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Western Cape Education Department
Directorate: Curriculum FET

LIFE SCIENCES

REVISION BOOKLET 2024 TERM 1

Grade 12

This revision program is designed to assist you in revising the critical content and skills covered during term 1. The purpose is to prepare you to understand the key concepts and to provide you with an opportunity to establish the required standard and the application of the knowledge necessary to succeed in the NCS examination.

The revision program covers the following topics:

- DNA: Code of Life - 27 marks in Paper 2
- Meiosis - 21 marks in Paper 2
- Human reproduction - 41 marks in Paper 1
- Reproduction in vertebrates - 8 marks in Paper 1

1. Key Life Sciences Concepts

1.1 General tips to approach certain question types in the Life Sciences question papers

1.1.1 Multiple Choice

This question type is found in section A in the paper. Every multiple question starts with a stem in the form of a statement or question. Four possible answers are given from which you have to choose the correct one.

When answering multi-choice questions:

1. Read the stem and cover/block the four possible answers. (Don't look at the answers at this stage)
2. Think about the question and think of the correct answer.
3. Then uncover the 4 possible answers.
4. If you see your answer, circle the LETTER.
5. Look at the other possible options to check that none of the other options is a better option than the one you have chosen.
6. If you do not see your possible answer, then cross out the 3 options that you think are probably incorrect.
7. NEVER leave a multiple choice question UNANSWERED.

EXAMPLE

(DBE, November 2016, Paper 1)

1. The part of the brain that receives nerve impulses from the semi-circular canals is the...

- A cerebrum.
- B cerebellum.
- C hypothalamus.
- D medulla oblongata.

Stem: This refers to the question.

REMEMBER: The semi-circular canals are structures found in the human ear and they play a role in balance. The cerebellum in the brain controls balance.

Answer: Therefore, the correct answer is option B.

Why are the other options incorrect? The cerebrum is responsible for interpreting the senses (e.g. hearing) and not for balance. The hypothalamus is responsible for most homeostatic control mechanism (e.g. thermoregulation). The medulla oblongata controls involuntary actions (e.g. heart beat).

(DBE, June 2015, Paper 2)

2. Which ONE of the following is TRUE about genes? Genes are ...

- A codes for a particular characteristic.
- B made up of amino acids.
- C made up of RNA.
- D found in a ribosome.

Stem: This refers to the question.

REMEMBER: A gene is a segment of DNA /a chromosome that is responsible for a particular characteristic e.g. attached or unattached earlobes

Answer: Therefore, the correct answer is option

A. Why are the other options incorrect?

Proteins are made up of amino acids. Genes are made up of DNA and NOT RNA. DNA is found in the nucleus and mitochondria and NOT in the ribosome.

1.1.2 Matching of columns

This question type is found in section A in the paper. Normally a key is provided to be used to present your answer to the question.

Every question starts with a description or statement. TWO possible answers are provided.

When answering this question:

1. *Read the description and each possible answer separately.*
2. *If the possible answer is correct make a ✓ next to the possible answer. If the possible answer is incorrect make an X next to the possible answer.*
3. *Use the key to present your answer.*

EXAMPLE

(DBE, June 2015, Paper 1)

Indicate whether each of the descriptions 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.

COLUMN I	COLUMN II
1. A young bird is helpless soon after hatching	A: Precocial development X B: Altricial development ✓

Read the statement in column I with possible answer A. It is incorrect (Refer to list of terminology in Paper 1). Place an X next to it. Read the statement in column I with possible answer B. It is correct. Place a ✓ next to it. Now use the key to present your answer. Because only possible answer B is correct your answer will be **B only**.

(DBE, November 2015, Paper 2 (2))

Indicate whether each of the descriptions 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.

COLUMN I	COLUMN II
1. A sex-linked genetic disorder	A: Haemophilia ✓ B: Colour-blindness ✓

Read the statement in column I with possible answer A. It is correct. Place a ✓ next to it. Read the statement in column I with possible answer B. It is correct. Place a ✓ next to it. Now use the key to present your answer. Because both possible answers are correct your answer will be **Both A and B**.

1.1.3 Drawing and interpreting a graph

A Drawing of a graph

- Make sure that you know the difference between a line graph, bar graph, histogram and a pie chart.
- Always provide a heading for your graph that includes both independent and dependent variables.
- The independent variable refers to the factor that is being investigated. This factor is usually manipulated /changed by the investigator at the start or during the course of the investigation.
- The independent variable is plotted on the x-axis of a graph.
- The dependent variable refers to the effect of the independent variable. This effect is **usually** measured in some way and appears on the y-axis of a graph.
- Label the x and y-axis which may include the units of measurement like °C, seconds, years, number of organisms, etc.
- Work out an appropriate scale for the axes.
- When drawing a bar graph, remember that the bars should be of equal width. The spaces between the bars should also be the same.
- When drawing a pie chart you must use a compass to draw the circle of the chart and a protractor to measure the angles in degrees of the different sectors.

B Interpreting a graph

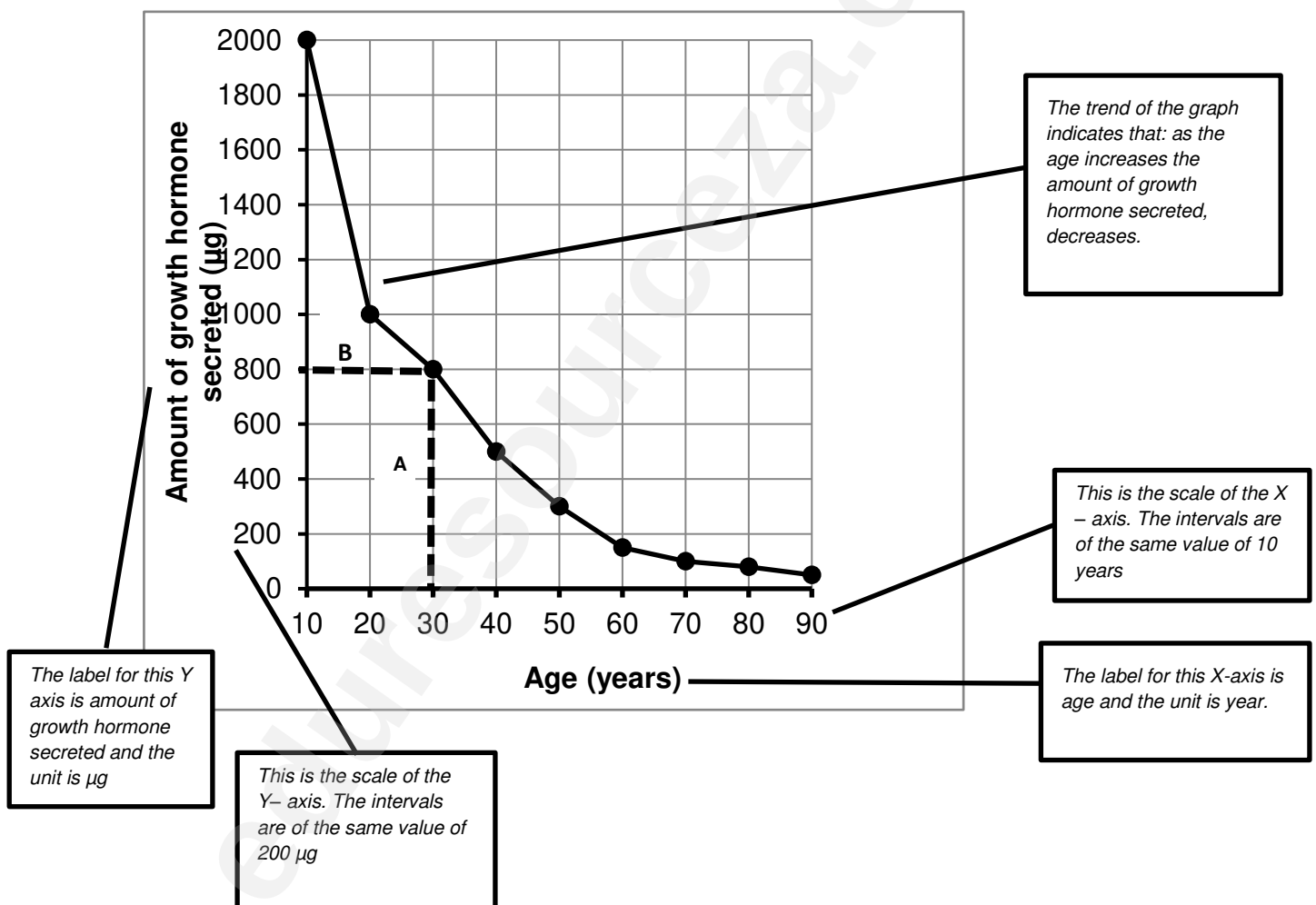
- Read the caption of the graph to understand what is represented. The caption gives you the two variables that are under investigation and the relationship between the two variables.
- Remember that the independent variable is on the X-axis and the dependent variable is on the Y-axis.
- In a line graph the shape of the line indicates the relationship between the two variables.

EXAMPLE

(DBE, November 2016, Paper 1)

This is the caption of the graph indicating the independent and dependent variables. In this graph the independent variable is the *age* and the dependent variable is the *amount of the growth hormone produced*. The caption also indicates that there is a relationship between the two variables.

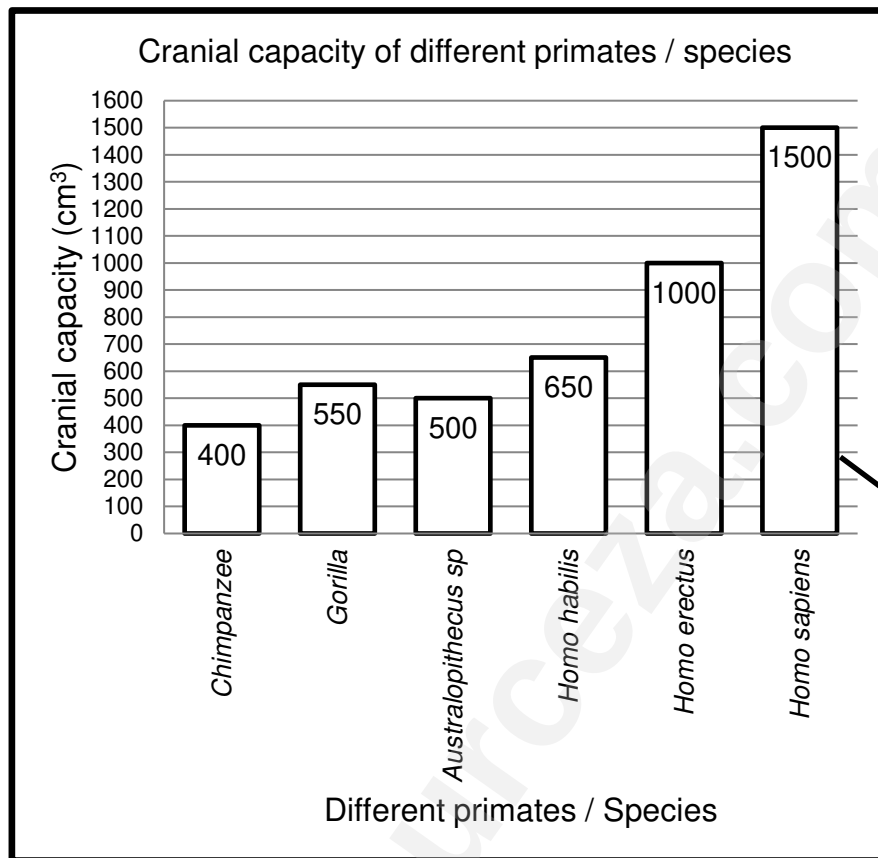
The graph below shows the relationship between the production of growth hormone and age.



You can be asked to read values from the graph e.g. how much of the growth hormone is secreted at 30 years?

Take a ruler and pencil and draw a vertical line (A) from the X-axis from point 30 until it touches the graph and then draw a horizontal line (B) from this crossing point to the Y-axis as indicated by the dotted line. Then read off the value on the Y-axis. In this graph the answer is $800 \mu\text{g}$.

(DBE, November 2014, Paper 2)



1. Which species has the smallest cranial capacity?

Answer: Chimpanzee

2. Which species has the largest cranial capacity?

Answer: Homo sapiens

Refer to the *Mind the GAP Study Guide*, p.109-110 for step-by-step instructions on how to draw a pie chart and how to convert percentages into degrees in order to measure the angles of each sector.

1.1.4 Calculations:

You will be expected to do simple calculations that involve addition, subtraction, multiplication and division.

You must have a calculator.

Show your working of your calculation step by step because marks are allocated for the steps as well as for the correct answer.

Include the unit in your final answer.

The following examples will guide you to calculate averages and percentages.

A. How to calculate averages:

Find the sum of all the items and divide this total by the number of items.

EXAMPLE:

The table below represents the results of an investigation that was carried out to determine the effect of caffeine on the pulse rates in different people after 10 minutes of drinking a cup of black coffee.

NUMBER OF PARTICIPANTS	PULSE RATE (BPM)
1	76
2	91
3	95
4	89
5	89

$$\begin{aligned}
 \text{Average pulse rate} &= \frac{\text{sum of the pulse rates of participants}}{\text{total number of participants}} \\
 &= \frac{(76 + 91 + 95 + 89 + 89)}{5} \\
 &= \frac{440}{5} \\
 &= 88 \text{ BPM}
 \end{aligned}$$

Remember to show your working of your calculation step by step because marks are allocated for the steps as well as for the correct answer.

Remember to include the unit in your final answer

B. Calculating Percentage:

Take the value of which you want the percentage of, and divide it by the total sum of items.

EXAMPLE:

The table below shows the number of plant species found at different altitudes in a mountain range.

ALTITUDE (m)	NUMBER OF PLANT SPECIES
1000	65
1500	60
2000	35
2500	20
Total	180

Calculate the percentage of plant species found at an altitude of 1500m.

$$\begin{aligned}
 \text{Percentage} &= \frac{\text{number of plant species at 1500m}}{\text{Total number of plant species}} \times \frac{100}{1} \\
 &= \frac{60}{180} \times \frac{100}{1} \\
 &= 33.3\%
 \end{aligned}$$

1.1.5 Comprehensions

You may be asked to read a passage or extract from a newspaper or other source that you have never seen before. It will relate in some way to the work that you have studied and you may have to draw on knowledge that you have learnt to answer some of the questions.

Read the passage/extract carefully and underline the important information.

The first few questions normally relate directly to the passage/extract.

Try to link the content of the passage/extract to the content you have studied.

EXAMPLE:

(Free State, September 2016, Paper 1)

Read the extract below.

DIABETES – TREATMENT AND MANAGEMENT

Two forms of diabetes are found in humans namely type I and type II.

With type 1 diabetes, the body's immune system mistakenly sees the insulin-producing cells in the pancreas as foreign, and destroys them.

People with type II diabetes are able to produce some of their own insulin. Often, it's not enough. Overeating, especially of foods rich in sugar, causes repeated stimulation of the pancreas, which responds by secreting large amounts of insulin. The excess insulin decreases the target cells' ability to respond to insulin. Treatment focuses on diet and exercise.

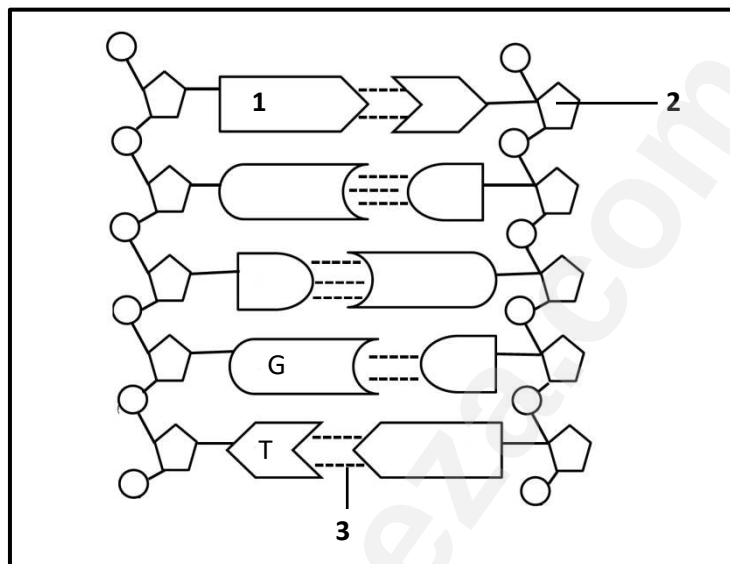
[Source: www.diabetesresearch.org]

- 1 Explain the consequence for **TYPE I** diabetics, when their immune system destroys their insulin-producing cells.
(Answer: The body cannot produce any insulin. ✓ *The answer is coming from the text – the insulin-producing cells are destroyed and therefore no insulin is produced. But you can't stop here – the question asks you to explain the consequence, so you have to continue:* high levels of glucose in blood ✓ *therefore they have to inject themselves daily✓ to control the blood sugar level*)
- 2 Give TWO target cells in the human body whose ability to respond to insulin can decrease.
(Answer: Hepatic✓/Liver cells– *(that is where glucose is converted to glycogen)* and Muscle cells✓ *(stimulates the cells to absorb glucose. This is knowledge you should have)*)
- 3 Name ONE body fluid that can be used to test for the presence of excess glucose in the body.
(Answer: Blood✓ or Urine✓ - *this is knowledge you should have*)

Revision Questions:

2.1 DNA – CODE OF LIFE

Q1. The diagram below shows a part of a DNA molecule.



1.1 Provide labels for:

- (a) 1 (1)
(Adenine – it matches the same shape of the complementary T in the diagram. Remember Adenine pairs with Thymine)
- (b) 2 (1)
(Deoxyribose sugar – the molecule represented is DNA. The sugar portion of DNA is deoxyribose and that of RNA is ribose)
- (c) 3 (1)
(Hydrogen bond – weak bond found between nitrogenous bases A and T and C and G in DNA)

1.2 Give the number of nucleotides shown in the diagram. (1)
(10 – a nucleotide is made up of 3 components i.e. a sugar, phosphate and nitrogenous base. This molecule above has 10 of these nucleotides)

1.3 Give ONE difference between the nitrogenous bases found in DNA molecules and those found in RNA molecules. (2)
(DNA has the nitrogenous base thymine whereas RNA has the nitrogenous base uracil. Remember the question asked for differences between nitrogenous bases and not any other structural or functional difference. For differences between DNA and RNA please refer to Mind the Gap Study Guide p.2)

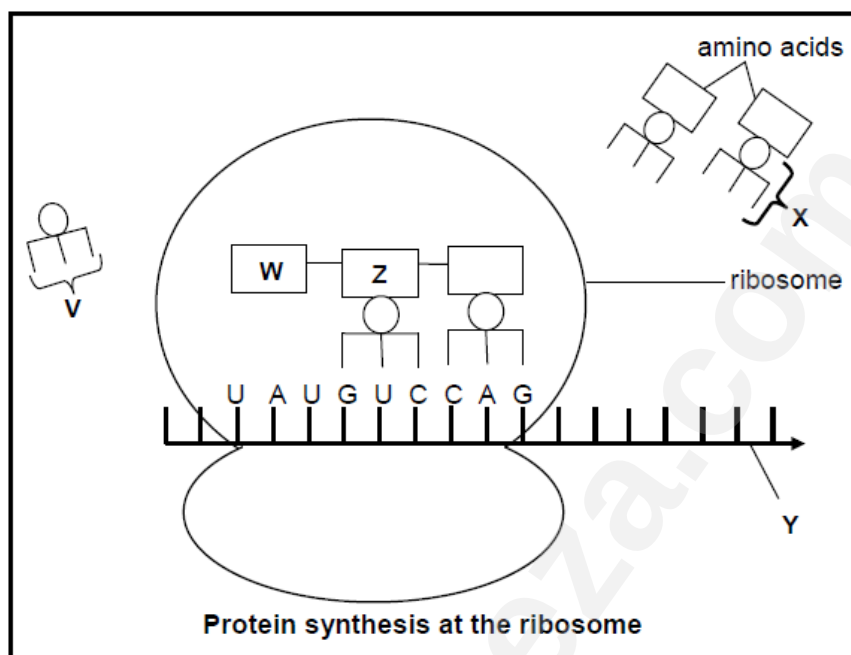
There are two processes involved in protein synthesis, namely **transcription** and **translation**. Make sure that you know and are able to describe these two processes:

Transcription	Translation
• The double helix DNA unwinds. • The double-stranded DNA unzips/weak hydrogen bonds break • to form two separate strands. • One strand is used as a template • to form mRNA • using free RNA nucleotides from the nucleoplasm. • The mRNA is complementary to the DNA. • mRNA now has the coded message for protein synthesis.	• Each tRNA carries a specific amino acid. • When the anticodon on the tRNA • matches the codon on the mRNA • then tRNA brings the required amino acid to the ribosome. • Amino acids become attached by peptide bonds • to form the required protein.

NB: Do not confuse transcription with DNA replication

DNA Replication
• The double helix DNA unwinds • Double stranded DNA unzips • as the weak hydrogen bonds break • Each original DNA strand serves as a template • Free DNA nucleotides build a new DNA strand onto each of the original DNA strands • by attaching to their complementary nitrogenous bases/ (A to T, and C to G) • this results in two identical DNA molecule

Q2. Study the diagram below which shows a part of the process of protein synthesis.

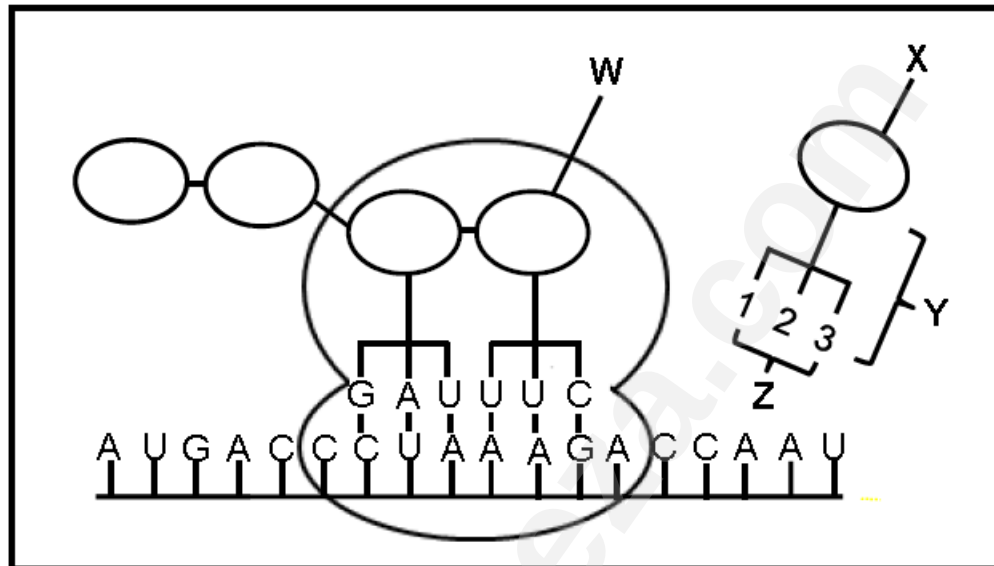


- 2.1 Identify the stage of protein synthesis that is shown in the diagram above. (1)
- 2.2 Identify molecules **X** and **Y**. (2)
- 2.3 State the term for the group of three nitrogenous bases indicated by **V**. (1)
- 2.4 Give the nitrogenous bases on the DNA strand that codes for the bases UAU on molecule **Y**. (1)
- 2.5 Use the table below to identify amino acid **W**.

tRNA	Amino acid
GUC	glutamine
UAA	isoleucine
AUA	tyrosine
CCC	glycine
GGG	proline
CAG	valine

- 2.6 Name and describe the process that occurs in the nucleus to produce molecule **Y**. (5)
- (12)**

- Q3.** The diagram below shows part of a process involved in the production of a protein.



- 3.1 Identify:
- Molecule Y (1)
 - The group of nitrogenous bases Z (1)
- 3.2 If X is the next amino acid required after W, then identify
- Nitrogenous bases 1,2 and 3 (2)
 - The DNA base triplet that codes for X (2)
- 3.3 Describe the process of transcription. (6)

- Q4.** A section of a DNA molecule has the following base sequence:

CTTACA

- Name the nitrogenous base represented by **C** in the DNA molecule. (1)
- The percentage of guanine in this DNA molecule is 30%. Give the percentage of thymine in the same molecule. (2)

4.3 Give the mRNA sequence, from left to right, for this segment of DNA. (2)

4.4 The table below shows the DNA triplets that code for some amino acids.

DNA TRIPLET	AMINO ACID
ACA	Cysteine
CTT	Glutamic acid
TGT	Threonine
TTA	Asparagine
GAA	Leucine
TAC	Methionine

Give the sequence of amino acids that would be coded for by the section of DNA above. (2)

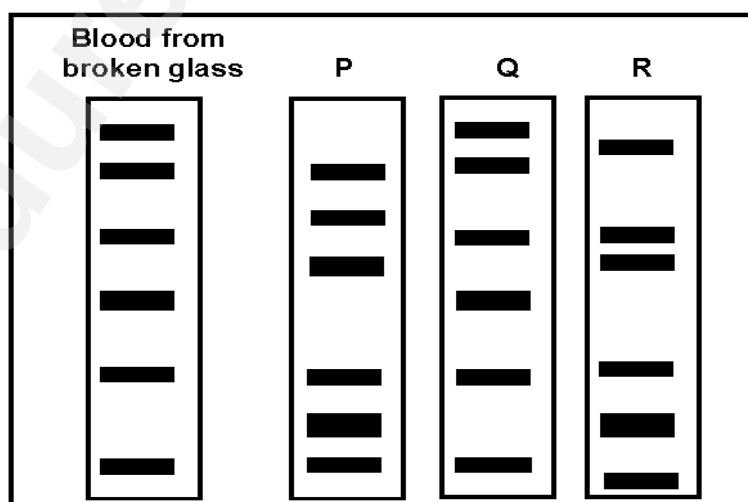
4.5 Give the anticodon for the amino acid methionine. (1)

4.6 Describe how a mutation on DNA may change the structure of a protein. (4)

4.7 Tabulate TWO structural differences between a monomer of RNA and a monomer of DNA. (5)

Q5. When a thief broke into a car he cut his arm on the broken glass. Scientists extracted DNA from the blood found on the broken glass. They analysed this DNA sample and compared it to the DNA from three suspects, P, Q and R.

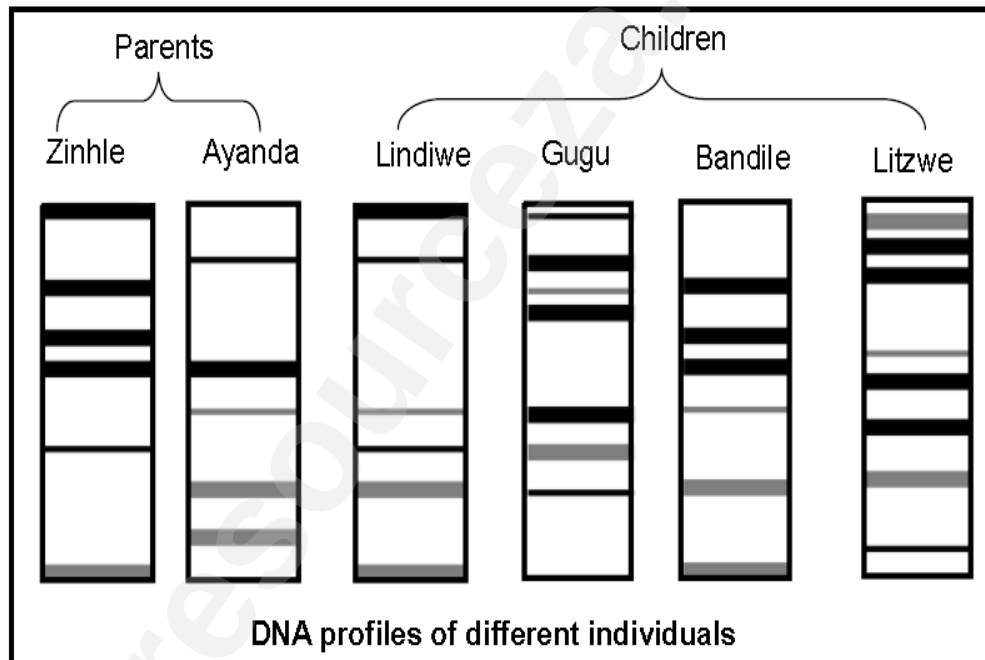
The table below shows the results of the analysis for the DNA from each source.



- 5.1 What do the diagrams above represent? (1)
- 5.2 Which suspect is most likely the thief? (1)
- 5.3 Give a reason for your answer to QUESTION 5.2. (2)
- 5.4 State TWO possible disadvantages of using this evidence in a court of law. (2)

Q6. The diagram below shows the DNA profiles of six members of a family. The greater the similarity in the position of the bands in the DNA profiles of different individuals, the more closely they are related.

The parents, Zinhle and Ayanda, have four children. Two of the children are their biological offspring while the other two children are adopted.



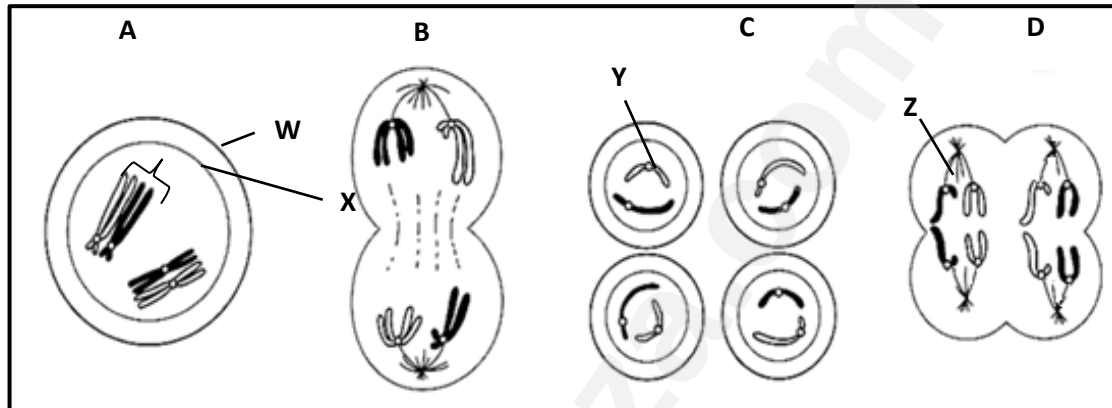
- 6.1 Which TWO children are the biological offspring of Zinhle and Ayanda? (2)
- 6.2 Give an explanation for your answer to QUESTION 6.1 using evidence from the DNA profiles. (2)

2.2 MEIOSIS

Study the section on meiosis in the *Mind the GAP Study Guide* on p.9 – 16 before you answer the following questions. In question one the answers are provided with an explanation.

(DBE, March 2016, Paper 2)

Q1. The diagrams below show different phases in meiosis.

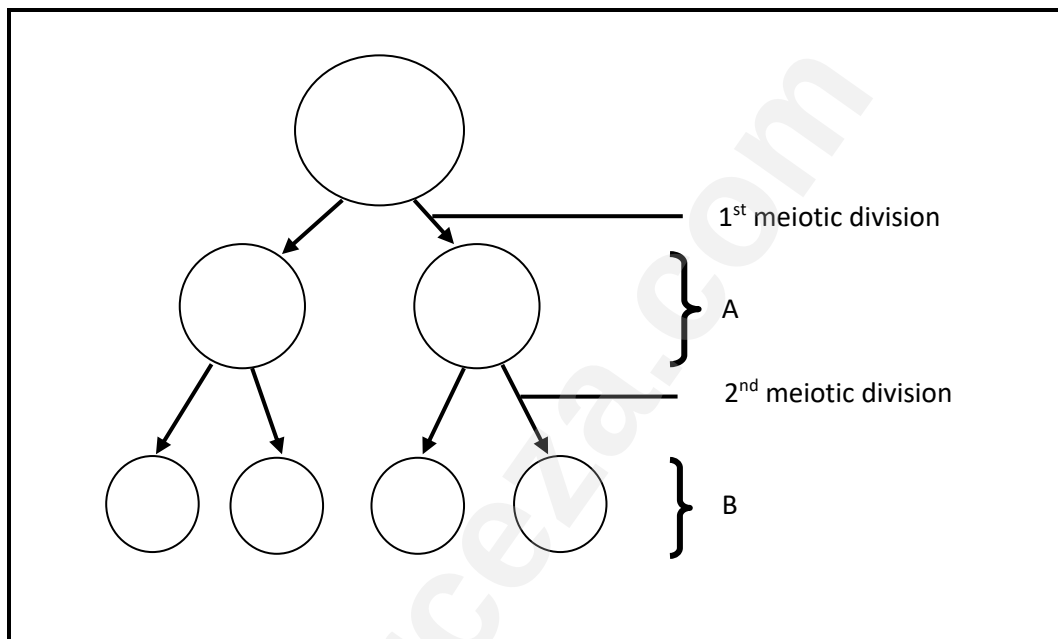


- 1.1 Label structures **W** and **X**. (2)
(W – Cell membrane /Plasmalemma. The outer membrane is the cell membrane and the inner membrane is the nuclear membrane. The outer line is not a cell wall. X - Homologous chromosomes. The chromosome pair is similar in length and shape.)
- 1.2 How many chromosomes are present in each cell in:
 - (a) Phase A (4- there are 2 homologous pairs of chromosomes which equals to 4 chromosomes) (1)
 - (b) Phase C (2 – this is the end of the reduction division - Telophase II – each of the 4 cells/gametes contains half of the original number of chromosomes) (1)
- 1.3 Give only the LETTER of the diagram that represents anaphase II. (*D – chromatids are being pulled apart and not chromosomes – as in anaphase I*). (1)
- 1.4 State the function of structure Y and structure Z. (*Y - Holds the 2 chromatids of a single chromosome together, because it is the centromere. Z - Pulls chromosomes/chromatids to the poles, because it is the spindle fibres*) (2)
- 1.5 Identify phase C. (*Telophase II, because four cells are formed with only half of the original number of chromosomes*) (1)

(8)

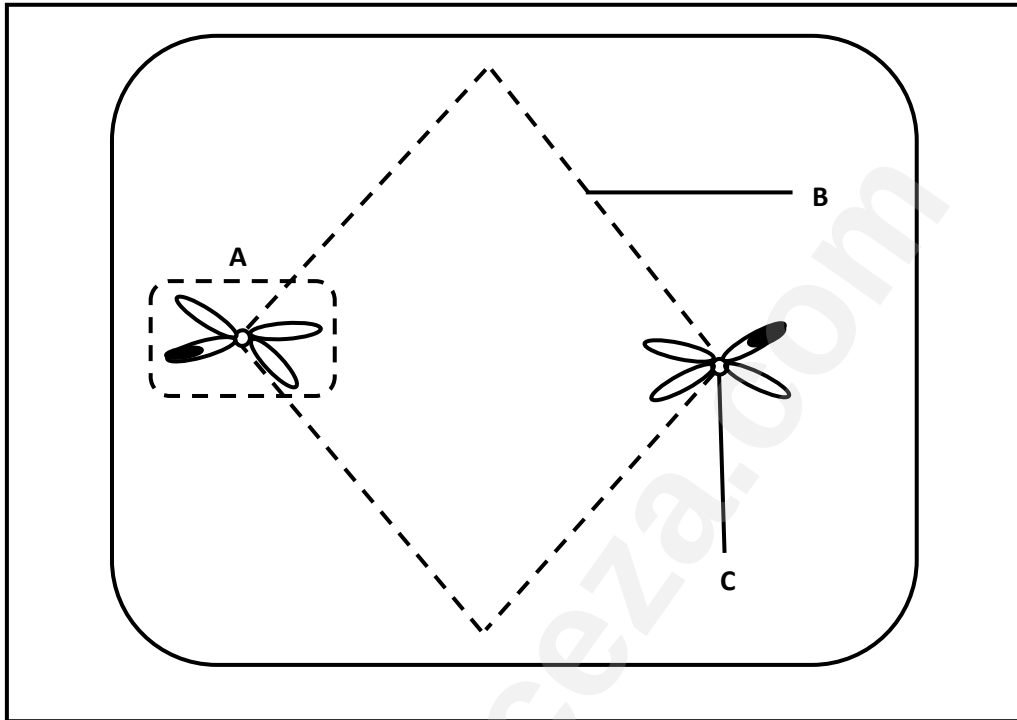
Try the following questions on your own. Write down your answers first before you refer to the answers provided in Answer Booklet.

Q2. Study the diagram below, which shows a process occurring in a human male.



- 2.1 Name the process by which male gametes in humans are formed through meiosis. (1)
 - 2.2 Name the organ in males where the process mentioned in QUESTION 2.1 takes place. (1)
 - 2.3 How many chromosomes will be found in each cell at:
 - (a) A (1)
 - (b) B (1)
 - 2.4 Name TWO processes occurring during the 1st meiotic division that contribute to the genetic variation of cells **A**. (2)
 - 2.5 How many cells at **B** will carry the Y-chromosome? (1)
 - 2.6 What are the mature cells at **B** called? (1)
- (8)**

Q3. The diagram below illustrates a phase in meiosis.



3.1 Identify part:

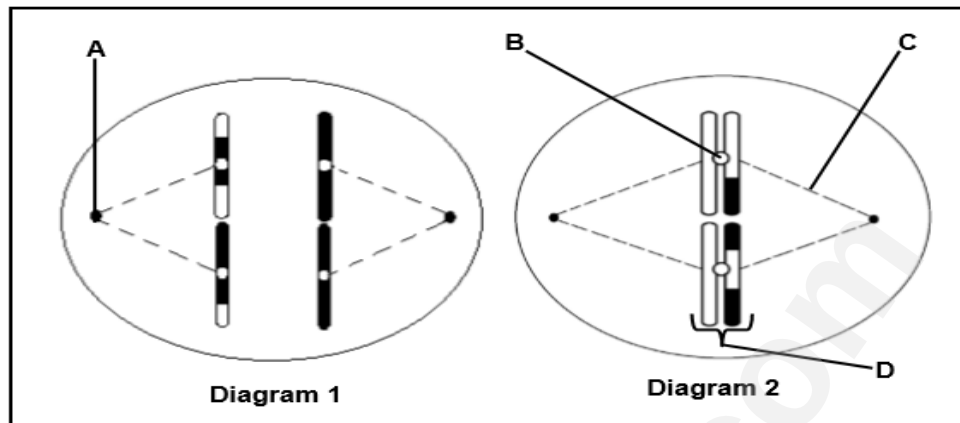
- | | | |
|-----|----------|-----|
| (a) | A | (1) |
| (b) | B | (1) |
| (c) | C | (1) |

3.2 Identify the phase illustrated above. (1)

3.3 Give a reason for your answer to QUESTION 3.2. (2)

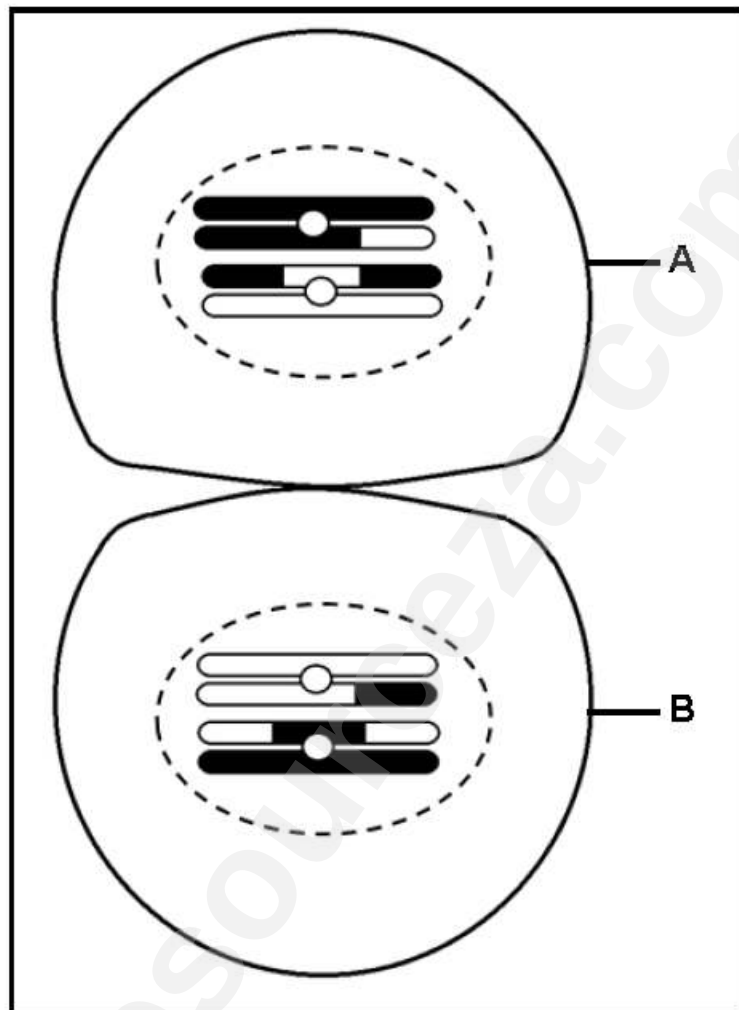
(6)

Q4. The diagrams below represent two phases of meiosis in an organism.



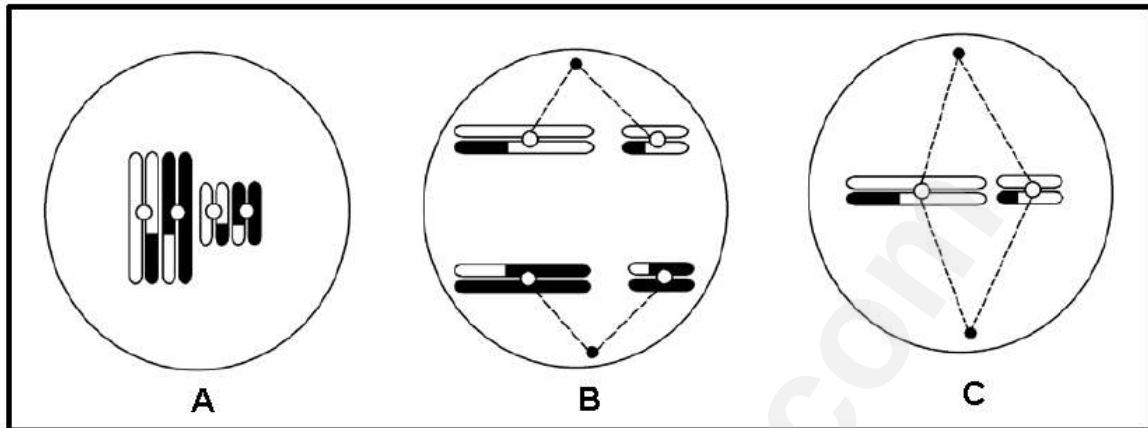
- 4.1 Identify the phase of meiosis represented in Diagram 1. (1)
- 4.2 Identify part:
- (a) A (1)
- (b) B (1)
- (c) C (1)
- 4.3 State what happens to structure D in the next phase of meiosis. (1)
- 4.4 Name the process during which genetic material was exchanged, as shown in the diagrams above. (1)
- 4.5 State the consequence if the process named in QUESTION 4.4 does not occur. (1)
- 4.6 Give the number of chromosomes present in:
- (a) The original parent cell in this organism (1)
- (b) A human cell in the same phase as that shown in Diagram 2 (1)
- (9)**

Q5. The diagram below represents a phase of meiosis.



- 5.1 Identify the phase of meiosis in the diagram above. (1)
- 5.2 Name TWO structures in a flower where meiosis takes place. (2)
- 5.3 Draw a diagram to show only the TWO gametes formed from cell **A**. (NO labels required.) (4)
- 5.4 Tabulate TWO differences between prophase **I** and prophase **II**. (5)
- 5.5 State ONE difference between metaphase **I** and metaphase **II** (2)
- 5.6 Describe the events of anaphase **II**. (3)

Q6. The diagrams below represent various phases of meiosis.



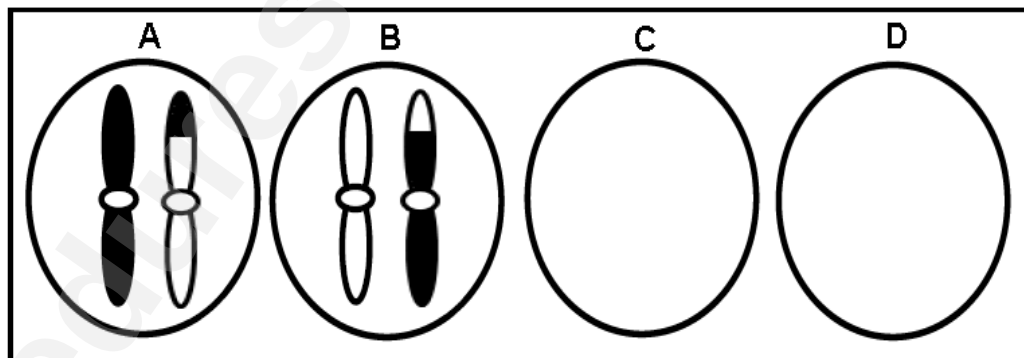
6.1 Identify the phase of meiosis in diagram:

(a) A (1)

(b) B (1)

6.2 Draw a labelled diagram to show the cells that will be formed at the end of meiosis from the cell in diagram C. (5)

Q7. The diagrams below represent the distribution of chromosome pair 21 as it appears in gametes at the end of meiosis II in a human male.



7.1 Explain why the gametes represented by diagrams **C** and **D** do not have any chromosomes. (3)

7.2 If gamete **A** is involved in fertilisation, describe how this may result in Down syndrome. (3)

7.3 Due to the process of crossing over, the chromosomes in diagrams **A** and **B** appear different to each other.

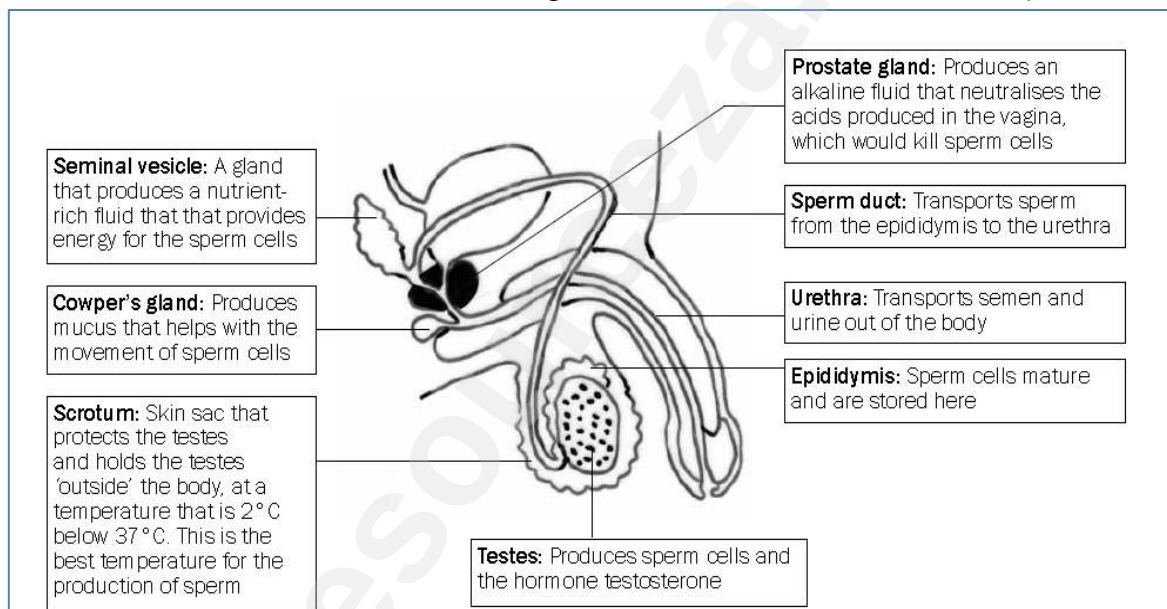
- (a) Identify the phase of meiosis during which crossing over occurs. (1)
- (b) Describe the events during crossing over. (3)

HUMAN REPRODUCTION:

Structure of male and female reproductive systems

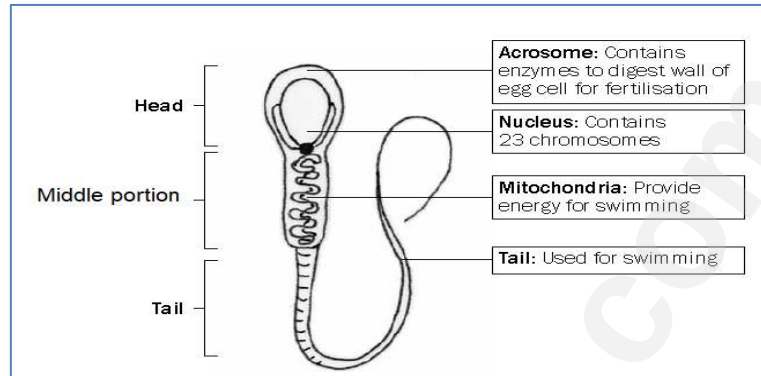
Structure of male reproductive system

You should be able to *label and* give the functions of the different parts.



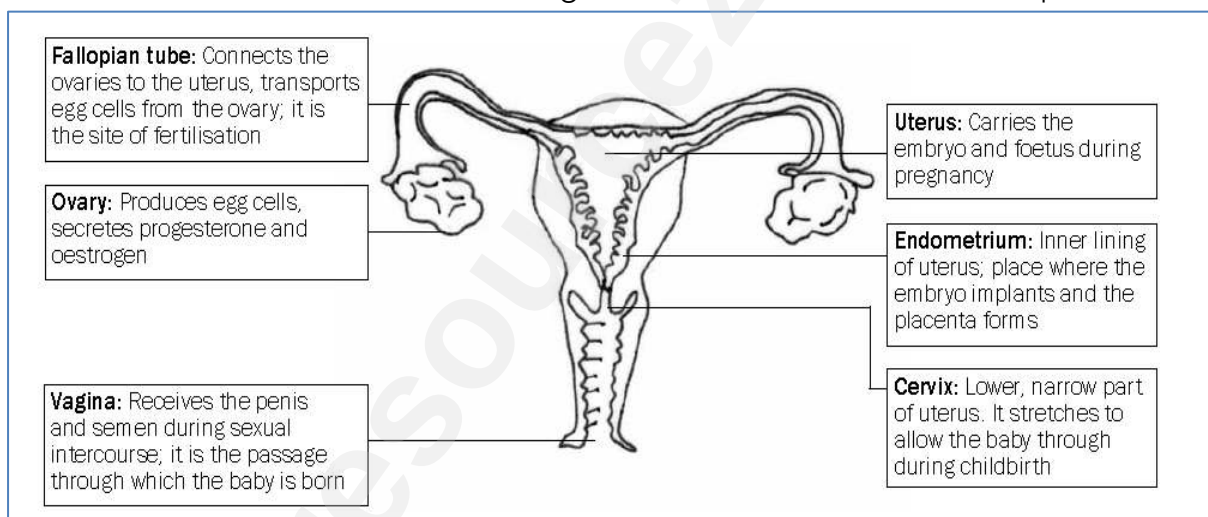
Structure of a sperm cell:

You should be able to draw a sperm cell and label and give the functions of the different parts. Note: The following labels are required according to the National Examination Guideline document: **acrosome, head, haploid nucleus, middle portion/neck, mitochondrion, tail.**



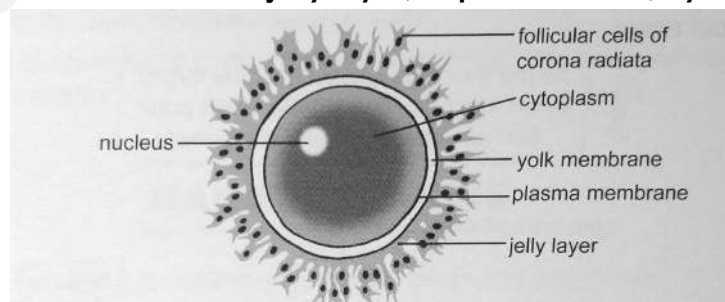
Structure of female reproductive system:

You should be able to label and give the functions of the different parts.



Structure of an ovum:

You should be able to draw an ovum and label and give the functions of the different parts. Note: The following labels are required according to the National Examination Guideline document: **jelly layer, haploid nucleus, cytoplasm.**



Define puberty?

Puberty is the stage when secondary characteristics develop in males and females.

Define gametogenesis (links with meiosis):

- Gametogenesis is the formation of gametes by meiosis
- Male gametes formed by **spermatogenesis**
- Female gametes formed by **oogenesis**

Describe the process of spermatogenesis:

- Diploid cells in the seminiferous tubules of the testes undergo meiosis under the influence of the hormone, **testosterone**, to form **haploid sperm cells**

Describe the process of oogenesis:

- Diploid cells in the ovary undergo mitosis to form numerous follicles.
- At the onset of puberty and under the influence of **FSH**
- One cell inside a follicle enlarges and undergoes **meiosis**
- Of the four cells that are produced, only one survives to form a **haploid ovum**.
- This occurs in a monthly cycle.

Describe the menstrual cycle (ovarian and uterine cycles) and how it is influenced by different hormones (note the structures and names and functions of different hormones)

- The menstrual cycle is a series of events that occur in the female body to prepare it for possible pregnancy.
- The pituitary gland/hypophysis secretes **FSH** which stimulates the development of a primary follicle into a **Graafian follicle** in the ovary
- The **Graafian follicle** secretes **oestrogen** which stimulates the thickening of the lining of the uterus/endometrium
- Around day 13/14 pituitary gland/hypophysis secretes **LH which** cause **ovulation** to occur
- The remains of the Graafian follicle develop into the **corpus luteum** which secretes the hormone, **progesterone** which continues to stimulate the thickening of the uterus
- High levels of progesterone inhibit the production of FSH so that the ovaries are no longer stimulated to produce another follicle (**negative feedback mechanism**).

- If fertilisation does not occur, the corpus luteum degenerates and stops producing progesterone
- The pituitary gland/hypophysis is no longer inhibited in its production of FSH and a new follicle develops
- The thick endometrium is no longer maintained, and it degenerates and is shed together with blood and menstruation takes place
- If fertilisation does occur the corpus luteum continues to function until the 12th week of pregnancy.

Describe the development of a zygote until implantation occurs:

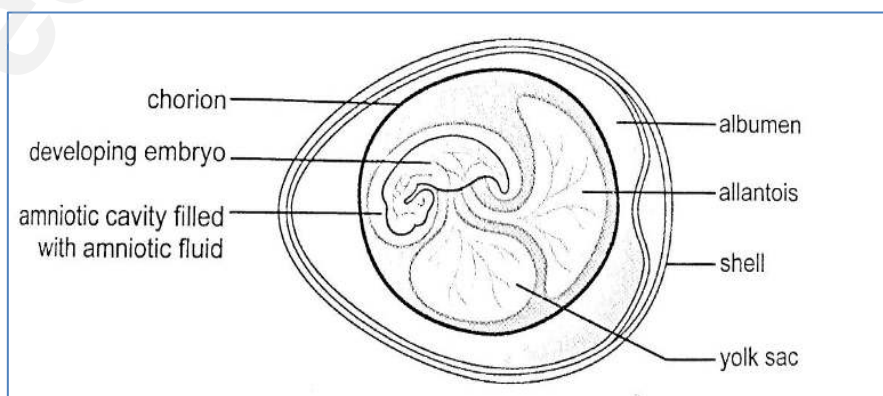
- **Zygote** divides by mitosis to form a ball of cells called the **morula**
- The morula further divides to form a hollow ball of cells called the **blastula**.

DIVERSITY OF REPRODUCTIVE STRATEGIES:

You should be able to **differentiate** between the different reproductive strategies.

- **External fertilisation** - takes place outside the female's body e.g. in fish and amphibians. Large number of gametes are produced. More energy is used to produce a large number of gametes.
- **Internal fertilisation** – takes place inside the female's body. Fewer gametes are produced. Less energy used to produce a small number of gametes.
- **Ovipary** – The embryo develops in an egg outside the female's body e.g. in fish, some birds and reptiles. Large number of gametes are produced which requires a lot of energy
- **Ovivivipary** – The egg is retained/hatched in the female body and the young are born live. Female produces few eggs, which requires less energy.
- **Vivipary** – Internal fertilization takes place and the fertilized egg develops into an embryo which is directly connected to the mother as it receives nutrients through a placenta e.g. mammals. The female produces few gametes which requires less energy.
- **Amniotic egg** - The type of egg produced by reptiles, birds that has extra-embryonic membranes. After internal fertilization the embryo is enclosed in an egg with a hard shell.

Structure of an amniotic egg



- **Precocial development** - The type of development in some animals e.g. birds where the hatchlings' eyes are open, and their bodies are covered with feather. Most of the energy is used for prenatal development.
- **Altricial development** – The type of development in some animals where the young are not fully developed and cannot move around immediately after being born or hatched.
- **Parental care** – a behavioural pattern where parents spend time and energy on the feeding and protection of their offspring.

REVISION QUESTIONS

- Answer the questions below.
- The **instructional verbs (in italics)** e.g. name, give, describe, explain etc. and the **mark allocation per question** give an indication of what and how much information you should provide in your answer.

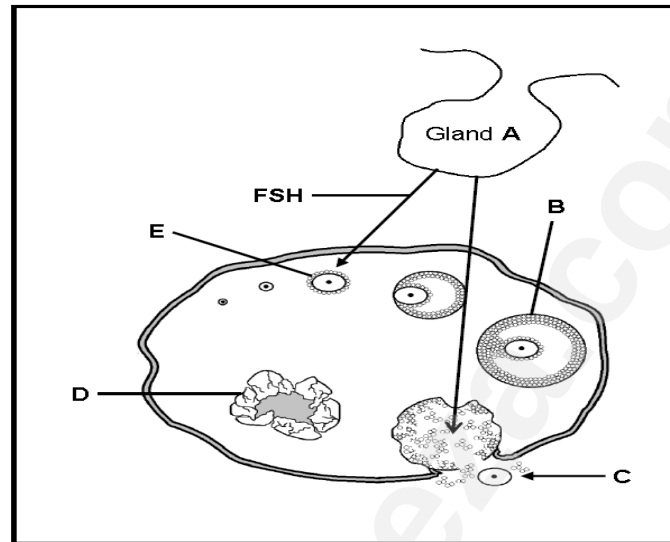
Examples of some of the instructional verbs used in test and examination questions:

Instructional verb	Meaning
<i>Name</i>	Give the name of something
<i>Differentiate</i>	Use differences to qualify between two or more categories
<i>Tabulate</i>	Draw a table and indicate the answers as direct pairs.
<i>Describe</i>	State in sentences the main points of a process
<i>Explain</i>	Give your answer in a cause-effect or statement and reason sequence
<i>Compare</i>	Give similarities and differences between concepts

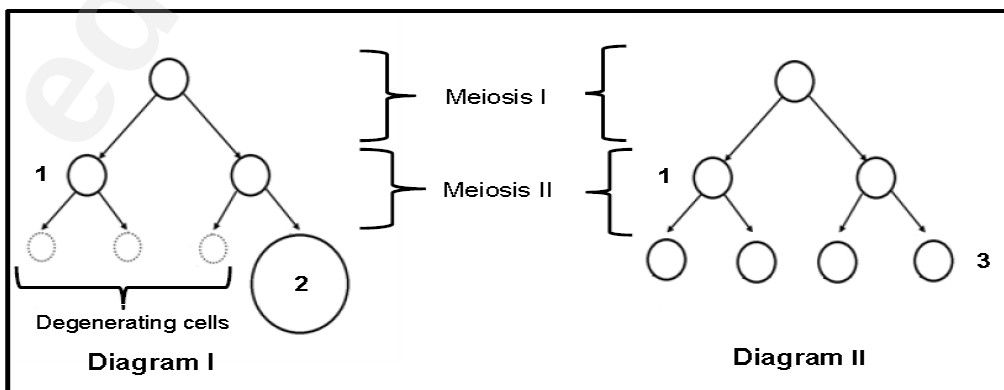
- Please note that **HIGHER ORDER questions** are in **BOLD** and marked with a (*)

Topic: Human reproduction:

1. The diagram below represents an endocrine gland **A** and the events that take place in the ovary during the menstrual cycle in humans.



- 1.1 Identify:
- (a) Gland A (1)
 - (b) Structure B (1)
 - (c) Process C (1)
 - (d) Structure D (1)
- 1.2 State the effect on the oestrogen levels in the blood if gland **A** stops secreting FSH. (1)
- 1.3 State ONE function of LH. (1)
2. Diagrams I and II below represent gametogenesis in human males and females (not in any particular sequence). The diagrams are NOT drawn to scale.



- 2.1 Identify the specific type of gametogenesis in Diagram I. (1)

(*)2.2 Explain your answer to QUESTION 2.1 by referring to a visible difference between Diagram I and Diagram II. (2)

2.3 Where in the human body does the type of gametogenesis shown in Diagram II take place? (1)

2.4 Give the chromosome number of:
 (a) The cells at **1** (1)
 (b) Cell **2** (1)

2.5 Name TWO processes that take place during Meiosis I that lead to genetic variation in the four cells shown at **3** in Diagram II. (2)

(*)2.6 Explain the implication for the human population size if the three cells referred to in Diagram I did not degenerate, but remained as gametes. (2)

3. An investigation was carried out to determine the effects of smoking during pregnancy on the baby's birth weight. Babies born weighing 2 499 g or less have a low birth weight.
 The table below compares the percentage of babies with a low birth weight born to mothers who smoked with mothers who did not smoke in a certain city in 2009.

BIRTH WEIGHT (GRAMS)	PERCENTAGE OF TOTAL BIRTHS (%) IN 2009	
	MOTHERS WHO SMOKED	MOTHERS WHO DID NOT SMOKE
<1 000	0,7	0,2
1 000–1 499	0,9	0,3
1 500–1 999	2,2	1,1
2 000–2 499	7,1	3,2

[Adapted from www.aicw.gov.au]

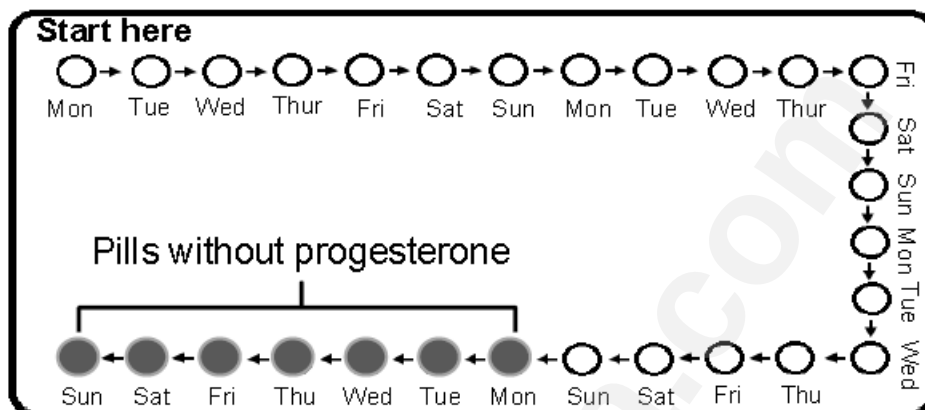
(*)3.1 Draw a histogram to represent the percentage of births in each weight group born to mothers who smoked. (6)

3.2 Why were babies that weighed more than 2 500g at birth not included in the investigation? (1)

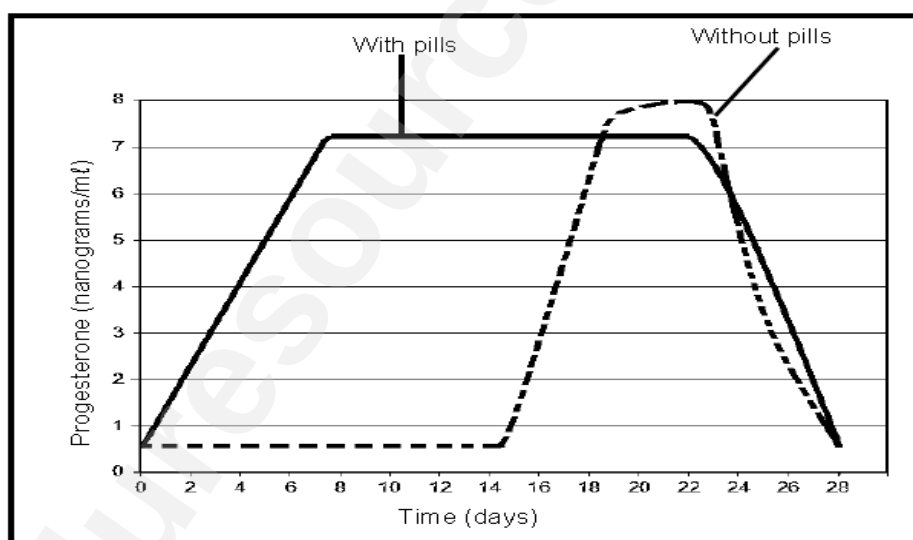
(*)3.3 State a general conclusion for the investigation based on the data in the table. (2)

(*)3.4 Describe how chemicals from cigarette smoke are able to reach the baby's blood from the mother's blood. (2)

4. Contraceptives are used to prevent pregnancy. Some females use pills that contain progesterone. In one packet there would be 28 pills, of which 21 contain different concentrations of progesterone according to the day in the cycle and the remaining 7 will contain no progesterone. A female has to take one pill daily at the same time in a given sequence, as shown below.

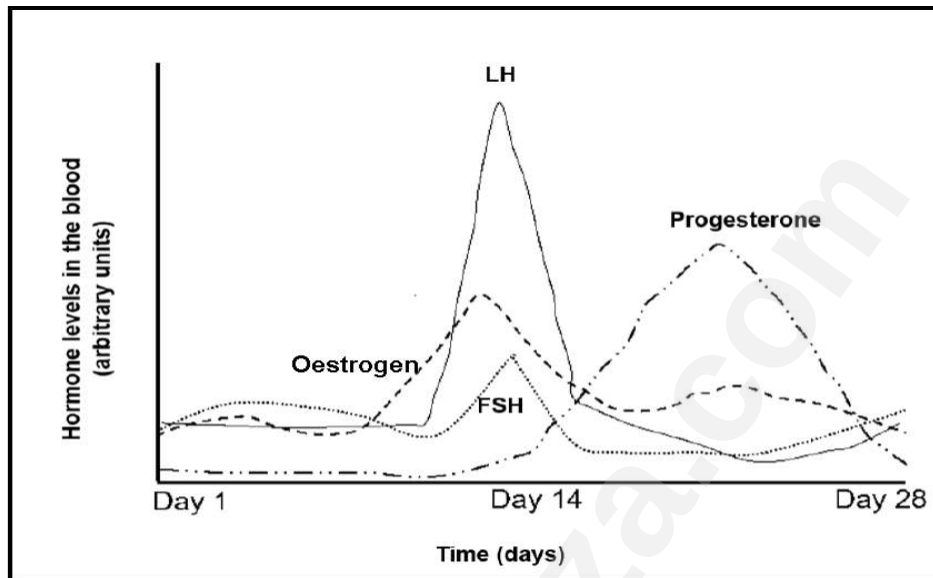


The graph below shows the difference in the progesterone levels during a menstrual cycle of a woman taking contraceptive pills and a woman not taking contraceptive pills.



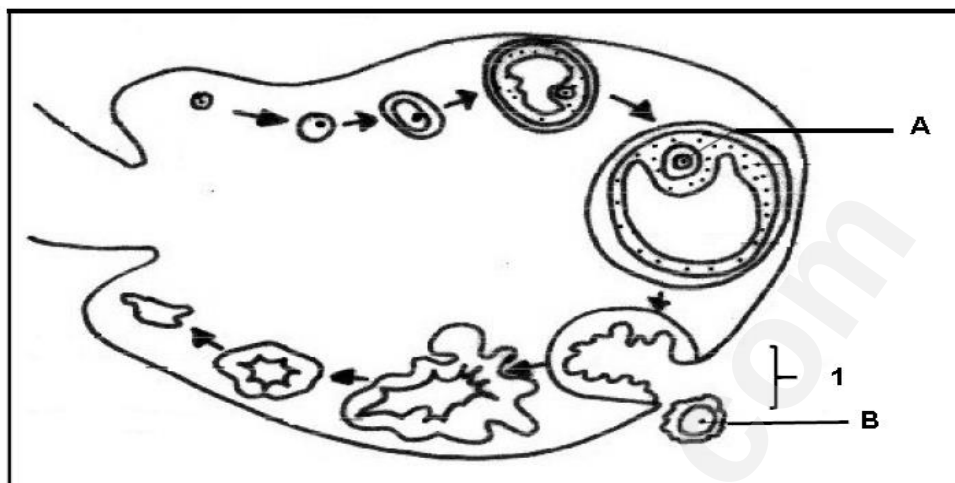
- (*)4.1 The oestrogen levels between days 8 and 22 will remain low in the woman who takes contraceptive pills. *Explain why this is the case.* (4)
- (*)4.2 Ovulation took place on day 14 in the woman not taking contraceptive pills. *Explain the evidence in the graph that supports this conclusion.* (2)
- (*)4.3 Suggest ONE reason for including pills with no hormones in the contraceptive pill packet. (1)

5. The graph below shows the changes in the concentration of hormones in the blood of a woman during a menstrual cycle.



- (*)5.1 Explain why the concentration of FSH in the blood increases after Day 1. (3)
- 5.2 State what happens to oestrogen levels in the blood when the LH level increases. (1)
- (*)5.3 Explain why the oestrogen level decreases after Day 14. (2)
- (*)5.4 With reference to hormonal control, describe what causes menstruation to occur between Days 1 – 4. (2)
- 5.5 Describe the process of oogenesis. (5)
6. The human ovarian cycle includes follicle development, ovulation and the formation of the corpus luteum. Describe the secretion and functions of the hormones involved in the ovarian cycle and also describe the negative feedback mechanism in which progesterone controls the production of ova. (17)

7. The diagram below shows events in the ovary during the menstrual cycle in a 28-day cycle.



- 7.1 Identify:

- (a) Structure A (1)
(b) Process 1 (1)

- 7.2 Name the hormone responsible for process 1. (1)

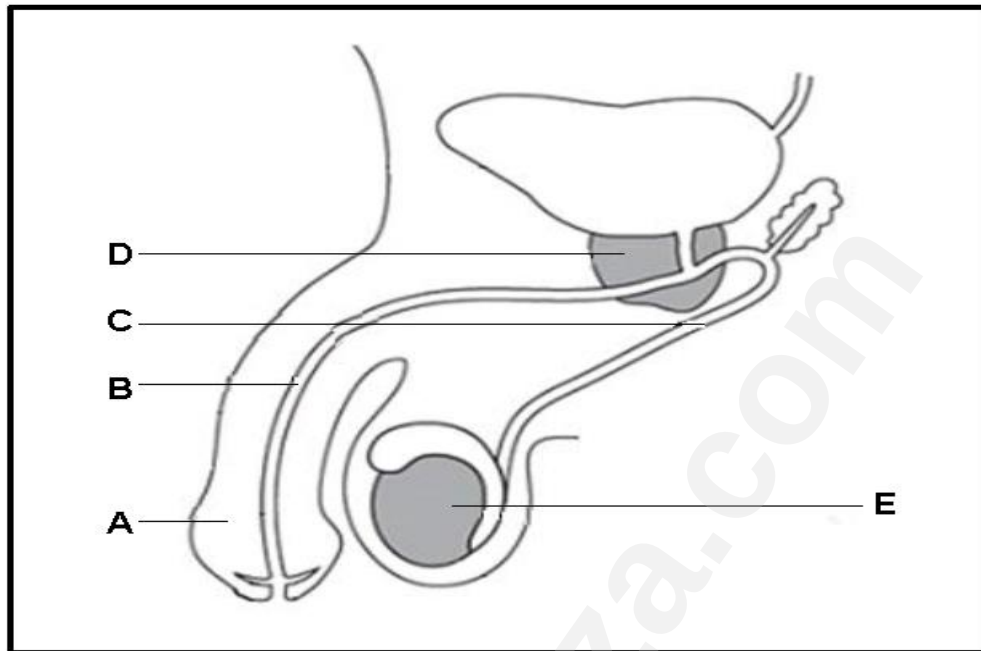
- (*)7.3 A woman was given medication with high concentration of progesterone. Explain the effect of this medication on the ovarian cycle. (3)

- (*)7.4 Give an observable reason which suggest that fertilisation did not take place after the process numbered 1. (2)

- (*)7.5 Explain why a female who has only her ovaries removed will not undergo menstruation. (4)

- 7.6 Draw a labelled diagram of the structure B. (3)

8. The diagram below represents a part of the male reproductive system.



- 8.1 Identify

- | | | |
|-----|---|-----|
| (a) | B | (1) |
| (b) | D | (1) |
| (c) | E | (1) |

- 8.2 Describe the process of spermatogenesis in part **E**. (4)

- (*)8.3 Test results show that a man has a low sperm count. Explain why a doctor would advise the man to wear underwear that is not tight. (3)

- (*)8.4 During a vasectomy the vas deferens from both testes is cut. Explain ONE reason why a man who has had a vasectomy is still capable of ejaculation. (2)

- (*)8.5 Explain THREE structural adaptations of the sperm for fertilisation. (6)

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