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EXAMINATION	NATIONAL SENIOR CERTIFICATE
GRADE	12
DATE	MAY/JUNE 2024
SUBJECT	LIFE SCIENCES
PAPER	1
MARK TOTAL	150
DURATION (HOURS)	2 ½
NUMBER OF PAGES	21

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer **ALL** 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 according to the numbering system used in the 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 ink.
7. Draw diagrams or flow charts only when asked to do so.
8. The diagrams in this question paper are **NOT** necessarily drawn to scale.
9. You may use non-programmable calculators, protractors and compasses.
10. Write neatly and legibly, **ONLY** in blue ink.

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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), for example **1.1.11 D.**

1.1.1 Which of the following correctly represents the events involved in the secretion and action of antidiuretic hormone?

	Water level in the blood relative to normal.	Amount of ADH produced relative to normal.	Amount of water reabsorbed by the kidneys.
A	Increase	Increase	Decrease
B	Increase	Decrease	Increase
C	Decrease	Increase	Increase
D	Decrease	Decrease	Decrease

1.1.2 Uneven curvature of the lens resulting in distroted images.

A Long-sightedness.

B Otitis media.

C Asigmatism.

D Myopia.

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1.1.3 The following are effects of the secretion of different hormones:

1. Controls the metabolic rate of cells
2. Increases the heart rate
3. Inhibits cellular metabolism
4. Promotes weight gain

Which ONE of the following combinations of the effects is due to thyroxin?

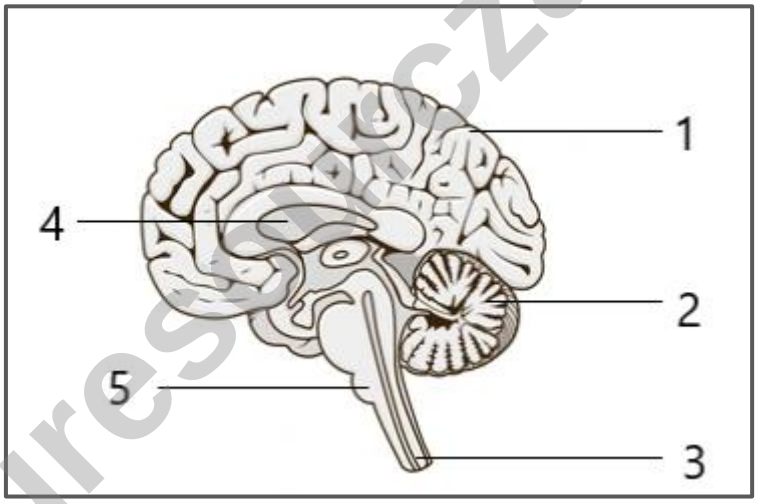
A 1, 3 and 4

B 2, 3 and 4

C 1 and 2

D 1, 2, 3 and 4

QUESTIONS 1.1.4 – 1.1.5 relate to the diagram representing a cross section of the human brain.



[Source: https://www.vectorstock.com/royalty-free-vector/human-brain]

1.1.4 Part of the brain is responsible for the control of the heart rate and depth of breathing.

A 1

B 3

C 4

D 5

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1.1.5 Areas of the brain that will work together to maintain balance after seeing a rock and stumbling over it.

A 1 and 2

B 1, 2 and 4

C 1 and 3

D 2, 4 and 5

1.1.6 Meiosis in a human male occurs in the…

A epididymis.

B vas deferens.

C scrotum.

D seminiferous tubules.

1.1.7 The seminal vesicle in humans…

A stores sperm.

B produces sperm.

C produces an alkaline fluid.

D produces a nutrient rich fluid.

1.1.8 The plant hormone that inhibits growth…

A Auxin.

B Gibberellin.

C Abscisic acid.

D Indole Acetic Acid.

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1.1.9 The ploidy of a normal human gamete.

A 46

B 24

C 44 + 2

D 22 + 1

(9x2) = **[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 Period of development from fertilisation to birth.

1.2.2 The membranes which protect the central nervous system.

1.2.3 The type of defence mechanism in plants where toxins are secreted.

1.2.4 Nervous system which consists of cranial and spinal nerves.

1.2.5 Suppression of the growth of lateral buds due to the presence of the hormone auxin.

1.2.6 The watery fluid that supports the cornea and the front chamber of the eye.

1.2.7 Process that leads to the formation of gametes.

(7 x 1) = [7]

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1.3 Indicate whether each of the following 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	
1.3.1	Fluid that surrounds cells.	**A**	Blood.
		B	Tissue fluid.
1.3.2	The placenta…	**A**	Allows foetal and maternal blood to mix.
		B	Secretes the hormone progesterone.
1.3.3	Pressure waves are converted into an impulse in the…	**A**	Organ of Corti.
		B	Auditory nerve.
1.3.4	The blind spot in the eye has…	**A**	No rods and cones.
		B	Blood vessels and optic nerve.

(4x2) = **[8]**

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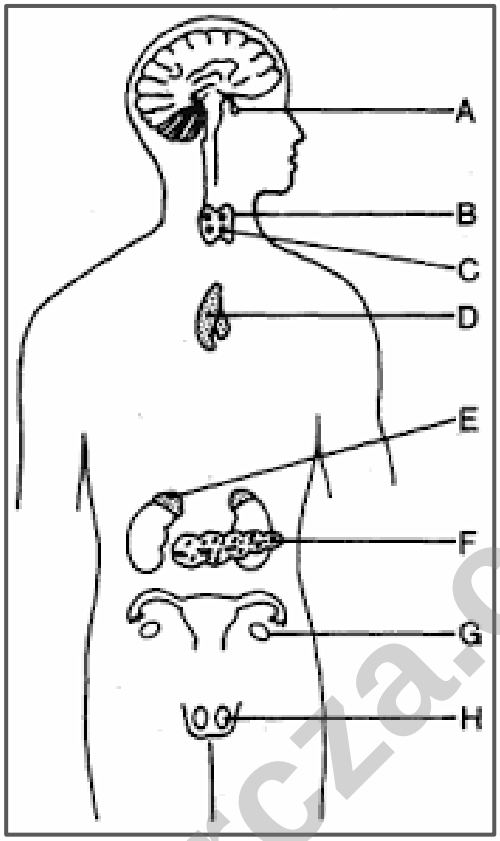
1.4 The diagram below shows the location of various glands in the human body.



[Source: http://www.imagequiz.co.uk/quizzes/5107491692085248]

1.4.1 Provide the LETTER and NAME of the gland that:

a) will only be found in females. (2)

b) acts as both an endocrine and exocrine gland. (2)

c) is responsible for the regulation of salt concentrations in the blood. (2)

1.4.2 Name ONE hormone secreted by gland:

a) **H** (1)

b) **B** (1)

c) **A** (1)

[9]

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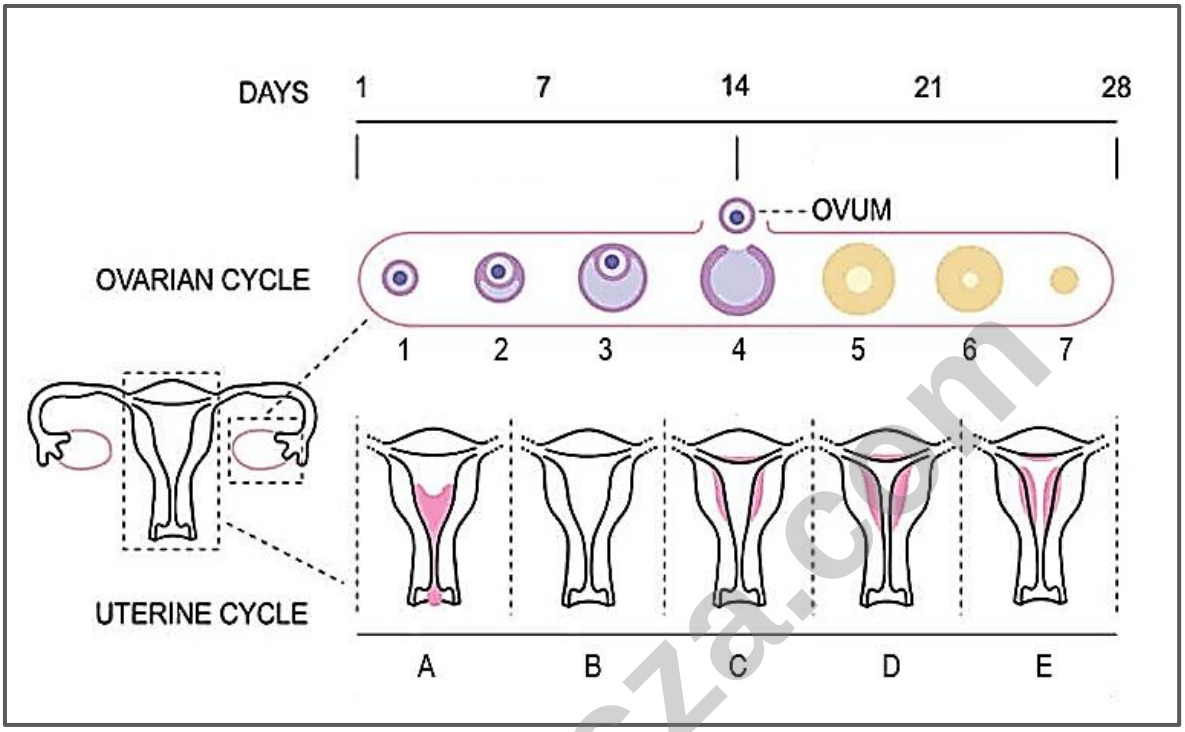
1.5 The diagram below represents the changes that take place over a 28-day period in the female reproductive system.



[Source: https://microbenotes.com/menstrual-cycle/]

The changes that take place during the ovarian cycle are represented by diagrams **1 – 7.**

The changes that take place during the uterine cycle are represented by diagrams **A – E.**

1.5.1 Identify the:

a) process represented by diagram **4**. (1)

b) process represented by diagram **A**. (1)

c) structure represented by diagram **5**. (1)

1.5.2 Name the **hormone** responsible for:

a) change in diameter from diagram **1** to **3**. (1)

b) increase in endometrial thickness from diagram **C** to **D**. (1)

c) process represented by diagram **4**. (1)

1.5.3 Has fertilisation taken place after day **14**? Provide a reason for your answer. (2)

[8]

TOTAL SECTION A: [50]

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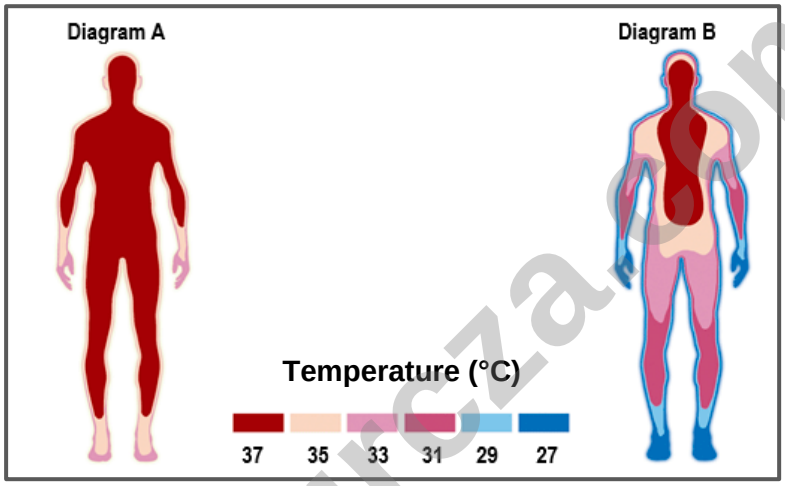
SECTION B

QUESTION 2

2.1 A man, Peter, works in a food processing factory. Part of his duties require him to inspect the cold rooms (freezers) to ensure that the temperature within the cold rooms remain below -5 °C.

The diagrams A and B below illustrate the difference in Peter's body temperature inside and outside the cold rooms.



[Source: https://hotcore.info/babki/skin-regulates-body-temperature]

2.1.1 Name the negative feedback mechanism that will take place to regulate Peter's body temperature. (1)

2.1.2 Which diagram (**A** or **B**) represents Peter before entering the cold room? (1)

2.1.3 What is the normal average human body temperature? (2)

2.1.4 Describe the physical changes that will take place from diagram **A** to **B** in terms of:

a) sweating (2)

b) blood vessels (2)

c) appearance of the skin (1)

[9]

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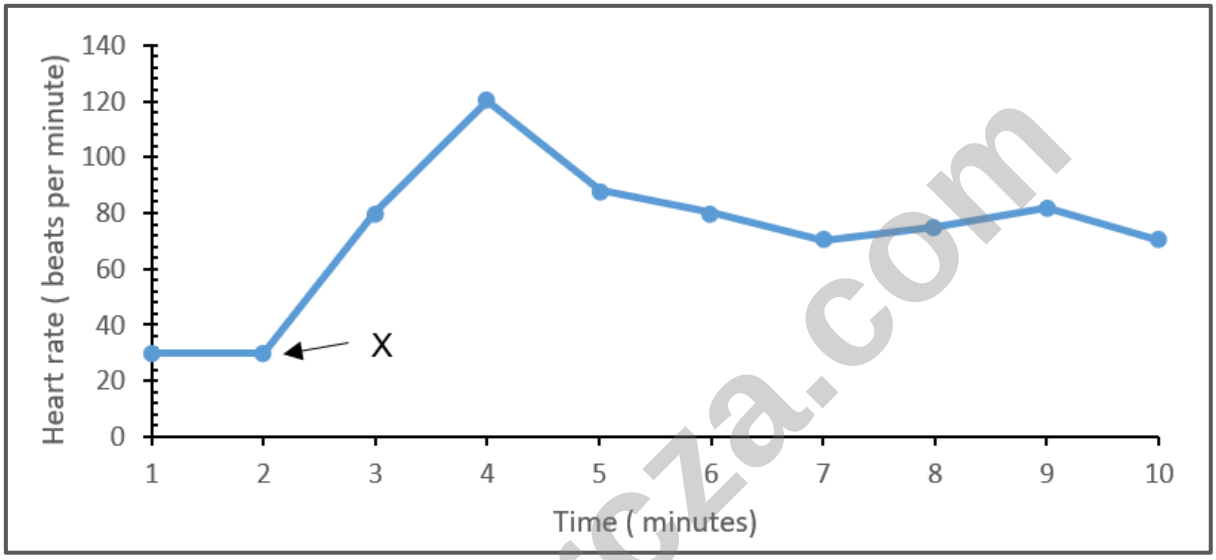
2.2 Paramedics responded to the scene of a motor vehicle accident. Intravenous (injected into a blood vessel) adrenalin was administered to one of the patients to stabilise her heart rate.

The following graph shows the change in the patient's heart rate just before and after the intravenous adrenalin. Point **X** indicates the time when the injection was administered.



[Source: Adapted from: https://www.researchgate.net/journal/Pharmaceutical-Research]

2.2.1 What was the patient's heart rate before adrenalin was administered? (1)

2.2.2 Briefly describe the effect of administering adrenalin on the patient's heart rate using the data presented by the graph. (2)

2.2.3 The patient was very hungry and on her way to dinner with friends. Provide a possible reason why she was no longer hungry after she was treated by the paramedics. (2)

2.2.4 Construct a table to represent the information from the graph in 2 minute time intervals, starting from point **X**. (5)

[10]

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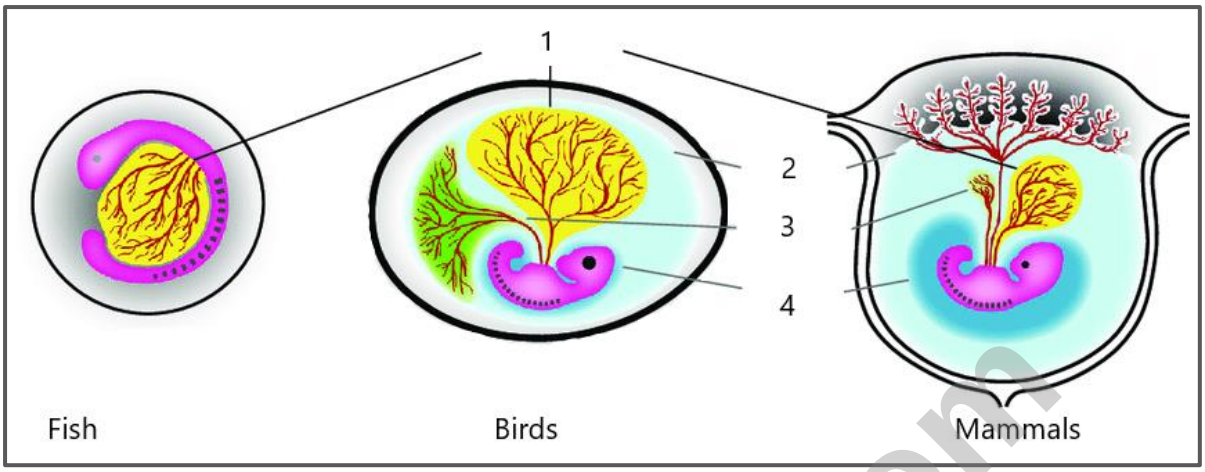
2.3. The diagram below illustrates a comparison between the embryonic development in fish, birds and mammals.



[Source: https://www.researchgate.net/figure/Extraembryonic-membranes-in-fish-birds-and-mammals]

2.3.1 Identify the type of embryonic development represented in the diagrams for:

a) Fish. (1)

b) Mammals. (1)

2.3.2 What type of fertilisation is associated with the type of embryonic development in birds and mammals? (1)

2.3.3 Part labelled **1** represents the yolk sac. How does the size of the yolk sac differ in fish and mammals, compared to the size of the embryo? The diagrams are not drawn to scale. (1)

2.3.4 Provide a possible reason for the difference mentioned in QUESTION 2.3.3. (2)

2.3.5 Which one of the above mentioned organisms will produce the highest number of gametes? Provide a reason for your answer. (2)

[8]

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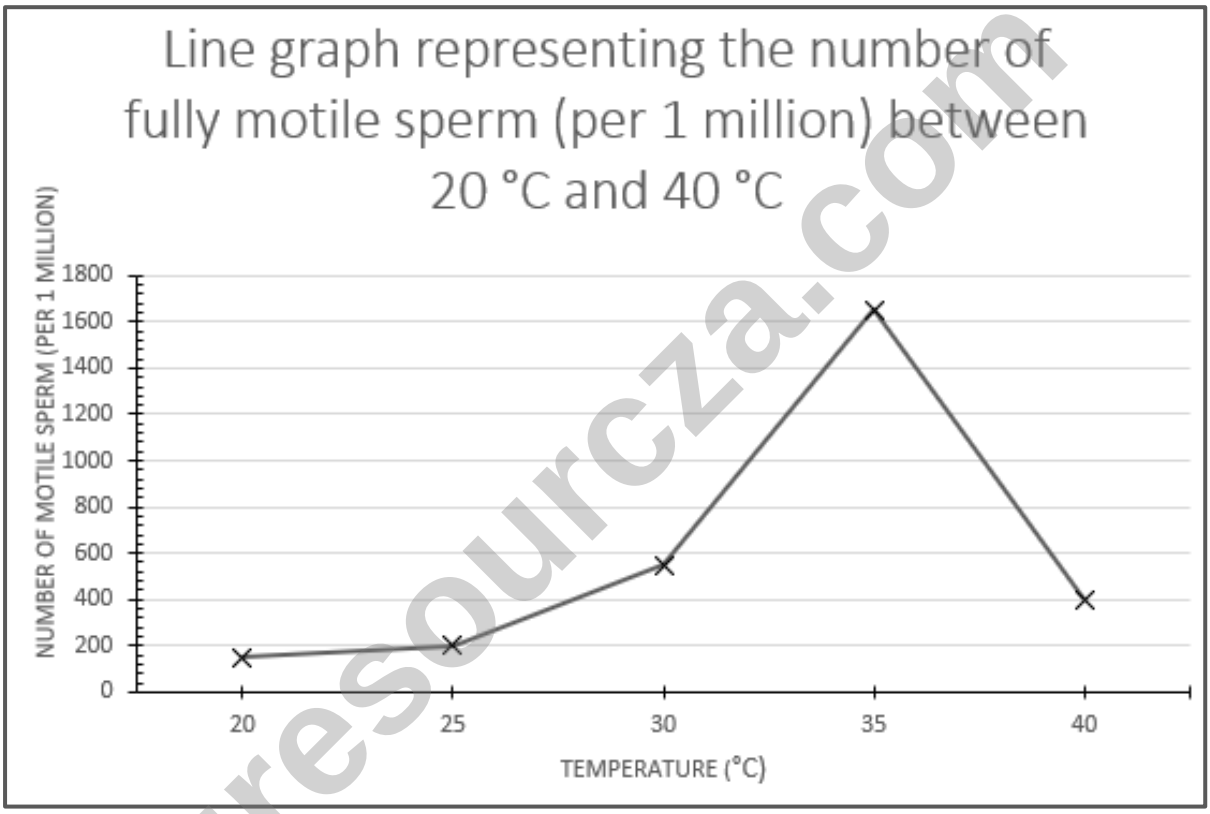
2.4 A study was conducted to determine the effect of temperature on the motility of sperm cells in a human male. The graph below represents the average number of fully motile sperm cells at different temperatures.

During the investigation the following factors were kept constant:

- The age of the men.
- Fitness and general health of the men.

A sample of 2 500 men were used to conduct the investigation.



[*Source: Examiners own*]

2.4.1 Describe the trend evident in the graph. (2)

2.4.2 Identify the:

a) Independent variable (1)

b) Dependent variable (1)

c) Optimal temperature for sperm cell motility (1)

2.4.3 Explain how the investigation would be influenced if the sample size of men were decreased to 250 men. (2)

2.4.4 Provide a possible explanation for the decrease in sperm cell motility at 40°C. (2)

[9]

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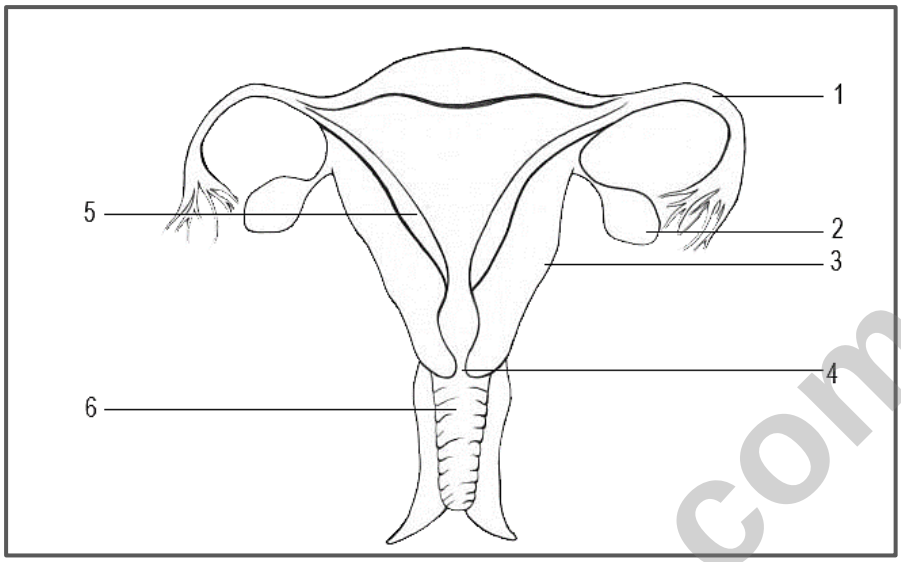
2.5 The diagram below illustrates the structure of the human female reproductive system. Study the diagram and answer the questions that follow.



[Source: https://www.researchgate.net/figure/Female.reproduction]

2.5.1 Name the structures labelled:

a) 3 (1)

b) 6 (1)

2.5.2 Give the NUMBER of the labelled part to which each of the following statements is applicable to:

a) area where the corpus luteum is maintained after fertilisation. (1)

b) will form part of the placenta after implantation. (1)

c) dilates during the initial stages of labour. (1)

d) place where fertilisation takes place. (1)

2.5.3 Describe the process that takes place in part labelled **2** that leads to the formation of a haploid gamete. (4)

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QUESTION 2.5.4 and 2.5.5 refer to the extract below:

Tubal ligation — also known as having your tubes tied or tubal sterilization — is a type of permanent birth control. During tubal ligation, the Fallopian tubes are cut, tied or blocked to permanently prevent pregnancy. The procedure doesn't affect your menstrual cycle.

2.5.4 Briefly explain how tubal ligation works to prevent pregnancy. (2)

2.5.5 Provide ONE possible reason why tubal ligation will not affect a woman's menstrual cycle. (2)

[14]

TOTAL QUESTION 2: [50]

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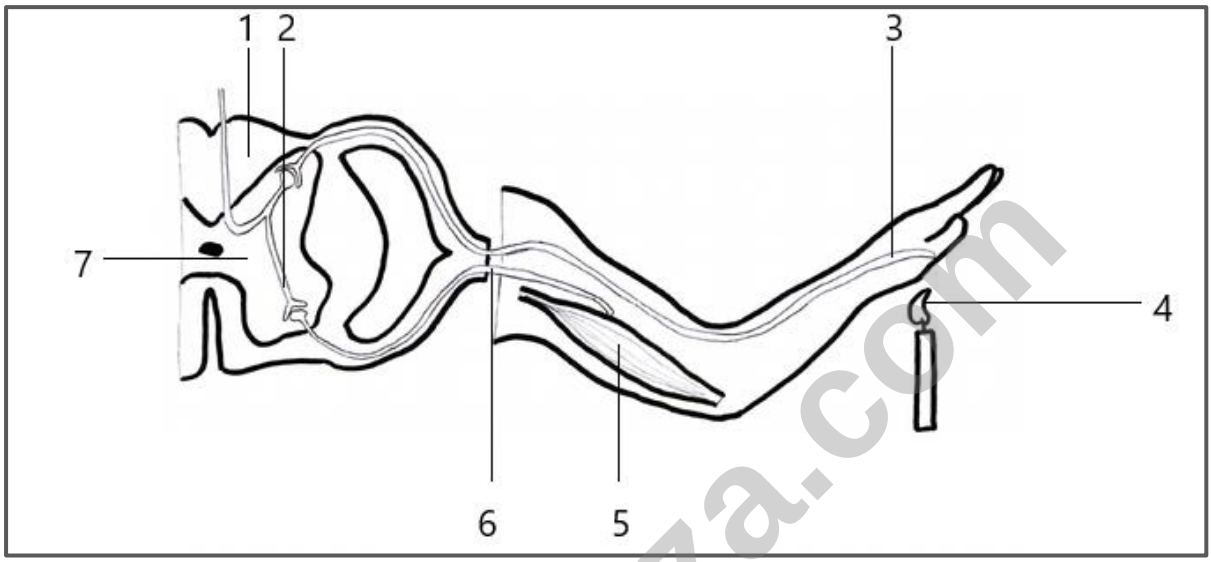
QUESTION 3

3.1 Reflexes allow organisms to respond to changes in their environment in order to protect themselves against harm. The following diagram represents the impulse pathway through the nervous system of a human.



[Source: https://www.tes.com/teaching-resource/reflex-arc]

3.1.1 Define the term *reflex arc*. (1)

3.1.2 Provide labels for regions **1** and **7**. (2)

3.1.3 Name the physiological connection between parts **2** and **6**. (1)

3.1.4 Provide ONE reason why the connection named in QUESTION 3.1.3 is significant. (1)

3.1.5 Describe the pathway that an impulse will travel from the point where the stimulus will be received to where the impulse will be interpreted to generate an appropriate response. Use the NUMBER and the NAME of the relevant parts in the description. (5)

3.1.6 Explain the effect on the reflex action if part **6** was damaged. (2)

3.1.7 The nerve pathway in the above response is about 1.5 meters in length. A nerve impulse travels at $75 m.s^{-1}$. Calculate the time taken for this reflex to occur. Show all calculations. (3)

[15]

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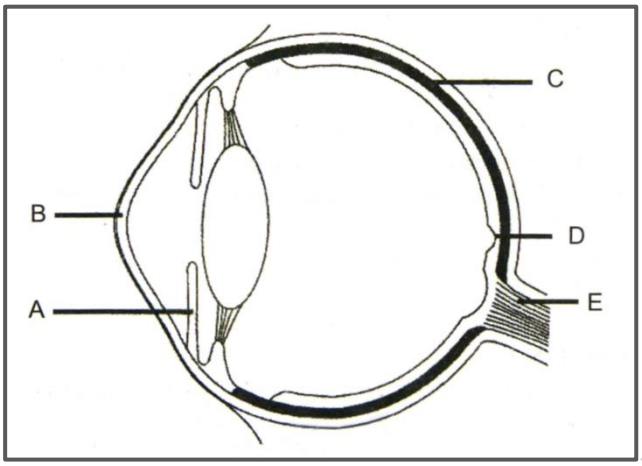
3.2 The diagram below shows a cross section of the human eye.



[Source: https://www.tes.com/teaching-resource/eye]

3.2.1 Provide the LETTER and NAME of the part which:

a) Regulates the amount of light entering the eye. (2)

b) Supplies nutrients and oxygen to the eye. (2)

c) Transmits impulses to the brain. (2)

d) Area of clearest vision. (2)

3.2.2 Describe ONE way in which part **B** is structurally suited to perform its function. (2)

[10]

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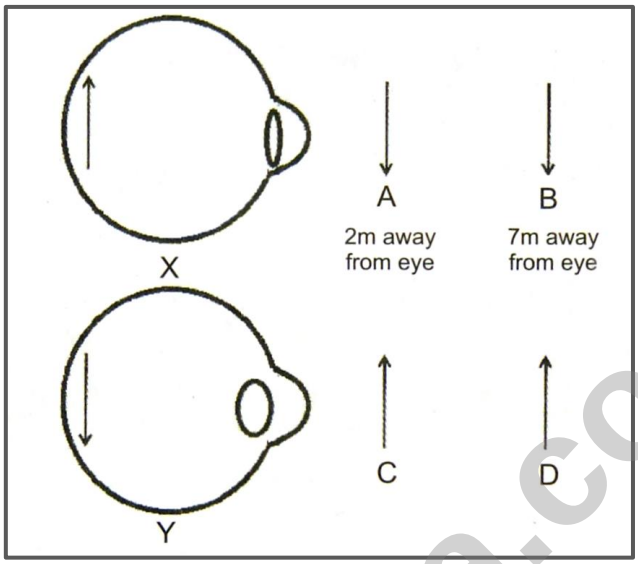
3.3 The diagram shows two eyes (**X** and **Y**) focussed on objects at different distances from the eye. Objects **A** and **C** were 2 meters away from the eye and objects **B** and **D** were 7 meters away from the eye.



[Source: https://www.tes.com/teaching-resource]

3.3.1 Write down the LETTER only of the object that:

a) Eye **X** is focussed on. (2)

b) Eye **Y** is focussed on. (2)

3.3.2 Name and describe the process that allows eye **X** to form a clear image on the retina. (5)

[9]

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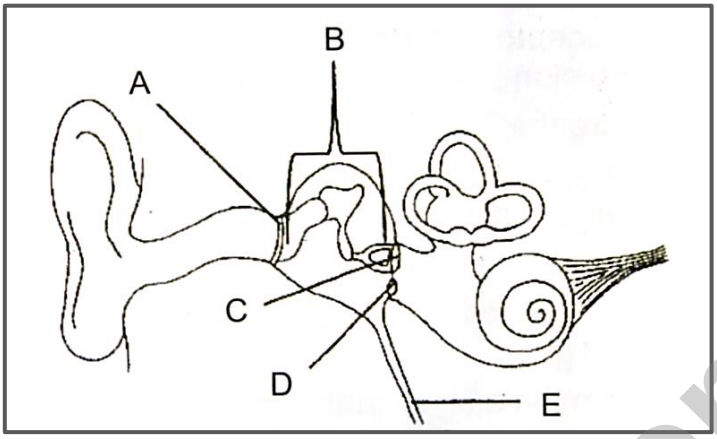
3.4 Study the diagram below showing a portion of the human ear and answer the questions that follow.



[*Source: https://www.tes.com/teaching-resource/ear/internal*]

3.4.1 Provide a label for part **B** in the middle ear. (1)

3.4.2 Provide ONE function of part **D**. (1)

3.4.3 How are parts **A** and **C** structurally suited to the amplification of sound? (2)

3.4.4 Name part **E** and explain what would happen if part **E** became blocked. (3)

[7]

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3.5 Three plant shoots were used to investigate the effect of auxin on the growth of the shoots (**A**, **B** and **C**). The plant shoots were treated as follows:

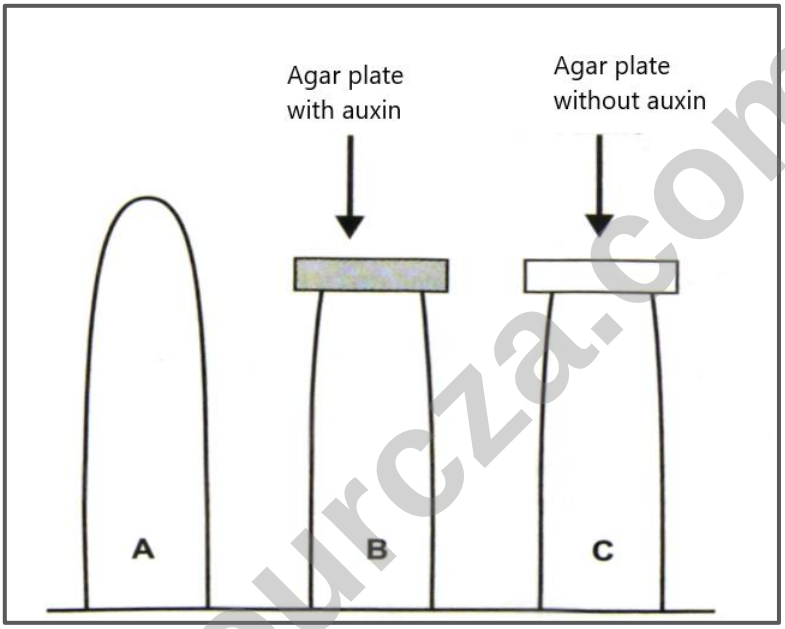
Shoot **A** – Untreated

Shoot **B** – Tip removed and agar plate with auxin placed on the top of the shoot.

Shoot **C** – Tip removed and agar plate without auxin placed on the top of the shoot.

All the shoots were exposed to uniform light.

NOTE: Agar is a jelly like medium that allows auxins to diffuse through it.



[*Source: Adapted from Exam Fever Gr 12 Q& A*]

3.5.1 Define the term *phototropism.* (1)

3.5.2 Provide a reason for the removal of the tip of shoots. (2)

3.5.3 Explain the results observed in shoot **C** after a few days. (2)

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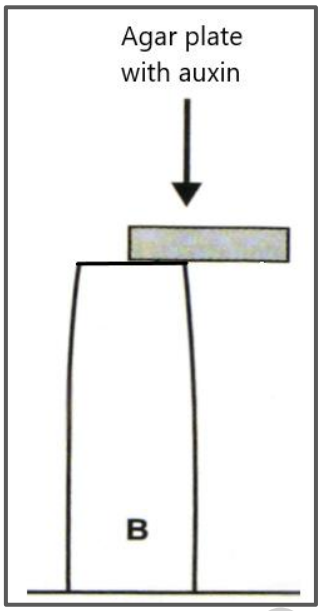
3.5.4 The agar plate on shoot **B** was moved as shown in the diagram below:



Describe why shoot **B** will grow more towards left after a few days. (4)

[9]

TOTAL QUESTION 3: [50]

TOTAL SECTION B: [100]

GRAND TOTAL: [150]

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