



# 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  
NOVEMBER 2012**

**MARKS: 150**

**TIME: 2½ hours**

**This question paper consists of 13 pages.**

**INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in your ANSWER BOOK.
3. Start the answers 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 necessarily all drawn to scale.
9. Do NOT use graph paper.
10. You must use a non-programmable calculator, protractor and compass where necessary.
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 to D) next to the question number (1.1.1 to 1.1.9) in the ANSWER BOOK, for example 1.1.10 D.

1.1.1 Which ONE of the following represents the correct result of fertilisation in plants?

- A Ovule becomes the fruit
- B Ovum becomes the zygote
- C Ovary becomes the seed
- D Stigma enlarges to receive pollen grains

1.1.2 A recessive allele ...

- A always leads to a genetic disorder.
- B is never expressed in the phenotype.
- C is not expressed when in a genotype with a dominant allele.
- D produces the same phenotype when homozygous as when heterozygous.

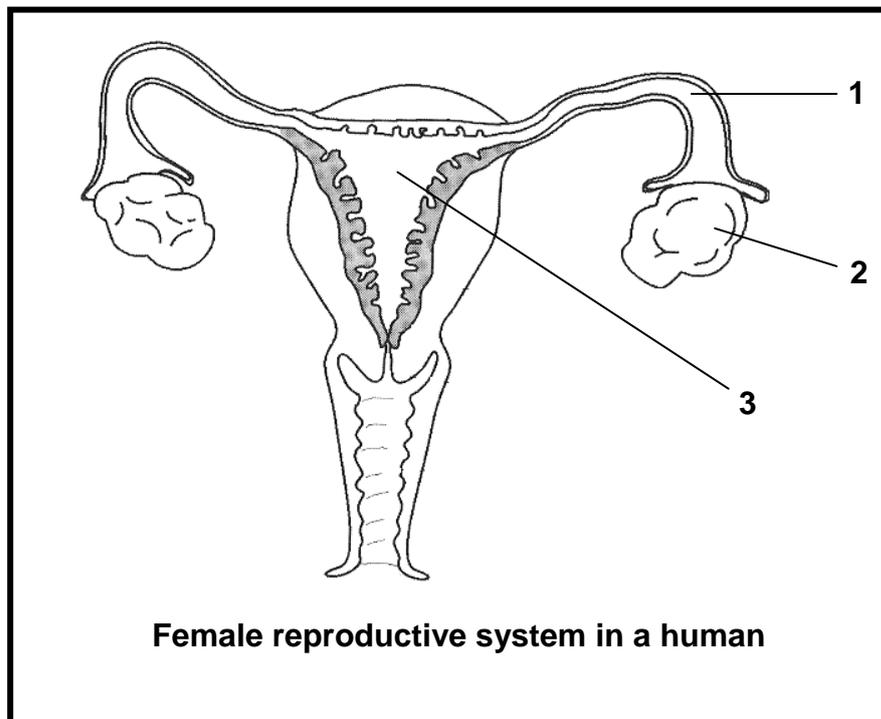
1.1.3 Which ONE of the following correctly represents the sex chromosomes in a human male and the chromosome in his sperm cell that contributes to forming male offspring?

	Human male	Sperm cell
A	XY	Y
B	XY	X
C	XX	Y
D	XX	X

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

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

- 1.1.5 The diagram below represents the female reproductive system in humans.



Which ONE of the following correctly represents the events that take place at the parts labelled 1, 2 and 3?

	1	2	3
A	Fertilisation	implantation	ovulation
B	Ovulation	implantation	fertilisation
C	Implantation	ovulation	fertilisation
D	Fertilisation	ovulation	implantation

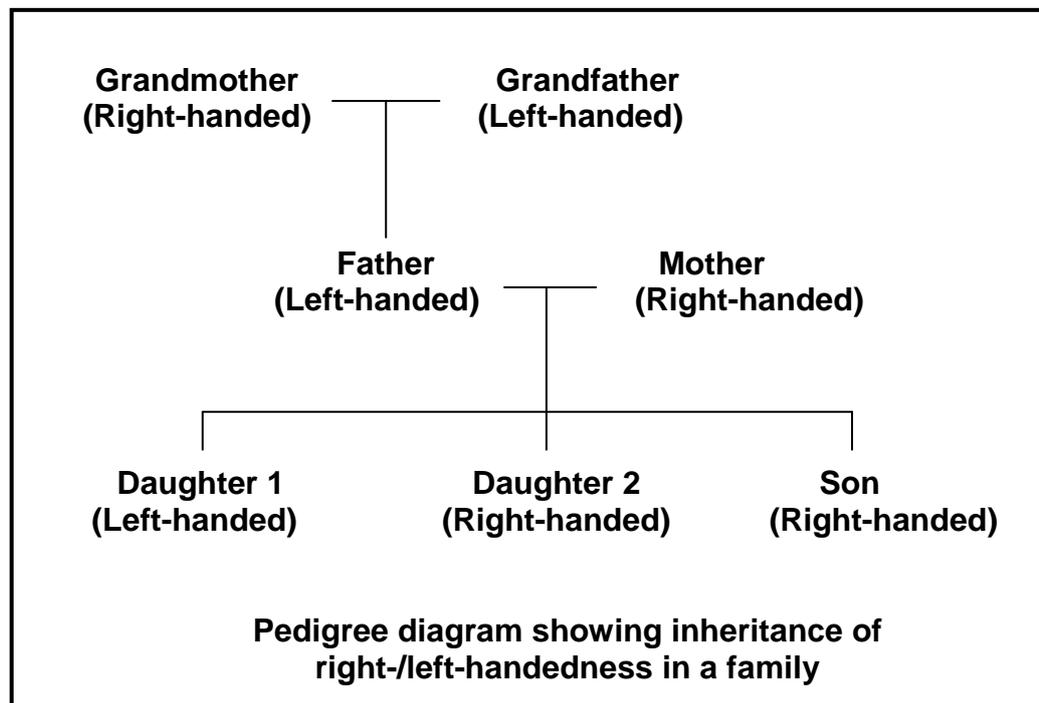
- 1.1.6 A ring of DNA (plasmid) is taken from a bacterial cell to produce insulin. The steps below are NOT in the correct order.

1. The gene for insulin is removed from a cell of a human pancreas.
2. The bacteria make clones of themselves and produce insulin.
3. The insulin gene is put into the plasmid and into a new bacterial cell.
4. The bacterial plasmid is cut using enzymes.

The correct order of the steps is ...

- A 3, 2, 4, 1.
- B 1, 2, 4, 3.
- C 1, 4, 3, 2.
- D 4, 2, 1, 3.

- 1.1.7 When a mouse with white fur was crossed with a mouse with black fur, the  $F_1$  generation had grey fur. What ratios of phenotypes could be expected in the  $F_2$  generation?
- A 50% grey, 25% white, 25% black  
 B 75% white, 25% black  
 C All grey  
 D 50% white, 50% black
- 1.1.8 In a human family the gene for right-handedness (**R**) is dominant over the gene for left-handedness. The pedigree diagram of three generations is shown below.



Which ONE is the correct expression of the genotypes of the following three individuals shown in the pedigree diagram?

	<b>Grandmother</b>	<b>Father</b>	<b>Daughter 1</b>
A	Rr	Rr	RR
B	Rr	rr	rr
C	RR	Rr	rr
D	Rr	rr	Rr

- 1.1.9 Which feature of the DNA molecule listed below is NOT always the same?
- A The order of the bases on a single chain of the molecule  
 B The arrangement of the sugar-phosphate groups  
 C The pairing of adenine with thymine and guanine with cytosine  
 D The weak hydrogen bonds between the bases (9 x 2) **(18)**

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 1.2.6) in the ANSWER BOOK.

- 1.2.1 The phase during which DNA replicates prior to cell division
- 1.2.2 An arrangement of black bars representing DNA fragments, used to determine whether people are related
- 1.2.3 The liquid that protects the embryo against mechanical injury and dehydration
- 1.2.4 Structure that produces pollen grains in angiosperm plants
- 1.2.5 Twins that are genetically different
- 1.2.6 The use of biotechnology to produce an individual that is genetically identical to the one from which it was formed

**(6)**

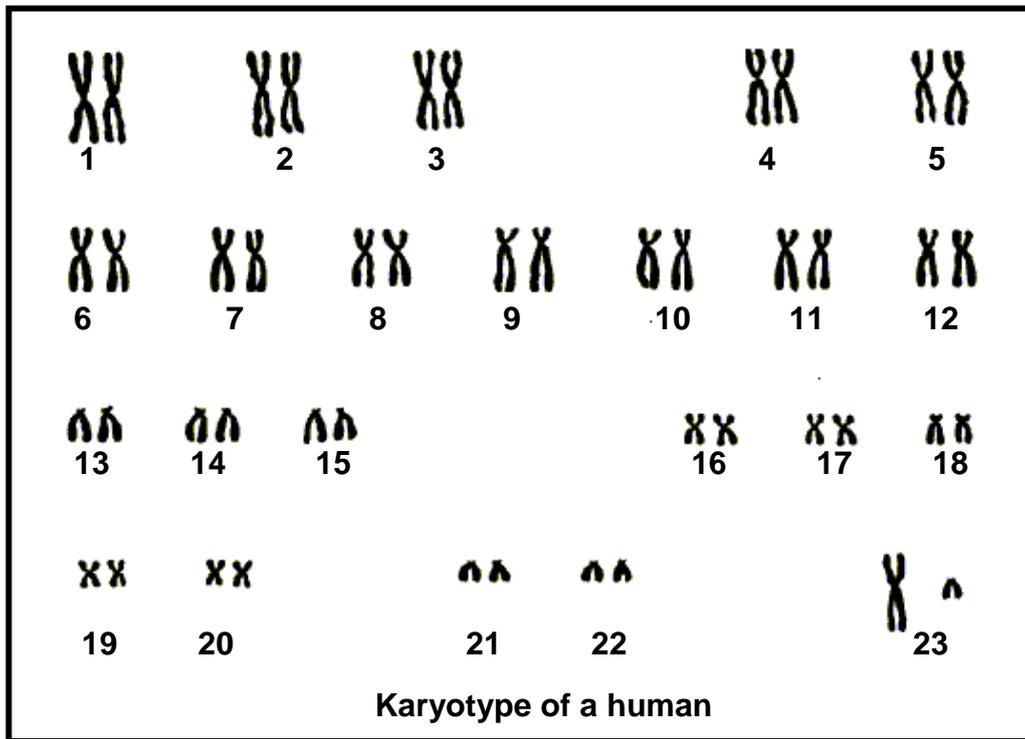
1.3 Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B**, or **none** next to the relevant question number (1.3.1 to 1.3.5) in the ANSWER BOOK.

COLUMN I	COLUMN II
1.3.1 Used to artificially produce organisms with characteristics that are useful to humans	A: Biotechnology B: Selective breeding
1.3.2 A genetic disorder that is sex-linked	A: Haemophilia B: Albinism
1.3.3 Results when a diploid cell divides during meiosis	A: Four diploid cells B: Four haploid cells
1.3.4 Whole chromosomes move towards the poles of the cell	A: Anaphase I B: Telophase I
1.3.5 Two different alleles of a gene are equally expressed in the phenotype	A: Incomplete dominance B: Complete dominance

(5 x 2)

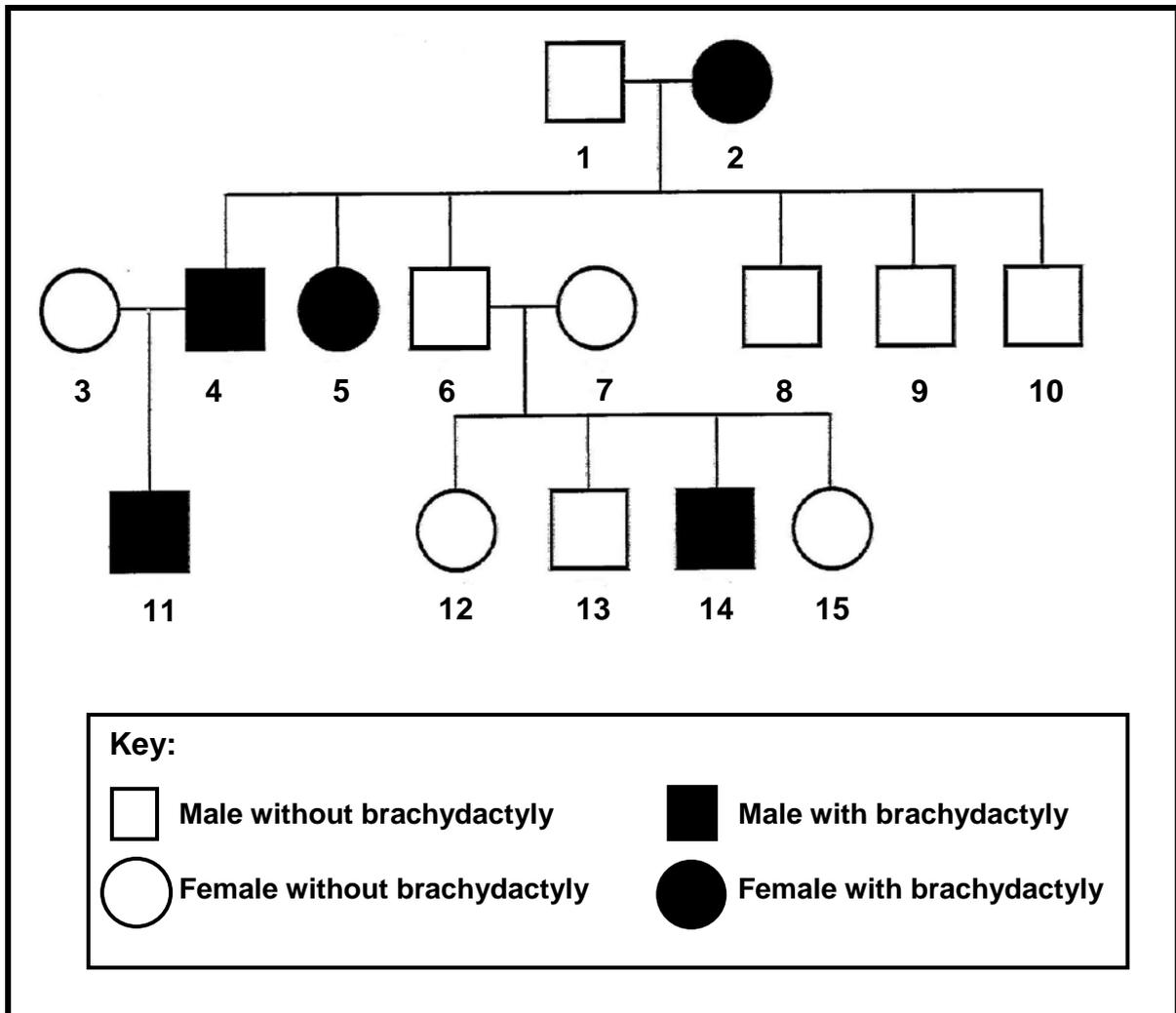
**(10)**

1.4 The diagram below represents a karyotype of a human cell.



- 1.4.1 How many chromosomes are present in this karyotype? (1)
  - 1.4.2 Is this karyotype that of a man or a woman? (1)
  - 1.4.3 Give a reason for your answer to QUESTION 1.4.2. (2)
  - 1.4.4 State how the karyotype of a person with Down syndrome would be different from that of the karyotype shown in the diagram above. (2)
- (6)**

1.5 Study the pedigree diagram below of a family in which some individuals have the rare inherited condition known as brachydactyly. People with this condition have short fingers and toes.



- 1.5.1 Study the pedigree diagram above and state whether brachydactyly is caused by a dominant or recessive allele. (2)
- 1.5.2 Give a reason for your answer to QUESTION 1.5.1. (2)
- 1.5.3 Use the letters **B** and **b** and write down the possible genotypes of the following individuals:
  - (a) 1 (2)
  - (b) 14 (2)
- 1.5.4 What are the chances of parents **3** and **4** having another child with this condition? (2)

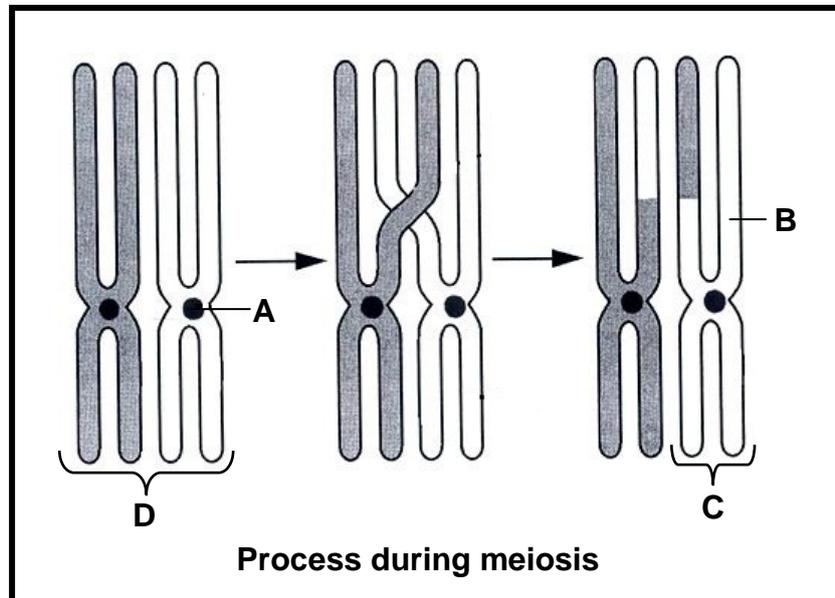
(10)

**TOTAL SECTION A: 50**

**SECTION B**

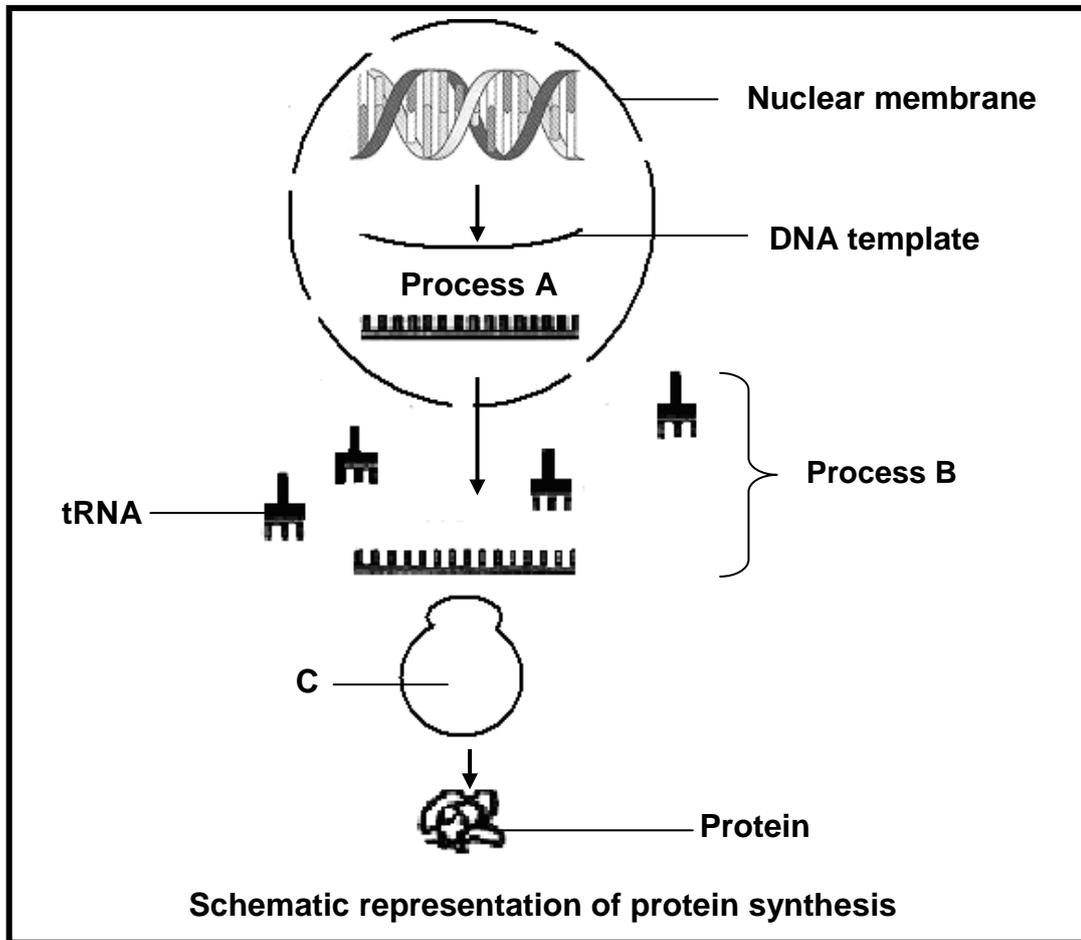
**QUESTION 2**

2.1 Study the diagram below showing a process during meiosis.



- 2.1.1 Label structures **A**, **B**, **C** and **D**. (4)
  - 2.1.2 Which process is illustrated in the diagram? (1)
  - 2.1.3 During which phase of meiosis does the process named in QUESTION 2.1.2 take place? (1)
  - 2.1.4 What is the benefit of the process named in QUESTION 2.1.2? (1)
  - 2.1.5 Name and describe **ONE** other way in which meiosis is able to produce the same benefit as the one named in QUESTION 2.1.4. (3)
  - 2.1.6 Tabulate **THREE** differences between meiosis I and meiosis II. (7)
- (17)**

2.2 The diagram below represents protein synthesis.



2.2.1 Name the following processes:

(a) A (1)

(b) B (1)

2.2.2 Describe how the mRNA is made from the DNA template during process A. (5)

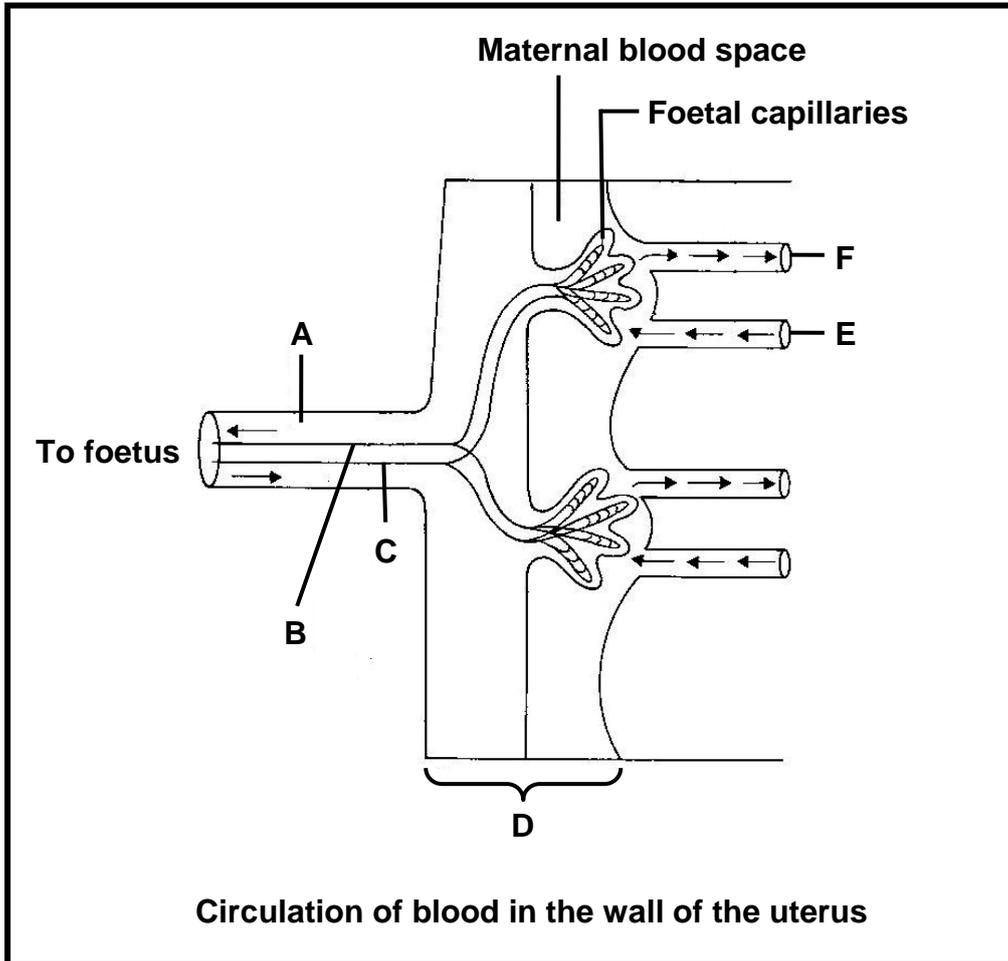
2.2.3 Write down the numbers 1 to 3 and next to each number the nitrogenous bases that will complete the table.

	Base sequence on DNA	Codon on mRNA	Anticodon on tRNA	Amino acid
(a)	CAA	1	2	Valine
(b)	3	GCA	CGU	Alanine

(6)  
(13)  
[30]

**QUESTION 3**

3.1 The diagram below shows the circulation of blood in the wall of the uterus of a pregnant woman. The arrows indicate the direction of flow of blood.



- 3.1.1 Label structures **A** and **D**. (2)
- 3.1.2 Which blood vessel, **B**, **C**, **E** or **F**, carries the following:
- (a) Food to the foetus (1)
  - (b) Blood from the mother (1)
- 3.1.3 The foetal capillaries are located inside numerous finger-like villi. Explain why this is useful. (2)
- 3.1.4 Name and describe the role of the TWO glands and their hormones in preparing part **D** for pregnancy. (5)
- (11)**

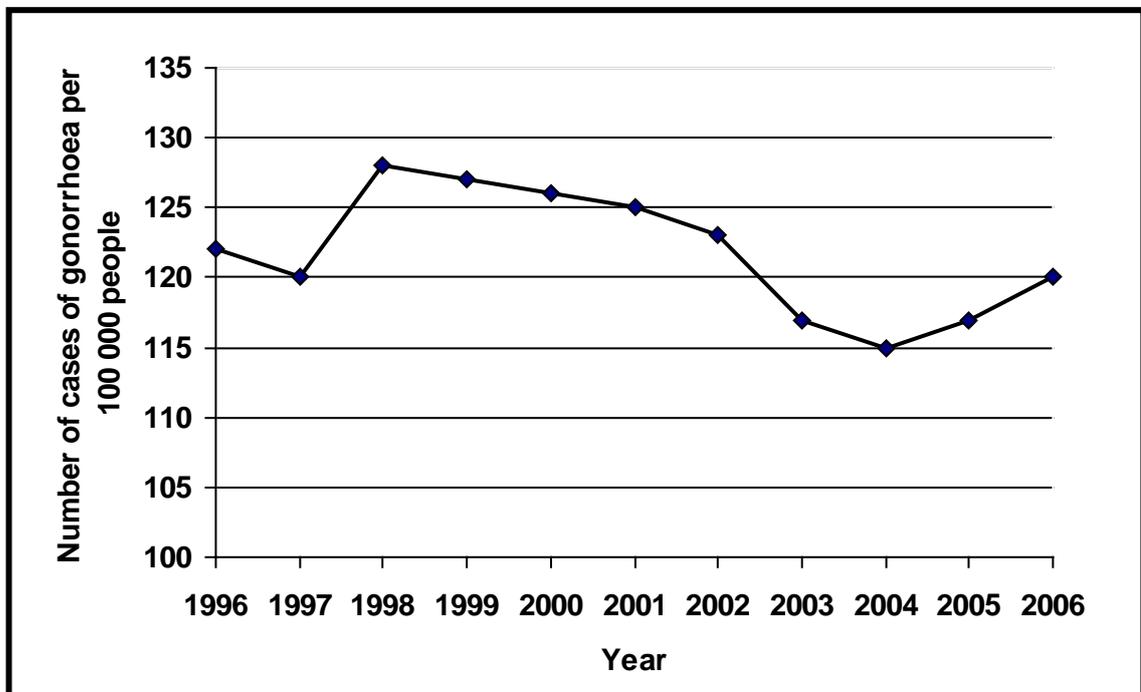
- 3.2 Some people have the ability to roll their tongues (rollers) while other people cannot roll their tongues (non-rollers).

Richard carried out an investigation to find out if there was a difference between the numbers of boys and girls who were rollers. In this investigation Richard tested 120 boys and 100 girls. Of the boys 100 were rollers and of the girls 80 were rollers.

3.2.1 Formulate a hypothesis for this investigation. (3)

3.2.2 State TWO ways in which the reliability of this investigation could be improved. (2)  
(5)

- 3.3 The graph below shows the number of cases of gonorrhoea in a country per 100 000 people between 1996 and 2006.



3.3.1 Calculate the percentage decrease in the number of cases of gonorrhoea between 2001 and 2004. Show ALL working. (3)

3.3.2 Describe the pattern of cases of gonorrhoea between 1997 and 2002. (2)

3.3.3 State TWO symptoms of gonorrhoea in men. (2)

3.3.4 List THREE strategies that health authorities can use to reduce the number of cases of sexually transmitted diseases, such as gonorrhoea. (3)  
(10)

- 3.4 List FOUR possible methods of treating infertility in men and women. (4)  
(30)

**TOTAL SECTION B: 60**

**SECTION C****QUESTION 4**

- 4.1 Explain THREE advantages of using genetically modified organisms for food. (6)
- 4.2 There are red-flowered, white-flowered and pink-flowered varieties in a certain plant. The results of two crosses are shown in the table below.

Crosses	Number of plants of each colour		
	Red	Pink	White
Red x white	0	115	0
Pink x pink	40	80	40

Using the symbols **R** (red) and **W** (white) for the alleles for flower colour, represent a genetic cross to explain the results in the table for the cross between two pink-flowered plants. (6)

- 4.3 Records of human fertility for the period 1941 to 1990 have shown changes in the sperm counts of normal men. The table below summarises the changing percentages of men with high or low sperm counts over a period of 50 years.

TIME PERIOD	MEN WITH HIGH SPERM COUNTS (%)	MEN WITH LOW SPERM COUNTS (%)
1941–1950	50	4
1951–1960	45	5
1961–1970	28	11
1971–1980	21	14
1981–1990	15	18

- 4.3.1 On the same system of axes, draw TWO sets of bar graphs to compare the percentages of men with a high sperm count with those with a low sperm count from 1941 to 1990. (11)
- 4.3.2 Describe the trend for men with low sperm counts and compare it with those with high sperm counts over the 50-year period. (2)  
(13)
- 4.4 Name any FOUR methods of contraception used by women. For each method, explain how it works in preventing pregnancy. (12)  
Content  
Synthesis: (3)  
(15)

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

**TOTAL SECTION C: 40**  
**GRAND TOTAL: 150**