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EXAMINATION	NATIONAL SENIOR CERTIFICATE
GRADE	12
DATE	NOVEMBER 2024
SUBJECT	LIFE SCIENCES
PAPER	1
MARK TOTAL	150
DURATION (HOURS)	2½
NUMBER OF PAGES	18

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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 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. 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 – D) next to the question numbers (1.1.1 to 1.1.10), for example 1.1.11. D.

1.1.1 A person with middle ear infection is usually discouraged from flying in an airplane because the:

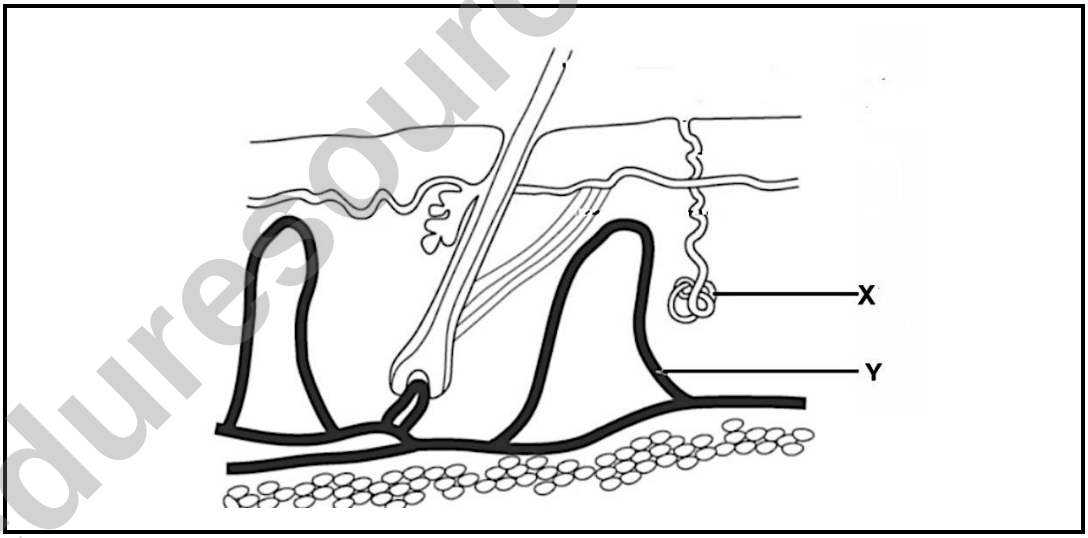
A maculae in the semi-circular canals cannot receive the stimulus.

B round window cannot absorb the sound waves.

C Eustachian tube cannot equalise the pressure on both sides of the tympanum membrane.

D auditory nerve will be damaged. (2)

1.1.2 The diagram below illustrates a section through the human skin.



Which row is the correct description of what will happen to the labelled structures when the skin is exposed to hot environmental conditions?

	Y	X
A	Constricts	Receives more blood
B	Dilates	Activity decreases
C	Dilates	Activity increases
D	Constricts	Receives less blood

(2)

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1.1.3 Which ONE of the following statements is true about the offspring of vertebrae with altricial development immediately after they are born/hatched?

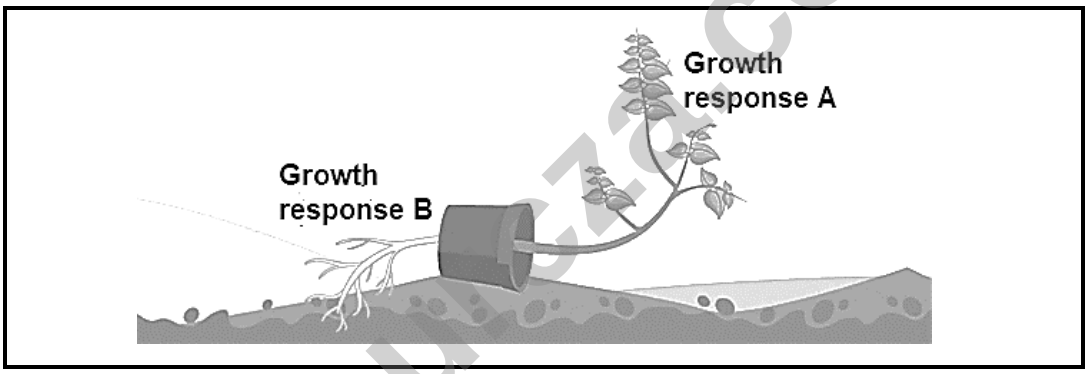
A Independent from parents, eyes are closed, can run away from predators.

B Eyes are closed, highly dependent on parents, bodies are naked.

C Dependent on parents, can run away from predators, bodies are naked.

D Can find food on their own, eyes are closed, cannot walk or run. (2)

1.1.4 The diagram below illustrates growth responses in a plant.



Which of the following is the correct description of the growth responses as illustrated in the diagram?

A Growth response B is positive geotropism.

B Growth response B is positive phototropism.

C Growth response A is positive geotropism.

D Growth response A is negative phototropism. (2)

1.1.5 Which hormone plays a role in the reabsorption of sodium ions in the kidney?

A ADH

B Insulin

C Cortisol

D Aldosterone (2)

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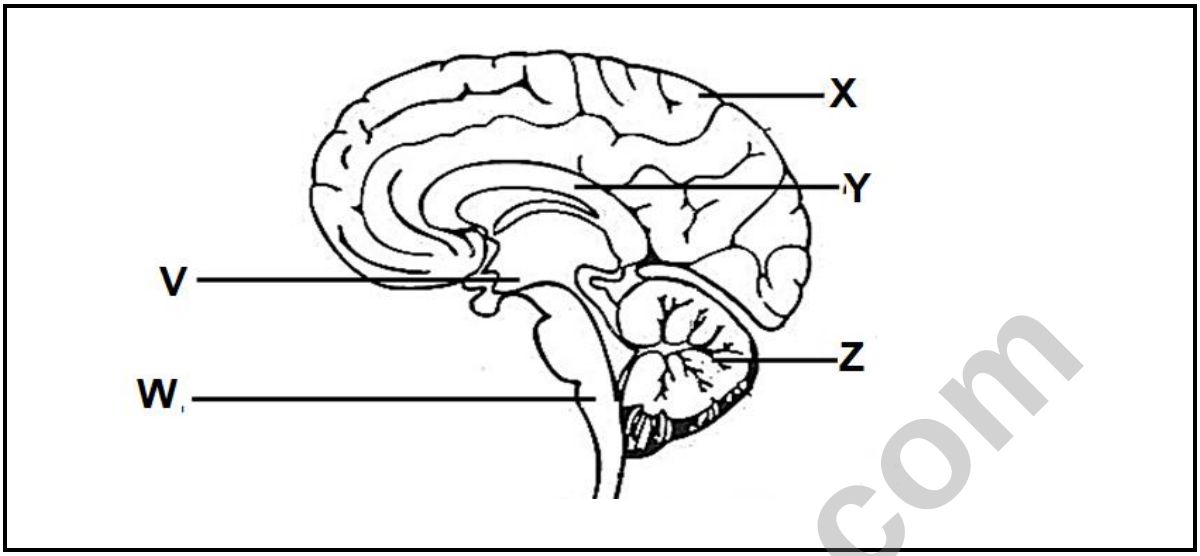
Questions 1.1.6 and 1.1.7 are based on the diagram below that illustrates the human brain.



1.1.6 The part that responds to hunger is …

A **V**

B **W**

C **X**

D **Y** (2)

1.1.7 Which row in the table below illustrates the correct labels for the labelled structures?

	LABELLED STRUCTURES		
	W	**X**	**Z**
A	Spinal cord	Cerebrum	Cerebellum
B	Medulla oblongata	Cerebellum	Cerebrum
C	Spinal cord	Cerebellum	Cerebrum
D	Medulla oblongata	Cerebrum	Cerebellum

(2)

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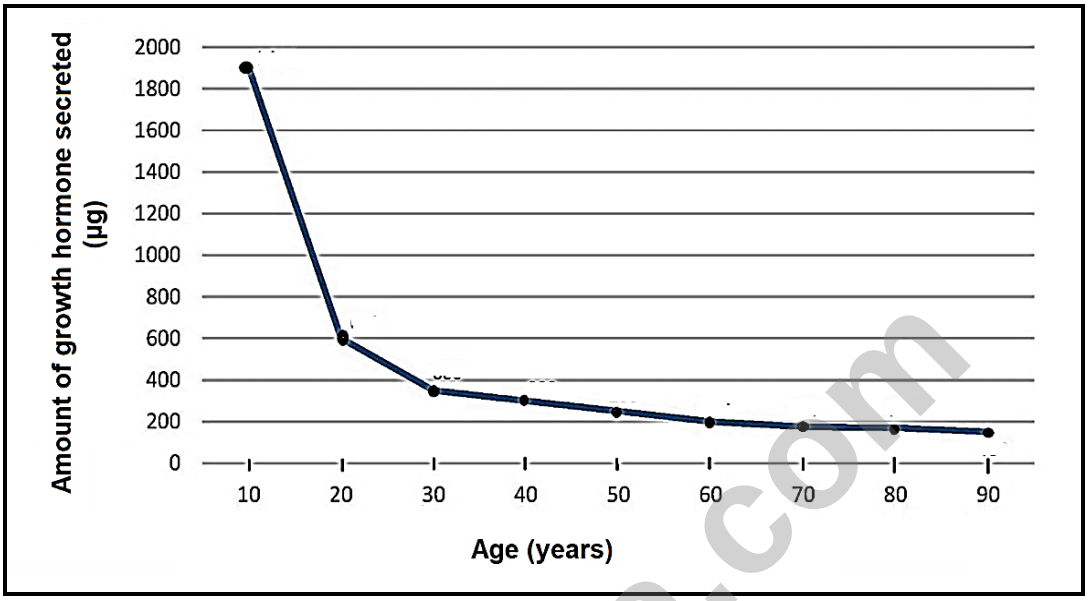
1.1.8 The graph below illustrates the secretion of growth hormone in humans at different ages.



Study the statements below:

i) Growth hormone is not secreted after the age of 80 years.

ii) The decrease in growth hormone secretion from age 10 years to age 20 years is 1 300 µg.

iii) The amount of growth hormone secreted decrease with an increase in age.

iv) The decrease in growth hormone secreted from age 30 years to age 50 years is 200 µg.

Which of the statements above are correct according to the graph?

A ii); iii) and iv)

B ii) and iii) only

C i) and iv) only

D iii) only (2)

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1.1.9 Which one of the followings statements about the effect of adrenaline on the body is TRUE?

A Constriction of blood vessels to the skeletal muscles

B Increase in the heart rate

C Constriction of bronchi

D Dilation of blood vessels to skin and the digestive system (2)

1.1.10 A person sitting in a dark room is asked to cover one eye. A torch light, positioned at varying distances from the person, is switched on at one-minute intervals for a period of 10 seconds. During this period the diameter of the pupil is measured. The results obtained are shown in the table below.

Time intervals (minutes)	1	2	3	4	5	6	7	8	9	10
Diameter of pupil (mm)	5	3	5	4	8	4	6	2	7	6

Which ONE of the following statements is correct according to the data in the table?

A The torch was the closest to the person at the time interval of 2 minutes.

B The torch was the furthest away from the person at the time interval of 5 minutes.

C The torch was at the same distance from the person at time intervals of 3 and 10 minutes.

D The largest increase in the diameter of the pupil occurred between time intervals of 4 and 5 minutes. (2)

(10x2) **[20]**

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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 1.2.8) in the ANSWER BOOK.

1.2.1 The control of the quantity of water entering and leaving the cells of an organism

1.2.2 Type of fertilisation that occurs in birds

1.2.3 The process of maintaining a constant, optimal internal environment in the body

1.2.4 The area of the retina that contains no photoreceptor cells

1.2.5 Plant hormone that stimulates cell division and elongation and increases the rate of germination

1.2.6 The part of a neuron that conducts impulses from the cell body

1.2.7 The canal that carries sound waves to the tympanic membrane

1.2.8 The organ or cells that are affected by a specific hormone or substance

(8x1) **[8]**

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 only **A, ONLY B, BOTH A and B or NONE** next to the question numbers (1.3.1 to 1.3.5) in the ANSWER BOOK.

COLUMN I		COLUMN II	
1.3.1	Pancreas	**A**	Endocrine gland
		B	Exocrine gland
1.3.2	Part of the human eye that is normally transparent	**A**	Cornea
		B	Lens
1.3.3	Presence of a placenta	**A**	Ovoviviparity
		B	Oviparity
1.3.4	Assists in concentrating light rays on the yellow spot	**A**	Radial muscles
		B	Cornea
1.3.5	Presence of amniotic eggs	**A**	Birds
		B	Fish

(5x2) **[10]**

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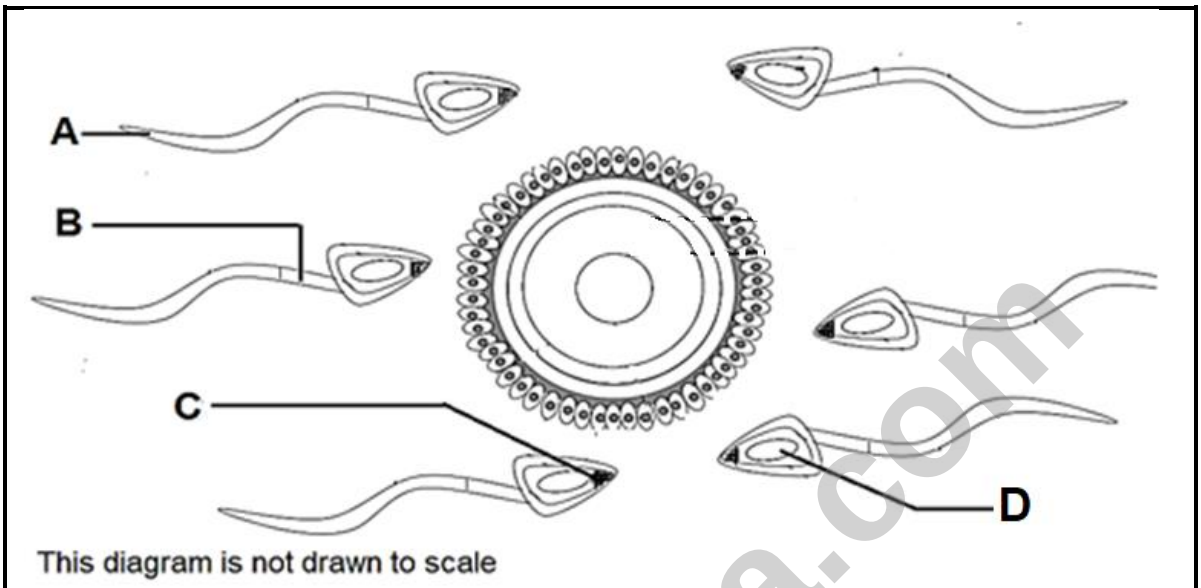
1.4 The diagram below illustrates a human ovum on the verge of fertilisation. Study the diagram and answer the questions that follow.



HUMAN OVUM ON THE VERGE OF FERTILISATION

1.4.1 Give the LETTER and the NAME of the part that:

a) Contains enzymes to break down the outer layer of the ovum. (2)
b) Contains mitochondria. (2)
c) Contains genetic material of the father. (2)

1.4.2 Describe how the structure labelled **A** performs its function. (2)

1.4.3 Name the place in the human body where the process illustrated in the diagram will occur. (1)

1.4.4 Name the cell that forms when the sperm and ovum fuse. (1)

1.4.5 Give evidence from the diagram to explain why the diagram is not drawn to scale. (2)

[12]

TOTAL SECTION A: [50]

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SECTION B

QUESTION 2

2.1 The photo below illustrates a student reading a book. Study the photo and answer the questions that follow.

STUDENT READING A BOOK

2.1.1 The student cannot see the letters in his book in focus.

a) Identify the condition which the student suffers from. (1)

b) Explain how spectacle lenses can correct the condition named in QUESTION 2.1.1 a). (2)

2.1.2 There are trees on the far side of the field. The student looks from his book to the trees.

a) Name the process that occurs in the eye when the student looks from his book to the trees for him to see a clear image of the trees. (1)

b) Describe how the student's eye adjusts to form a clear image of the trees. (4)

2.1.3 The student covers his left eye with his hand.

Explain how this will affect his vision of the trees. (3)

[11]

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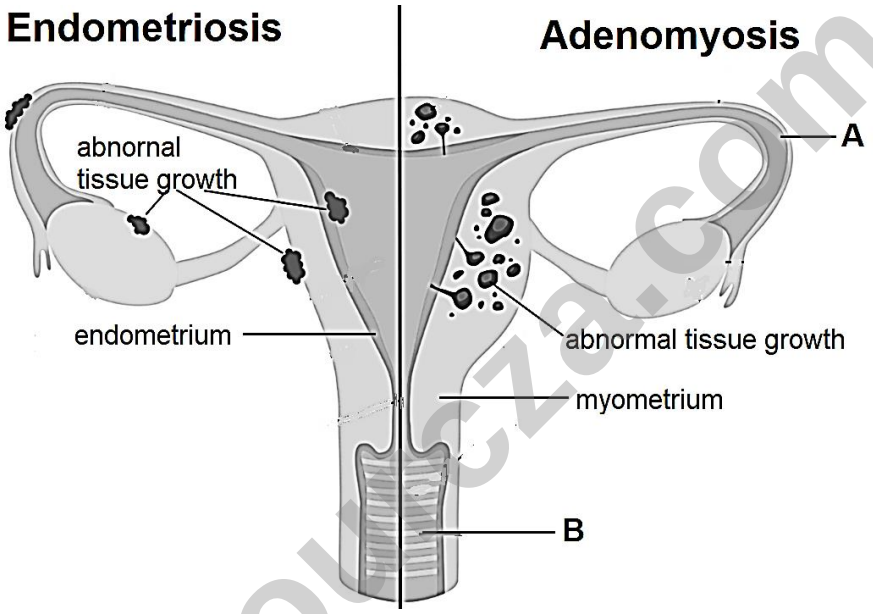
2.2 Read the following information on endometriosis and adenomyosis and answer the questions that follow.

Endometriosis and adenomyosis are both conditions that affect the uterus and can cause significant pain and discomfort. Other symptoms include heavy menstrual bleeding, painful menstrual cramps, pelvic pain, and infertility. Both of these conditions occur when the same type of cells that line the uterus grows outside of it. The diagram below illustrates the difference in the occurrence of endometriosis and adenomyosis.



OCCURANCE OF ENDOMETRIOSIS AND ADENOMYOSIS

2.2.1 Identify the parts labelled:

a) **A** (1)
b) **B** (1)

2.2.2 Describe the difference between the occurrence of endometriosis and adenomyosis. (2)

2.2.3 Explain ONE reason why endometriosis might cause infertility. (2)

2.2.4 The ovaries produce the hormone oestrogen.

a) Name the cells in the ovaries that produce oestrogen. (1)
b) State TWO functions of oestrogen in the female body. (2)

2.2.5 Explain why females with endometriosis and adenomyosis can suffer from anaemia. (2)

[11]

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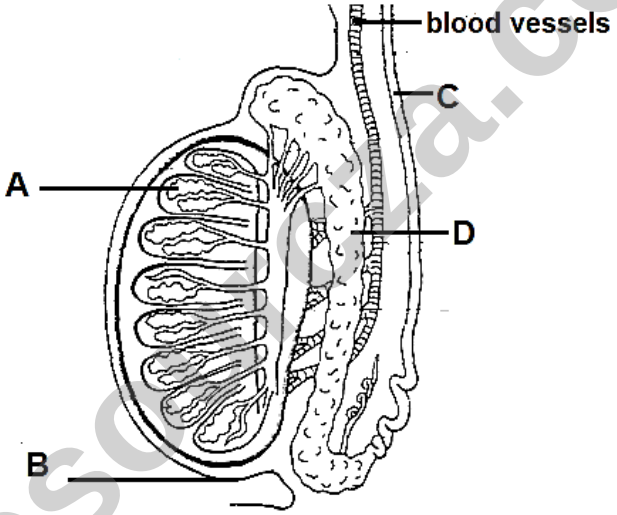
2.3 The following is information on castration. Read the text and study the diagram of the testis and then answer the questions.

Castration is the removal or destruction of testicles using radiation, surgery or drugs which causes a male to lose the use of the testes. In the olden days, castration was frequently used for religious or social reasons in certain cultures in Europe, South and East Asia. Castrated men were used to staff bureaucracies and palace households. The Czech Republic still practices surgical castration on convicted sex offenders.

Choir masters in the Roman Catholic church used to encourage the best singers among their choir boys who were nearing puberty to get castrated so they could retain their high voices which will enable them to retain their status in the choir. A minority were such good singers that they became famous opera singers.



LONGITUDINAL SECTION OF HUMAN TESTIS

2.3.1 Explain the term *longitudinal section* in the heading of the diagram above. (2)

2.3.2 Identify the parts labelled:

a) **A** (1)
b) **B** (1)
c) **D** (1)

2.3.3 State the LETTER of the structure in which spermatogenesis occurs. (1)

2.3.4 Explain how the part labelled **C** is structurally adapted to perform its function. (3)

2.3.5 Explain how the part labelled **B** will react when exposed to cold temperature. (4)

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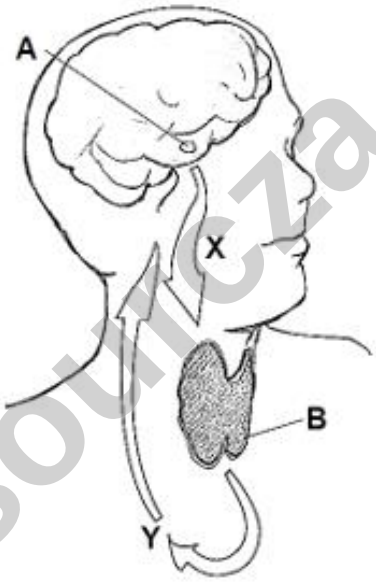
2.3.6 Castration is used as punishment for sex offenders in the Czech Republic.

Explain why this is considered as an effective method of punishment for these offenders. (3)

2.3.7 Explain why choir boys needed to be castrated before puberty to retain their high voices. (3)

[19]

2.4 The diagram below illustrates the interaction between two endocrine glands. Gland **A** is located at the base of the brain and gland **B** is at the base of the neck. Study the diagram and answer the questions that follow.



INTERACTION BETWEEN TWO ENDOCRINE GLANDS

2.4.1 Identify:

a) the gland labelled **A**. (1)
b) the hormone **X**. (1)

2.4.2 State TWO functions of the hormone labelled **Y**. (2)

2.4.3 Describe the negative feedback mechanism that occurs when the level of hormone **Y** in the blood is higher than the normal level. (5)

[9]

TOTAL QUESTION 2: [50]

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QUESTION 3

3.1 Read the following information on the incidence of occupational hearing loss and answer the questions that follow.

Occupational hearing loss is damage to the inner ear from noise or vibrations due to certain types of jobs. The table below illustrates the results of an investigation to determine the incidence of hearing loss at age 50 years in different professions.

Table illustrating the incidence of hearing loss at 50 years in different profession

Profession	Incidence of hearing loss at 50 years of age (%)
No noise exposure	9
Manufacturing	30
Firefighters	33
Agriculture	36
Air force	42
Carpenters	44
Plumbers	48
Army	50
Construction	63
Mining	60

3.1.1 Identify the independent variable in this investigation. (1)

3.1.2 Draw a bar graph to illustrate the incidence of hearing loss at 50 years of age in different professions. (7)

3.1.3 Give the ratio of the incidence of hearing loss in people with a profession of no noise exposure to the hearing loss of people working in construction. Express the ratio as a whole number. (2)

3.1.4 Occupational hearing loss is due to damage in the inner ear.

Explain why damage to this part of the ear causes hearing loss. (3)

3.1.5 State TWO ways how employers can decrease the incidence of occupational hearing loss in their employees. (2)

[15]

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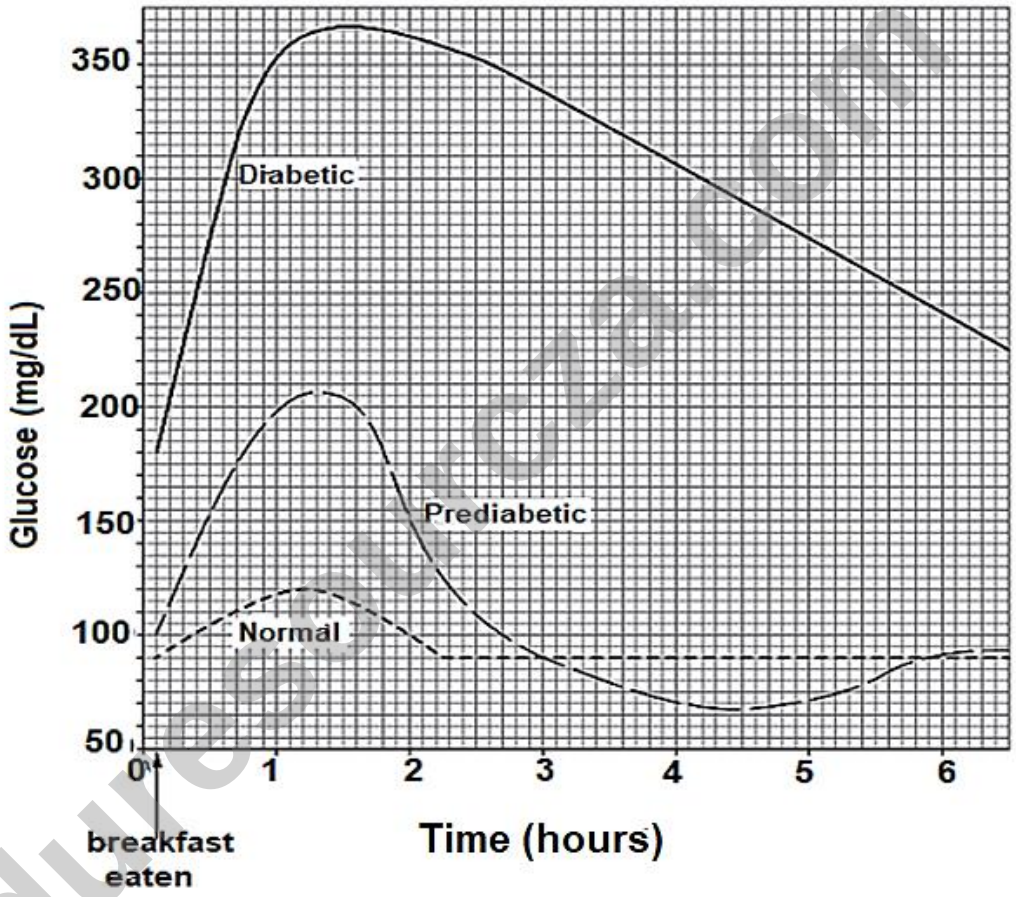
3.2 Read the following information about the regulation of blood glucose levels and answer the questions that follow.

The blood glucose level of people with no sign of diabetes is 80– 90mg/dL before meals and can rise to 120mg/dL after they consume food or beverages. (mg/dL is the milligrams of glucose per decilitre / 100 ml of blood)

The blood glucose levels of 3 women were measured first thing in the morning and every hour for the next 6 hours. Each of the women ate the same breakfast. The results are shown in the graph below.



3.2.1 Name TWO controlled variables in this investigation. (2)

3.2.2 Use the graph to determine the blood glucose level of the woman with diabetes 4 hours after the investigation started. (2)

3.2.3 A prediabetic person is someone who is developing diabetes.

Describe TWO ways how the results of the prediabetic women differ from the results of the normal women. (2)

3.2.4 State TWO ways how the diabetic woman can avoid the high increase in blood glucose after eating a breakfast. (2)

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3.2.5 The three women did not eat any food during the six hours after breakfast.

Describe how the body of the normal woman reduces the blood glucose level in her blood between hours one and two. (4)

[12]

3.3 Read the following information on the ripening of fruit and answer the questions that follow.

On the outside, the fruit ripening process is reflected by the change in colour, odour and hardness of the fruit. On the inside, there is a composition change as the starch that makes up the fruit is converted to sugar. Ethylene is a gaseous plant hormone that plays an important role in stimulating the ripening process of many fruits. Sometimes fruit at the grocery store, particularly pears, are sold unripe.

Students performed an investigation to determine if there is a way to accelerate the fruit ripening process at home. They followed the following method:

- Place an unripe pear in each of four plastic bags numbered **1** – **4**.
- Place one ripe banana into bag **3** and **4** and close the bags tightly.

- After 3 days cut the 4 pears in half.
- Pour iodine solution in a petri dish.
- Place the pears cut side down into the iodine solution for one minute to test the starch content.
- Observe and record the level of staining on each section of pear. The riper the pear the less the reaction with iodine occurs and the blue-black colour is not produced.

The students observed that the pears from bags **3** and **4** produced less blue-black colour with iodine than the pears from bag **1** and **2**.

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3.3.1 Formulate a hypothesis for this investigation. (2)

3.3.2 Explain why the pears were tested for starch content after 3 days. (2)

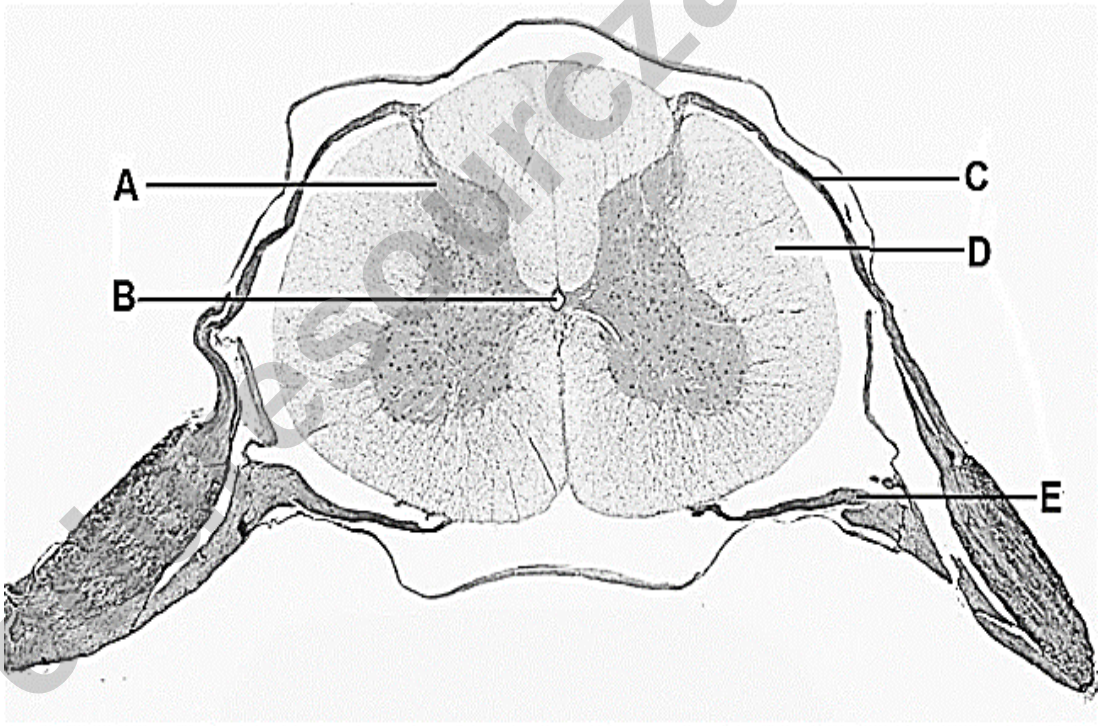
3.3.3 State TWO ways in which the students can increase the reliability of this investigation. (2)

3.3.4 Give the BAG NUMBERS of the bags that were the experiments/tests in this investigation. (2)

3.3.5 Explain the benefit for commercial fruit growers to use ethylene gas to stimulate the ripening of fruit before it is sold. (2)

[10]

3.4 The diagram below illustrates a micrograph of a cross section through the human spinal cord. Study the diagram and answer the questions that follow.



MICROGRAPH OF CROSS SECTION THROUGH SPINAL CORD

3.4.1 Name the two main parts of the human nervous system. (2)

3.4.2 Identify the parts labelled:

a) **A** (1)
b) **B** (1)
c) **C** (1)

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3.4.3 State TWO functions of the fluid that is found in the part labelled **B**. (2)

3.4.4 Identify the type of neuron that occurs in the structure labelled **E**. (1)

3.4.5 If the spinal cord is cut or crushed during an accident, paralysis can occur.

Explain why a person with a crushed spinal cord is unable to move his/her legs. (3)

3.4.6 Name TWO reflex actions of the spinal cord. (2)

[13]

TOTAL QUESTION 3: [50]

TOTAL SECTION B: [100]

GRAND TOTAL: [150]

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