

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

**LIFE SCIENCES P1
PREPARATORY EXAMINATION 2008**

MARKS: 150

TIME: 2½ hours

This question paper consists of 20 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 numbering system 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. Draw diagrams or flow charts ONLY 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. Non-programmable calculators, protractors and compasses may be used.
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 – 1.1.6) in the ANSWER BOOK, for example 1.1.7 D.

1.1.1 Meiosis occurs in the ...

- A zygote of humans.
- B bone marrow of humans.
- C anthers of plants.
- D root tip of plants.

1.1.2 In analysing the number of different bases in a DNA sample, the following result would be consistent with the base-pairing rules:

- A $A = G$
- B $A + G = C + T$
- C $A + T = G + T$
- D $A = C$

1.1.3 Which component is NOT directly involved in translation?

- A mRNA
- B DNA
- C tRNA
- D ribosomes

1.1.4 Which scientist is known as the father of genetics?

- A Watson
- B Darwin
- C Mendel
- D Newton

1.1.5 Which of the following male and female structures are LEAST alike in function?

- A Seminiferous tubules – vagina
- B Spermatogonia – oogonia
- C Testes – ovaries
- D Vas deferens – Fallopian tube (oviduct)

- 1.1.6 Which of the following statements about identical twins is CORRECT?
- A They have different sets of genes.
 - B They are formed from a single fertilised egg that splits into two cells.
 - C They may be of different sexes.
 - D They may be formed from two separate ova. (6 x 2) (12)

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 – 1.2.7).

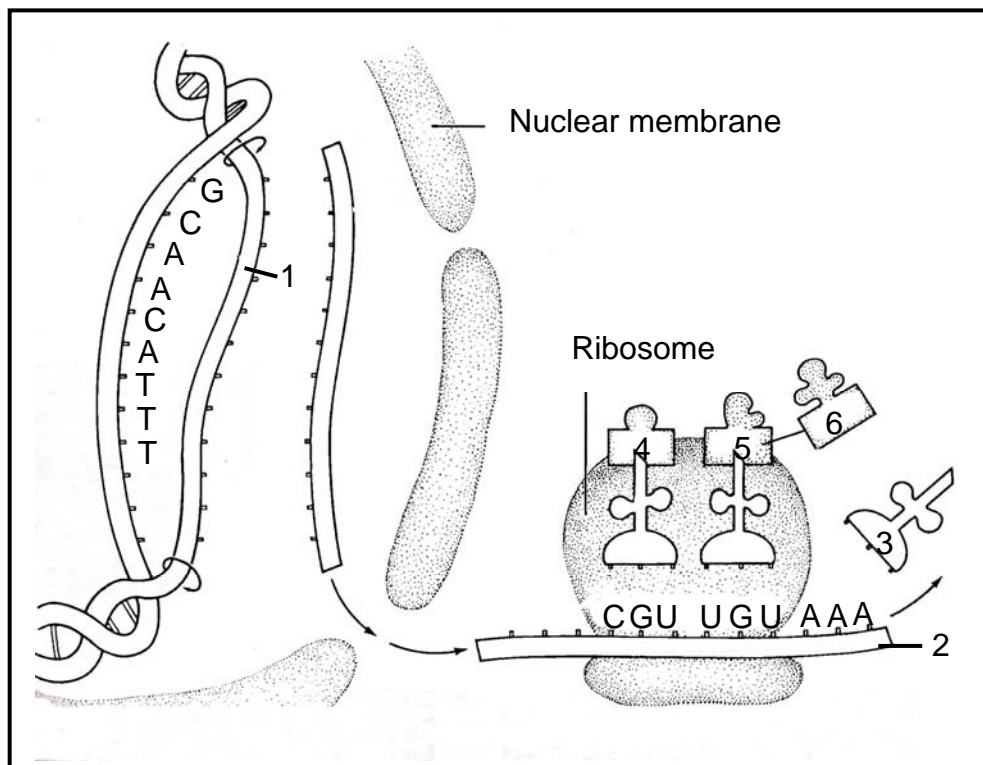
- 1.2.1 The process whereby DNA makes identical copies of itself
- 1.2.2 The outermost of four extra embryonic membranes which contributes to the formation of the placenta
- 1.2.3 The building block of nucleic acids
- 1.2.4 A threadlike, gene-carrying structure consisting of DNA and protein
- 1.2.5 A human genetic condition resulting from having an extra chromosome 21
- 1.2.6 The structure that the ovary of a flower develops into after fertilisation
- 1.2.7 Two fusions that occur in angiosperm to form a zygote and endosperm tissue (7 x 1) (7)

- 1.3 Choose an item from COLUMN II that matches a description in Column I. Write only the letter (A – I) next to the question number (1.3.1 - 1.3.5) in the ANSWER BOOK, for example 1.3.6 J.

COLUMN I		COLUMN II	
1.3.1	Changes into the corpus luteum	A	Fallopian tube
1.3.2	A nitrogenous base found in RNA only	B	Graafian follicle
1.3.3	Site of fertilisation in women	C	vasectomy
1.3.4	An individual that has identical alleles for a particular characteristic	D	uterus
1.3.5	Surgical procedure in men to prevent fertilisation of the ovum	E	heterozygous
		F	uracil
		G	ovary
		H	thymine
		I	homozygous (5 x 1)

(5)

1.4 Study the diagram illustrating protein synthesis below and answer the questions that follow.



- 1.4.1 Label the molecules indicated by 2 and 3. (2)
- 1.4.2 Using the letters of the genetic code, write down the complementary nitrogenous bases on strand 1 of the DNA double helix, starting from the top. (3)

- 1.4.3 Use the table below to determine which three amino acids in the diagram are represented by 4, 5 and 6.

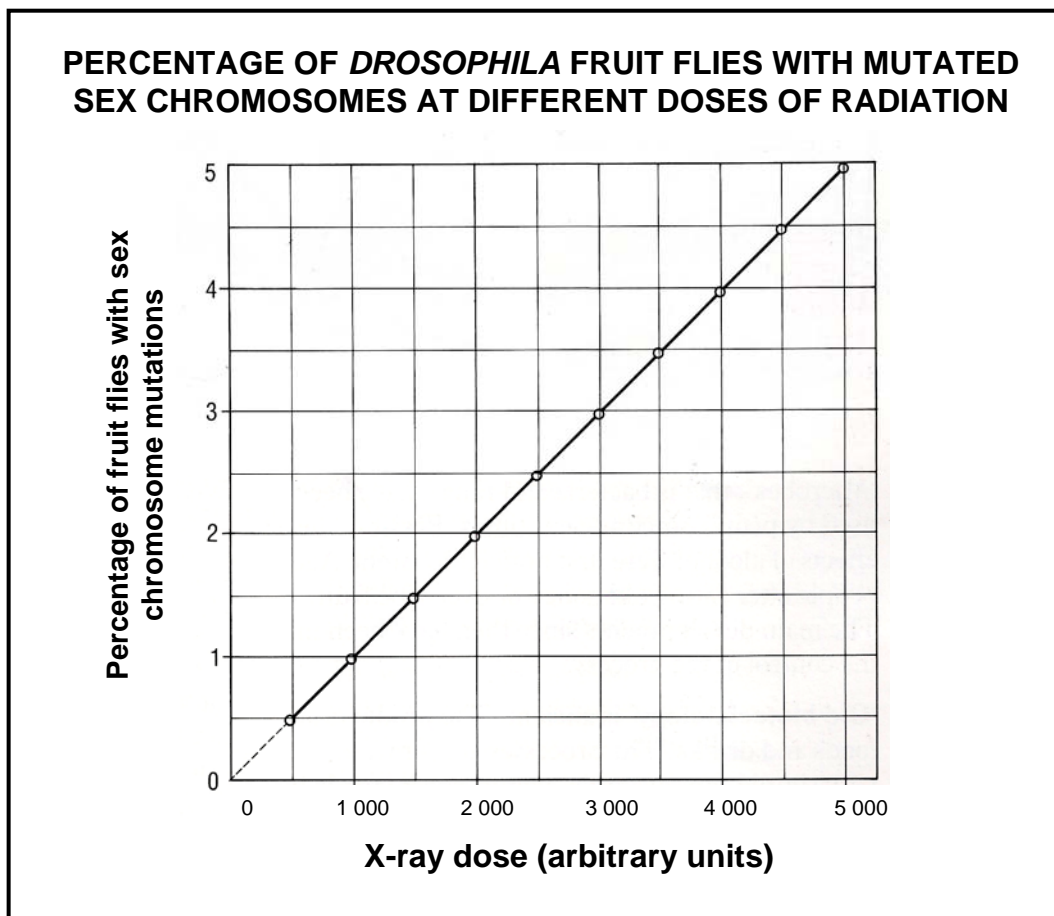
THE RELATIONSHIP BETWEEN tRNA AND AMINO ACIDS DURING PROTEIN SYNTHESIS	
tRNA anticodons	Amino acid
UGU	threoline
CGU	alanine
UUU	lysine
ACA	cysteine
GCA	arginine
GUU	glutamine
CUA	aspartate
CCA	glycine
AAA	phenylalanine

(3 x 2) (6)

- 1.5 Some mutations result from direct damage to DNA by radiation. We are exposed to background radiation such as radioactivity in the air (37%), cosmic rays from outer space (14%), radiation from ground and buildings (19%) and from food and drinks (17%) on a daily basis. Furthermore, some radiation are produced by humans, for example medical X-rays (12%), nuclear fallout (0,5%), luminous watches, et cetera (0,4%) and nuclear power station wastes (0,1%).

Scientists designed an experiment to investigate the relationship between the X-ray dose and the mutation rate of *Drosophila* fruit flies.

The graph below shows the results of the experiment.



- 1.5.1 Define the term *mutation*. (1)
- 1.5.2 What is the total daily radiation produced by humans? (2)
- 1.5.3 Draw a table to show the results of this experiment. (6)

- 1.5.4 Describe the relationship between the radiation dose and the number of mutations. (2)
- 1.5.5 In a control experiment, flies were not given X-rays. About 0,25% of these untreated flies showed mutation. Name TWO other causes that could have caused these mutations. (2)
- 1.5.6 Explain why the scientists wear protective clothing while using X-rays in their experiments. (2)

TOTAL SECTION A: 50

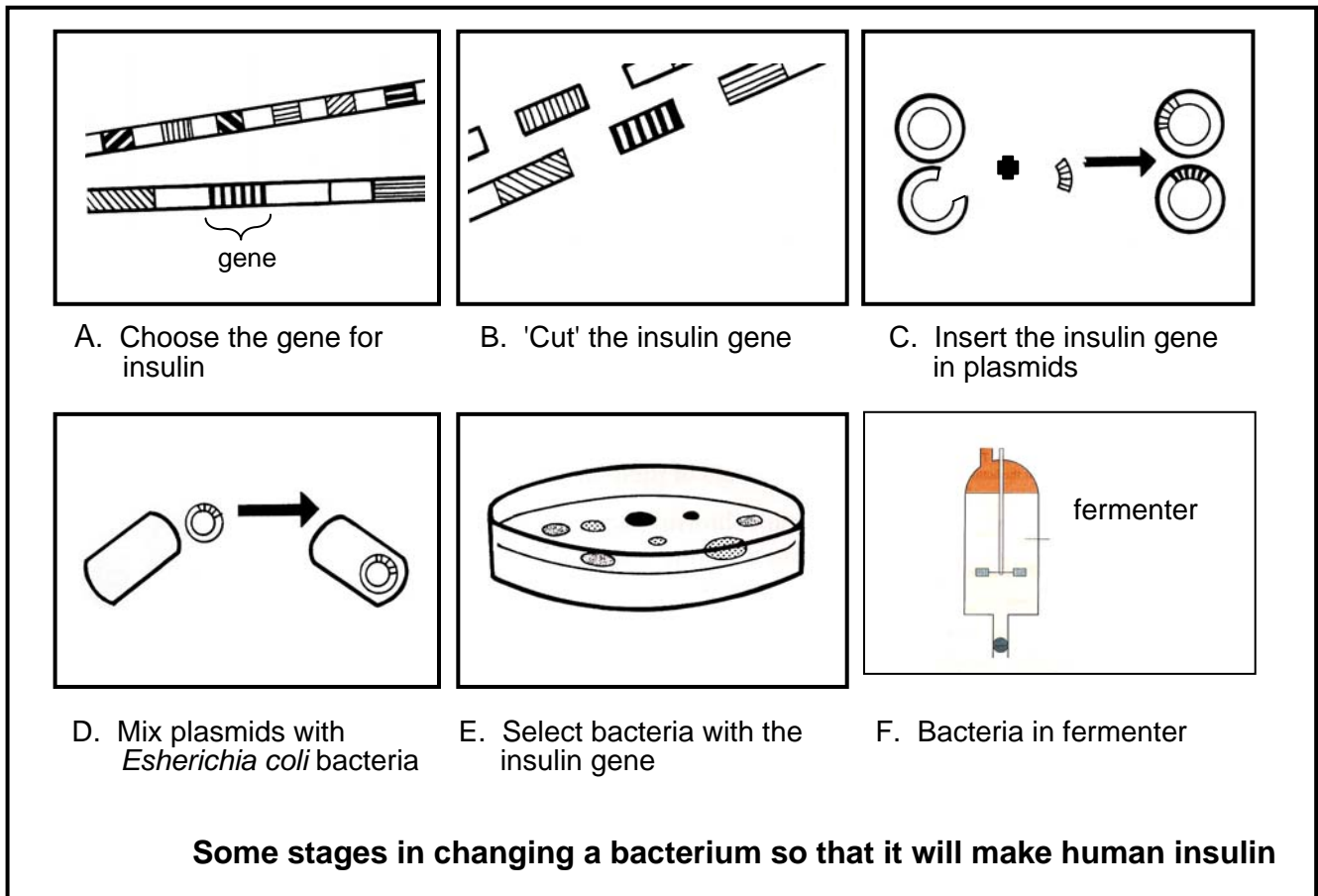
SECTION B

QUESTION 2

2.1 The diagrams below illustrate some stages in the manufacturing of insulin.

Study the diagrams and answer the questions that follow.

NOTE: The diagrams are NOT drawn to scale.



2.1.1 What is the function of each of the following in the manufacturing of insulin?

- (a) Enzymes (1)
- (b) Plasmids (1)
- (c) Fermenter (1)

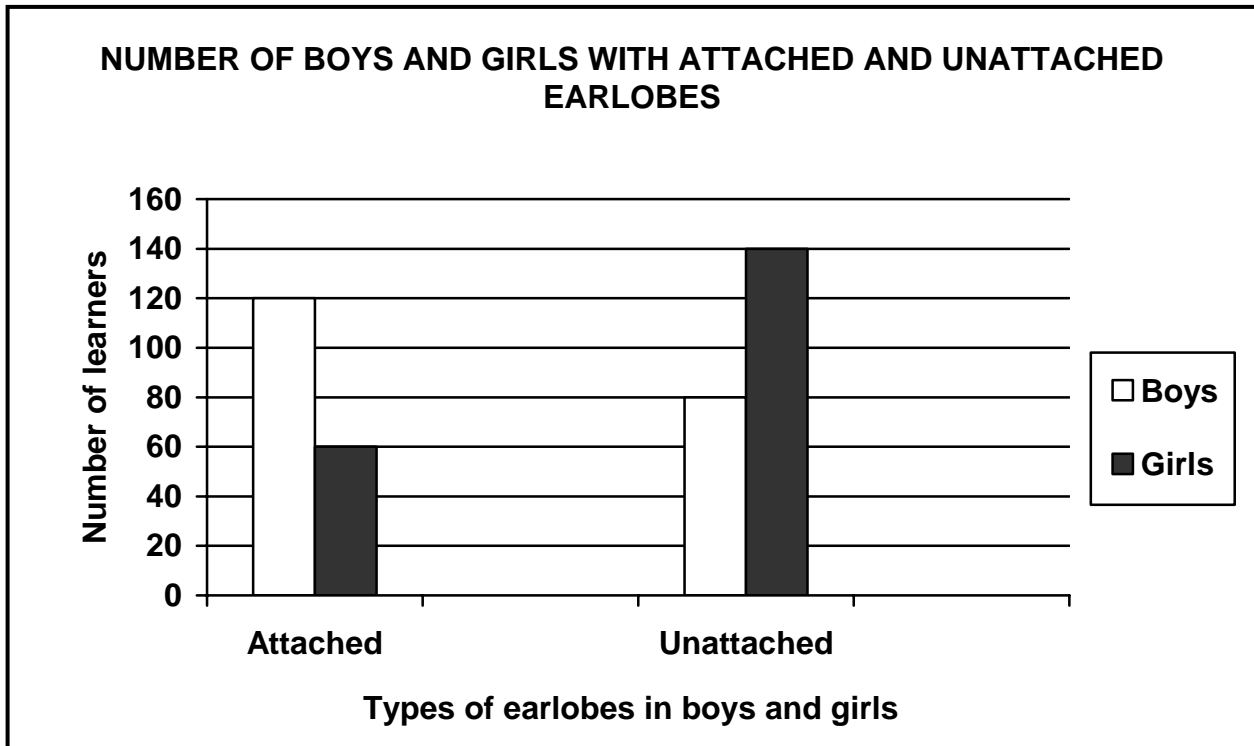
2.1.2 During which biological process is insulin (protein) manufactured by using the human gene? (1)

- 2.1.3 In the past, the pancreas of animals were used to extract insulin to treat diabetes.
- (a) Name ONE disadvantage of using animal pancreas to treat diabetes. (2)
- (b) Name ONE advantage of insulin produced by genetic engineering. (2)
- 2.2 A somatic cell of an animal has 4 chromosomes. Draw and label a cell of this animal during anaphase 2 of the second meiotic division. (7)
- 2.3 The gene for brown (B) eyes in humans is dominant to the gene for blue (b) eyes.
- Show how the possible phenotypes and the genotypes of the children may be obtained from parents with the following genotypes: Bb x bb. (7)

2.4 A group of Grade 12 learners in a school were asked to investigate the following hypothesis: More girls have unattached earlobes than boys. All the learners of the school were surveyed in this investigation.

2.4.1 State any TWO planning steps that must be considered in this investigation. (2)

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



2.4.2 How many girls were involved in this investigation? (1)

2.4.3 Should the Grade 12 learners accept or not accept/reject the hypothesis mentioned above? (1)

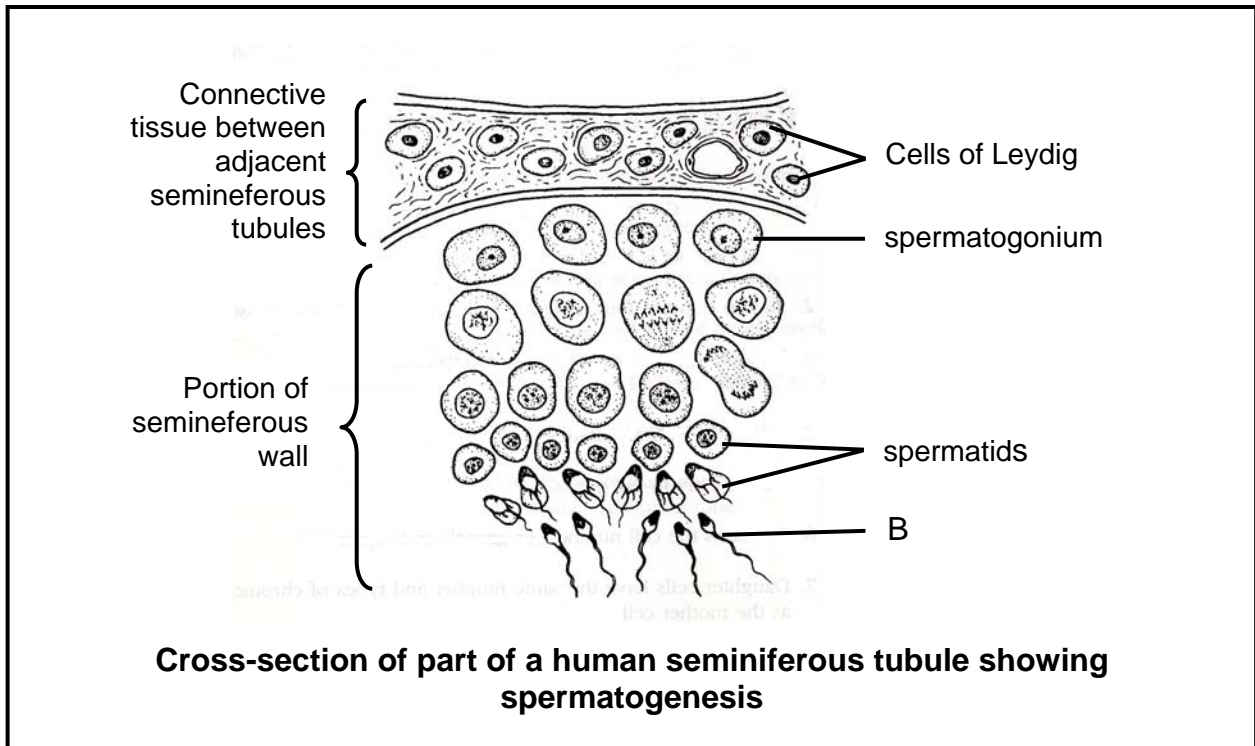
2.4.4 Give a reason for your answer in QUESTION 2.4.3. (2)

2.4.5 State ONE way in which the learners could have improved their investigation to make the results more valid and reliable. (2)

[30]

QUESTION 3

- 3.1 The diagram below represents a cross-sectional view of a human seminiferous tubule in which spermatogenesis is occurring. Study the diagram and answer the questions that follow.

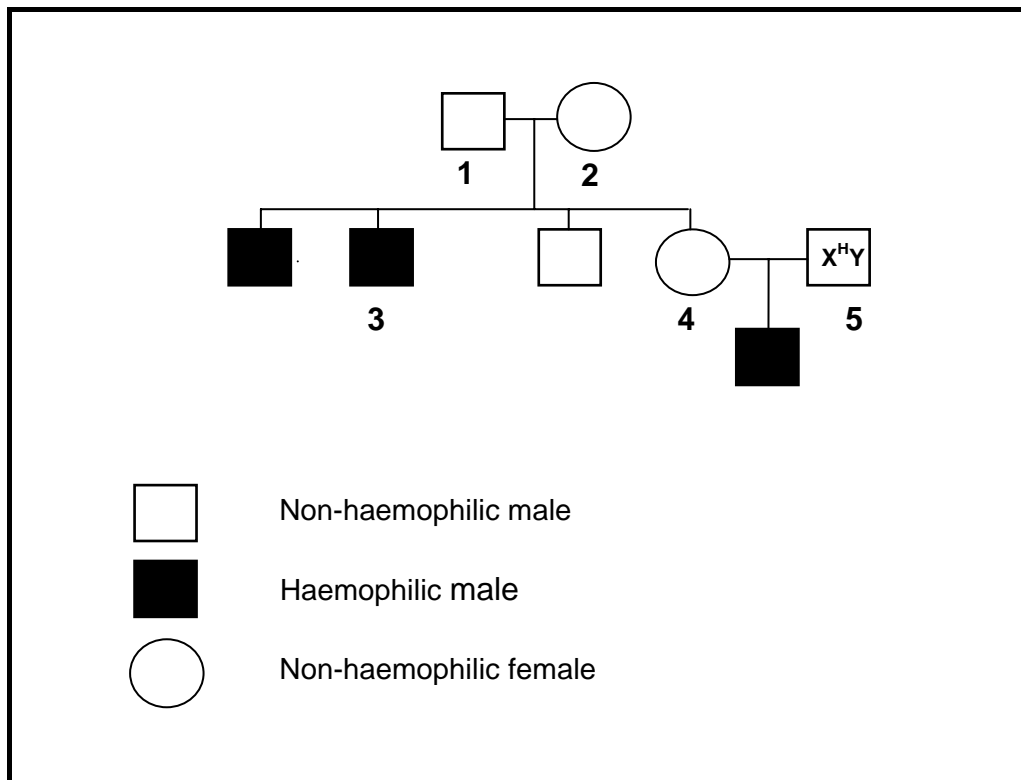


- 3.1.1 Name the hormone produced by the cells of Leydig. (1)
- 3.1.2 Name ONE function of the hormone named in QUESTION 3.1.1. (1)
- 3.1.3 How many chromosomes are in each of the following? (1)
- (a) Spermatogonium cell (1)
- (b) Spermatid (1)
- 3.1.4 Explain the importance of spermatogenesis as a mechanism to introduce **variation** by referring to prophase 1 and metaphase 1. (4)

- 3.2 In humans the gene responsible for the clotting of blood is carried on the X chromosome. Males who carry the recessive gene, bleed easily and are called haemophiliacs. Females will only have haemophilia if they have two recessive genes. The diagram below shows the occurrence of haemophiliacs in a certain family after surveys were carried out.

Let H = normal clotting (X^H)
h = haemophilia (X^h)

The genotype of individual 5 is indicated in the diagram below.



Write down the genotypes of the individuals 1 to 4.

(8)

- 3.3 A Grade 12 learner planned an investigation to establish the attitudes and beliefs of high school learners about albinism.

She asked THREE questions in the investigation:

1. Should mothers alone take the blame for children born with albinism?
2. Are people with albinism cursed and need to be hidden from public view?
3. Should people with albinism be employed?

The results of the investigation are shown in the table below. Study the table and answer the questions that follow.

Results of investigation on people's attitudes and beliefs about albinism		
	NUMBER OF PEOPLE	
	Yes	No
Question 1	40	10
Question 2	30	20
Question 3	5	45

- 3.3.1 How many people participated in this investigation? (1)
- 3.3.2 Draw a bar graph of the results. (7)
- 3.3.3 Write down conclusions from the results of each of the three questions asked in the investigation. (6)
- [30]**

TOTAL SECTION B: 60

SECTION C**QUESTION 4**

- 4.1 The basal body temperature is the temperature taken in the morning when factors such as exercise, eating, drinking or emotional disturbances have no influence.

In women the basal body temperature drops just before ovulation and then increases sharply a day later. During menstruation, the temperature drops again to normal. If the temperature stays high, pregnancy is presumed.

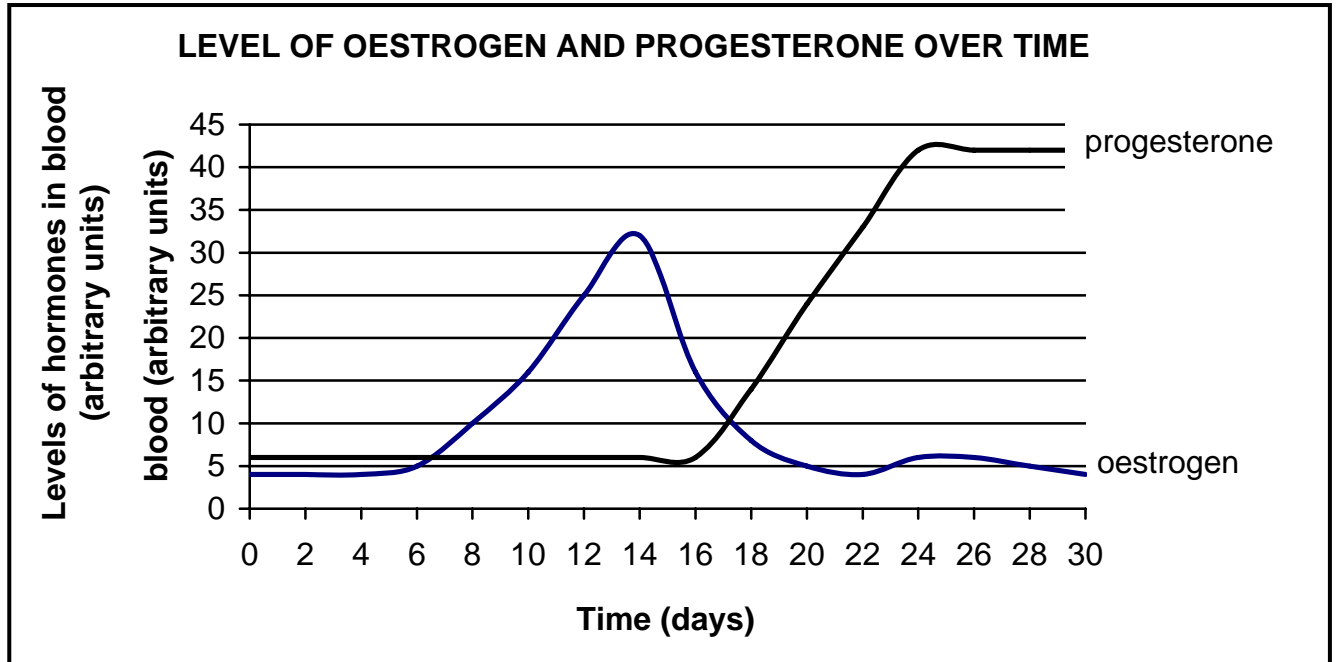
Josephine and Patsy, two young healthy women, recorded their basal body temperature for 28 days from the first day of menstruation. The results are shown in the table below. Study the table and answer the questions that follow.

BASAL BODY TEMPERATURE OF JOSEPHINE AND PATSY FOR 28 DAYS

DAY OF MENSTRUAL CYCLE	BODY TEMPERATURE (°C)	
	Josephine	Patsy
1	36,5	36,4
2	36,2	36,3
3	36,2	36,3
4	36,2	36,3
5	36,2	36,3
6	36,2	36,3
7	36,3	36,2
8	36,2	36,2
9	36,3	36,2
10	36,2	36,2
11	36,2	36,2
12	36,2	36,2
13	36,1	36,1
14	36,5	36,5
15	36,6	36,5
16	36,7	36,6
17	36,8	36,7
18	36,8	36,7
19	36,9	36,7
20	36,9	36,6
21	37,0	36,7
22	37,1	36,4
23	37,1	36,3
24	37,2	36,3
25	37,1	36,3
26	37,0	36,2
27	37,2	36,3
28	37,2	36,2

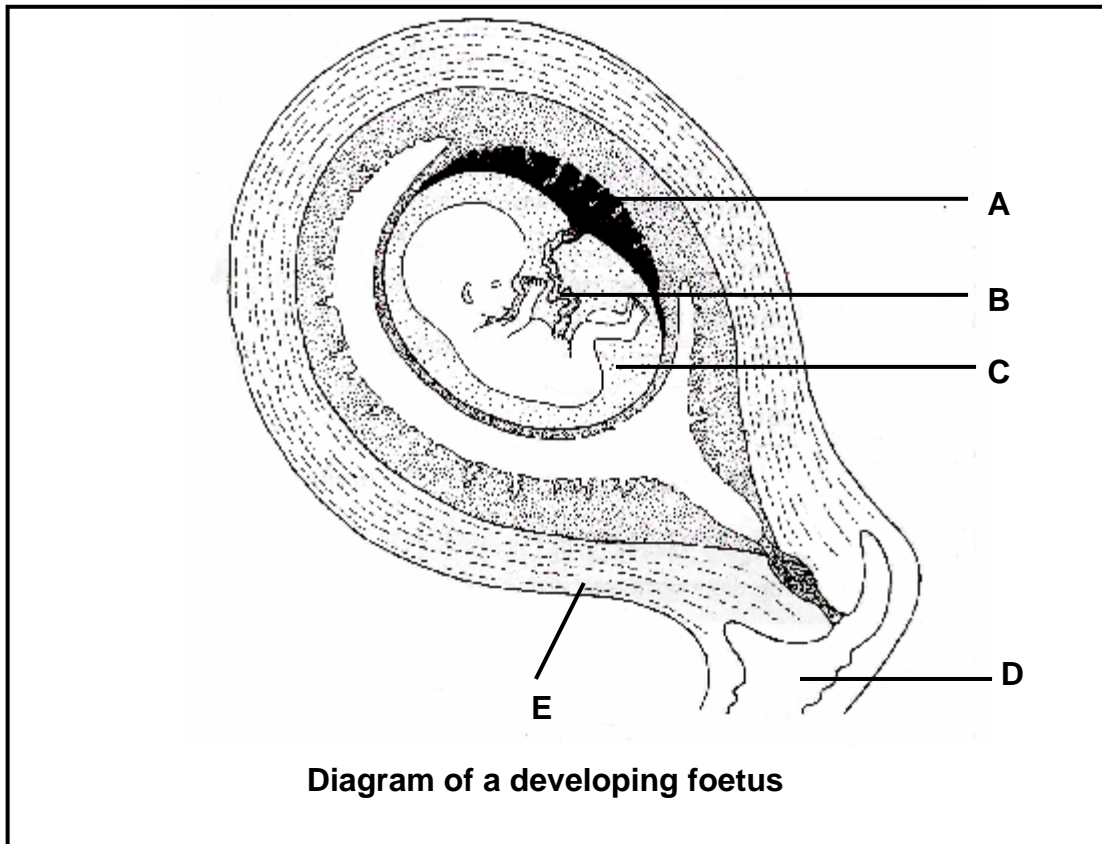
- 4.1.1 On which day of the menstrual cycles of the two women did ovulation occur? (1)
- 4.1.2 What is the difference between the basal body temperatures of Josephine and Patsy on day 28 of their menstrual cycles? (2)
- 4.1.3 These measurements were made at the same time each day in the same room and while each woman was wearing the same type of dressing gown. Explain why these precautionary measures were necessary. (2)
- 4.1.4 By interpreting the data in the table:
- (a) Which of the two ladies is pregnant? Give a reason for your answer. (2)
 - (b) Explain how basal body temperature could be used as a method of contraception. (2)
 - (c) Explain ONE disadvantage of using the basal body temperature as method of contraception. (2)

- 4.1.5 The graph below shows the levels of the hormones oestrogen and progesterone in the pregnant woman's blood. Answer the questions that follow.



- (a) When are the levels of oestrogen and progesterone equal? (2)
- (b) What is the amount of oestrogen in the blood on day 14? (2)
- (c) What evidence from the graph shows that an ovum was fertilised? (2)

4.2 Study the diagram of the developing foetus below.



- 4.2.1 Label structures A, B and D. (3)
- 4.2.2 Give TWO functions of the fluid found in C. (2)
- 4.2.3 Name the process by which some of the fluid from C is withdrawn by doctors to test for abnormalities in the foetus. (1)
- 4.2.4 Describe the function of E during the birth process. (2)

4.3 Yvonne considers giving her baby up for adoption as a solution to her poor circumstances. She does not have a permanent job, neither will the father of her child help to support their baby. Yvonne also consumes alcohol on a daily basis. Write an essay in which you address the following:

4.3.1 Choose an opinion that is either for or against adoption and discuss at least FOUR reasons to support your viewpoint. (8)

4.3.2 Briefly discuss the consequences of Yvonne's alcohol abuse on the unborn child's mental and physical make-up. (4)

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

Synthesis: (3)

TOTAL SECTION C: 40

GRAND TOTAL: 150