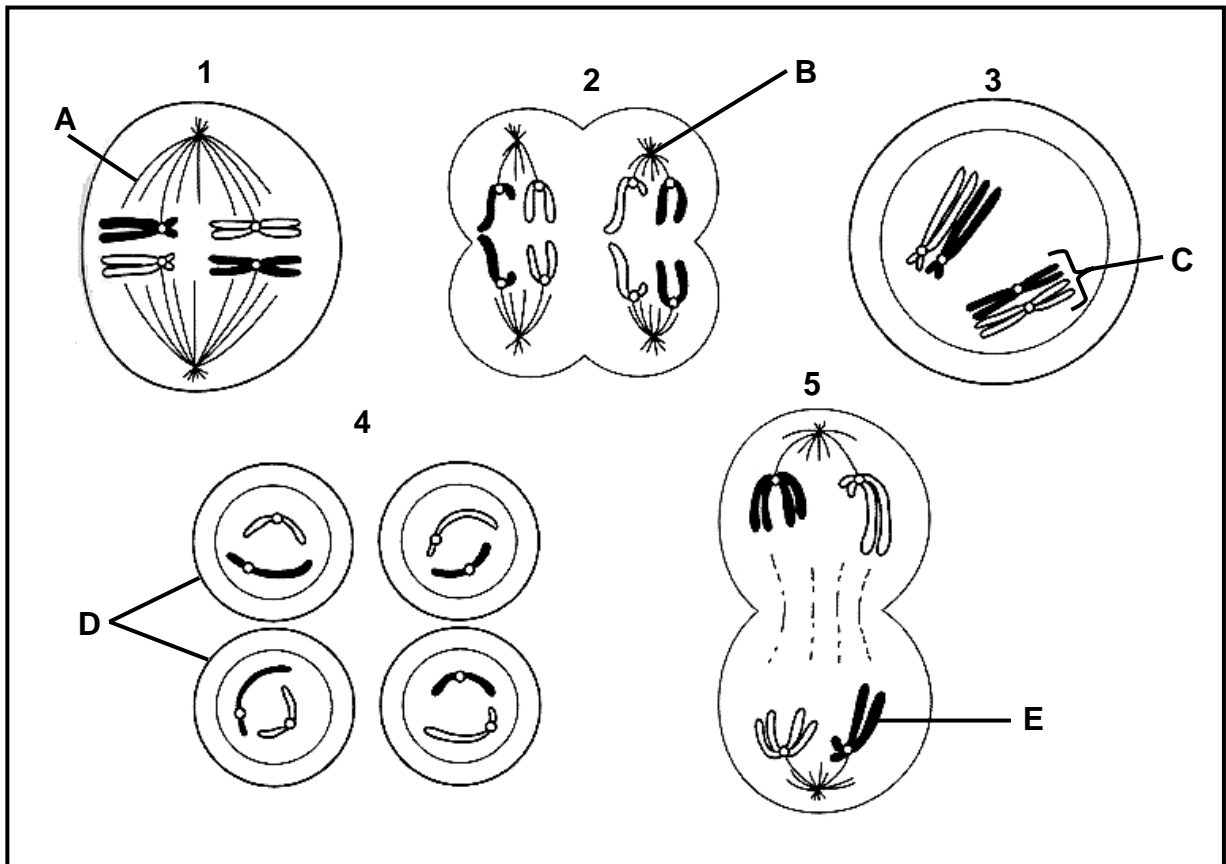
(7)

1.3 Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B**, or **none** next to the relevant question number (1.3.1 to 1.3.6).

	COLUMN I	COLUMN II
1.3.1	Changes in the structure of DNA that might be harmful or beneficial	A Gestation B Mutation
1.3.2	Method of contraception	A The pill B The rhythm method
1.3.3	Red flowering plants crossed with white flowering plants produce pink flowering plants	A Co-dominance B Incomplete dominance
1.3.4	Receives pollen grains	A Stigma B Style
1.3.5	The duct/tube carrying sperm from the testes to the urethra in males	A Epididymis B Ureter
1.3.6	Stimulates the formation of the Graafian follicle	A Progesterone B Oestrogen

(6 x 2) (12)

1.4 The diagrams below show cells dividing during meiosis.



- 1.4.1 Give the names of the parts labelled **A** to **E** respectively. (5)
- 1.4.2 Identify the phase represented in:
- (a) Diagram 1 (1)
- (b) Diagram 2 (1)
- 1.4.3 Write down the numbers of the diagrams in the correct sequence in which the phases occur. (3)
- 1.4.4 Explain TWO ways in which meiosis is important. (4)
- (14)**

- 1.5 The table below shows the autosomes and sex chromosomes of human egg and sperm cells.

EGG (23)	SPERM (23)	ZYGOTE (46)	SEX OF CHILD
22 + X	22 + X	(a)	(c)
22 + X	22 + Y	(b)	(d)

- 1.5.1 Write down the letters **(a)** and **(b)** and next to each the autosomes and sex chromosomes that complete the table above. (2)
- 1.5.2 Write down the letters **(c)** and **(d)** and next to each the sex of the child that completes the table above. (2)
- 1.5.3 A woman has three children, all of whom are boys. What is the probability of her fourth child being a girl? Explain your answer. (3)
(7)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

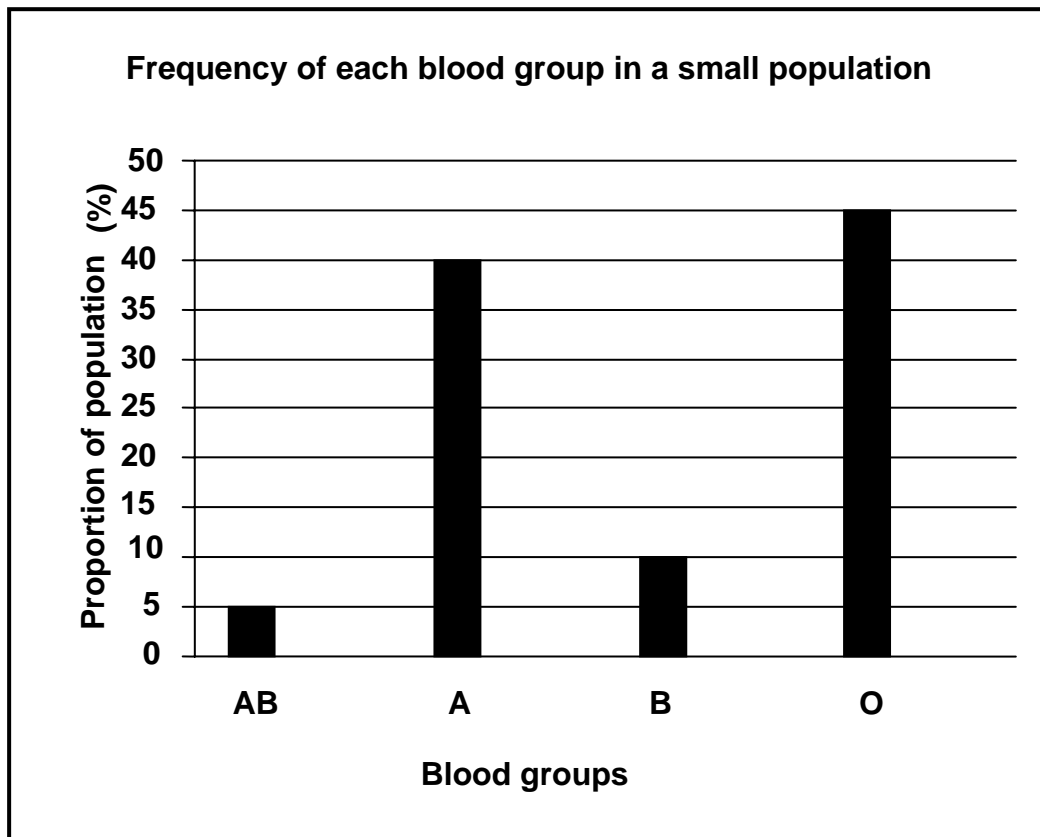
- 2.1 The relative amounts of DNA were measured in the cells of a plant during mitosis and meiosis. The results are given in the table below.

PHASE OF NUCLEAR CYCLE		DNA CONTENT PER CELL (ARBITRARY UNITS)
Mitosis	Early interphase	4
	Prophase	8
Meiosis I	Early prophase	8
	Late telophase	4
Meiosis II	Late prophase	4
	Telophase	2

Account for the differences in DNA content between:

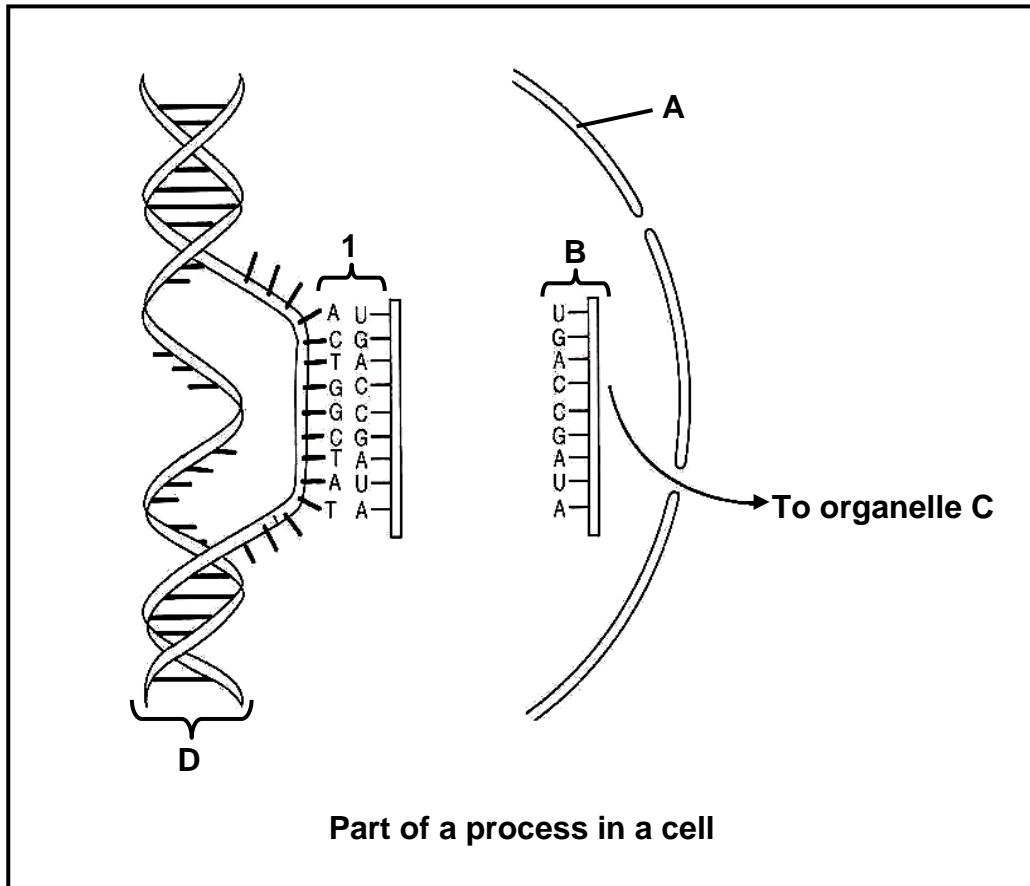
- 2.1.1 Early interphase and prophase of mitosis (2)
- 2.1.2 Early prophase of meiosis I and late prophase of meiosis II (2)
(4)

- 2.2 The graph below shows the results of an investigation into the frequency of blood groups in a small human population.



- 2.2.1 Which blood group has the lowest frequency in the population investigated? (1)
- 2.2.2 How many times more often would you find people with blood group **A** compared to blood group **B** in this portion of a human population? (1)
- 2.2.3 Which allele is the least frequent in this population? (1)
- 2.2.4 Explain your answer to QUESTION 2.2.3. (2)
- 2.2.5 Explain why most people in this population have blood group O. (3)
- (8)**

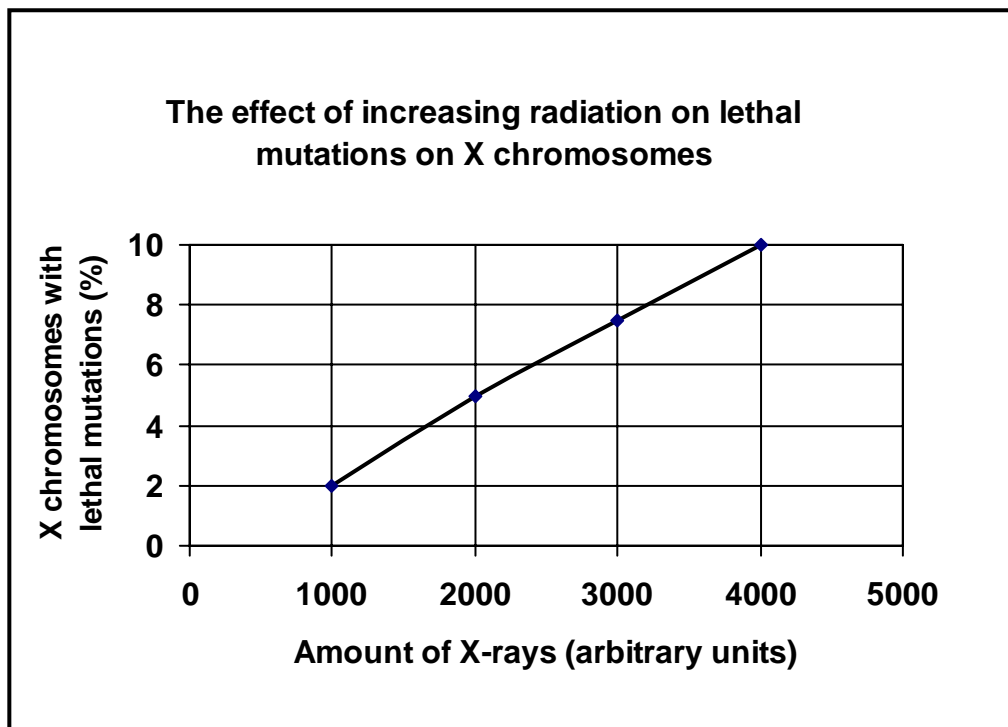
2.3 Study the diagram below and answer the questions which follow.



- 2.3.1 Label structures **A**, **B** and **D** respectively. (3)
 - 2.3.2 State ONE function of molecule **D**. (1)
 - 2.3.3 Which process is taking place at **1**? (1)
 - 2.3.4 Identify organelle **C**. (1)
- (6)**

- 2.4 An investigation to determine the effect of increasing radiation on lethal (deadly) mutations on X chromosomes in fruit flies was undertaken by scientists.

The results are shown in the graph below.



- 2.4.1 Formulate a possible hypothesis for this investigation. (3)
- 2.4.2 Name ONE factor that was varied by the scientists in this investigation. (1)
- 2.4.3 How many different values of the factor named in QUESTION 2.4.2 above were used? (1)
- 2.4.4 Name THREE factors that would have to be kept constant during this investigation. (3)
- 2.4.5 What conclusion can be drawn from the results presented in the graph? (2)
- 2.4.6 If you were carrying out this investigation, describe ONE way in which you would ensure that the results obtained are reliable. (2)
- (12)**
[30]

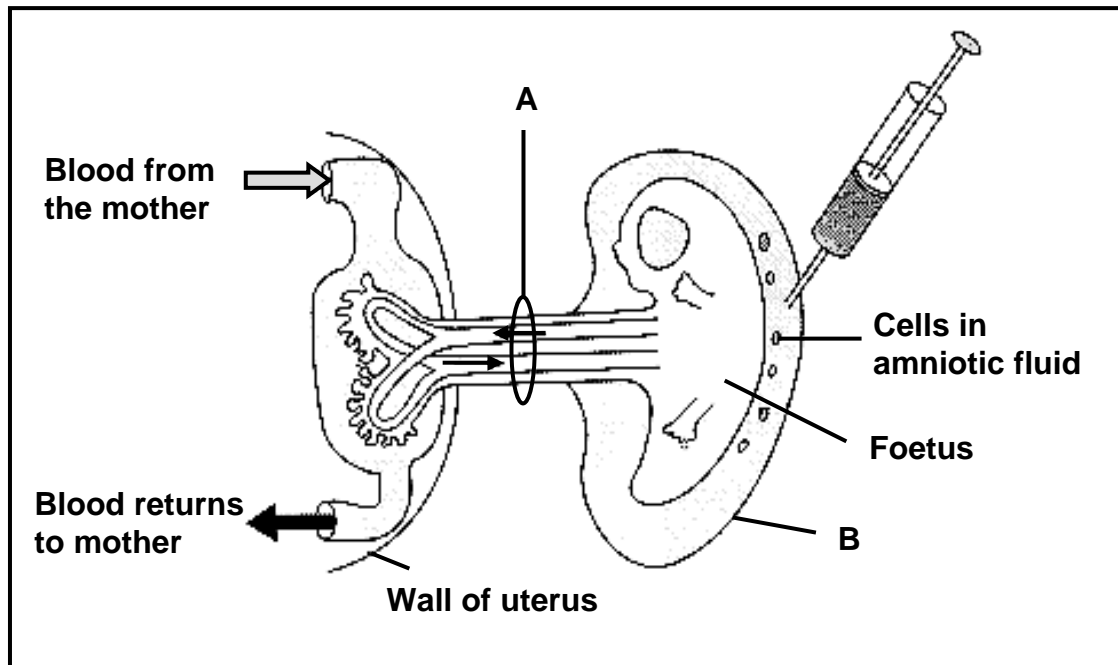
QUESTION 3

- 3.1 In rabbits the dominant allele (B) produces black fur and the recessive allele (b) produces white fur. Study the table below showing the genotypes of four rabbits.

RABBIT	1	2	3	4
GENOTYPE	BB	Bb	Bb	bb

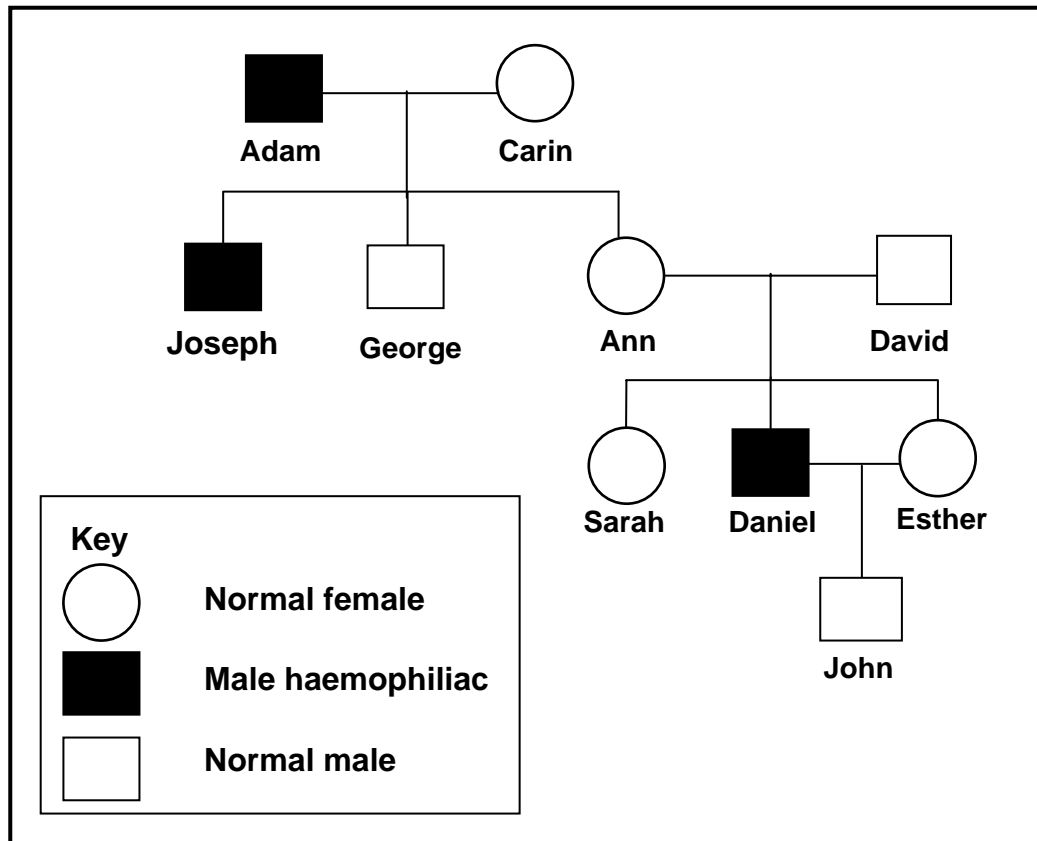
- 3.1.1 What are the phenotypes for rabbits **2** and **4**, respectively? (2)
- 3.1.2 State the genotypic ratio that is shown in the table above. (1)
- 3.1.3 If rabbits **1** and **4** mated and had 18 offspring, how many of these would you expect to be black? (1)
- 3.1.4 Rabbit **2** was allowed to mate with rabbit **4**.
- Represent a genetic cross to show the possible phenotypes and the genotypes of the F₁ generation for fur colour. (6)
- (10)**

- 3.2 During pregnancy, the developing foetus is attached to the mother's body through the placenta. Study the diagram below which shows the structure of the placenta and its attachment to the foetus.



- 3.2.1 Label structures **A** and **B** respectively. (2)
- 3.2.2 Name: (2)
- (a) TWO useful substances that pass from the mother to the foetus (2)
- (b) TWO harmful substances that may pass from the mother to the foetus. (2)
- 3.2.3 State ONE function of the amniotic fluid. (1)
- 3.2.4 Name the technique used to draw a sample of the amniotic fluid as shown in the diagram above. (1)
- 3.2.5 Give THREE reasons why some people might be in favour of the process named in QUESTION 3.2.4. (3)
- 3.2.6 Which condition would a baby have if it had 3 copies of chromosome number 21? (1)
- (12)**

3.3 Study the pedigree diagram of a family where some individuals have haemophilia. Haemophilia is a sex-linked disorder. Use X^H for normal blood clotting and X^h for the haemophiliac trait.



- 3.3.1 From the pedigree diagram above, state the relationship between gender and the incidence of haemophilia. (2)
- 3.3.2 Write down ALL the possible genotypes of:
- (a) Adam
 - (b) Ann
 - (c) John

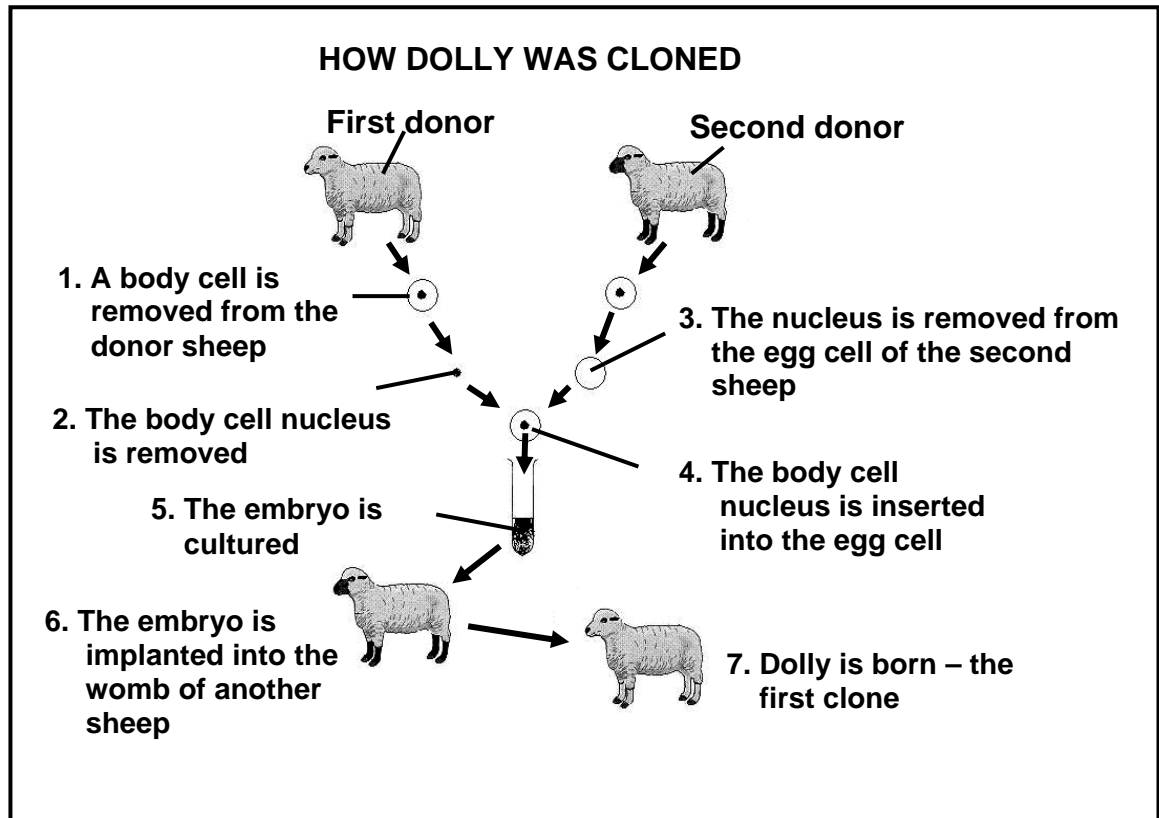
(6)
(8)
[30]

TOTAL SECTION B: 60

SECTION C

QUESTION 4

4.1 Study the diagram below that shows the cloning of a sheep named Dolly.



- 4.1.1 Why was it necessary to remove the nucleus from the egg cell of the second donor before the sheep could be cloned? (2)
- 4.1.2 Will Dolly have the characteristics of the first or second donor sheep? (1)
- 4.1.3 Explain your answer to QUESTION 4.1.2. (2)
- 4.1.4 Number 5 in the diagram states that 'the embryo is cultured'. Through which type of cell division does the embryo develop? (1)
- 4.1.5 Give:
- (a) THREE reasons why people could be in favour of genetic engineering in plants (3)
 - (b) THREE reasons why people could be against cloning in humans (3)
- (12)**

- 4.2 The following table shows the average human foetal length of males and females over a 40-week period of gestation.

TIME (WEEKS)	FOETAL LENGTH (cm)	
	MALE	FEMALE
8	1	1
13	7	7
16	14	13
24	33	31
36	46	43
40	51	49

- 4.2.1 Draw TWO sets of bar graphs on the same system of axes to compare male and female foetal length over time. (11)

- 4.2.2 State TWO conclusions from the results shown in the graphs. (2)
(13)

- 4.3 Gonorrhoea and HIV/Aids are common sexually transmitted diseases (STDs) which infect a relatively high percentage of young sexually-active people worldwide.

Write a mini-essay in which you state the causes, THREE symptoms and the possible treatment and prevention for each of these STDs.

Content: (12)
Synthesis: (3)
Total: **(15)**

NOTE: NO marks will be awarded for answers in the form of flow charts or diagrams.

TOTAL SECTION C: 40
GRAND TOTAL: 150