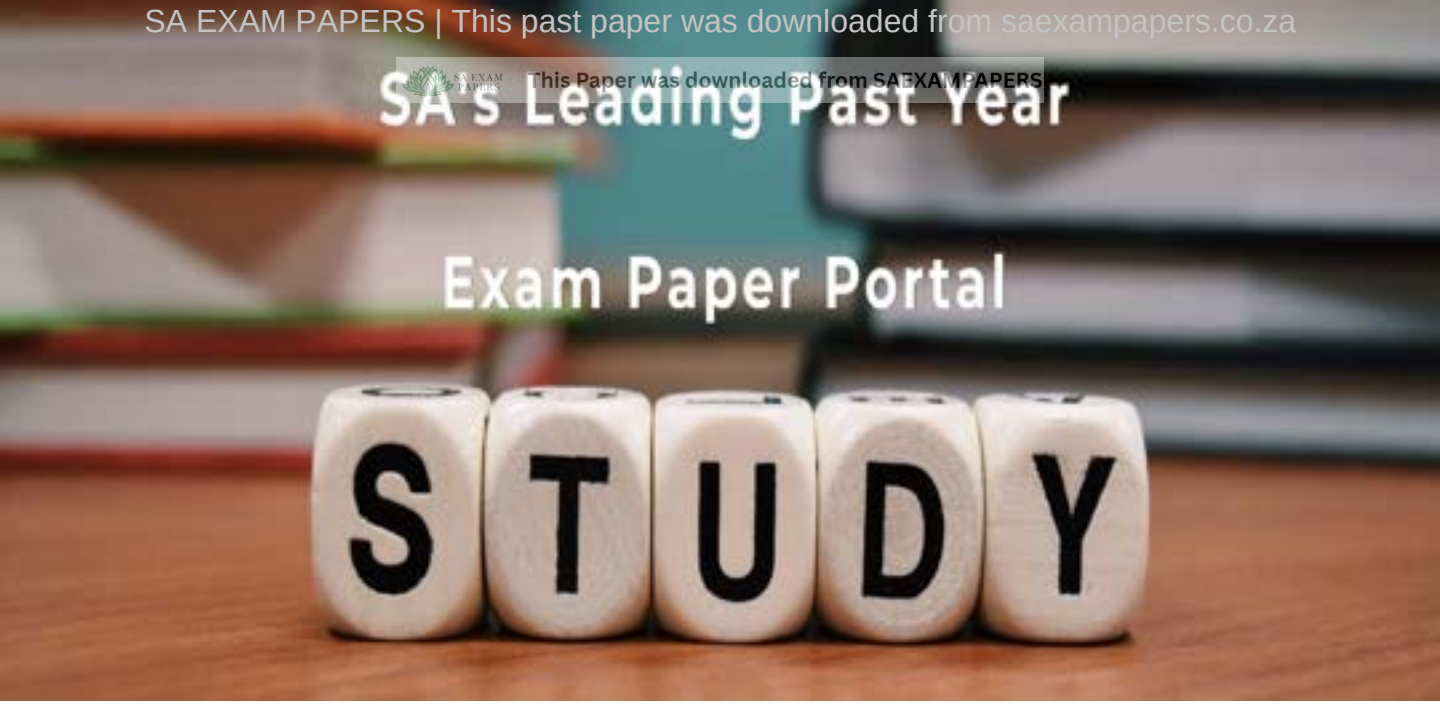


GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PREPARATORY EXAMINATION

2025

10831

LIFE SCIENCES

(PAPER 1)

TIME: 2½ hours

MARKS: 150

LIFE SCIENCES: Paper 1

10831E

20 pages

X05

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions in the ANSWER BOOK.
2. Start the answers to EACH question at the top of a NEW page.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Present your answers according to the instructions of each question.
5. Do ALL drawings in pencil and labels in blue or black ink.
6. Draw diagrams, flow charts or tables only when asked to do so.
7. The diagrams in this question paper are NOT necessarily drawn to scale.
8. Do NOT use graph paper.
9. You must use a non-programmable calculator, protractor and compass, where necessary.
10. Write neatly and legibly.

SECTION A

QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A – D) next to the question numbers (1.1.1 to 1.1.8) in the ANSWER BOOK, e.g. 1.1.9 E.

1.1.1 Which of the following is a mechanical defence mechanism that plants use?

A Production of sweet nectar in flowers
B Secretion of chemicals to make leaves taste better to herbivores
C Thorns on stems and leaves
D Increased secretion of abscisic acid causes leaves and fruit to fall off the plant

1.1.2 The following statements describe some parts of a human sperm cell.

(i) Many mitochondria that provide energy for movement
(ii) A tail that moves in a whip-like motion
(iii) Acrosome that contains enzymes to digest the jelly layer of the ovum
(iv) The nucleus contains 23 chromosomes

Which combination of statements are structural adaptations that ensure that sperm cells can move towards an ovum?

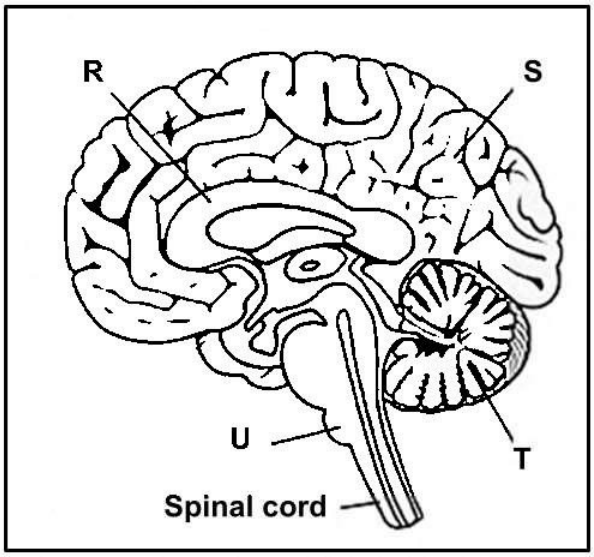
A (i), (ii) and (iv) only
B (i) and (ii) only
C (i), (ii) and (iii) only
D (ii) and (iii) only

1.1.3 Which of the following events takes place during oogenesis?

A Three daughter cells from meiosis will degenerate.
B The diploid germinal epithelial cells lining the seminiferous tubules go through meiosis.
C Four daughter cells survive to form mature ova.
D One daughter cell will mature into a sperm cell.

QUESTIONS 1.1.4 AND 1.1.5 ARE BASED ON THE FOLLOWING DIAGRAM.

The diagram below shows the internal structure of the human brain.



[Source: ***https://www.shutterstock.com/search/labeled-brain-anatomy***]

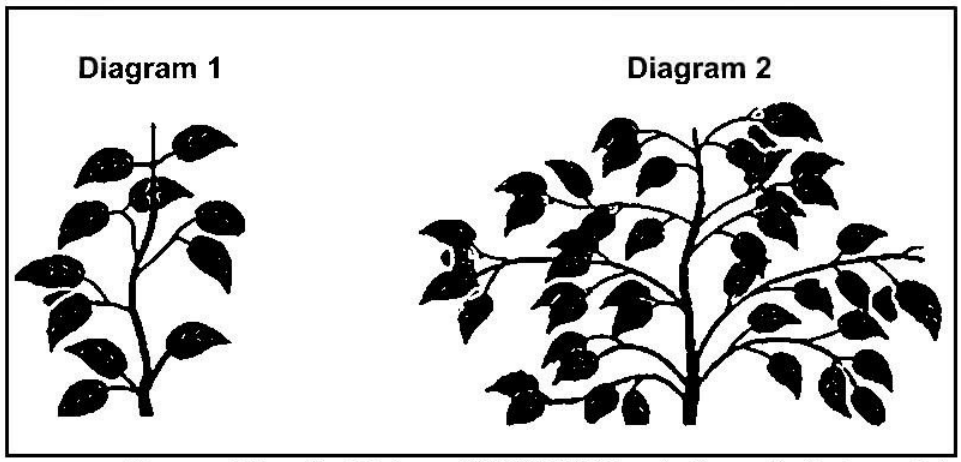
1.1.4 Which of the following is NOT a function of part **S**?

A Controls voluntary muscular movements
B Regulates heartbeat
C Interprets sensory impulses
D Controls higher thought processes

1.1.5 Which label indicates the corpus callosum?

A Part **R**
B Part **S**
C Part **T**
D Part **U**

1.1.6 A person has a tree in his garden, as shown in **Diagram 1**. He wants the tree to grow to look like the neighbour's tree, as shown in **Diagram 2**.



[Source: *https://quizlet.com/280394463/93-apical-growth-flash-cards/*]

How should the tree in Diagram **1** be treated to achieve his goal?

A Treat the plant with auxins to elongate the cells.
B Provide the stem with unilateral light.
C Add abscisic acid to the soil to promote growth.
D Cut the main stem to remove apical dominance.

1.1.7 A person begins to climb to the top of Mount Everest. Which of the following changes will most likely occur in the person's body as they start to climb?

A Oxygen in the blood increases, causing the rate and depth of breathing to decrease.
B Carbon dioxide in the blood increases, causing the rate and depth of breathing to increase.
C Oxygen in the blood decreases, causing the rate and depth of breathing to decrease.
D Carbon dioxide in the blood decreases, causing the rate and depth of breathing to increase.

1.1.8 The graph below shows the growth rates in boys and girls from birth until their late teens.

[Source: *https://www.glowm.com/resources/glowm/cd/pages/v5/v5c016.html*]

Which of the following statements is a correct conclusion from the graphs?

A Boys always have a higher growth rate than girls.
B Boys stop growing at a younger age than girls.
C Girls have a higher growth rate than boys between the ages of 4 and 6 years.
D Girls have a higher growth rate than boys between the ages of 10 and 13 years.

(8 x 2) **(16)**

1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question numbers (1.2.1 to 1.2.5) in the ANSWER BOOK.

1.2.1 A chemical substance that causes communication between the end of one neuron and the start of the next neuron

1.2.2 The hormone that stimulates the production of milk in human females

1.2.3 A bony structure that encloses and protects the brain

1.2.4 Fluid that protects the human embryo against mechanical injuries

1.2.5 A phenomenon where an increase in the secretion of one hormone inhibits the secretion of another hormone

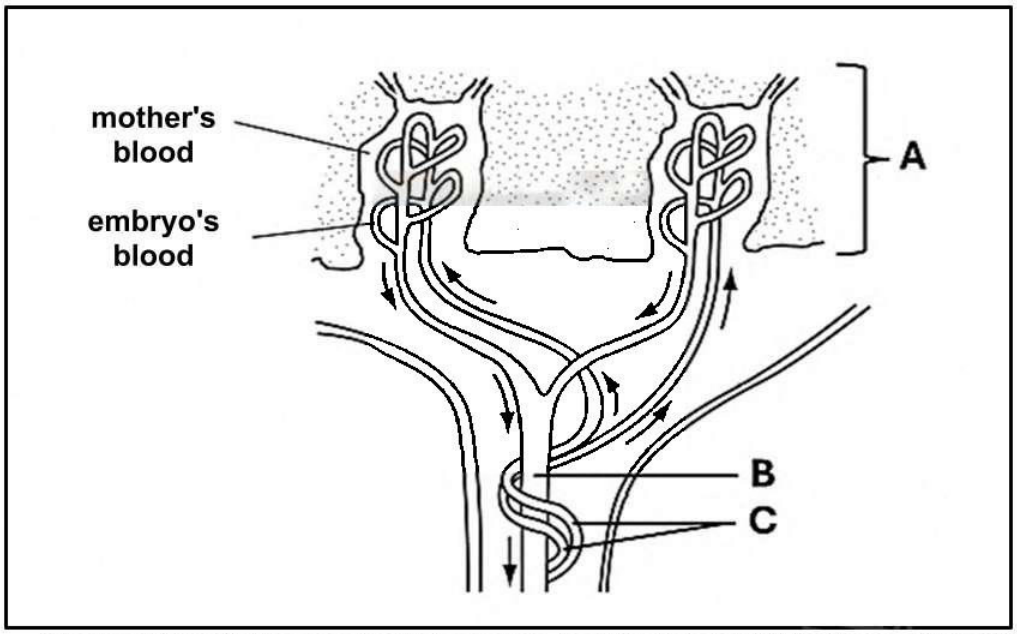
(5 x 1) **(5)**

1.3 Indicate whether each of the statements in COLUMN I applies to **A ONLY, B ONLY, BOTH A and B** or **NONE** of the items in COLUMN II. Write **A only, B only, BOTH A and B or None** next to the question numbers (1.3.1 to 1.3.3) in the ANSWER BOOK.

	COLUMN I		COLUMN II
1.3.1	The site where fertilisation takes place	A B	Fallopian tube Uterus
1.3.2	A condition, which results in the lens becoming cloudy	A B	Astigmatism Cataracts
1.3.3	Pupillary mechanism response when the stimulus is a bright light	A B	Ciliary muscle contracts Radial muscles contract

(3 x 2) **(6)**

1.4 The diagram below shows how the blood of a human embryo flows close to the mother's blood during pregnancy.



[Source: *https://www.savemyexams.com/o-level/biology/cie/23/topic-questions/16-development-of-organisms-and-continuity-of-life/16-4-sexual-reproduction-in-humans/multiple-choice-questions/*]

1.4.1 Give the name of the structure that contains vessel **B** and vessel **C**. (1)

1.4.2 List TWO important substances that are transported by vessel **B**. (2)

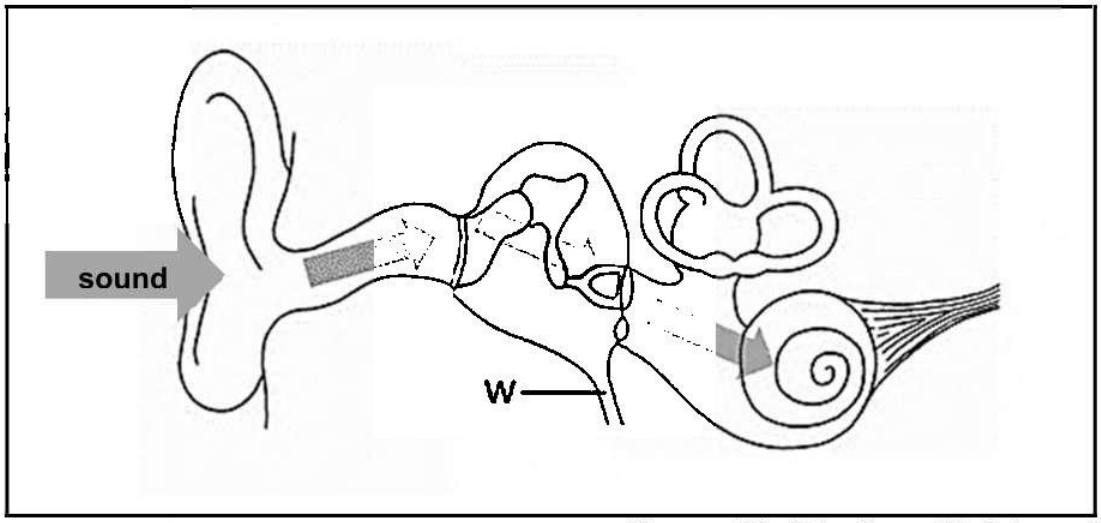
1.4.3 One of the functions of part **A** is to bring the mother's and embryo's blood close together.

(a) Identify part **A**. (1)

(b) Name the process by which substances move down a concentration gradient from the mother's blood to the embryo's blood. (1)

(5)

1.5 One of the main functions of the human ear is hearing.



[Source: Mind The Gap – Life Sciences]

1.5.1 Give the name of the part of the ear that performs each of the following functions:

(a) Directs soundwaves to the auditory canal (1)

(b) Converts sound stimulus into nerve impulses (1)

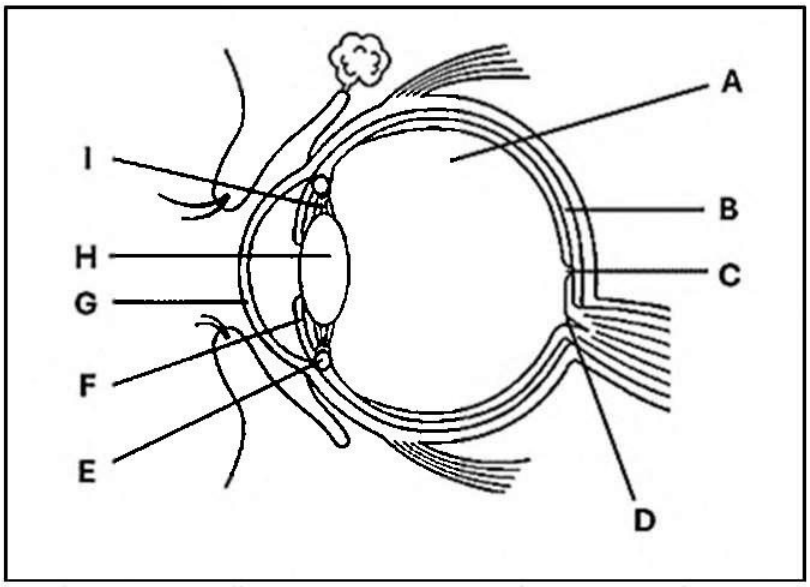
(c) Transmits vibrations from the tympanic membrane to the oval window (1)

1.5.2 A middle ear infection can result in the production of excess fluid. If part **W** becomes blocked, the fluid cannot drain naturally and a build-up of fluid causes an increase in pressure in the middle ear which may interfere with hearing.

(a) Identify part **W**. (1)

(b) Give the name of the small tube that is surgically inserted into the tympanic membrane to drain the excess fluid and reduce pressure in the middle ear. (1)
(5)

1.6 The diagram below represents the internal structure of the human eye.



[Source: *https://www.shutterstock.com/image-vector/structural-diagram-eye-no-text-line-2289561893*]

1.6.1 Give the LETTER and NAME of the part that:

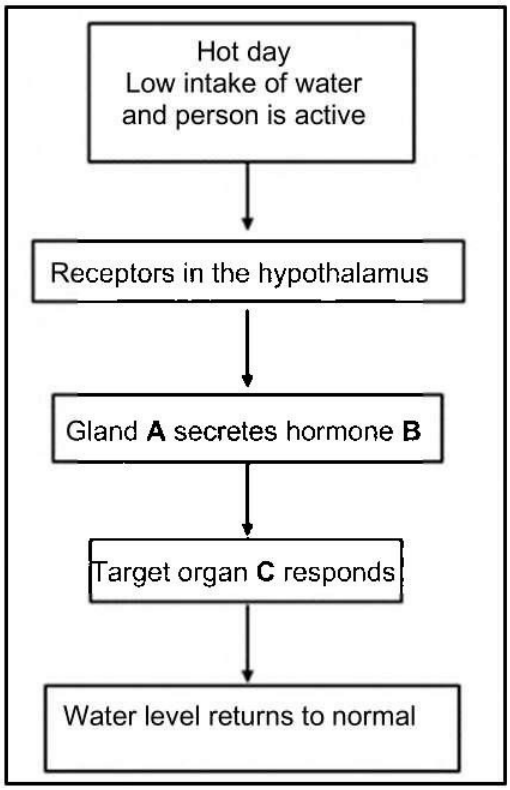
(a) Contains the highest concentration of cones (2)

(b) Is a transparent layer at the front of the eye that causes the refraction of light (2)

(c) Prevents the reflection of light in the eye (2)

1.6.2 Give the LETTER(S) of the part(s) that will cause a change in the shape of part **H** during accommodation. (2)
(8)

1.7 The flow diagram below shows the process of homeostasis in a human body on a hot day to balance the internal water level.



1.7.1 Name the homeostatic process represented by the flow diagram above. (1)

1.7.2 Give the name of:

(a) Gland **A** (1)

(b) Hormone **B** (1)

(c) Target organ **C** (1)

1.7.3 Will the urine produced on a hot day be DILUTED or CONCENTRATED? (1)
(5)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

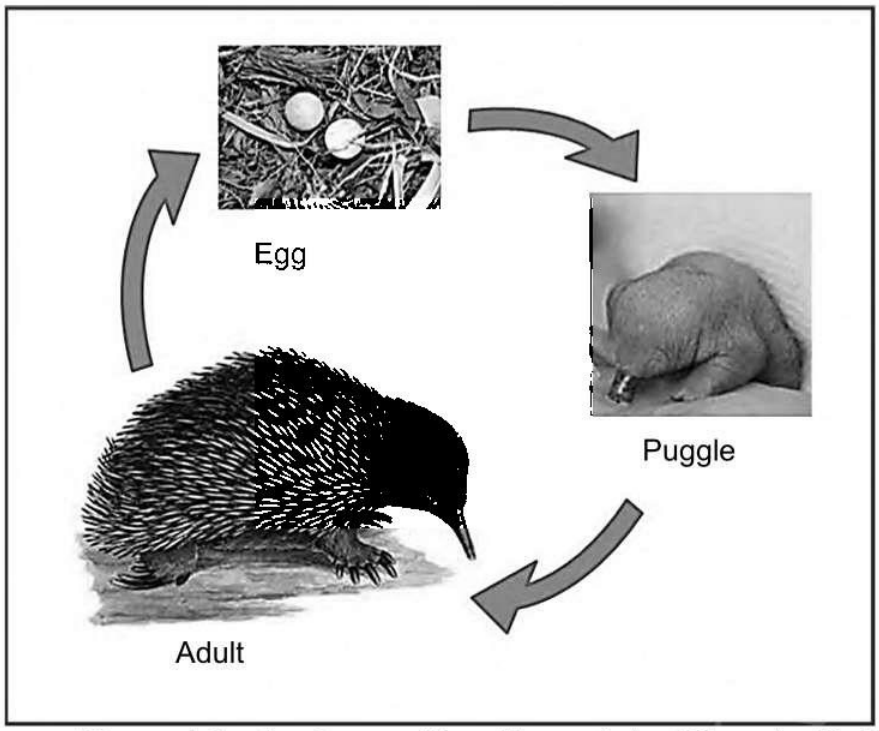
2.1

Echidnas are mammals that reproduce using internal fertilisation.

An adult female echidna usually lays a single, leathery egg once a year. She rolls the newly laid egg, into a deep pocket, or pouch, on her stomach to keep it safe. Ten days later the baby echidna, called a puggle, hatches.

At birth the puggle does not have spines sticking out from its skin. The puggle laps up milk that the mother's body secretes from special glands in her pouch. It remains in the pouch until its spines begin to break through its skin, at about 53 days. Then the mother puts the puggle into a burrow, where she returns to feed it every 5 to 10 days until it is old enough to go out on its own, at about 7 months old.

[Adapted from *https://animals.sandiegozoo.org/animals/echidna*]



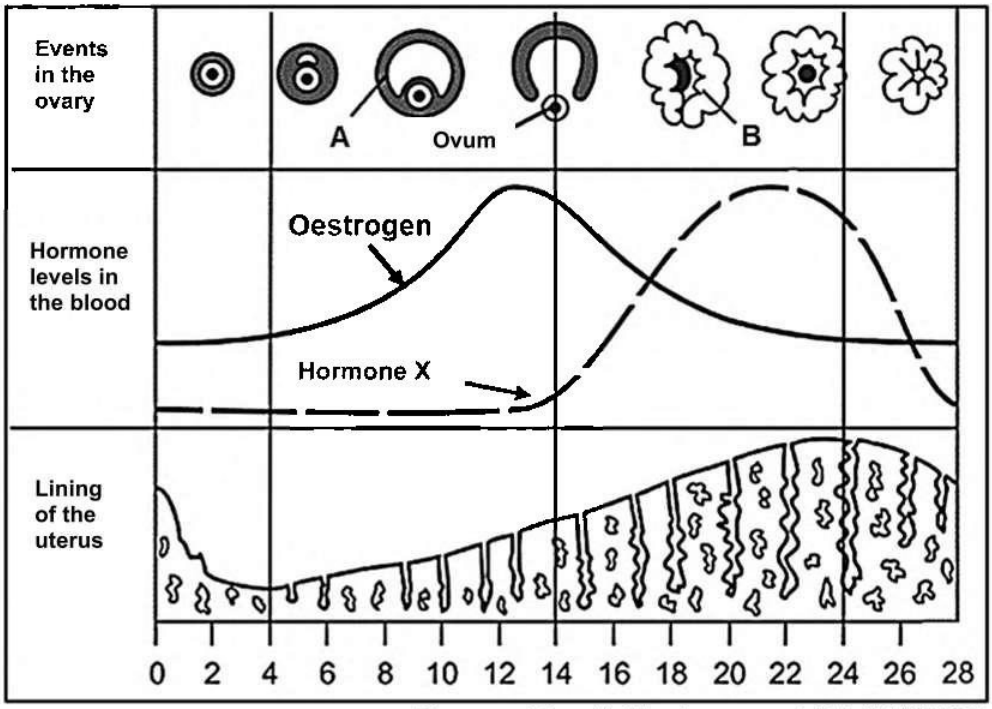
[Source: *https://cpsteamwork6.weebly.com/animal-life-cycles.html*]

2.1.1 Describe *internal fertilisation*. (2)

2.1.2 Using the information above, give TWO reasons that would support the conclusion that echidnas are altricial at birth. (2)

2.1.3 Different species of mammals have different strategies for embryonic development. Tabulate TWO differences between the embryonic development strategies of *vivipary* and *ovipary*. (5)
(9)

2.2 The diagram below represents parts of the menstrual cycle.



[Source: *https://slideplayer.com/slide/14462286/ Human reproduction slide 10 And https://quizlet.com/209572122/june-2014-part-b-flash-cards/*]

2.2.1 Using the diagram above, identify:

(a) Part **A** (1)

(b) Part **B** (1)

2.2.2 (a) According to the diagram above, on which day did ovulation take place? (1)

(b) Give ONE visible reason for your answer to QUESTION 2.2.2 (a). (1)

2.2.3 (a) Identify hormone **X**. (1)

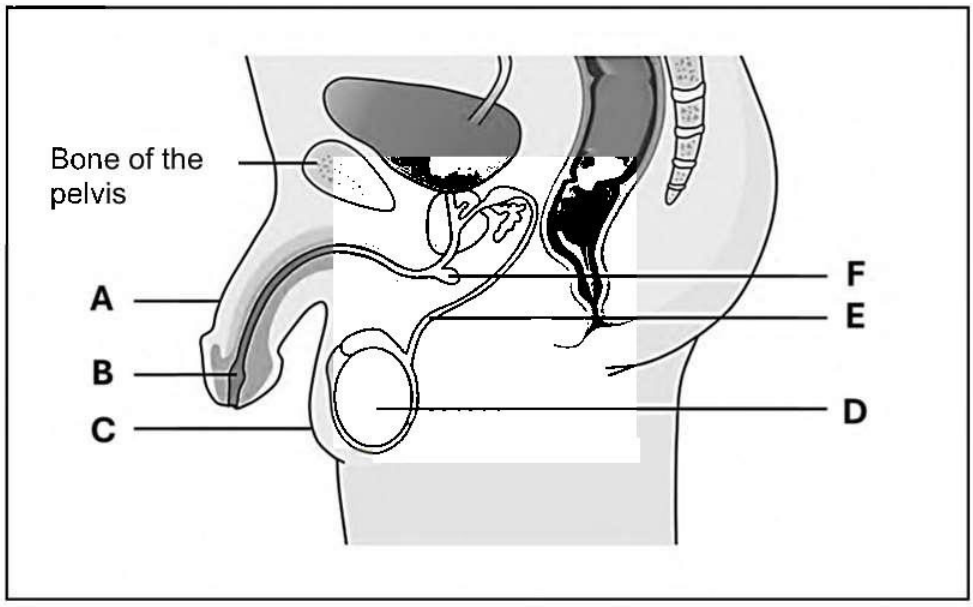
(b) Explain the influence of hormone **X** on the uterus between day 14 and day 24. (2)

2.2.4 According to the diagram above, for how long did menstruation last? (1)

2.2.5 Describe the role of FSH in the menstrual cycle. (3)

(11)

2.3 The diagram below shows a side view of the male reproductive system.



[Source: ***https://www.healthdirect.gov.au/male-reproductive-system***]

2.3.1 Identify the parts labelled:

(a) **B** (1)

(b) **F** (1)

2.3.2 Give the name of the part that:

(a) Transports sperm away from the epididymis to the accessory glands (1)

(b) Is used to deposit sperm into the female during copulation (1)

2.3.3 Name TWO secretions from the accessory glands and describe how each secretion can improve sperm maturation and motility. (4)
(8)

2.4 In 2018, a teaching hospital in India carried out a survey to determine the incidence of cancer in different parts of the female reproductive system. They carried out research by interviewing patients and studying patient records. The results are shown in the table below.

Part of the female reproductive system	Incidence of cancer (%)
Cervix	56,94
Endometrium	22,50
Ovary	15,56
Vagina	3,33
Vulva	1,67

[Adapted from *https://www.researchgate.net/publication/329215773_Prevalence_of_female_reproductive_tract_cancer_in_a_teaching_hospital_of_Rohtas_District_Bihar_India*]

2.4.1 Where is the cervix located in the female reproductive system? (1)

2.4.2 State TWO planning steps that would have been taken before the start of this survey. (2)

2.4.3 Draw a pie chart to represent the data in the table. (6)
(9)

2.5 Myopia is referred to as short-sightedness and is a common cause of visual disability worldwide. The World Health Organisation has grouped the following conditions among the leading causes of blindness and vision impairment in the world:

- myopia
- uncorrected refractive error with cataract
- macular degeneration
- infectious disease
- vitamin A deficiency

[Adapted from *https://pmc.ncbi.nlm.nih.gov/articles/PMC1123161/*]

2.5.1 According to the text above, name TWO of the leading causes of blindness and vision impairment worldwide other than short-sightedness. (2)

2.5.2 Explain why a blurred image will be formed on the retina of a short-sighted person. (2)

2.5.3 (a) Describe the type of lens that will be used to correct short-sightedness. (1)

(b) Explain how the lens in QUESTION 2.5.3 (a) will correct short-sightedness. (2)
(7)

2.6 A pirouette is a ballet move where a dancer spins or rotates on one foot. During a pirouette, the dancer's head remains still, and the body turns.

[Source: *https://rachelhuntanimations.blogspot.com/2012/10/random-character.html*]

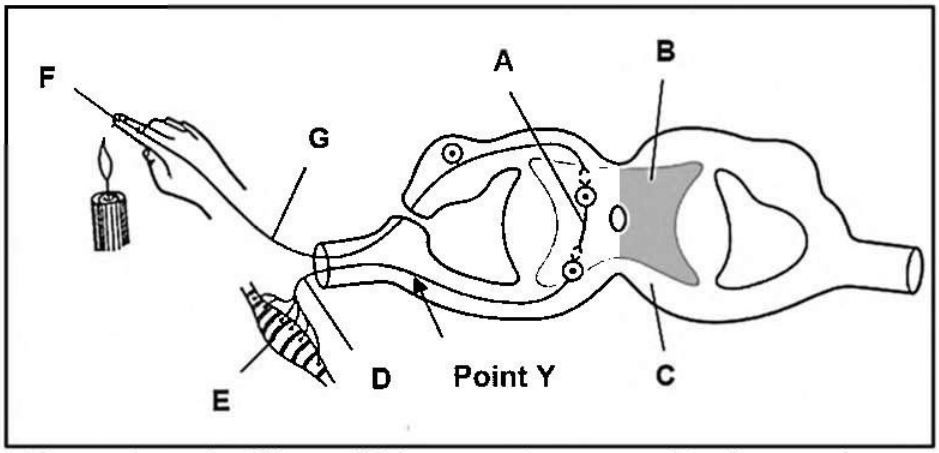
Describe how the dancer maintains her balance throughout the pirouette. (6)

(6)

[50]

QUESTION 3

3.1 The diagram below shows a reflex arc.



[Source: https://askfilo.com/biology-question-answers/the-diagram-shows-a-simple-reflex-arc-which-labelled-part-is-the-sensory-neurone]

3.1.1 To which part of the nervous system does the spinal cord belong? (1)

3.1.2 Define the term *synapse*. (2)

3.1.3 Give the name of the type of neuron that forms:

(a) Grey matter in the spinal cord (1)

(b) The dorsal root of the spinal nerve (1)

3.1.4 Describe the difference between a *reflex arc* and a *reflex action*. (2)

3.1.5 Write the letters for parts **A**, **D** and **G** in the correct order to indicate the direction in which an impulse will travel. (2)

3.1.6 Describe how the flame would affect the person if part **D** was damaged at point **Y.** (3)

3.1.7 Draw a labelled diagram of a sensory neuron. (5)
(17)

3.2 A study was conducted to investigate the effects of environmental temperature on human core body temperature. The researchers exposed 26 male participants, between the ages of 20 – 25 years, to varying environmental temperatures (10°C, 20°C, 30°C, and 40°C) while monitoring their core body temperatures every 15 minutes for an hour at each environmental temperature. The table below represents the average results collected after conducting the investigation three times.

Environmental temperature (°C)	Average Core Body Temperatures (°C)
10	36,5
20	36,8
30	36,6
40	36,7

3.2.1 Name the process by which humans can maintain a constant internal body temperature. (1)

3.2.2 Identify the following in the investigation:

(a) The independent variable (1)

(b) The dependent variable (1)

3.2.3 Explain the importance of conducting the investigation on male participants only. (2)

3.2.4 Describe TWO ways in which the researchers ensured the reliability of the results. (2)

3.2.5 Describe TWO ways in which the human body can maintain a constant body temperature regardless of increased environmental temperature. (2)
(9)

3.3 Diabetes is a chronic disease where the body either cannot produce insulin (Type 1 Diabetes) or cannot use insulin effectively (Type 2 Diabetes). Managing diabetes often requires frequent monitoring of blood glucose levels to avoid complications such as nerve damage, kidney failure, or vision loss.

Traditional blood glucose monitoring involves finger-prick tests, which can be painful and inconvenient. New technologies, such as Continuous Glucose Monitors (CGM), have been developed to address this.

Instead of regular finger pricks, which occur once or twice a day, a CGM uses a small sensor inserted just under the skin, usually on the back of the upper arm. The sensor measures glucose levels in the tissue fluid (the fluid surrounding cells) every minute and transmits the data wirelessly to a smartphone or reader.

[Adapted from *https://www.freestyle.abbott/za-en/products/freestyle-libre-2.html*]

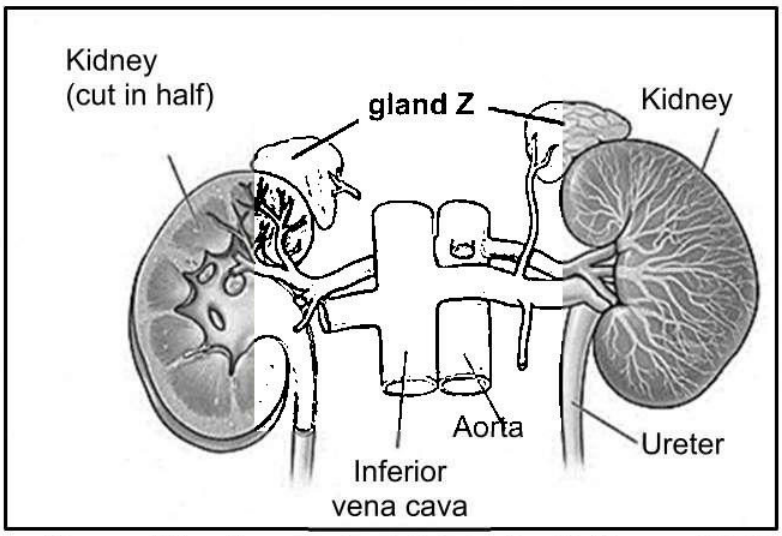
3.3.1 According to the text above, list TWO possible complications of diabetes. (2)

3.3.2 A Type 1 diabetes patient with a CGM receives an alert from her smartphone indicating that her blood glucose level is outside of normal limits. In response to the alert, she immediately injects herself with the required dose of insulin.

(a) State whether the smartphone alert warns her that her blood glucose level is too HIGH or too LOW. (1)

(b) Describe the role of the injected insulin in regulating her blood glucose levels. (3)
(6)

3.4 The diagram below shows two glands in the human endocrine system. The glands secrete the hormones, aldosterone and adrenaline.



[Source: https://my.clevelandclinic.org/health/diseases/16448-hyperaldosteronism]

3.4.1 Give the definition of a *hormone*. (2)

3.4.2 Identify gland **Z**. (1)

3.4.3 Gland **Z** increases the secretion of adrenaline during a 'fight or flight' response.

(a) Name the part of the autonomic nervous system that is stimulated by an increase in the secretion of adrenaline. (1)

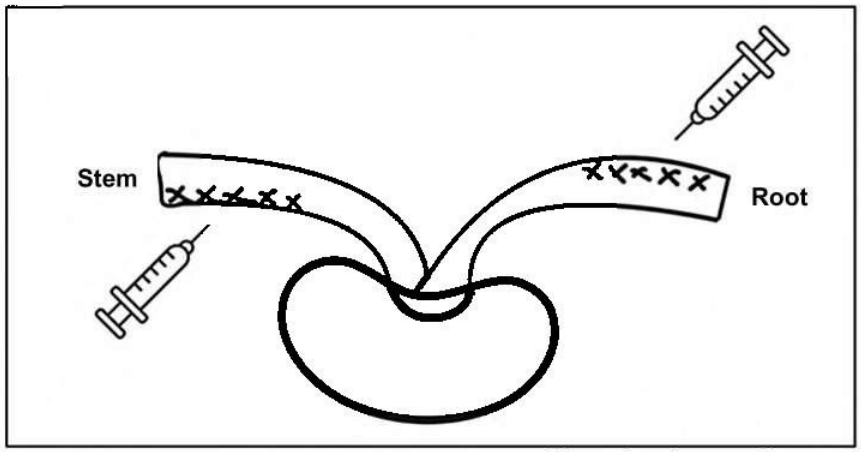
(b) Describe the effect that an increase in the secretion of adrenaline will have on the digestion of food in the stomach. (2)

3.4.4 The normal aldosterone level is 7 ng/dL. A person who develops a tumour in gland **Z** experiences hyperaldosteronism (over-secretion of aldosterone). Hyperaldosteronism is confirmed with a blood test that shows an aldosterone level of 30 ng/dL.

Calculate the percentage increase in aldosterone level. Show ALL calculations. (3)
(9)

3.5 An investigation was carried out where a germinating bean seed's young root and stem were injected with auxins in a dark and gravity-free environment aboard the International Space Station.

The tips of the young root and stem were cut off, and a high concentration of auxins was injected into the cells at the sites, as shown in the diagram below.



[Examiner's own diagram]

3.5.1 Define the term *tropism*. (2)

3.5.2 Explain the significance of cutting off the tips of the young roots and stems in this investigation. (3)

3.5.3 After injecting the auxins, as shown in the diagram, the seedling was left to grow for 10 days.

Redraw the germinating seed diagram and show the expected growth after 10 days. (3)

3.5.4 Give the name of the hormone that causes the germination of the bean seed. (1)
(9)
[50]

TOTAL SECTION B: 100

TOTAL: 150

END