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LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

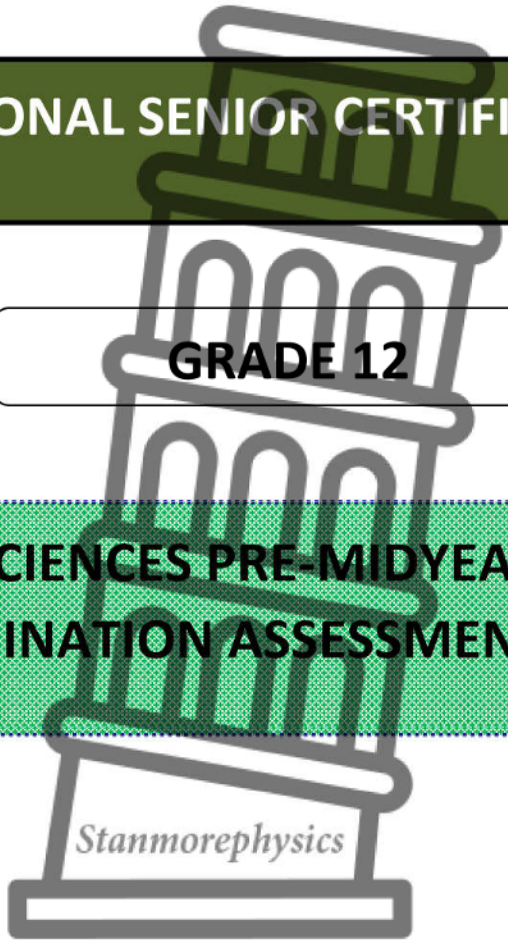
DEPARTMENT OF
EDUCATION

MOGALAKWENA DISTRICT

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES PRE-MIDYEAR EXAMINATION ASSESSMENT: 2023.



TOTAL MARKS: 150
TIME: 2,5 HOURS

This question paper consists of 17 pages including the cover page.

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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 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. Make ALL drawings in pencil and label them in blue or black ink.
7. Draw diagrams, tables or flow charts only when asked to do so.
8. The diagrams in this question paper are NOT necessarily drawn to scale.
9. Do NOT use graph paper.
10. You must use a non-programmable calculator, protractor and a compass, where necessary.
11. Write neatly and legibly.

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SECTION A			
QUESTION1			
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 1.1.10) in the ANSWER BOOK, for example 1.1.10 D		
	1.1.1	During which of the following phases does DNA replication take place? A. Telophase B. Prophase C. Interphase D. Metaphase	2
	1.1.2	The term that describes nuclear division is known as… A. Gametogenesis B. Cytokinesis C. Karyokinesis D. Cytoclosis	2
	1.1.3	Which part of the human brain controls balance and equilibrium? A Cerebrum B Cerebellum C Medulla oblongata D Corpus callosum	2
	1.1.4	A learner conducted an investigation to determine the percentage of people that are long-sighted. The factor that is LEAST likely to affect such an investigation is the ... A light intensity of the room in which the test was conducted. B height of the people. C age of the people in the sample. D distance between the tool used to test the sight and the person being tested.	2

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	1.1.5	The data below represents the results of an investigation used to determine how the thickness of the lens changed as a pencil was moved away from the eye. **DISTANCE FROM EYE (cm)** / **THICKNESS OF LENS (mm)** 10 / 4,0 20 / 3,6 30 / 3,2 50 / 2,9 100 / 2,6 150 / 2,6 200 / 2,6 [Adapted from *Complete Biology*, 2000] The general conclusion that can be made from the data is that … A as the distance from the eye increased up to 100 cm, the thickness of the lens increased, after which it remained constant. B as the distance from the eye decreased, the thickness of the lens remained constant. C as the distance from the eye increased up to 100 cm, the thickness of the lens decreased, after which it remained constant. D the thickness of the lens increased with an increase in distance	2
	Questions 1.1.6 and 1.1.7 refer to the information below. In pea plants yellow seed colour (Y) is dominant over green seed colour (y). Smooth seed texture (S) is dominant over wrinkled seed texture (s). A student crossed a plant which had yellow wrinkled seeds with a plant which had green smooth seeds.		2
	1.1.6	Which ONE of the following shows possible alleles present in a gamete that is produced by the plant with yellow wrinkled seeds? A YYss B yySS C yS D Ys	2

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	1.1.7	Which ONE of the following is a possible representation of the genotypes of the P_1 generation? A YYSS x yyss B Yyss x yySs C YYSS x yySs D Yyss x YySs	2
	1.1.8	The gland that acts as both exocrine and endocrine is the… A Pancreas B Thyroid gland C Adrenal gland D Mammary gland	2
	1.1.9	Which of the following CORRECTLY represents the events involved in the secretion and action of ADH(antidiuretic hormone)?	2
	1.1.10	Eggs or ova are produced in the… A Fallopian tubes B ovaries C uterus D vagina	2
		(10 X 2)	**(20)**

	WATER LEVEL IN BLOOD RELATIVE TO NORMAL	AMOUNT OF ADH PRODUCED RELATIVE TO NORMAL	AMOUNT OF WATER REABSORBED BY KIDNEYS
A	Increase	Increase	Decrease
B	Increase	Decrease	Increase
C	Decrease	Increase	Increase
D	Decrease	Decrease	Decrease

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 1.2.8) in the ANSWER BOOK.		
	1.2.1	Mutual exhange of genetic information between homologous chromosomes at the chiasma	1
	1.2.2	The bag that contains the testes	1
	1.2.3	The inner wall of the uterus which is richly supplied with blood	1
	1.2.4	Site where sperms are stored in the male	1
	1.2.5	A chromosome number twice that of a gamete of a given species	1
	1.2.6	The type of cell division during which reduction of chromosomes takes place	1
	1.2.7	A rapid involuntary response to a stimulus	1
	1.2.8	Membrane like structures that surround the brain and spinal chord	1
		(8 X 1)	**(8)**

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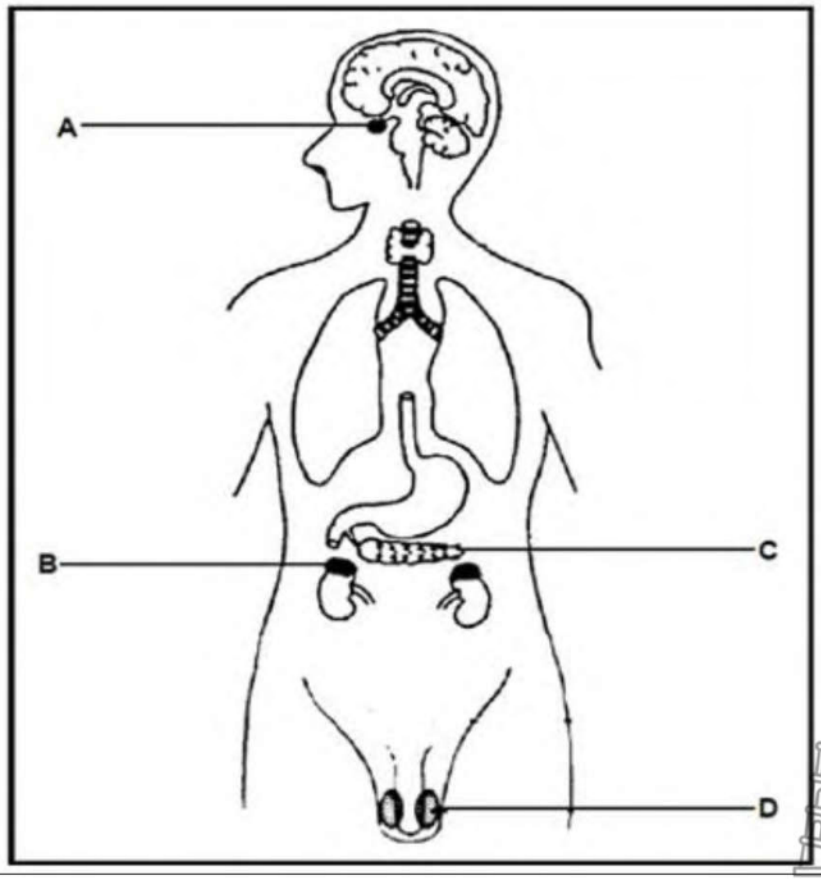
1.3 Indicate whether each of the descriptions in COLUMN I applies to A ONLY, B ONLY, BOTH A AND B or NONE of the items in COLUMN II. Write A only, B only, both A and B, or none next to the question number (1.3.1 to 1.3.3) in the ANSWER BOOK.

COLUMN I	COLUMN 11
1.31. Part of the female reproductive system where fertilisation takes place	A. Vagina B. Fallopian tube
1.3.2 Ejaculated from the male during copulation	A. Semen B. Amniotic fluid
1.3.3 Cells in the pancreas that secrete insulin	A. Thyroid B. Beta cells
1.3.4 Prepares the body for stress	A. insulin B. Adrenalin

(4 x 2) **(8)**

1.4 The diagram below represents parts of the endocrine system in humans.



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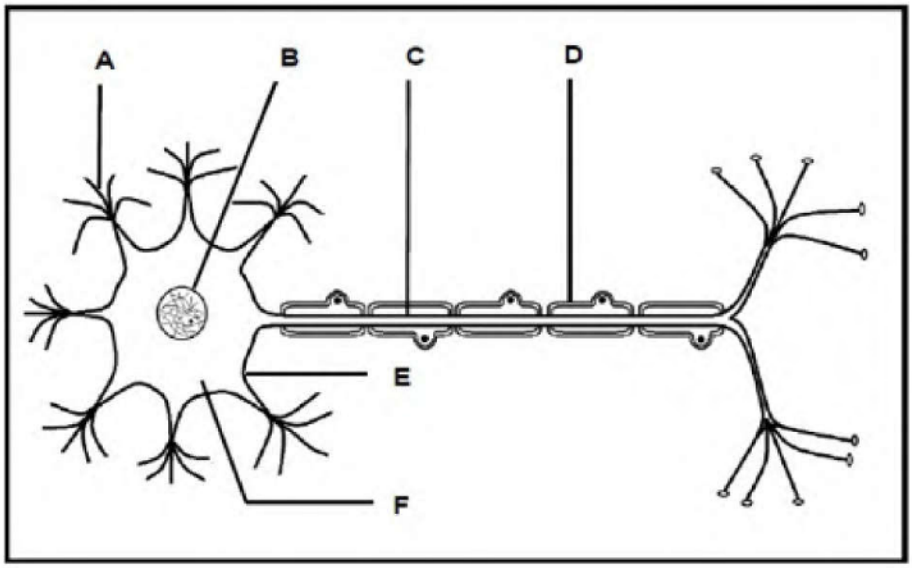
	1.4.1	Identify gland: (a) A (b) B	 1 1
	1.4.2	Give the LETTER and the NAME of the gland that secretes a hormone responsible for: (a) Starting puberty in males (b) Stimulating absorption of glucose by cells (c) Making the kidney tubules permeable to water	 2 2 2
			(8)
1.5	The diagram below represents the structure of a neuron.  		
	1.5.1	Name the type of neuron in the diagram above.	1
	1.5.2	Identify part: (a) B (b) F (c) A	 1 1 1
	1.5.3	Give the LETTER and the NAME of the part that transmits impulses away from the cell body	2
			(6)

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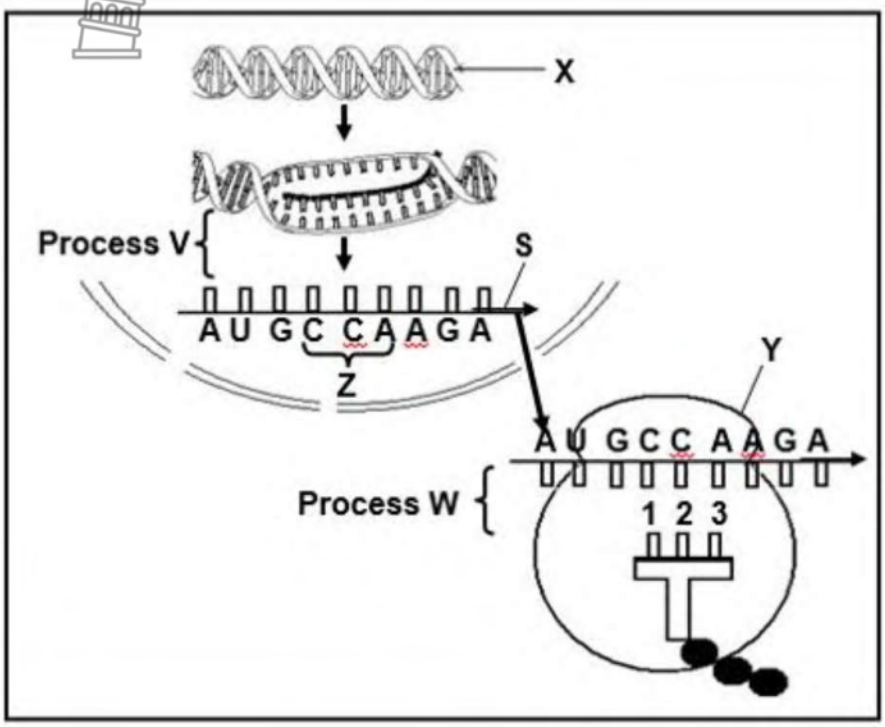
		TOTAL SECTION A	**50**
SECTION B			
QUESTION 2			
2.1	The diagram below shows the process of protein synthesis. 		
	2.1.1	Identify the following: (a) Molecule **X** (b) Organelle **Y**	 1 1
	2.1.2	Identify the nitrogenous base labelled: (a) 1 (b) 3	 1 1
	2.1.3	Describe the role of DNA during transcription.	3
	2.1.4	Describe the part of protein synthesis shown as process **W**, which occurs at organelle **Y**.	4
	2.1.5	Describe the way in which protein synthesis would be affected by a gene mutation	5
			(16)

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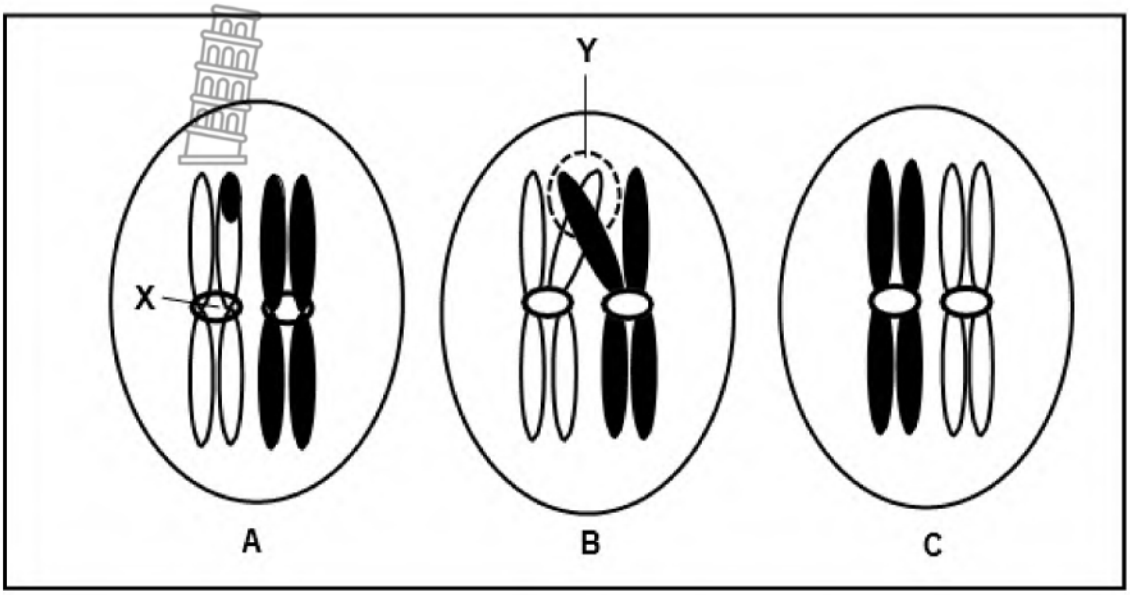
2.2 The diagrams below represent a chromosome pair in a female human cell. The cells (**A**, **B** and **C**) show different events in a phase of meiosis, which are not necessarily in the correct sequence.



2.2.1	How many pairs of chromosomes occur in a normal human cell?	1
2.2.2	Give labels for: (a) Structure **X** (b) Area **Y**	 1 1
2.2.3	Name the organ in the human female where meiosis occurs.	1
2.2.4	Name the: (a) Process occurring in diagram **B** (b) Phase represented by the diagrams above (c) Type of cells that would result from meiosis of this cell	 1 1 1
2.2.5	Arrange the letters **A**, **B** and **C** to show the correct sequence of the events.	1
		(8)

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2.3 In rabbits, black fur is produced by the allele (**B**) and white fur by the allele (**b**).

The table below shows the genotypes of some rabbits.

RABBIT	GENOTYPE
1	BB
2	Bb
3	bb

2.3.1 What is the phenotype:

(a) Produced by the recessive allele — 1

(b) Of rabbit **2** — 1

2.3.2 Give the NUMBER only (**1**, **2** or **3**) of the rabbit(s) that is/are:

(a) Pure-bred — 2

(b) Homozygous dominant — 1

2.3.3 Use a genetic cross to show the percentage chance of rabbits **1** and **3** having offspring with white fur. — 6

(11)

2.4 A lack of immunity to infections (agammaglobulinemia) is a sex-linked recessive genetic disorder in humans. The dominant allele is represented by $\mathbf{X^A}$ and the recessive allele is represented by $\mathbf{X^a}$.

An individual with the disorder is described as affected and an individual without it is described as unaffected. The pedigree diagram below illustrates inheritance of this disorder.

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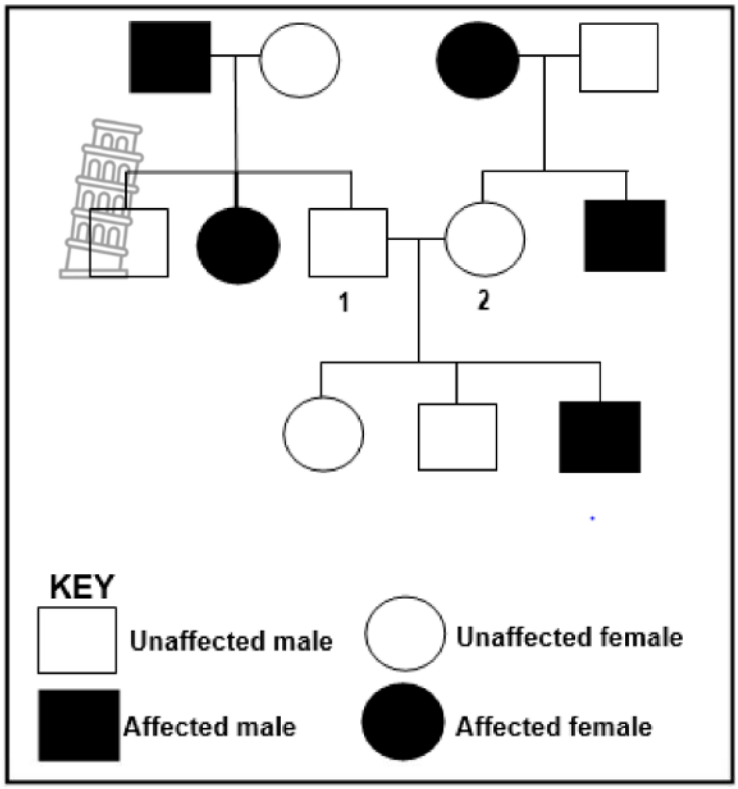

	2.4.1	Name the genotypes of individuals: (a) 1 (b) 2	 2 2
	2.4.2	What percentage of the males in this pedigree diagram is affected? Show ALL working.	2
	2.4.3	Explain why any son of an affected female will always have this disorder.	3
			(9)

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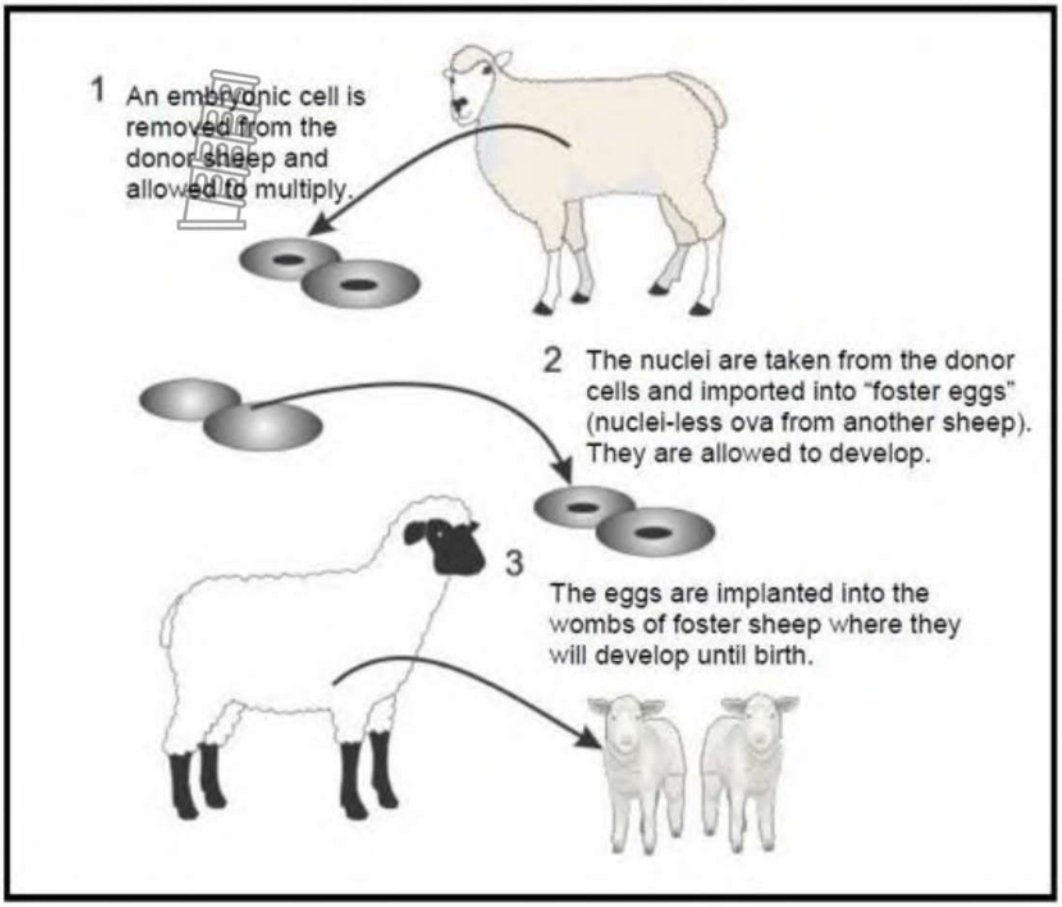
2.5 The diagram below shows one method of cloning sheep.



2.5.1	Explain why the lambs produced by this technique are identical to each other.	2
2.5.2	Explain why the lambs are not genetically identical to the sheep which produced the "foster" eggs.	2
2.5.2	Describe how cloning in animals or plants can be beneficial to humans	2
		(6)
		[50]

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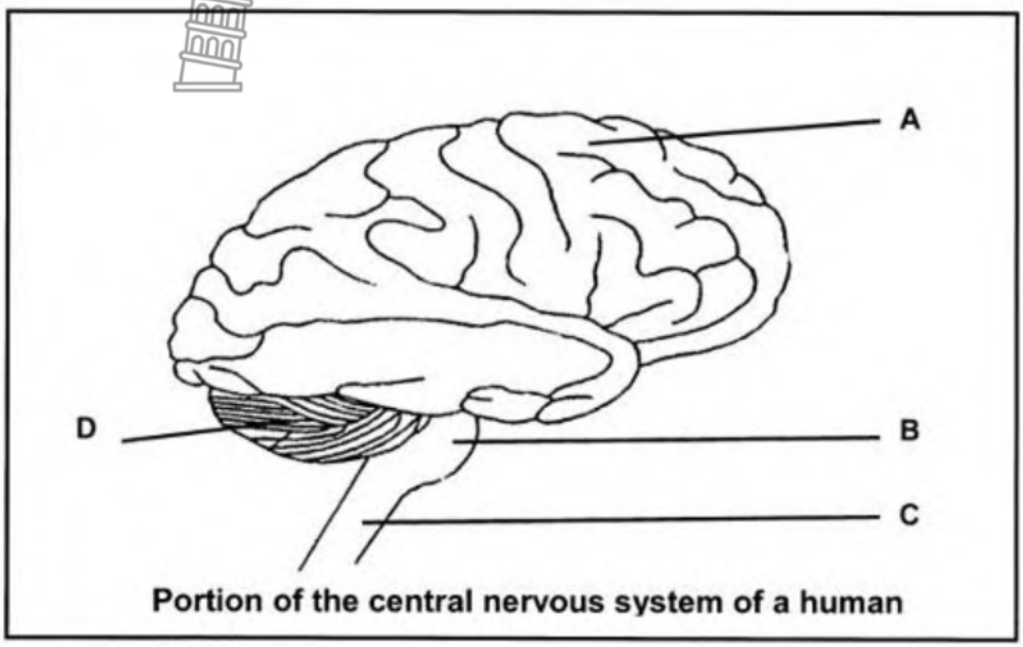
QUESTION 3

3.1 The diagram below represents a portion of the central nervous system of a human.



Portion of the central nervous system of a human

Give the LETTER and the NAME of the part responsible for each of the following:

3.1.1	Regulation of breathing	2
3.1.2	Origin of voluntary actions	2
3.1.3	Maintenance of balance and equilibrium	2
		(6)

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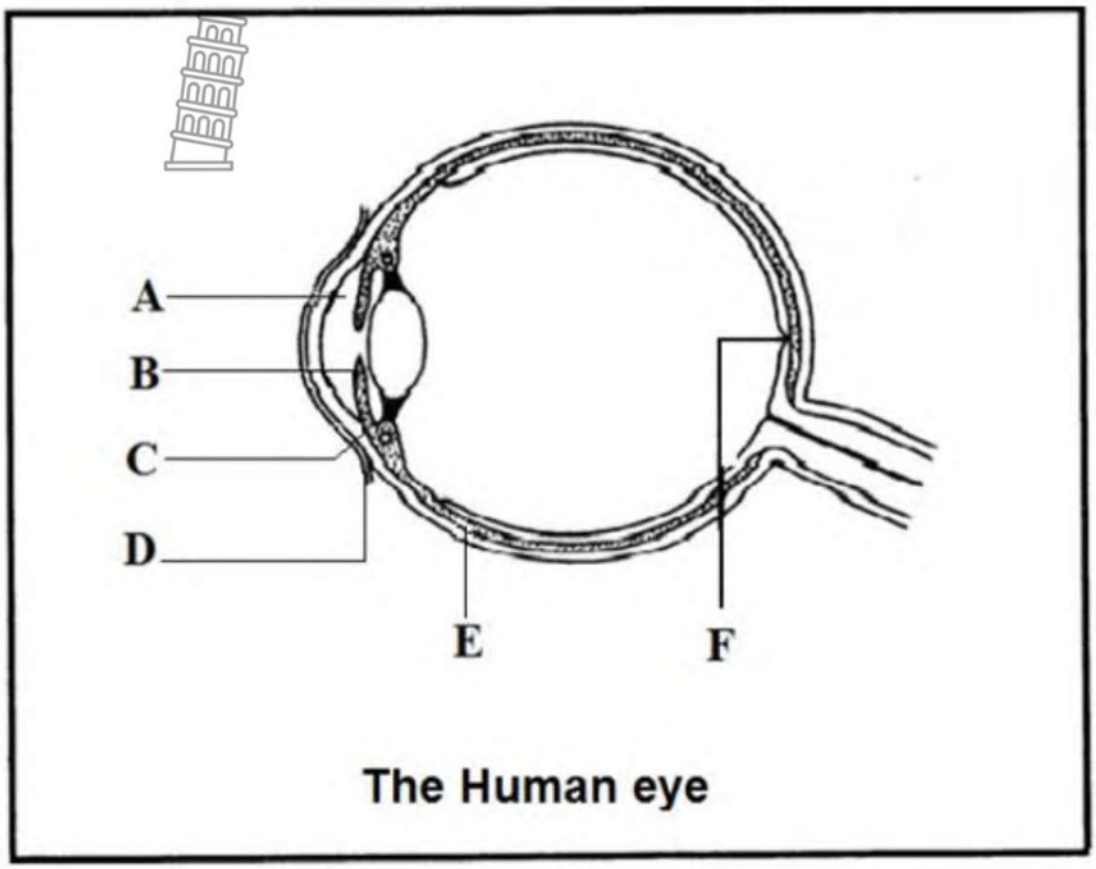
3.2	Study the diagram that represents the human eye and answer the questions that follow.		



The Human eye

Write down the letter and name of each of the following.

3.2.1	Liquid that helps to keep the shape of the cornea.	2
3.2.2	Area where the clearest image is formed.	2
3.2.3	Part of the eye responsible for the colour of the eye.	2
		(6)

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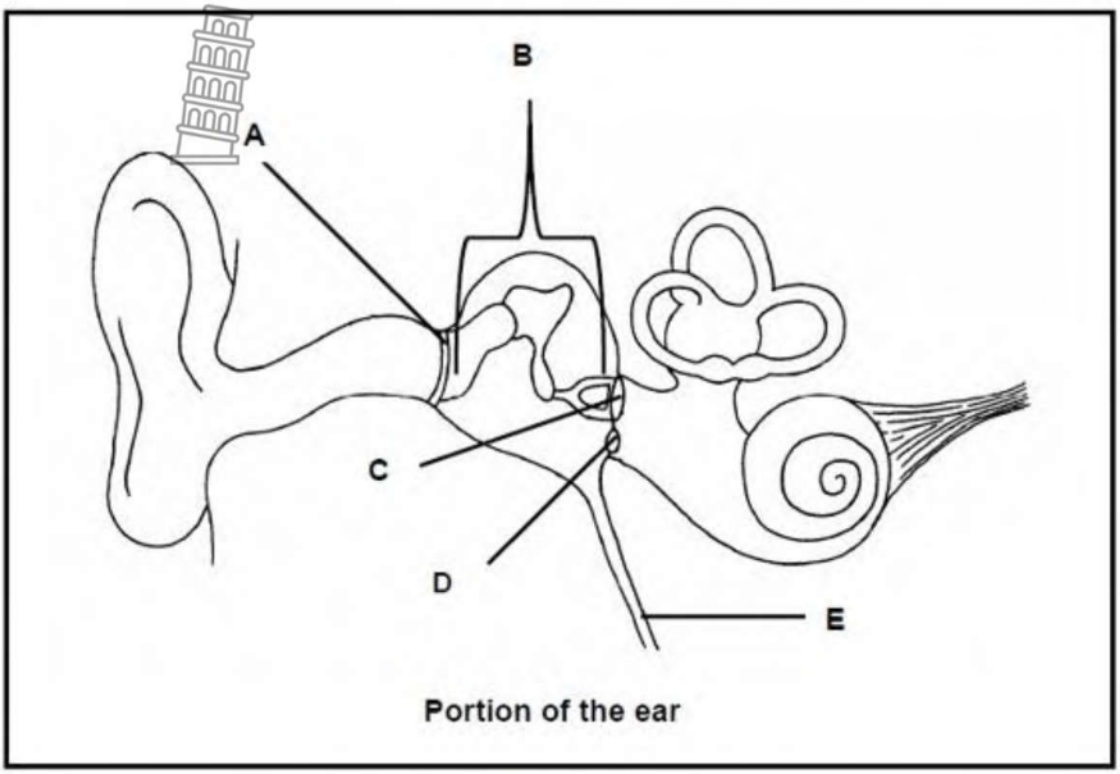
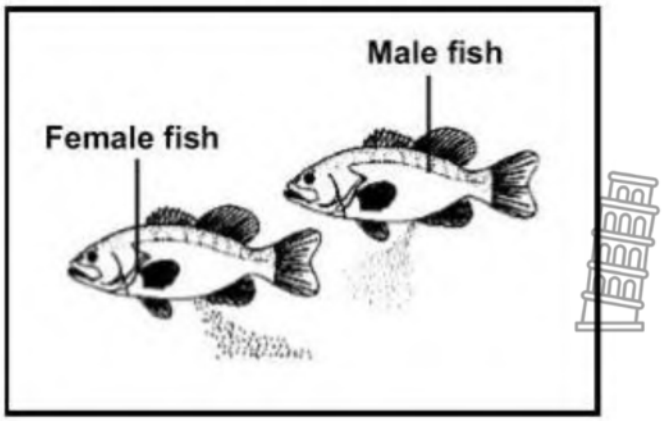
3.3	Study the diagram below showing a portion of the human ear and answer the questions that follow.		
	 Portion of the ear		
	3.3.1	Provide labels for parts **A**, **C** and **D**, respectively.	3
	3.3.2	State ONE function for parts **B** and **D**, respectively.	2
	3.3.3	How are parts **A** and **C** together suited for the amplification of sound?	2
	3.3.4	Explain what would happen if part **E** is blocked with mucus.	2
			(9)
3.4	The diagram below shows a certain species of fish mating.		
			

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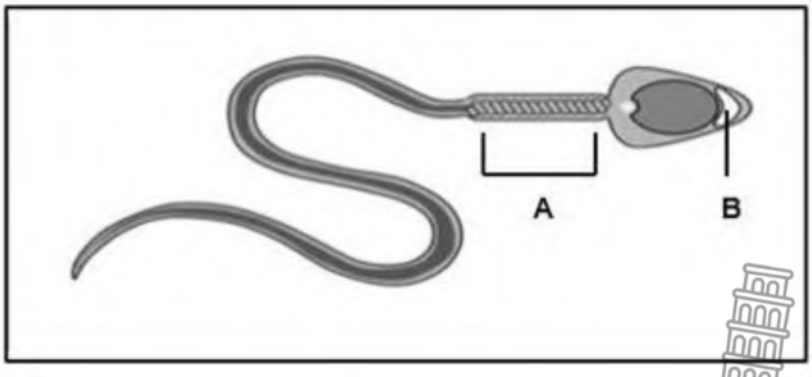
	3.4.1	Identify the type of fertilization displayed by the fish species.	1
	3.4.2	State TWO visible ways in which the chances of fertilisation in these fishare increased.	2
	3.4.3	Give TWO reasons why there is no need for then eggs of these fish to be covered by a hard or leathery shell	2
			(5)
3.5	An investigation was conducted to determine the relationship between the ages of women, the number of pregnancies per month and the chances of miscarriages. The results of the investigation are shown in the table below.		

AGES OF WOMEN	PREGNANCIES PER MONTH (%)	MISCARRIAGES (%)
22	25	10
28	24	11
34	18	15
40	6	24
46	2	50

[Adapted from http://www.children.gov.on.ca]

	3.5.1	Draw a line graph to show the relationship between the ages of the women and the percentage of pregnancies per month.	6
	3.5.2	Describe the relationship that exists between the ages of women and the chances of them miscarrying.	2
			(8)
3.6	The diagram below represents a sperm.		



	3.6.1	Label part **A** and **B**	2
	3.6.2	Explain TWO ways in which the sperm is adapted to ensure effective movement towards the Fallopian tubes.	4
			(6)

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3.7	An investigation was done to determine the effect of different amounts of thyroxin on body weight in rats. The procedure was as follows: • 45 healthy female rats of the same species were used. • They were divided into three groups of 15 each (Groups A, B and C). • Their average body weight was determined and recorded. • Group A was injected daily with methimozole which inhibits the production of thyroxin in rats. • Group B was injected daily with DL-thyroxin which stimulates the production of more thyroxin than under normal conditions in rats. • Group C was given no treatment. • All three groups were exposed to the conditions above for 2 months. • The average body weights of all the groups were determined weekly.		
	3.7.1	In the investigation identify the: (a) Independent variable (b) Dependent variable	 1 1
	3.7.2	State THREE factors that were kept constant during the investigation.	3
	3.7.3	Which group of rats (**A**, **B** or **C**) would be expected to gain the most weight?	1
	3.7.4	Explain your answer to QUESTION 3.7.3	3
	3.7.5	In which group of rats (**A**, **B** or **C**) would the levels of TSH in the blood be low?	1
			(10)
			[50]
		GRAND TOTAL	**150**

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GRADE 12

LIFE SCIENCES PRE-MIDYEAR EXAMINATION ASSESSMENT MARKING GUIDELINES: MAY 2023.

Total Marks: 150
Duration: 2,5 HOURS

These marking guidelines consist of 9 pages including the cover page.

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PRINCIPLES RELATED TO MARKING LIFE SCIENCES

1. **If more information than marks allocated is given**
   Stop marking when maximum marks is reached and put a wavy line and 'max' in the right hand margin.

2. **If, for example, three reasons are required and five are given**
   Mark the first three irrespective of whether all or some are correct/incorrect.

3. **If whole process is given when only part of it is required**
   Read all and credit relevant part.

4. **If comparisons are asked for but descriptions are given**
   Accept if differences/similarities are clear.

5. **If tabulation is required but paragraphs are given**
   Candidates will lose marks for not tabulating.

6. **If diagrams are given with annotations when descriptions are required**
   Candidates will lose marks.

7. **If flow charts are given instead of descriptions**
   Candidates will lose marks.

8. **If sequence is muddled and links do not make sense**
   Where sequence and links are correct, credit. Where sequence and links is incorrect, do not credit. If sequence and links becomes correct again, resume credit.

9. **Non-recognized abbreviations**
   Accept if first defined in answer. If not defined, do not credit the unrecognised abbreviation but credit the rest of answer if correct.

10. **Wrong numbering**
    If answer fits into the correct sequence of questions but the wrong number is given, it is acceptable. Indicate that the candidate's numbering is wrong.

11. **If language used changes the intended meaning**
    Do not accept.

12. **Spelling errors**
    If recognizable accept provided it does not mean something else in Life Sciences or if it is out of context.

13. **If common names are given in terminology**
    Accept, provided it was accepted at the National memo discussion meeting.

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14. **If only the letter is asked for but only name is given (and vice versa)**
No credit.

15. **If units are not given in measurements**
Memorandum will allocate marks for units separately, except where it isalready given in the question.

16. Be sensitive to **the sense of an answer, which may be stated in a different way**.

17. **Caption**
Credit will be given for captions to all illustrations (diagrams, graphs, tables, etc.) except where it is already given in the question.

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SECTION A			
QUESTION 1			
1.1	1.1.1	B✓✓	
	1.1.2	C✓✓	
	1.1.3	B✓✓	
	1.1.4	B✓✓	
	1.1.5	C✓✓	
	1.1.6	D✓✓	
	1.1.7	B✓✓	
	1.1.8	A✓✓	
	1.1.9	C✓✓	
	1.1.10	B✓✓	
		(10 x 2)	**(20)**
1.2	1.2.1	Crossing over✓	1
	1.2.2	Scrotum✓	1
	1.2.3	Endometrium✓	1
	1.2.4	Epididymis✓	1
	1.2.5	Diploid✓	1
	1.2.6	Meiosis✓	1
	1.2.7	Reflex action✓	1
	1.2.8	Meninges✓	1
		(8 x 1)	**(8)**
1.3	1.3.1	B only✓✓	
	1.3.2	A only✓✓	
	1.3.3	B only✓✓	
	1.3.4	B only✓✓	
		(4 x 2)	**(8)**
1.4	1.4.1	(a) Hypophysis✓/Pituitary gland (b) Adrenal✓ gland	1 1
	1.4.2	(a) D✓ – Testis✓ (b) C✓ – Pancreas✓/Islets of Langerhans (c) A✓ – Hypophysis✓/Pituitary gland	2 2 2
			(8)
1.5	1.5.1	Motor✓ neuron	1
	1.5.2	(a) Nucleus✓/nuclear membrane (b) Cytoplasm✓ (c) Dendrite✓	1 1 1
	1.5.3	(a) C✓- Axon✓	2
			(6)
		TOTAL SECTION A	**50**

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SECTION B **QUESTION 2**			
2.1	2.1.1	(a) DNA ✓ (b) Ribosome ✓	1 1
	2.1.2	(a) G ✓ (b) U ✓	1 1
	2.1.3	– DNA codes for a particular protein ✓ but cannot leave nucleus – One strand of DNA is used as a template ✓ – to form mRNA ✓	3
	2.1.4	– According to the codons on mRNA ✓ – tRNA molecules with matching anticodons ✓ – bring the required amino acids to the ribosome ✓ – This is called translation ✓ – The amino acids become attached by peptide bonds ✓ – to form the required protein ✓ (any 4)	4
	2.1.5	- A gene mutation affects arrangement/type of the nitrogen bases/nucleotides✓ - This changes the code on the DNA ✓ - which changes the code on the RNA✓ - A different amino acid✓ may be coded for - which causes a change in the amino acid sequence in✓ the protein - leading to the formation of a different/alternate/no protein✓ ANY 5	5
			(16)
2.2	2.2.1	23✓	1
	2.2.2	(a) Centromere✓ (b) Chiasma✓/chiasmata	1 1
	2.2.3	Ovary✓	1
	2.2.4	(a) Crossing over✓ (b) Prophase I✓ (c) ova✓/gametes/sex cells	1 1 1
	2.2.5	C→ B→ A✓(correct sequence)	1
			(8)
2.3	2.3.1	(a) White✓fur (b) Black✓fur	
	2.3.2	(a) 1✓ and 3✓ ***(Mark first TWO only)*** (b) 1✓ ***(Mark first ONE only)***	2 1

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	2.3.3	**P_1** Phenotype: Black X White✓ Genotype: BB X bb✓ *Meiosis* **G**/gametes: B, B X b, b✓ *Fertilisation* **F_1** Genotype: Bb; Bb, Bb; Bb ✓ Phenotype: All black *0✓%white P_1 and F_1✓ Meiosis and fertilisation✓ **(*compulsory mark + 5)** **OR** **P_1** Phenotype: Black X White✓ Genotype: BB X bb✓ *Meiosis* *Fertilisation* Gametes: B, B / b: Bb, Bb / b: Bb, Bb 1 mark for correct gametes 1 mark for correct genotypes **F_1** Phenotype: All black *0✓% white P_1 and F_1✓ Meiosis and fertilisation✓ **(* compulsory mark + 5)**	6
			(11)
2.4	2.4.1	(a) X^AY✓✓ (b) X^AX^a✓✓	2 2
	2.4.2	$\frac{3}{7} \times 100$ ✓ $= 42,86$✓/42,9/43%	2
	2.4.3	- An affected female carries two/only recessive alleles✓/X^aX^a - Sons/males inherit one X chromosome✓ from their mothers - Sons/males need only one recessive allele to be affected✓ - And therefore must inherit X^a from their mother✓ Any 3	3
			(9)
2.5	2.5.1	Contain the same chromosomes ✓because the embryonic cell has divided by mitosis ✓/ they are all produced from nuclei of the donor sheep✓ which multiply / divide by mitosis✓ therefore have the same DNA ✓	2

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	2.5.2	The nucleus and genetic material ✓originated from another sheep ✓ / the nuclei of the foster sheep were not used ✓and therefore did not contain the same genetic material / the ova used did not contain nuclei✓ / it is the nucleus which contains the genetic material ✓	2
	2.5.3	Animals or plants with superior / favourable characteristics ✓ can be produced to enhance food production ✓ / biotechnology.	2
			(6)
			[50]
QUESTION 3			
3.1	3.1.1	C✓ – Medulla Oblongata✓	2
	3.1.2	A ✓- Cerebrum✓	2
	3.1.3	D✓ - Cerebellum✓	2
			(6)
3.2	3.2.1	A ✓ – aqueous humour / fluid ✓	2
	3.2.2	F ✓ – yellow spot / fovea centralis ✓	2
	3.2.3	B ✓ – iris ✓	2
			2
			(6)
3.3	3.3.1	A – Tympanic membrane✓/ Tympanum/Eardrum C – Oval window✓/fenestra ovalis D – Round window✓/fenestra rotunda	3
	3.3.2	B – transmit vibrations✓ from the tympanic membrane to inner ear/ amplifies sound waves D – prevents pressure build up of waves✓/absorbs pressure wave set up by tympanic canal of the inner ear/eases sound waves out of inner ear/ prevents sound waves from moving backwards in perilymph	2
	3.3.3	Tympanic membrane/A has a larger surface area✓ than the oval window✓/C	2
	3.3.4	Ossicles will not vibrate freely ✓ to transmit vibrations to the inner ear✓/ causing partial deafness **OR** Cannot equalise pressure ✓on either side of tympanic membrane leading to pain✓/ middle ear infection/ a burst eardrum / vibrations not being transmitted/ partial deafness Any (1 x 2)	2
			(9)

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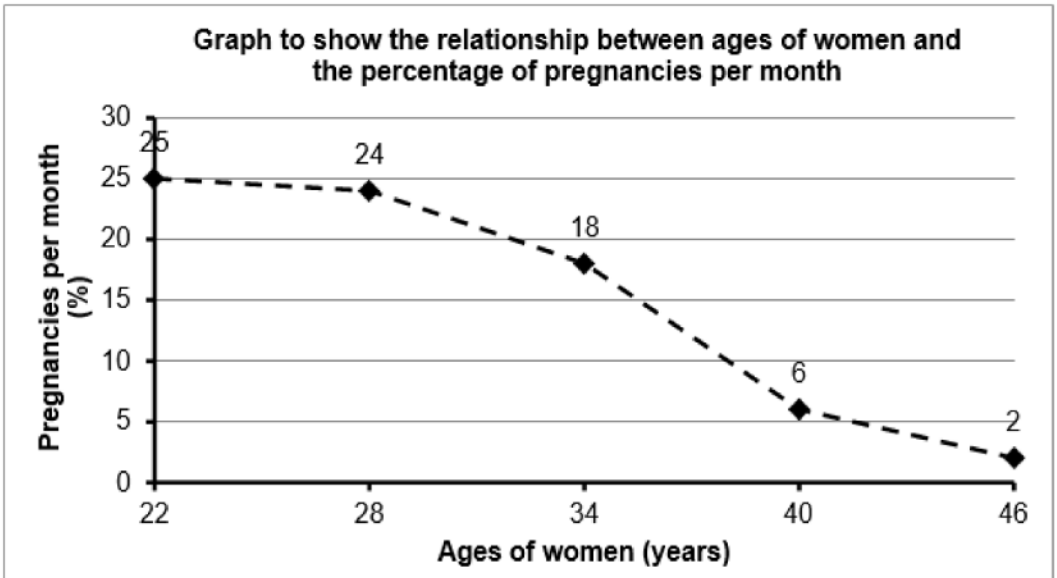
3.4	3.4.1	External ✓ fertilization	1
	3.4.2	- A large amount of sperm is released ✓ - A large amount of eggs is released ✓ - The male and female swim close to each other ✓/the sperm is released close to the eggs (Any 2) **(Mark first TWO only)**	2
	3.4.3	- No danger of drying out ✓	2
			(5)
3.5	3.5.1		6

Mark allocation of the graph

Criteria	Mark Allocation
Correct type of graph drawn for the pregnancies per month only	1
Title of graph including the two variables (Age of women and pregnancies per month)	1
Correct label and unit for X-axis and Y-axis	1
Correct scale for X-axis and Y-axis	1
Drawing of the graph	0: No points plotted correctly 1: 1 to 4 points plotted correctly 2: All 5 points plotted correctly

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	3.5.2	The older the women, the higher the chances of having miscarriages✓✓ **OR** The younger the women, the lower the chances of having miscarriages✓✓	2
			(8)
3.6	3.6.1	A – Middle piece ✓ B—acrosome ✓	1 1
	3.6.2	Mitochondria : ✓supplies energy ✓ for locomotion of the sperm cell Tail : ✓can propel forward ✓for swimming/locomotion of the sperm cell.Torpedo shape : ✓reducing friction ✓ **(MARK FIRST TWO ONLY)**	4
			6
3.7	3.7.1	(a) Amount of thyroxin✓ (b) Body weight✓	1 1
	3.7.2	- Same number of rats in each group✓ - All rats were of the same species✓ - All groups were investigated for the same period of time✓ - All rats were the same gender✓ - All groups were weighed after the same interval✓ (Any 3) **(Mark first THREE only)**	3
	3.7.3	Group A✓	1
	3.7.4	- Low thyroxin levels✓ - will lead to low metabolic rate✓ - Therefore the energy from the diet is used very slowly✓ - and more organic compounds are stored✓ (Any 3)	3
	3.7.5	Group B✓	**1**
			(10)
			[50]
		GRAND TOTAL	**150**