Western Cape Government

Education

Directorate: Curriculum FET

LIFE SCIENCES

TELEMATICS INTERACTIVE TEACHING AND LEARNING

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LESSON 1 (FEBRUARY 2014)
DNA, RNA, PROTEIN SYNTHESIS, GENETIC CROSSINGS, PEDIGREE DIAGRAM AND MEIOSIS

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 in your ANSWER BOOK, for example 1.1.0 D.

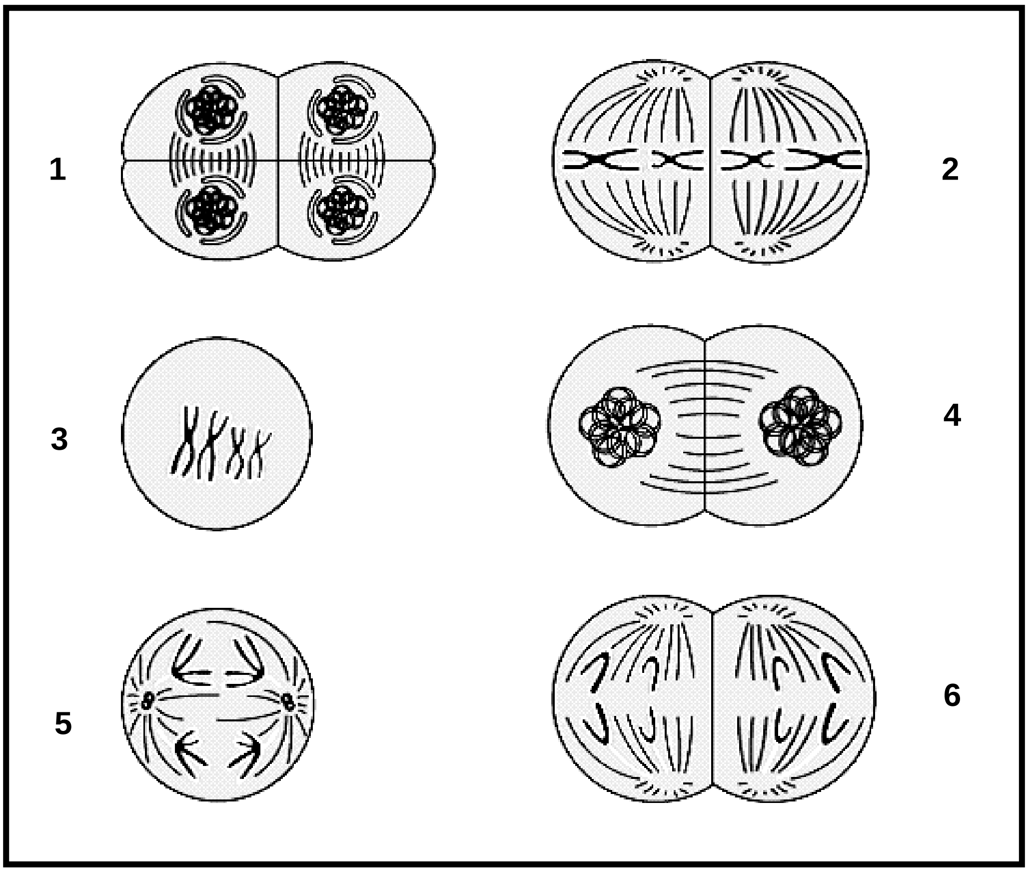
1.1.1 Two parents have children with the following blood groups:

CHILD	BLOOD GROUP
1	A
2	O
3	AB
4	B

If the father has blood group A, what blood group must the mother have?

A Blood group A
B Blood group B
C Blood group O
D Blood group AB

1.1.2 The diagrams below represent six different phases of meiosis taking place in a cell with four chromosomes.



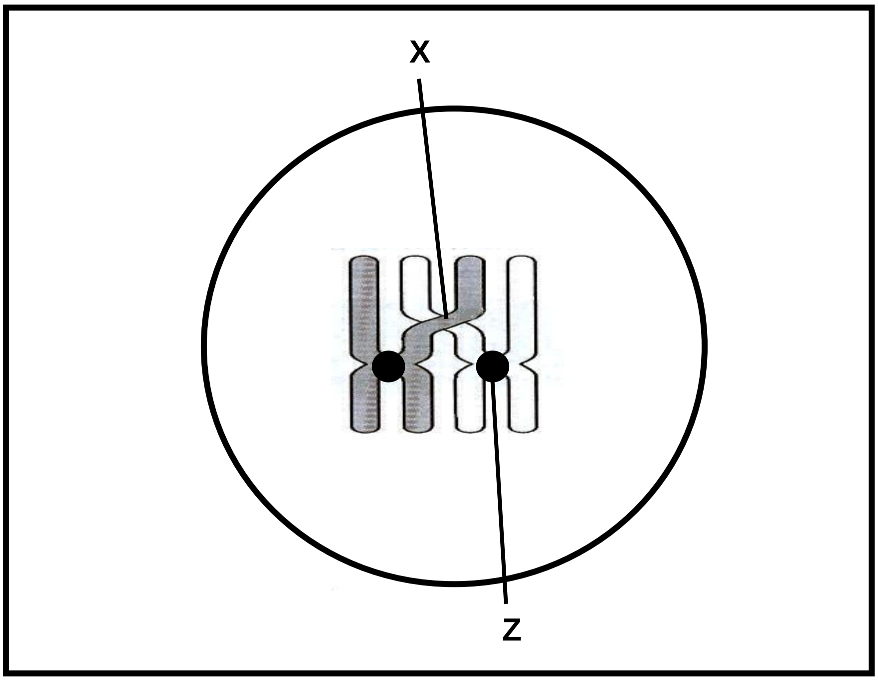
The correct sequence of the different phases in which the above-mentioned division takes place is …

A 1, 2, 3, 4, 5, 6.
B 6, 2, 5, 4, 1, 3.
C 3, 5, 4, 2, 6, 1.
D 3, 4, 5, 6, 1, 2.

1.1.3 Which of the following is CORRECT regarding scientific investigations?

A Increasing the sample size decreases the validity.
B Allowing many variables increases the reliability.
C Controlling the variables decreases the validity.
D Repeating the investigation increases the reliability.

2.1 The diagram below shows crossing over in a pair of homologous chromosomes.



2.1.1 Identify the point **X** and part **Z** respectively. (2)

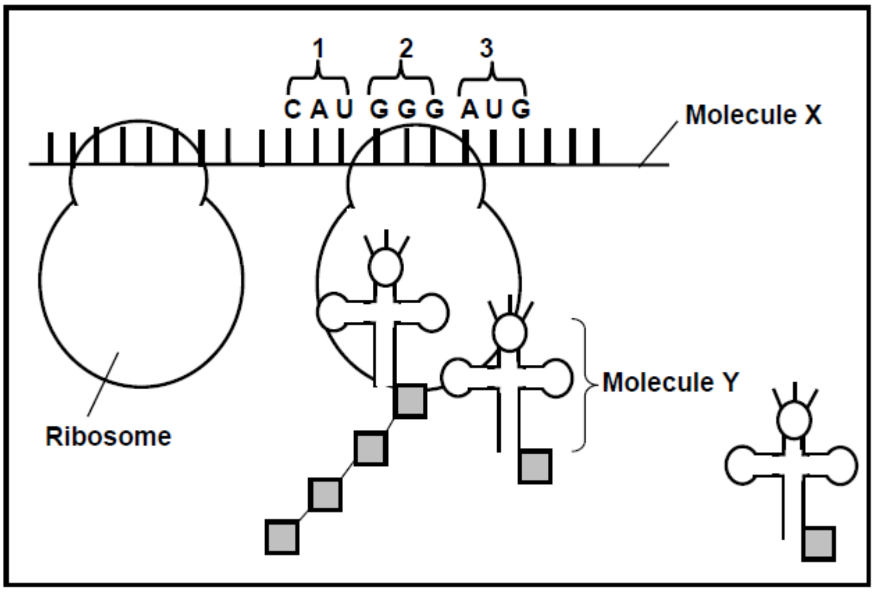
2.1.2 Give ONE observable reason why the chromosomes above are regarded as homologous. (1)

2.1.3 Give ONE reason why crossing over is important. (1)

2.1.4 Name ONE other process occurring during meiosis that has the same importance as crossing over. (1)

2.1.5 If a mouse egg cell contains 20 chromosomes, how many chromosomes will there be in its skin cell? (1)

2.2 The diagram below shows a part of the process of protein synthesis.



2.2.1 Name the stage of protein synthesis represented in the diagram above. (1)

2.2.2 Identify:

(a) Molecule **X** (1)

(b) Molecule **Y** (1)

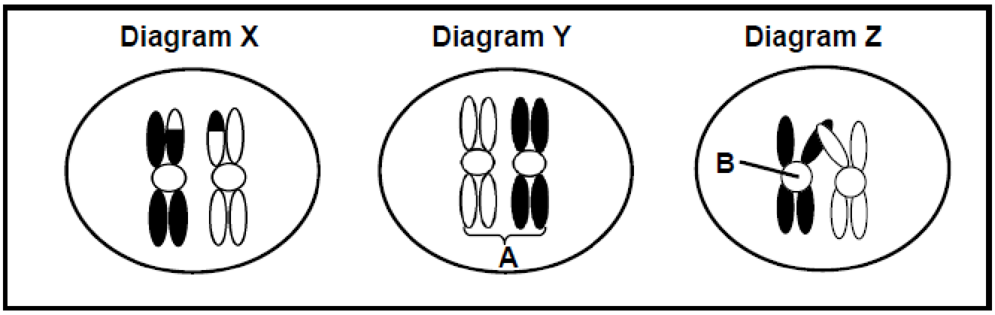
(c) Structure **1** (1)

2.2.3 The table below shows the DNA base triplets that code for different amino acids found in human proteins.

AMINO ACID	BASE TRIPLET IN DNA
Leucine	GAA
Proline	GGG
Lycine	TTT
Histidine	GTA
Serine	TCA
Methionine	TAC
Glycine	CCC
Glutamine	GTC

Using the information in the table and the diagram above, write down the sequence of the amino acids that correspond with structures **1**, **2** and **3**. (3)

2.3 The diagrams below show chromosome pair 21 in the nucleus of a cell of the ovary of a woman. The chromosomes are involved in a process that takes place in a phase of meiosis.

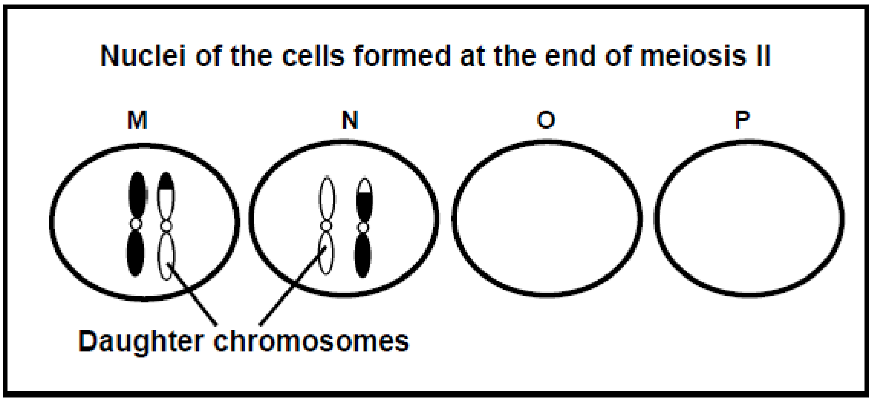


2.3.1 Give labels for **A** and **B**. (2)

2.3.2 Rearrange the letters **X**, **Y** and **Z** to show the correct sequence in which the events take place in this phase. (1)

2.3.3 Explain why the chromosomes in Diagram **X** and Diagram **Y** are different in appearance. (4)

2.3.4 The diagram below shows the nuclei of the four cells that resulted from meiosis involving the chromosomes in Diagram **X** above.



(a) Explain why nuclei **O** and **P** do NOT have chromosomes. (2)

(b) Name and explain the disorder that will result if diagram **M** represents an egg cell that fuses with a normal sperm cell. (3)

2.4 A geneticist wanted to find out which corn colour is dominant in a species of maize. The species has two phenotypes for colour, yellow and white. She performed four genetic crosses and recorded the colour of the offspring as shown in the table below.

Genetic crosses	Parent phenotypes	Offspring phenotypes
1	yellow x yellow	all yellow
2	white x white	51 white and 17 yellow
3	white x yellow	32 white and 34 yellow
4	white x white	all white

2.4.1 According to the results, which colour is dominant? (1)

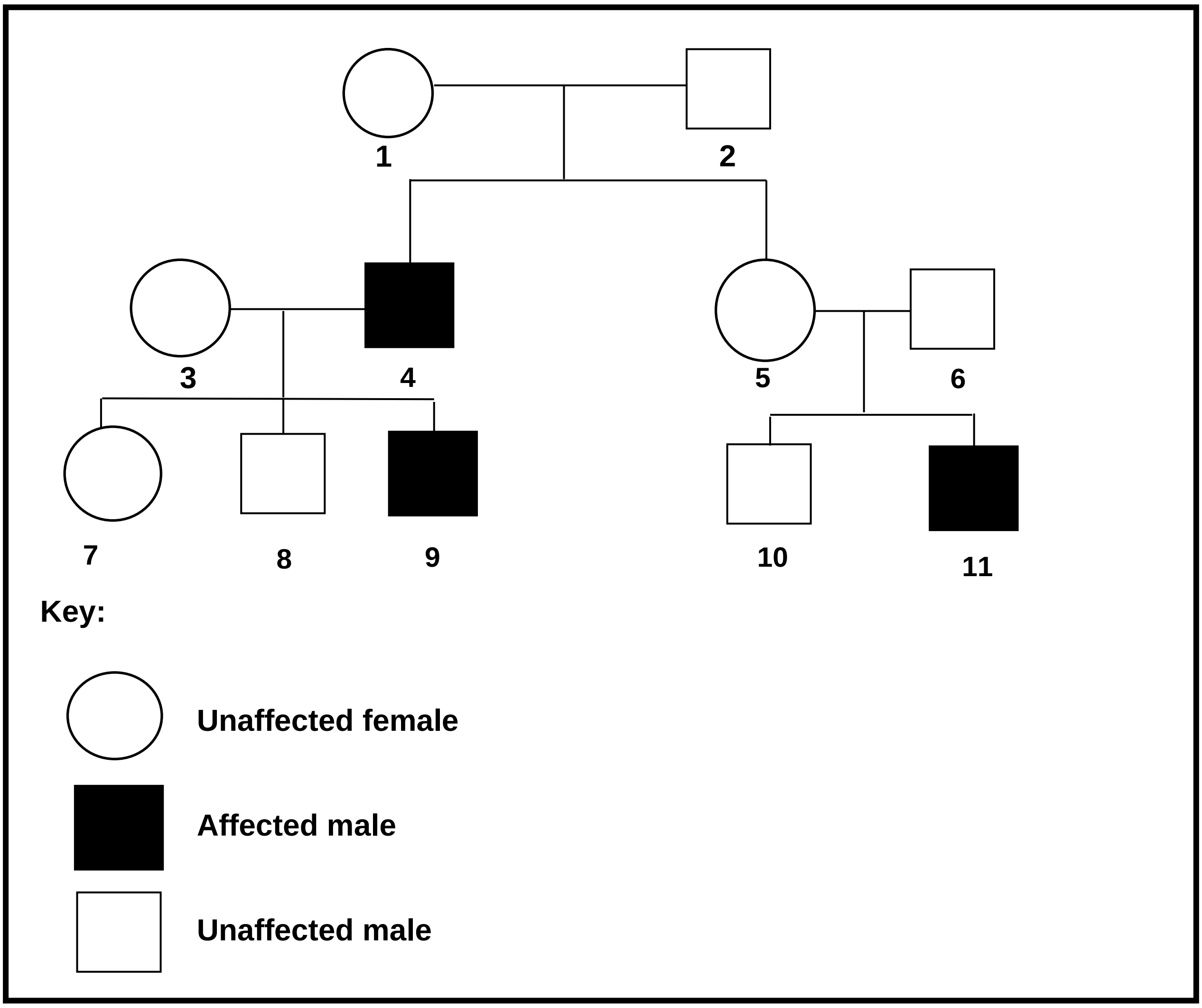
2.4.2 Which ONE of the genetic crosses (1, 2, 3 or 4) from the table allows the conclusion suggested in QUESTION 2.3.1? (1)

2.4.3 Give a reason for your answer to QUESTION 2.3.2. (2)

2.4.4 Use the symbols **G** and **g** to represent genetic cross 2. Also indicate the proportions of the F_1 phenotypes. (6)

QUESTION 3

3.1 The pedigree diagram below traces the inheritance of haemophilia in a family.



3.1.1 How many family members not affected by haemophilia are carriers? (1)

3.1.2 Explain why this disorder affects mostly males in this family. (3)

3.1.3 Use the possible alleles X^H, X^h and Y to determine the genotype of the following:

(a) Individual 1 (2)

(b) Individual 4 (2)

3.1.4 What are the chances of individual 10 and his wife, who is a carrier (not shown in the pedigree), having a son who is affected? (2)

3.1.5 Give TWO reasons why individual 9 and his partner should undergo genetic counselling before starting a family. (2)

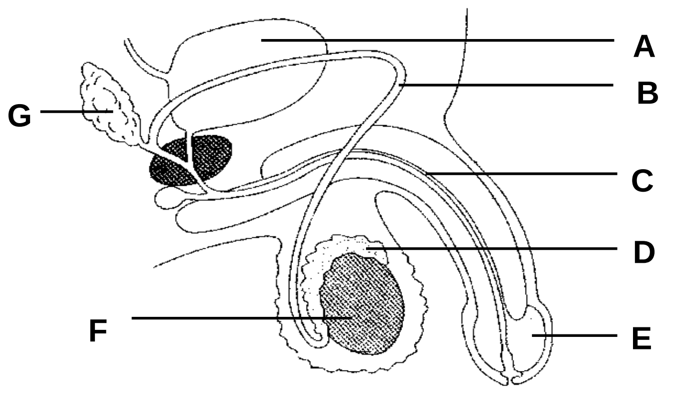
LESSON 2 (MARCH 2014)
REPRODUCTION, HYPOTHESIS TESTING AND MENSTRUAL CYCLE

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 in your ANSWER BOOK, for example 1.1.11 D.

1.1.1 During oogenesis four haploid cells are formed. How many of these haploid cells develop into an ovum/ova?

A 4
B 2
C 3
D 1

1.4 Study the diagram of the male reproductive system below.



The structure of the male reproductive system

1.4.1 Write down the LETTER (A to G) and the NAME of the following:

(a) The part where meiosis takes place (2)

(b) The part that transports semen and urine to the outside of the body (2)

(c) The part where immature sperm cells are stored (2)

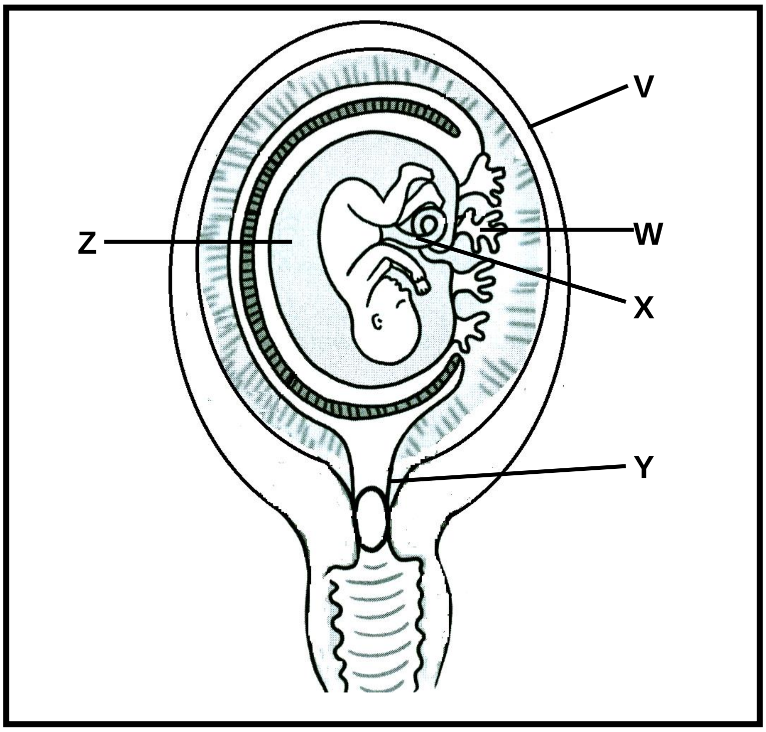
1.4.2 Name the male hormone that is responsible for the development of secondary sexual characteristics during puberty. (1)

1.4.3 Write down the LETTER (A to G) of the following:

(a) The part where the hormone mentioned in QUESTION 1.4.2 is produced (1)

(b) The part which is cut surgically during male sterilisation (1)

2.3 The diagram below represents a developing foetus in a human body.



2.3.1 Identify the parts labelled:

(a) X (1)

(b) Y (1)

2.3.2 State ONE function of the fluid labelled **Z**. (1)

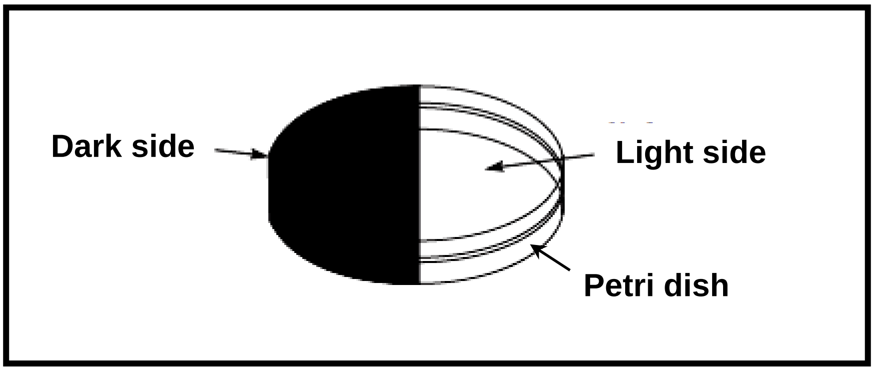
2.3.3 Explain how the part labelled **V** is structurally suited to perform its function during the process of birth. (2)

2.3.4 Name TWO systems in the baby's body that take over the functions of part **W** once the baby is born. (2)

2.3.5 Explain what prevents another ovum from being produced while the foetus is developing in a human body. (2)

QUESTIONS 1.1.8 and 1.1.9 refer to the investigation below.

An investigation to demonstrate the response of woodlice to light was carried out in a petri dish. Half the petri dish was covered with black paper and the other half left in light as shown in the diagram below.



Ten woodlice were introduced into the petri dish. The number of woodlice in each side was counted for ten minutes every two minutes. The results are shown in the table below.

Time (minutes)	Number of woodlice	
	Dark side	Light side
2	6	4
4	7	3
6	7	3
8	8	2
10	10	0

1.1.8 Which of the following represents a hypothesis that can be supported by the data in the table?

A There will be fewer woodlice in the dark side than in the light side.
B There will be more woodlice in the dark side than in the light side.
C The investigation is done to determine the response of woodlice to light conditions.
D There will be the same number of woodlice in the dark side and the light side.

1.1.9 The dependent variable in this investigation is the ...

A light and dark side.
B time in minutes.
C number of woodlice in the light or dark side.
D dark side.

2.2 In an investigation a learner was asked to put a cotton thread through the eye of a needle 10 times with both eyes open and then with only the right eye open. This was done under the same light intensity and at a distance of 50 cm from the eyes.

The results are recorded in the table below.

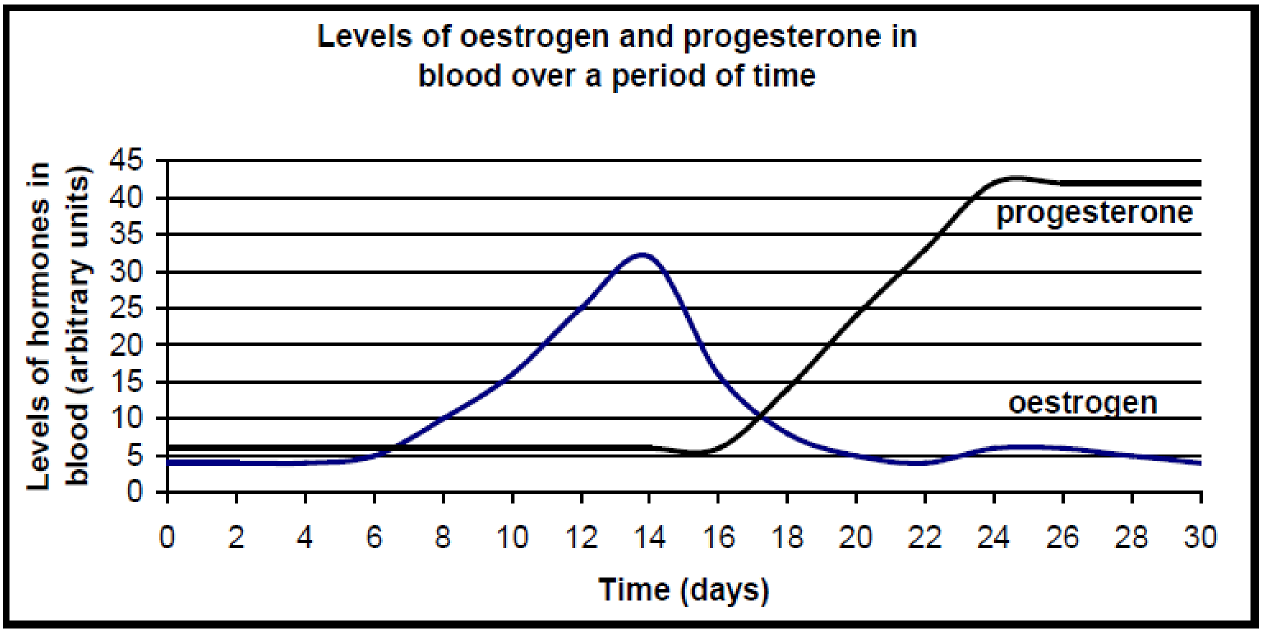
	TIME TAKEN TO THREAD THE NEEDLE in seconds (s)	
Attempts	**Two eyes open**	**Only right eye open**
1	12	38
2	12	35
3	10	37
4	11	36
5	9	34
6	9	33
7	10	30
8	8	31
9	7	29
10	7	28

2.2.1 Apart from the factors mentioned, state TWO other factors that had to be kept constant during the investigation. (2)

2.2.2 State a general conclusion that can be drawn for the results above. (2)

2.2.3 Give a reason why more than one attempt was made in this investigation. (1)

3.1 The graph below shows the levels of the hormones oestrogen and progesterone in a pregnant woman's blood.



3.1.1 When are the levels of oestrogen and progesterone the same? (2)
3.1.2 How much oestrogen is in the blood on day **14**? (2)
3.1.3 What evidence from the graph shows that an ovum was fertilised? (2)

4.1 Name TWO types of twins formed in humans and explain how each type is formed during fertilisation. (6)

4.2 Describe the menstrual cycle and how it is influenced by different hormones content (17)
Synthesis (3)
(20)