



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

VERSION 2 (OLD CONTENT) FOR PART-TIME CANDIDATES

FEBRUARY/MARCH 2012

MARKS: 150

TIME: 2½ hours

This question paper consists of 15 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 necessarily 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 options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A–D) next to the question number (1.1.1–1.1.5) in the ANSWER BOOK, for example 1.1.6 D.

1.1.1 During which ONE of the following stages does replication of DNA occur?

- A Interphase
- B Prophase
- C Telophase I
- D Telophase 2

1.1.2 When the first child of two parents without any visible genetic disorder was born, it was found to have a serious genetic disorder. The parents were told that a recessive gene caused the disorder. The chances of having another child with the same disorder is ...

- A 100%.
- B 50%.
- C 25%.
- D 0%.

1.1.3 A nitrogenous base found only in RNA is ...

- A adenine.
- B uracil.
- C guanine.
- D thymine.

1.1.4 If an analysis of DNA from cells in a human body showed that thymine made up 15% of the nucleotide bases, then the percentage composition of guanine making up the DNA would be ...

- A 15%.
- B 70%.
- C 35%.
- D 85%.

1.1.5 Two complementary bases in a DNA strand are held together by ... bonds.

- A strong nitrogen
- B weak nitrogen
- C strong hydrogen
- D weak hydrogen

(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 (1.2.1–1.2.8) in the ANSWER BOOK.

- 1.2.1 The shape of a DNA molecule before DNA replication
- 1.2.2 Unspecialised cells which are capable of giving rise to any other cells of the same organism
- 1.2.3 The disease caused by uncontrolled division of cells
- 1.2.4 The complete set of an organism's genes
- 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 An arrangement of DNA fragments that can be used to determine whether people are related
- 1.2.7 Type of cell division during which the chromosome number does not change
- 1.2.8 The building blocks which form DNA and RNA

(8)

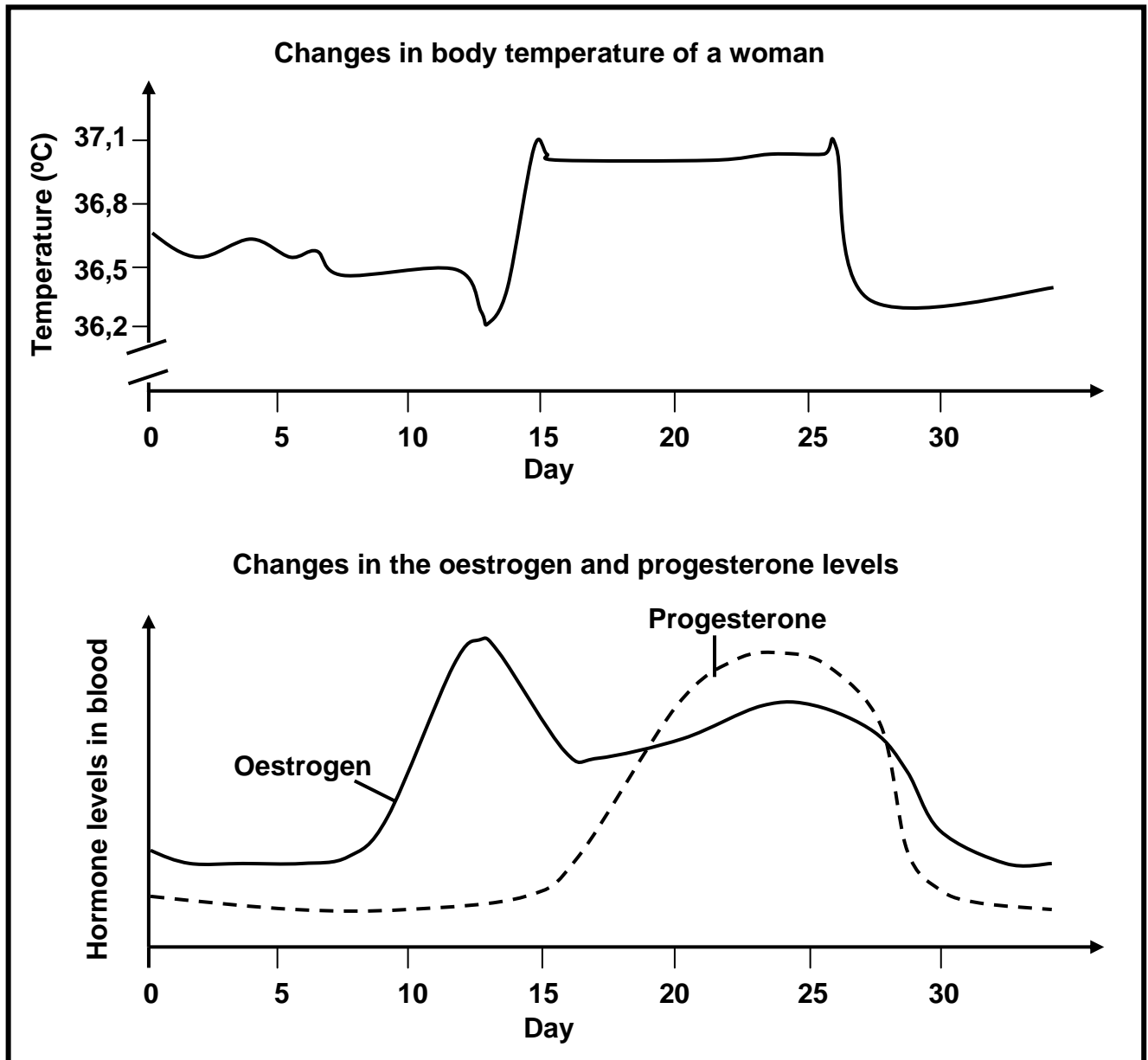
1.3 Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A and B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B**, or **none** next to the question number (1.3.1–1.3.6) in the ANSWER BOOK.

	COLUMN I	COLUMN II
1.3.1	Have a single set of chromosomes	A: Haploid B: Diploid
1.3.2	The number, shape and arrangement of all chromosomes in the nucleus of a somatic cell	A: Karyotype B: Phenotype
1.3.3	An individual that has one dominant allele and one recessive allele for a particular characteristic	A: Homozygous B: Heterozygous
1.3.4	Sudden changes in the genetic make up of an organism	A: Contraception B: Mutation
1.3.5	Carry genetic material	A: Genes B: Chromosomes
1.3.6	The genotype of blood group AB	A: I ^A i B: I ^B i

(6 x 2)

(12)

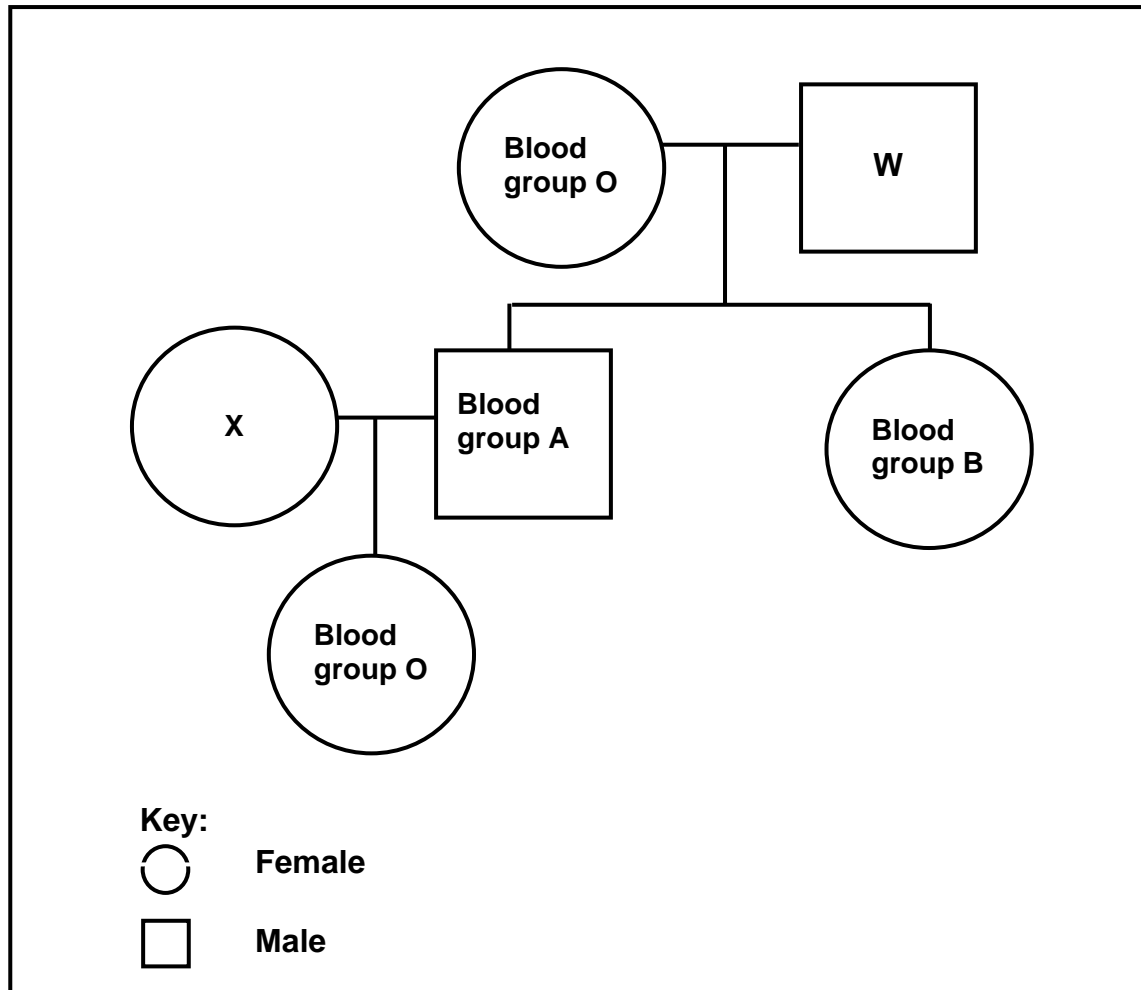
1.4 The two graphs below show the changes in temperature in a woman's body and the levels of the hormones oestrogen and progesterone during the menstrual cycle. The release of the ovum takes place when there is a rise in body temperature.



- 1.4.1 What was the temperature of the woman on day 15? (2)
 - 1.4.2 By how many degrees Celsius did her temperature vary between days 13 and 15? Show ALL working. (2)
 - 1.4.3 From the graph, state TWO factors that indicate that ovulation occurred. (2)
 - 1.4.4 Explain the importance of the higher level of progesterone from day 15 to day 20. (2)
- (8)**

1.5 It is possible to trace the inheritance of characteristics such as blood groups and genetic disorders over a number of generations.

1.5.1 The pedigree diagram below shows the blood groups of individuals of a family. The blood groups are indicated inside the circle or the square. The blood groups of individuals **W** and **X** are not indicated.



Write down ALL the possible genotypes of individuals:

(a) **W**

(b) **X**

(8)

1.5.2 Haemophilia is a blood-clotting disorder. Explain why mainly males suffer from this disorder.

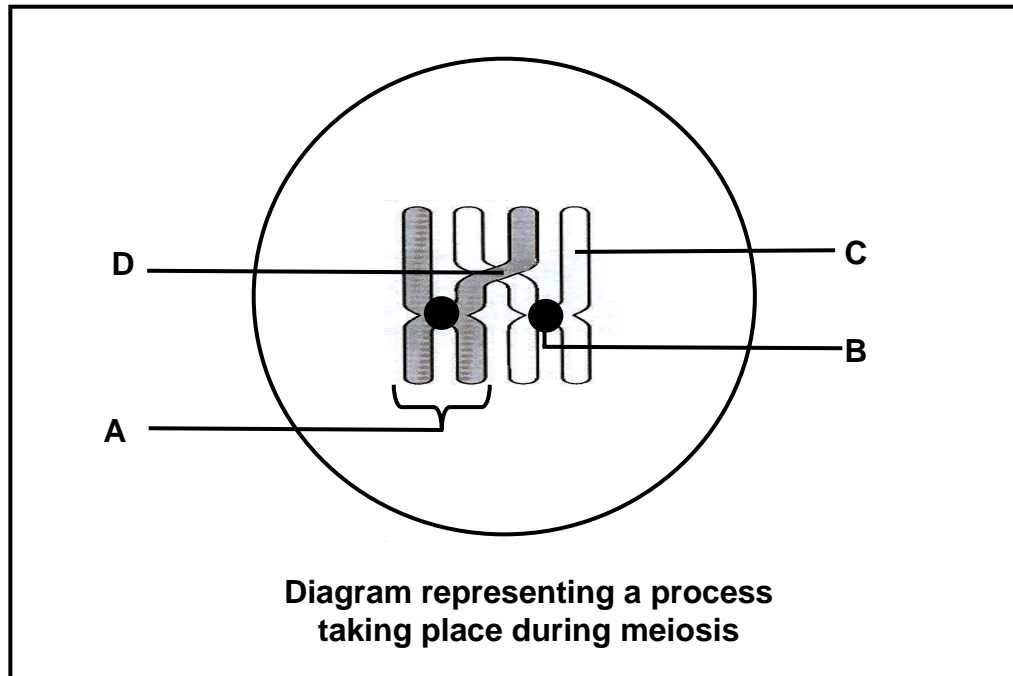
(4)

(12)

TOTAL SECTION A: 50

SECTION B**QUESTION 2**

2.1 The diagram below represents a process taking place during meiosis.



- 2.1.1 Label parts **A**, **B**, **C** and **D** respectively. (4)
- 2.1.2 Name the process in meiosis that is illustrated in the diagram above. (1)
- 2.1.3 State ONE importance of the process named in QUESTION 2.1.2. (2)
- 2.1.4 During which phase of meiosis does the process named in QUESTION 2.1.2 occur? (1)
- (8)**

2.2 The following questions are based on protein synthesis.

2.2.1 Define each of the following:

- (a) Transcription (2)
- (b) Translation (2)

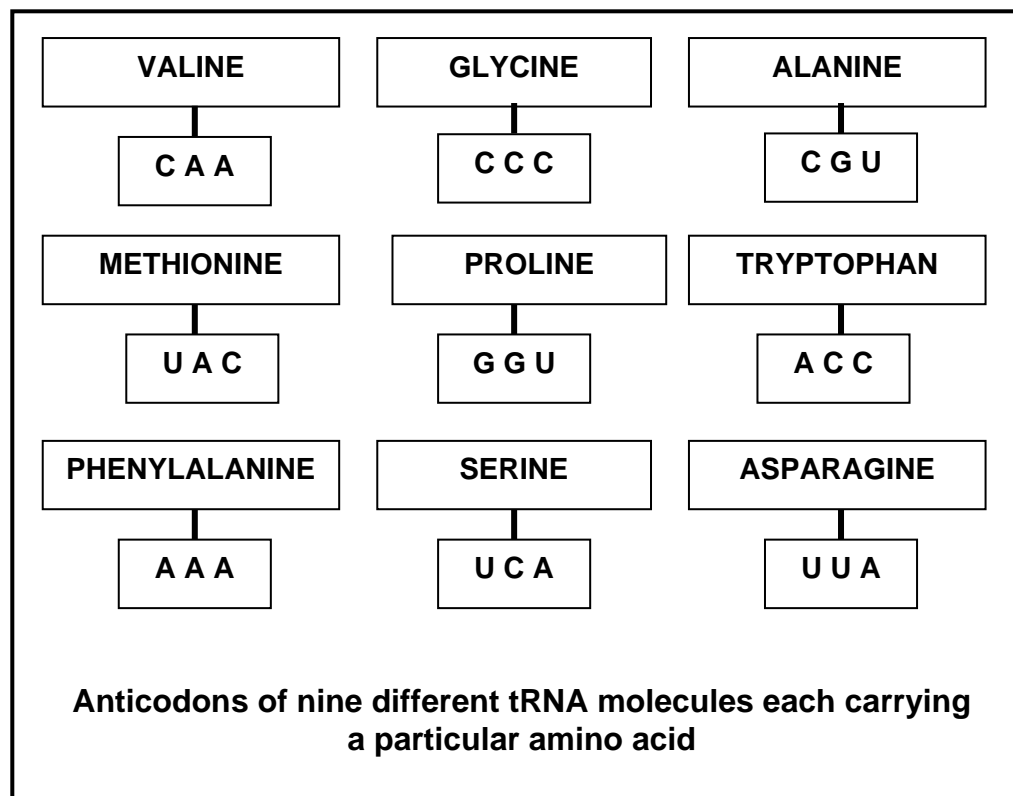
- 2.2.2 The diagram below shows the sequence of nitrogenous bases of a strand of DNA which codes for part of a protein molecule.

AAT — GCA — AGT

Write down the mRNA codon sequence that reads from left to right from the DNA sequence above.

(3)

- 2.2.3 The diagram below shows the anticodons of nine different tRNA (transfer RNA) molecules each carrying a particular amino acid.

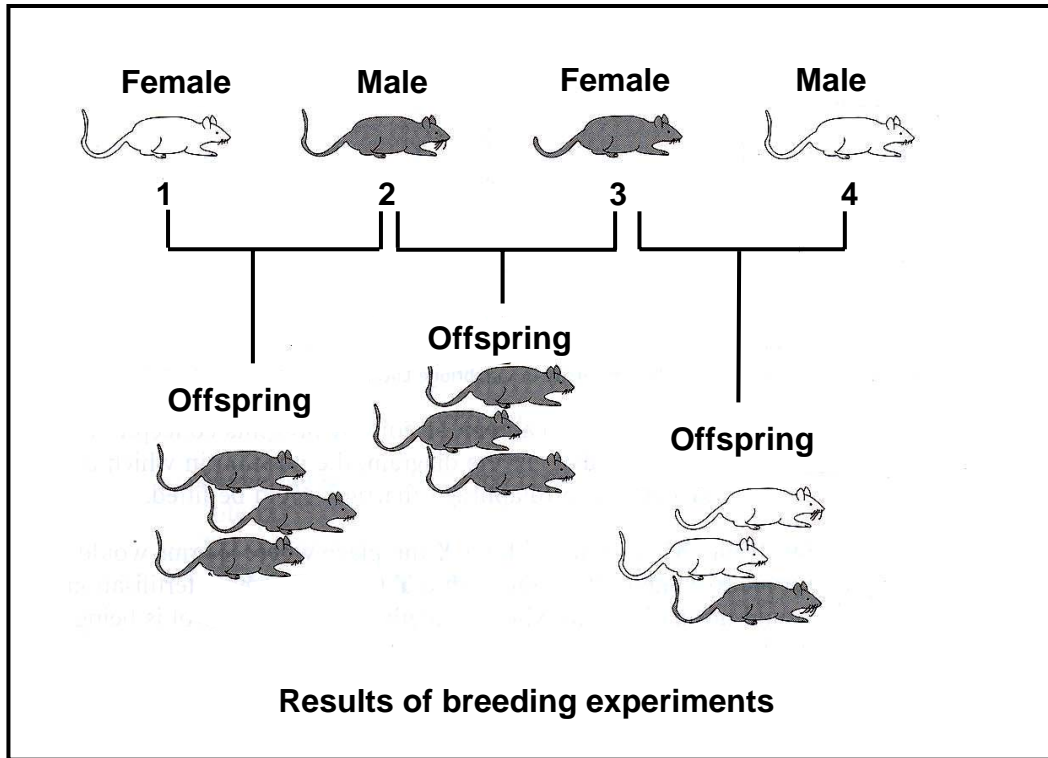


From the diagram above select and write down the amino acids (in the correct sequence) that would be required for the base sequence of mRNA shown below when read from left to right.

AUG — UGG — GUU

(3)
(10)

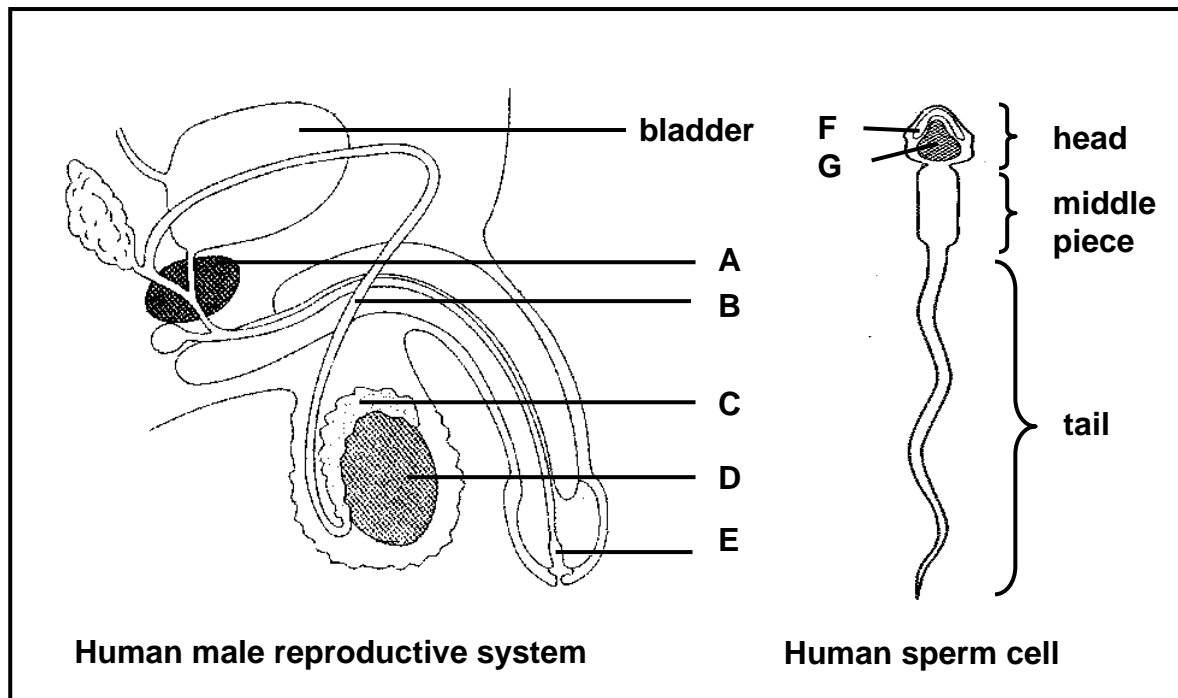
2.3 Study the diagrams below that show breeding experiments on mice. A single pair of alleles showing complete dominance controls coat colour (white or grey) in these mice.



- 2.3.1 Which sex chromosomes would be present in the gametes of mouse **2** and mouse **3** respectively? (2)
- 2.3.2 If mice **3** and **4** had a second set of offspring, what is the percentage chance that the first mouse born would be female? (1)
- 2.3.3 Which of the parent mice (**1**, **2**, **3** or **4**) is likely to be homozygous dominant for coat colour? (1)
- 2.3.4 State why mouse **3** can only be heterozygous for coat colour. (2)
(6)
- 2.4 Explain:
- 2.4.1 The principle of codominance (3)
- 2.4.2 Mendel's law of segregation (3)
(6)
[30]

QUESTION 3

3.1 Study the diagrams below and answer the questions that follow.



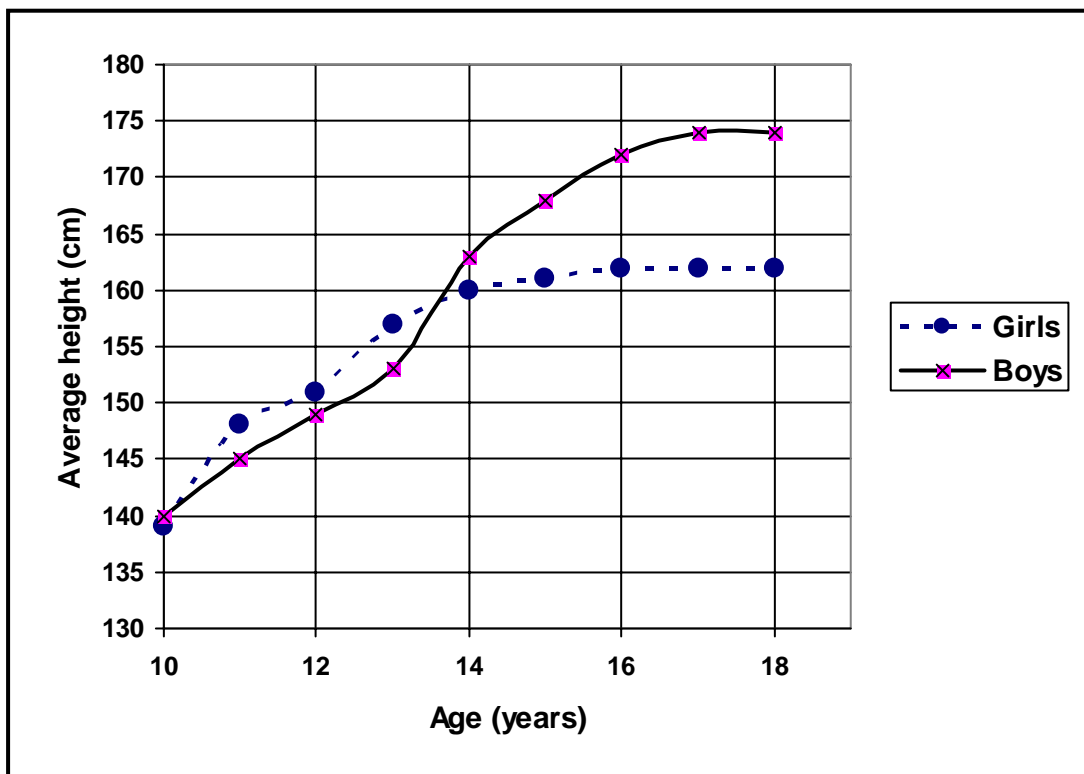
- 3.1.1 Label **A**, **B**, **E** and **G** respectively. (4)
- 3.1.2 State ONE function each of **C** and **F** respectively. (2)
- 3.1.3 Write down the LETTER and NAME of the part where sperms are produced. (2)
- 3.1.4 Explain why it is necessary for part **D** to 'hang outside' the body of the male. (2)
- 3.1.5 Name the following:
- (a) The cells in the testes that secrete a male sex hormone (1)
 - (b) The hormone that stimulates the development of secondary sexual characteristics in males (1)
- 3.1.6 During a vasectomy, part **B** is surgically cut.
- (a) Will it be possible for a man who is HIV positive to pass the HI virus to another person after he undergoes a vasectomy? (1)
 - (b) Explain your answer to QUESTION 3.1.6(a). (2)
- (15)**

3.2 A group of Grade 12 learners were asked to test the following hypothesis with regard to phenotypes:

Between 10 and 18 years, boys are taller than girls.

3.2.1 State any THREE steps in the planning process that must be considered in this investigation. (3)

3.2.2 The results of the learners' investigation are shown in the graph below.



- (a) At what age is the average height of the boys and the girls the same? (1)
- (b) Provide a caption for the graph above. (2)
- (c) Should the Grade 12 learners accept the hypothesis as a possible explanation of the results? (1)
- (d) Give a reason for your answer to QUESTION 3.2.2(c). (2)
- (9)**

- 3.3 Study the table below which shows the relationship between the age of a mother and the risk of having a Down syndrome baby.

Age of mother (years)	Risk of Down syndrome baby (per 10 000 births)
25	8
35	25
45	200

- 3.3.1 State the relationship between the mother's age and the chance of having a baby with Down syndrome. (2)
- 3.3.2 Explain why a person with Down syndrome has an abnormal number of chromosomes. (4)
(6)
[30]

TOTAL SECTION B: 60

SECTION C**QUESTION 4**

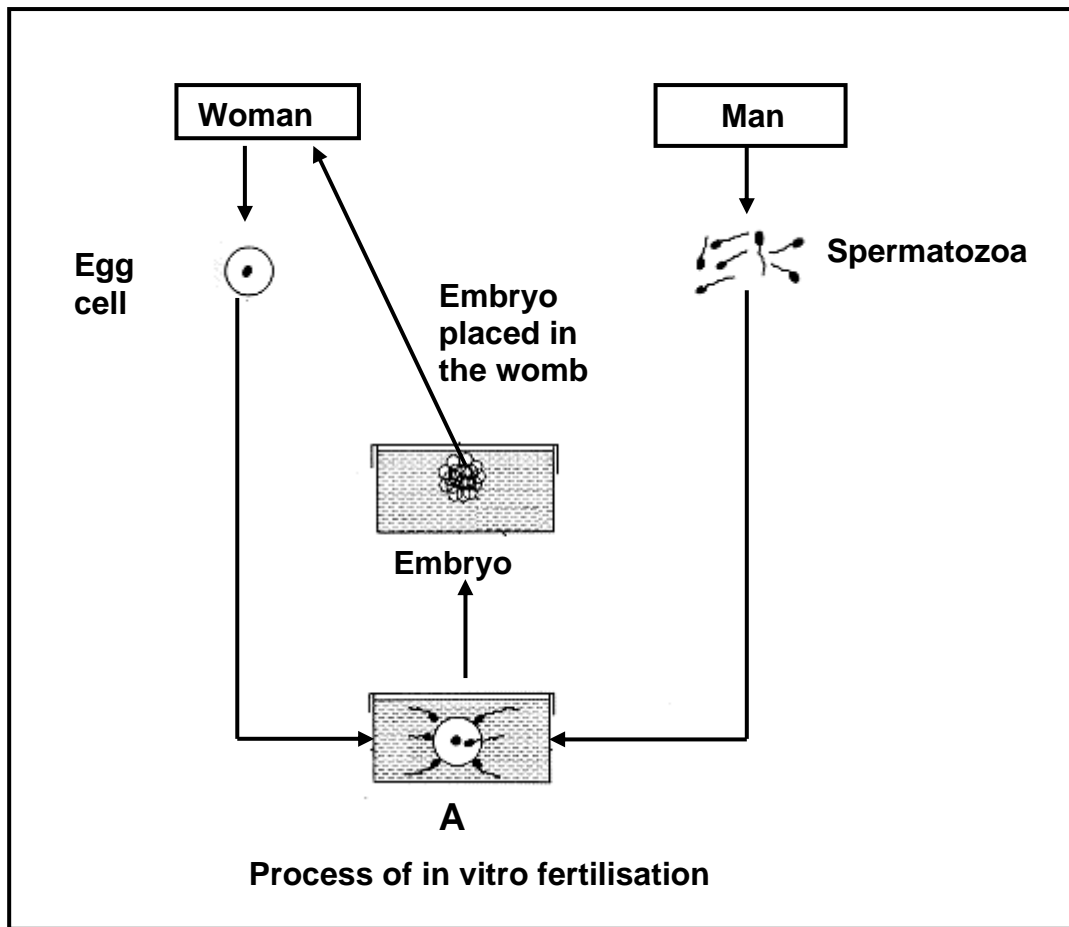
4.1 Some sexually transmitted diseases (STDs) are increasing worldwide.

The table below indicates the number of people infected with two common bacterial STDs.

Year	Number infected with syphilis (per 100 000 people)	Number infected with gonorrhoea (per 100 000 people)
1986	50	150
1990	150	280
1994	200	150
1998	220	100

- 4.1.1 Draw TWO line graphs on the same system of axes to compare the number of people infected with syphilis and gonorrhoea from 1986 to 1998. (11)
- 4.1.2 Describe the trends shown in the graph for EACH of the two diseases. (3)
- 4.1.3 The following proposal was made to control the spread of HIV:
All sexually active people should be compelled by law to get an HIV test and to make the results available to anybody who needs this information.
- (a) State TWO advantages of this proposal. (2)
- (b) State TWO disadvantages of this proposal. (2)
- (18)**

4.2 The diagram below illustrates what happens during in vitro fertilisation (IVF).



- 4.2.1 What process takes place at **A**? (1)
- 4.2.2 Give TWO reasons why a couple may not be able to have children normally. (2)
- 4.2.3 In IVF more embryos are produced than can be implanted in the woman's uterus.
Explain ONE advantage of producing many embryos. (2)
- 4.2.4 State ONE way in which IVF differs from cloning. (2)
- (7)**

- 4.3 Write a mini-essay in which you explain how any THREE contraceptive methods prevent human pregnancy. You should also explain ONE way in which contraception can influence the quality of human life.

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

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

TOTAL SECTION B: 40
GRAND TOTAL: 150