

LIFE SCIENCES: PAPER I

EXAMINATION NUMBER

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ANSWER BOOKLET

There are (xiv) pages in the Answer Booklet. Please write your examination number in the blocks above.

QUESTION 1

- 1.1 Select the term in Column B that best matches a description in Column A. Write the letter of the term in the corresponding space provided between the brackets. Each letter may only be used once.

COLUMN A

COLUMN B

- | | |
|--|---|
| <p>[] A new population is established by a very small number of individuals from a larger population.</p> <p>[] Promotes heterozygosity.</p> <p>[] One of the first scientific thinkers who proposed an idea of evolution.</p> <p>[] Theory of inheritance of acquired characteristics.</p> <p>[] A form of macroevolution with a constant rate of variations over long periods of time.</p> <p>[] Movement of genes from one population to another.</p> <p>[] Formulated the theory of evolution by natural selection.</p> <p>[] Structure which once performed a function in an ancestor of an organism.</p> <p>[] Similar structures in organisms acquired from a common ancestor.</p> <p>[] Proposed a similar mechanism of evolution to that of Charles Darwin.</p> | <p>A Outbreeding</p> <p>B Jean-Baptiste Lamarck</p> <p>C Alfred Wallace</p> <p>D Gene flow</p> <p>E Punctuated equilibrium</p> <p>F Homologous</p> <p>G Founder effect</p> <p>H Charles Darwin</p> <p>I Extinction</p> <p>J Gradualism</p> <p>K Erasmus Darwin</p> <p>L Vestigial organ</p> |
|--|---|

(10)

1.2 Six multiple-choice questions are given below. Choose the most correct option for each question and write the letter of your choice in the space provided in the table below.

Question	1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
Answer						

1.2.1 Living in a herd is of benefit to zebra as it:

- A allows individuals to source more food.
- B reduces competition as some zebra eat grass whilst other zebra eat leaves.
- C allows the herd to avoid predators more easily.
- D reduces competition for mates. (1)

1.2.2 Which of the following combinations of characteristics, (i) to (iv), are true of a social species such as termites?

- (i) Individuals live in groups
 - (ii) Individuals care for young that are not their own
 - (iii) All individuals of the colony have the same body structure
 - (iv) Not all individuals get to reproduce
- A (i), (ii), (iii), (iv)
 - B (i), (iii)
 - C (i), (ii), (iv)
 - D (ii), (iii) (1)

1.2.3 Wild dogs can be classified as a K-strategy species because:

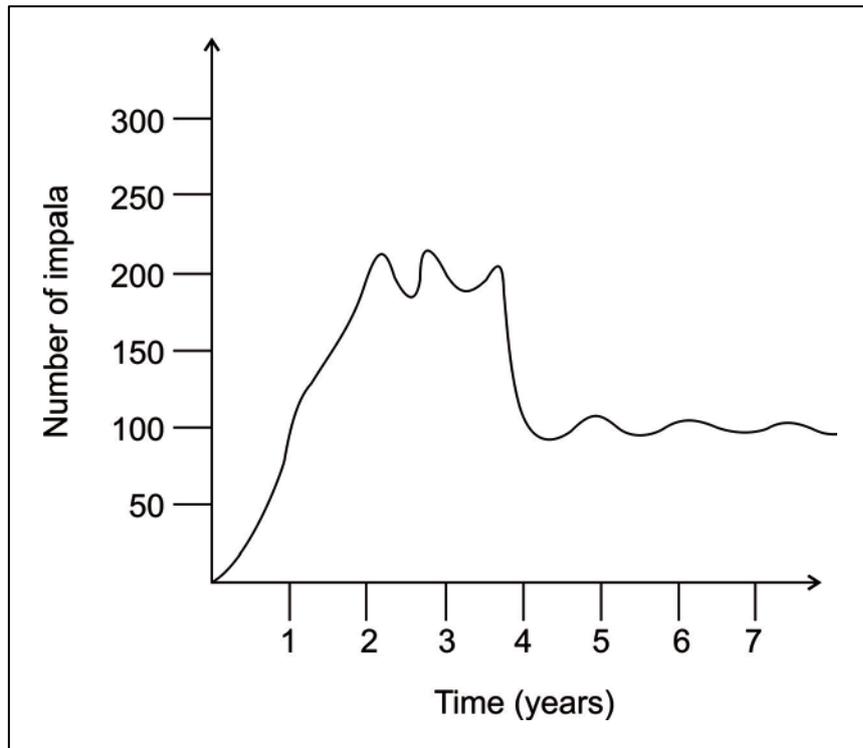
- A they only have one breeding pair in the pack.
- B they show high care of the young increasing their survival rate.
- C many wild dogs fall prey to lion.
- D they are an endangered species due to habitat loss. (1)

1.2.4 Certain plants attract pollinators by generating heat at different times of the day. Different plant species heat up at different times of the day.

This concept can be best described as:

- A a density independent factor.
- B resource partitioning.
- C asexual reproduction.
- D predation. (1)

1.2.5 The graph below shows the changes in the number of impala after being introduced into a fenced game reserve. During this period of time a drought occurred.



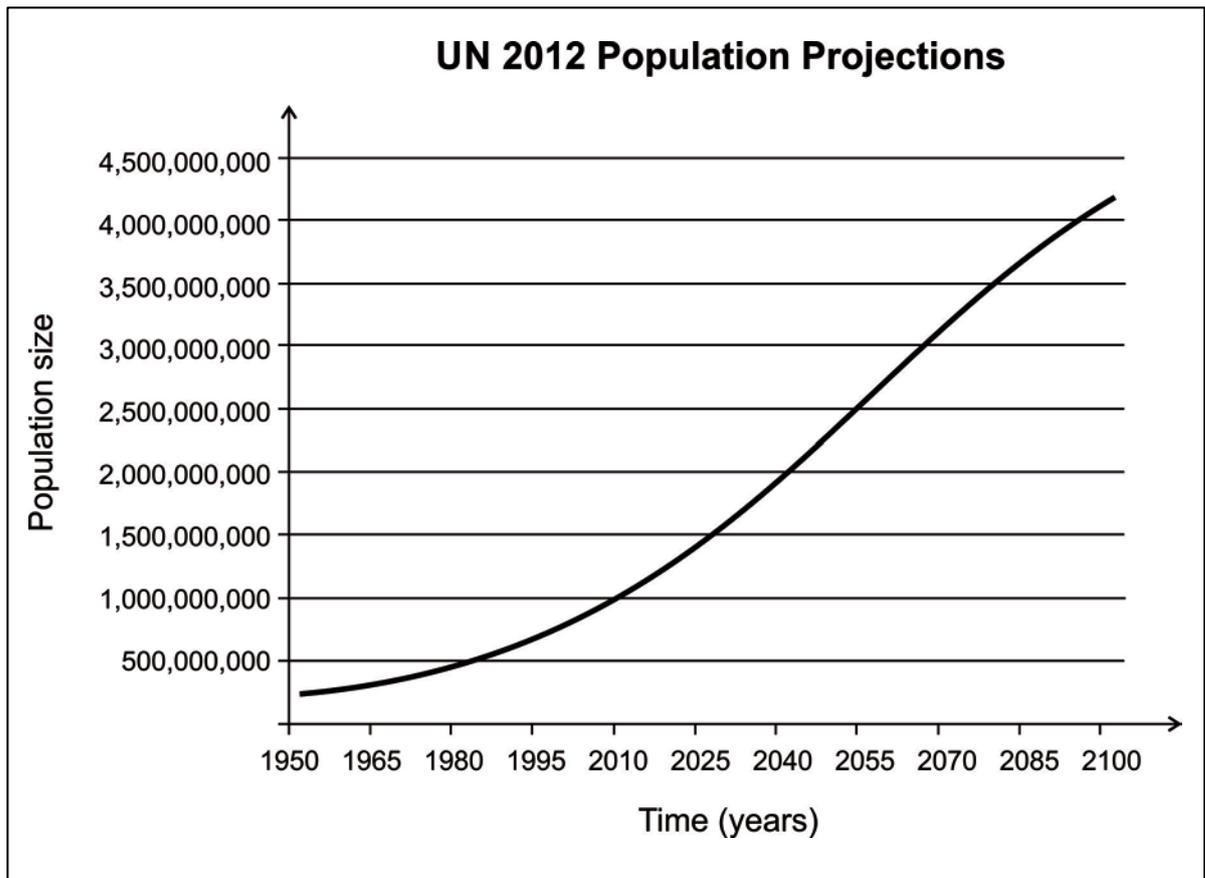
[Adapted from: <<http://www.rpd.net>>]

What is the carrying capacity of impala after the drought?

- A 100
- B 200
- C 150
- D 225

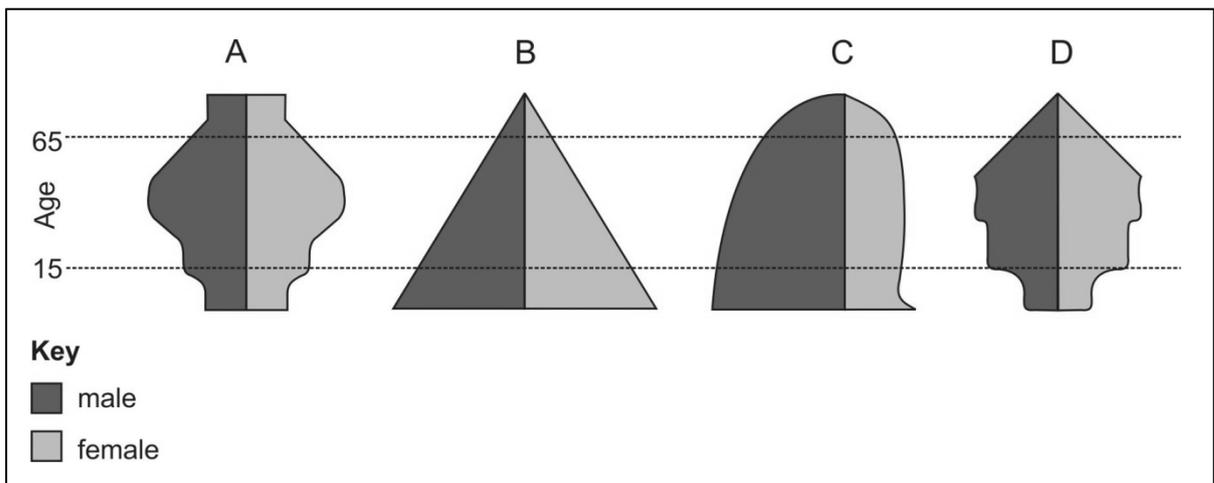
(2)

1.2.6 The graph below shows the United Nations' projections of population size for the continent of Africa.



[Adapted: <<https://www.amren.com>>]

Which of the following population pyramids is likely to represent the population of the African continent in 2100?

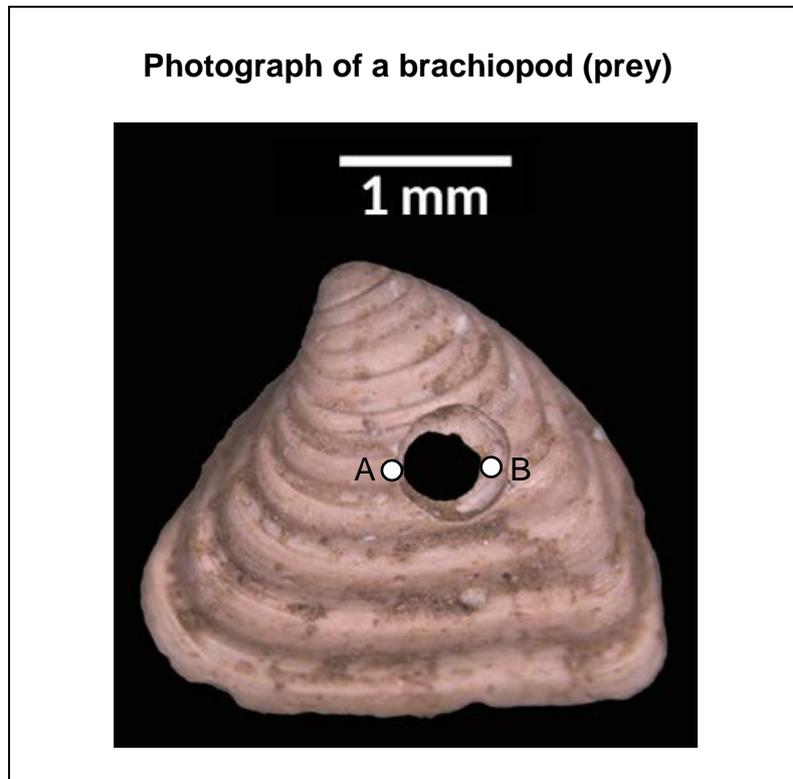


[Adapted: <<https://commons.wikimedia.org>>]

(2)

- 1.3 Predators such as moon snails (*Naticarus orientalis*) feed on prey with shells, e.g. brachiopods. Moon snails kill their prey by drilling through their shells. Drilling holes also allows the predator to reach the soft meat of the prey.

The photograph below shows a fossil shell of a brachiopod estimated to be about 4 million years old. The hole made by the predator is clearly seen.

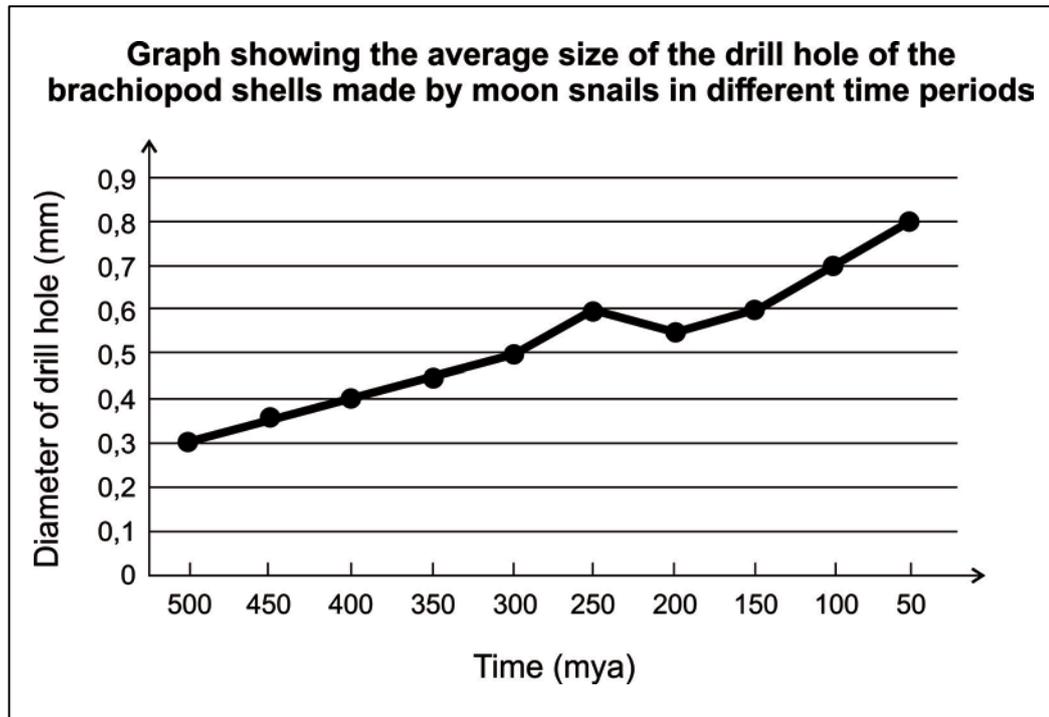


[Source: <<https://www.sciencenews.org>>]

- 1.3.1 Use the scale line to calculate the actual diameter of the drill hole from A to B. (Show all working).

(4)

1.3.2 Scientists measured the drill holes made by moon snails in 7 000 brachiopod fossil shells from different time periods. The data was published in a journal. This is shown in the graph below.



[Adapted: <<https://www.sciencenews.org>>]

- (a) Identify the independent variable of this study.

_____ (1)

- (b) What is the average size of the drill hole at 400 million years ago?

_____ (1)

- (c) Describe the trend shown by the graph.

_____ (2)

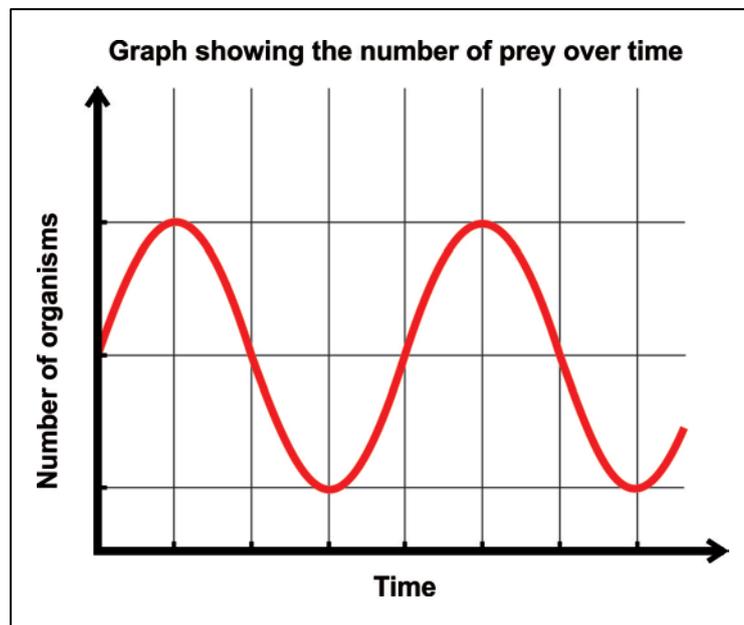
- (d) The actual size of the shells of the prey did not change with time. Suggest one physical feature of the shells that may have evolved for protection against predators.

_____ (1)

- (e) Give ONE reason why the data collected by the scientists can be regarded as reliable. Explain your answer.

(2)

- (f) The graph below shows an incomplete predator-prey relationship. On the graph, draw a line to represent the predators.



[Source: Lever, P.(2018) Pers.com.]

(2)

1.4 The following infographic relates to foetal alcohol syndrome. Use the information below to answer the question on the next page.

Foetal Alcohol Syndrome (FAS)

Foetal alcohol syndrome is a condition affecting children resulting from alcohol exposure during the mother's pregnancy. FAS causes brain damage and growth and behavioural problems. Defects are irreversible.

Foetal alcohol syndrome is 100% preventable

Facts about FAS

Physical abnormalities due to FAS include smaller physical size, narrow or small eyes, a smooth ridge between the nose and upper lip, and a thin upper lip

South Africa has the highest rate of FAS in the world

FAS can lead to intellectual disability, heart and skeletal defects, abnormalities of the kidneys, sight and hearing problems

Alcohol consumed by the mother at any stage during pregnancy may affect the foetus

The infographic features a central illustration of a pregnant woman in a pink dress and a silhouette of a fetus in a white circle. Red lines connect various text boxes to these central images. The title 'Foetal Alcohol Syndrome (FAS)' is written in large, bold, teal letters at the top left. A central text block explains the condition. A pink circle on the left states that FAS is 100% preventable. A pink circle on the right is titled 'Facts about FAS'. Below this, a pink box lists physical abnormalities. A pink box on the left notes that South Africa has the highest rate of FAS. Another pink box at the bottom left lists potential health consequences. A final pink box at the bottom center states that alcohol consumption during pregnancy can affect the fetus.

[Adapted: <<http://www.excelsiornews.co.za>>]

The five statements in the table below refer to the infographic on page viii. For each statement decide whether:

- A the statement is supported by the information in the infographic.
- B the statement is contradicted by the information in the infographic.
- C the statement is neither supported nor contradicted by the information in the infographic.

	Statement	A, B or C
1.4.1	South Africa has more cases of FAS than the rest of the world.	
1.4.2	Abnormalities caused by foetal alcohol syndrome are reversible.	
1.4.3	FAS can be prevented by avoiding alcohol during pregnancy.	
1.4.4	Children with FAS have physical abnormalities and intellectual disabilities.	
1.4.5	FAS largely affects poverty stricken areas.	

(5)

- 1.5 Study the following table which consists of two items (numbered 1 and 2) in the first column and a term in the second column. **Decide which item(s) relate to the term.**

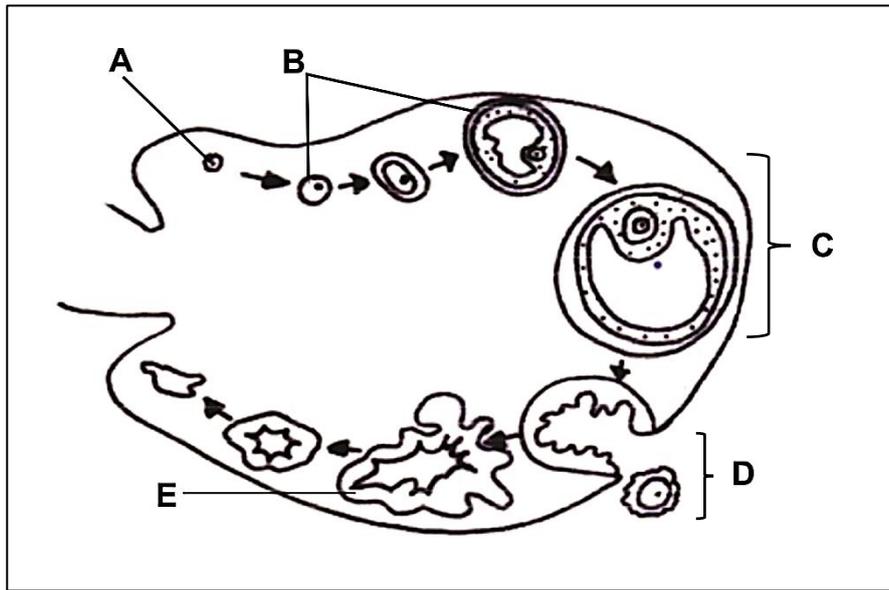
Write down your choice in the space provided in the "answer" column, making use of the following codes:

- A only item 1 relates to the term
- B only item 2 relates to the term
- C both item 1 and 2 relate to the term
- D neither item 1 or 2 relates to the term

Item	Term	Answer
1. Permanent contraception for female 2. Inserted into the uterus	IUD	
1. Prevents STIs 2. Chemical barrier	Male condom	
1. Tracking fertile days in the menstrual cycle 2. Prevents embryo implantation	Rhythm method	
1. Foreskin is removed 2. The fallopian tubes are tied off	Vasectomy	
1. Prevents ovulation 2. Contains reproductive hormones	Contraceptive pill	

(5)

1.6 The diagram below represents a section through a human ovary showing the development of the primary follicle during one menstrual cycle.



[Adapted: <<https://en.wikibooks.org>>]

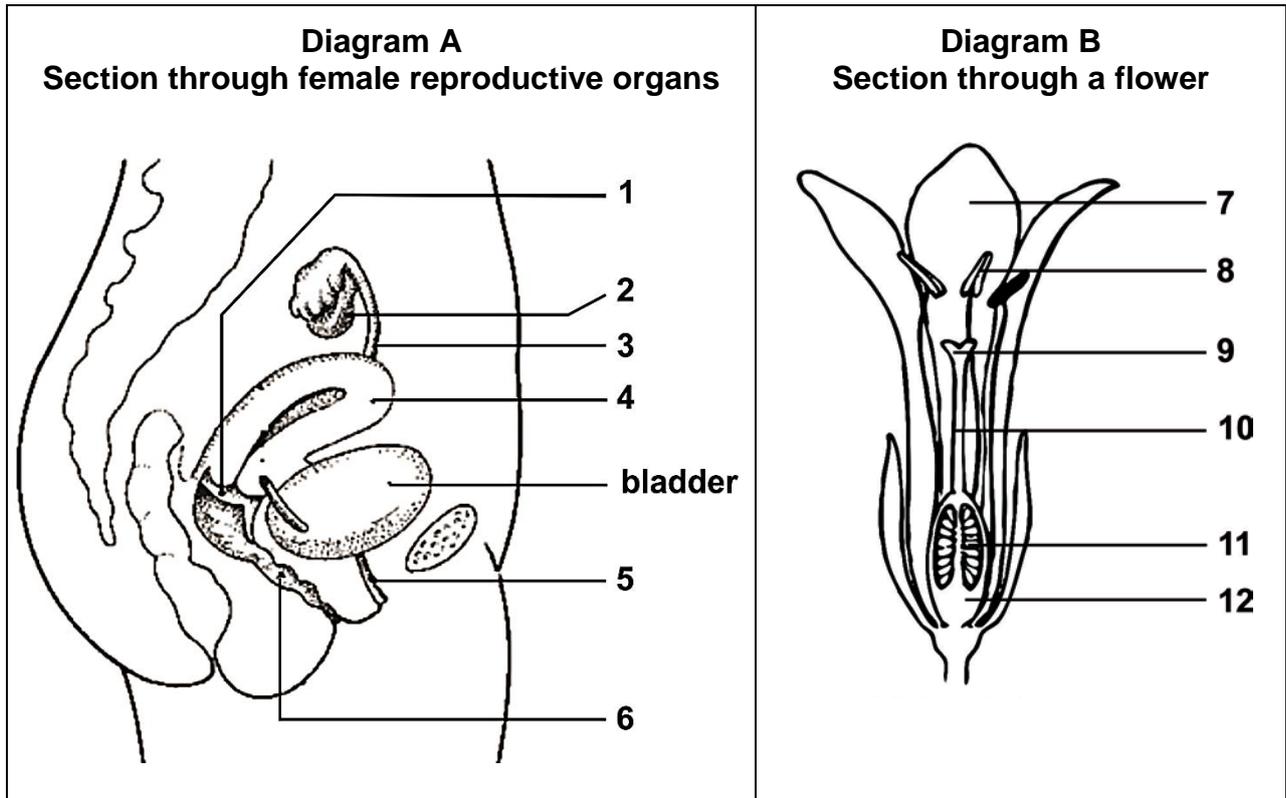
1.6.1 Label **on the diagram** above a mature egg cell/ovum. (1)

1.6.2 Select the letter from the diagram which best matches the term/description in the table below. Letters may be used more than once.

Term/Description	Correct letter
(a) Mature Graafian follicle	
(b) Ovulation	
(c) Corpus luteum	
(d) Releases oestrogen at the start of the menstrual cycle.	
(e) Starts developing as a result of FSH release.	
(f) Produces a hormone to inhibit FSH production after ovulation.	
(g) Remains in place if fertilisation does occur.	
(h) Occurs due to a surge in LH.	

(8)

1.7 The diagrams below show the human female reproductive organs (Diagram A) and the structure of a flower (Diagram B).



[Adapted: <<https://anatomyhuma123.com>>]

[Adapted: <<https://www.gutenberg.org>>]

1.7.1 Select the number(s) from the diagram(s) which best match the description in the table below. Numbers may be used more than once. Shaded blocks indicate no answers required.

Description	Label number(s)	
	Diagram A	Diagram B
Place where fertilisation takes place.		
Place where the male reproductive cells are deposited.		
Organ which protects a developing foetus.		
Structure where meiosis takes place.		
Structure which develops into the fruit.		

(8)

1.7.2 Plants such as the potato can reproduce asexually and sexually. In the space below tabulate THREE differences between sexual and asexual reproduction.

(6)

1.8 An investigation on the effect of age on the release of growth hormone was carried out on 89 male and 84 female subjects. The data collected is shown in the table below.

Table showing the average concentration of growth hormone at different ages

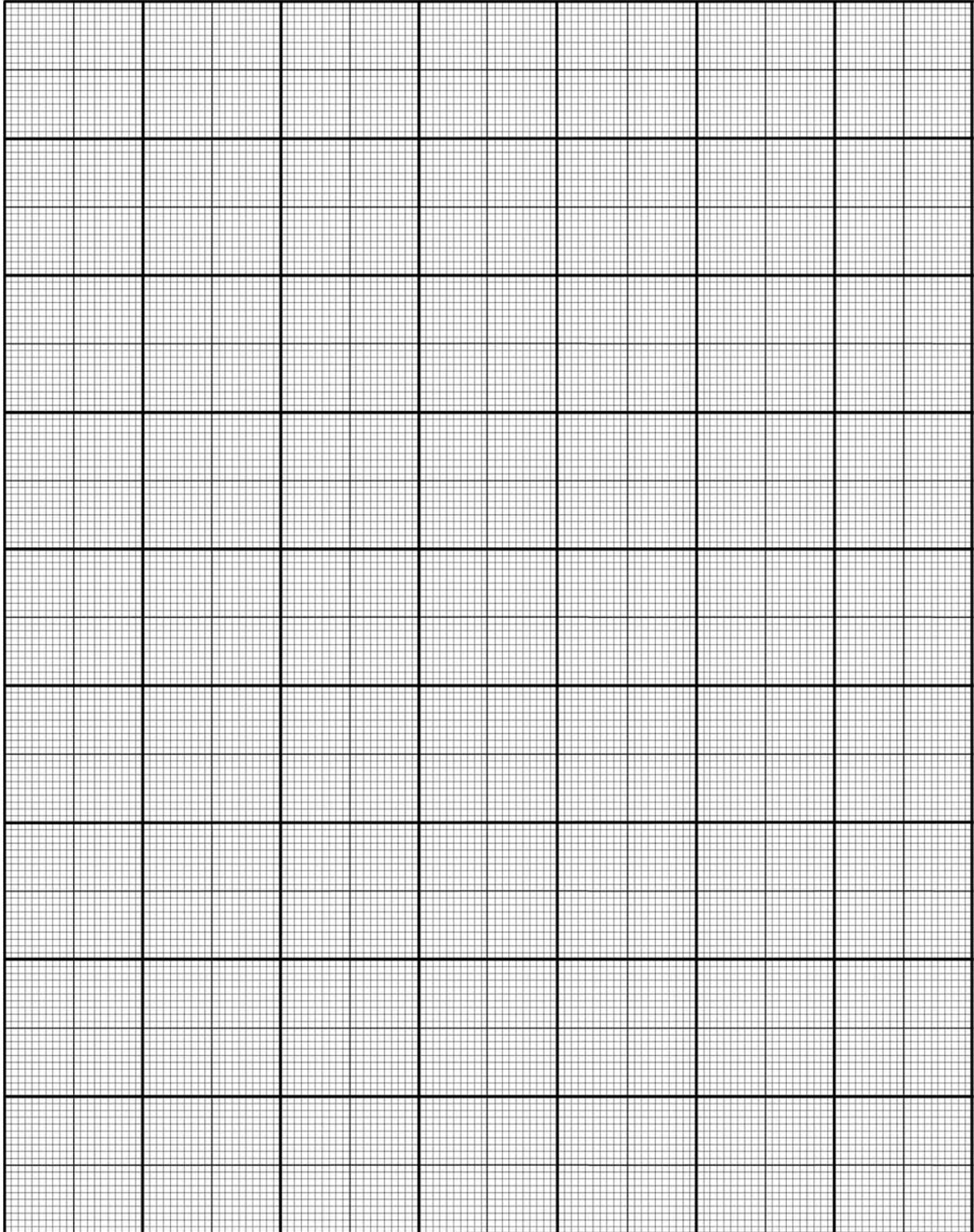
Age (years)	Growth hormone concentration (ng/ml)
10	5,8
20	7,2
30	4
40	2
50	1,4
60	1,4

*ng = nanograms

[Adapted: <<http://physrev.physiology.org>>]

1.8.1 Plot this data as a line graph on the graph paper on page xiii:

(8)



1.8.2 Name the gland that releases growth hormone.

_____ (1)

1.8.3 Blood samples were taken from the participants in the study. Explain why this is an appropriate way to measure growth hormone levels.

_____ (1)

1.8.4 Explain why growth hormone increased between the ages of 10 and 20 years.

_____ (2)

1.8.5 (a) From the table on page xii, identify when the growth hormone is at the lowest level.

_____ (1)

(b) Explain why the growth hormone is low at this age mentioned in question 1.8.5 (a) above.

_____ (1)

1.8.6 An over secretion of growth hormone can occur in adults.

(a) Name this condition.

_____ (1)

(b) State one symptom that would be present in an adult with this condition mentioned in Question 1.8.6 (a) above.

_____ (1)

[80]