

**LIFE SCIENCES: PAPER I**

**EXAMINATION NUMBER**

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**ANSWER BOOKLET**

There are thirteen (xiii) 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.

<b>Column A</b>		<b>Column B</b>	
[ ]	Giving birth to live young that have developed inside the mother's body.	A	K-strategy
[ ]	An evolutionary development that allowed the first reptiles to lay their eggs on land.	B	Oviparous
[ ]	Behaviour by which organisms select their partners for reproduction.	C	Asexual reproduction
[ ]	Characterised by a high number of offspring and no parental care.	D	Copulation
[ ]	No gametes are formed.	E	r-strategy
[ ]	Embryo develops after egg laying.	F	External fertilisation
[ ]	Fusion of male and female gametes outside the bodies of the reproducing individuals.	G	Courtship
[ ]	Eggs hatch inside the body of the parent.	H	Amniotic egg
[ ]	Breeding at different times of the year.	I	Ovoviviparous
[ ]	When the male reproductive organ enters the female's reproductive tract to deposit sperm.	J	Reproductive isolation
		K	Parental care
		L	Viviparous

(10)

- 1.2 Five 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
Answer					

- 1.2.1 Which of the following statements best describes evolution as a scientific theory?

- A It is based on spiritual beliefs.
- B It is a hypothesis that needs to be proved.
- C It is an explanation of natural phenomena that has a reliable body of supporting evidence, confirmed through observation and experimentation.
- D It explains natural phenomena using the beliefs and expertise of scientists.

(1)

- 1.2.2 Genetic variation in offspring cannot be caused by:

- A sexual reproduction.
- B crossing over during meiosis.
- C mutations in somatic cells.
- D random mating and fertilisation.

(1)

- 1.2.3 The females of a cichlid species of fish, *Pundamilia nyererei*, select males on the basis of colour:

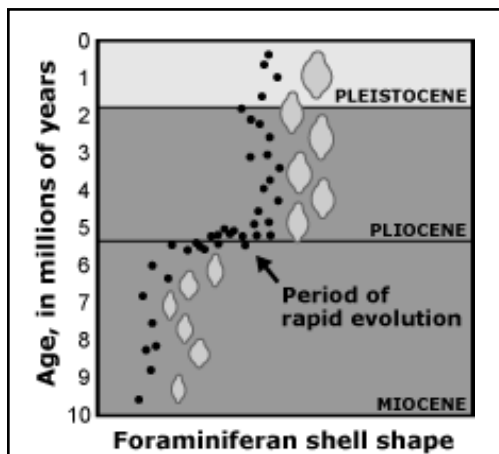
- In clear water, females tend to select bright red males.
- In cloudy water, females are less choosy and may select males with duller red colours.

Over time, one could expect to see:

- A more red males living in clear water.
- B more red males living in cloudy water.
- C no changes in colour of males in either location.
- D females becoming more red in colour.

(1)

1.2.4 The diagram below best represents:

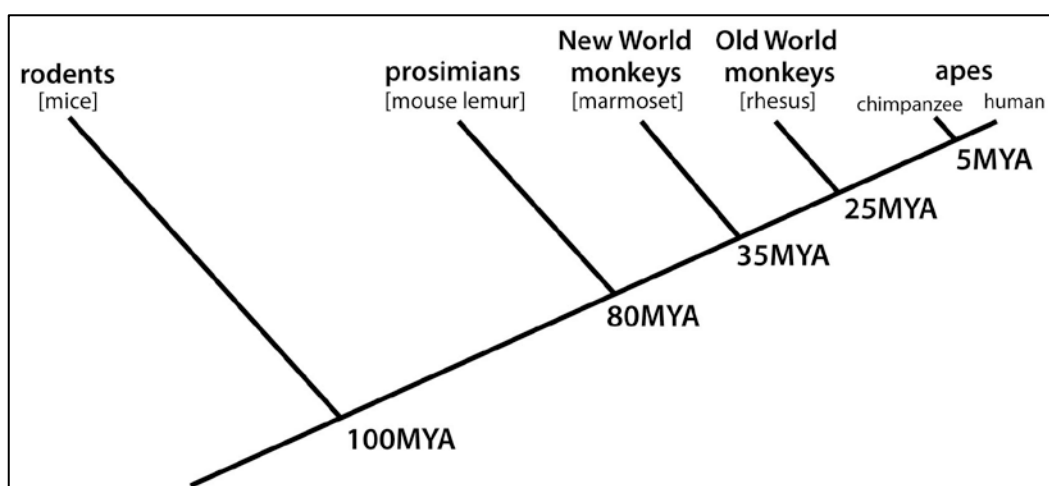


[Source: <<https://evolution.berkeley.edu>>]

- A gradualism
- B punctuated equilibrium
- C gene flow
- D convergent evolution

(2)

1.2.5 Study the evolutionary family tree of primates shown below.



[Source: <<https://www.sciencedirect.com>>]

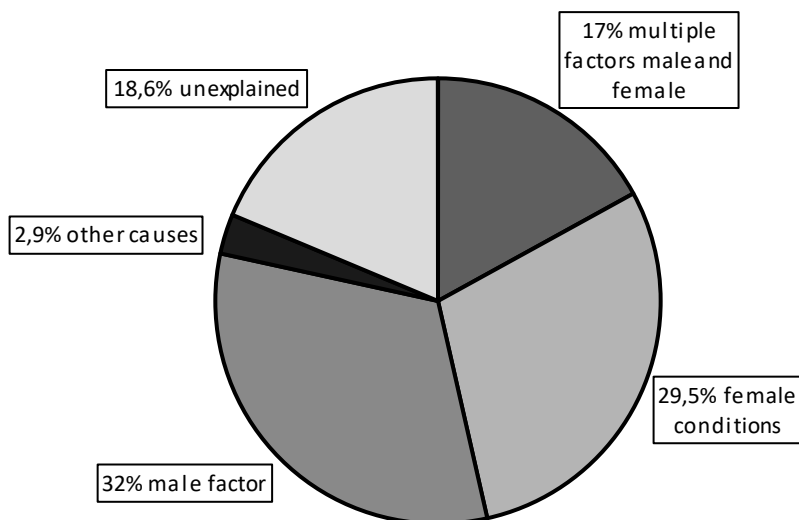
The family tree indicates that the last common ancestor of humans and chimpanzees lived:

- A about 25 million years ago
- B about 80 million years ago
- C about 5 million years ago
- D more than 100 million years ago

(2)

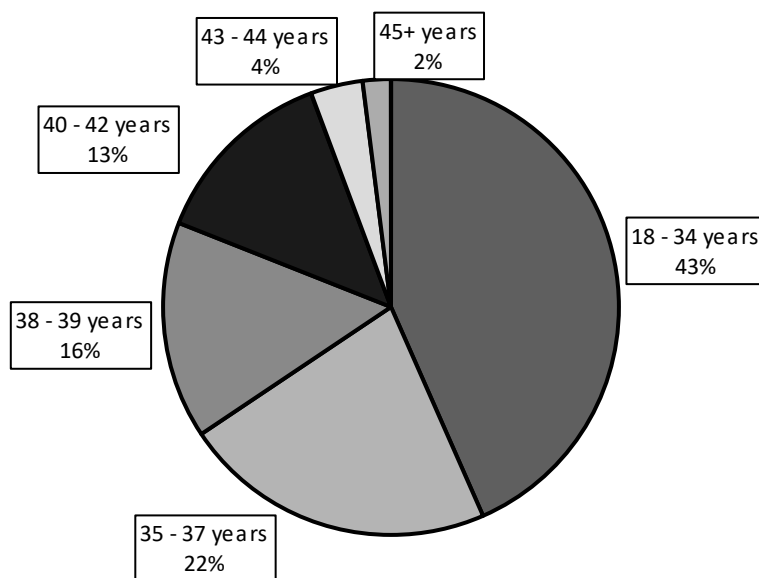
- 1.3 1.3.1 In-vitro fertilisation (IVF) is a common infertility treatment. The graphs below indicate the causes of infertility amongst couples who have IVF treatment and the ages of women receiving IVF treatment.

**Chart showing causes of infertility amongst couples receiving IVF treatment**



[Adapted: <<http://fertilityhospital.in>>]

**Chart showing ages of women receiving IVF treatment**



[Adapted: <<https://www.hfea.gov.uk>>]

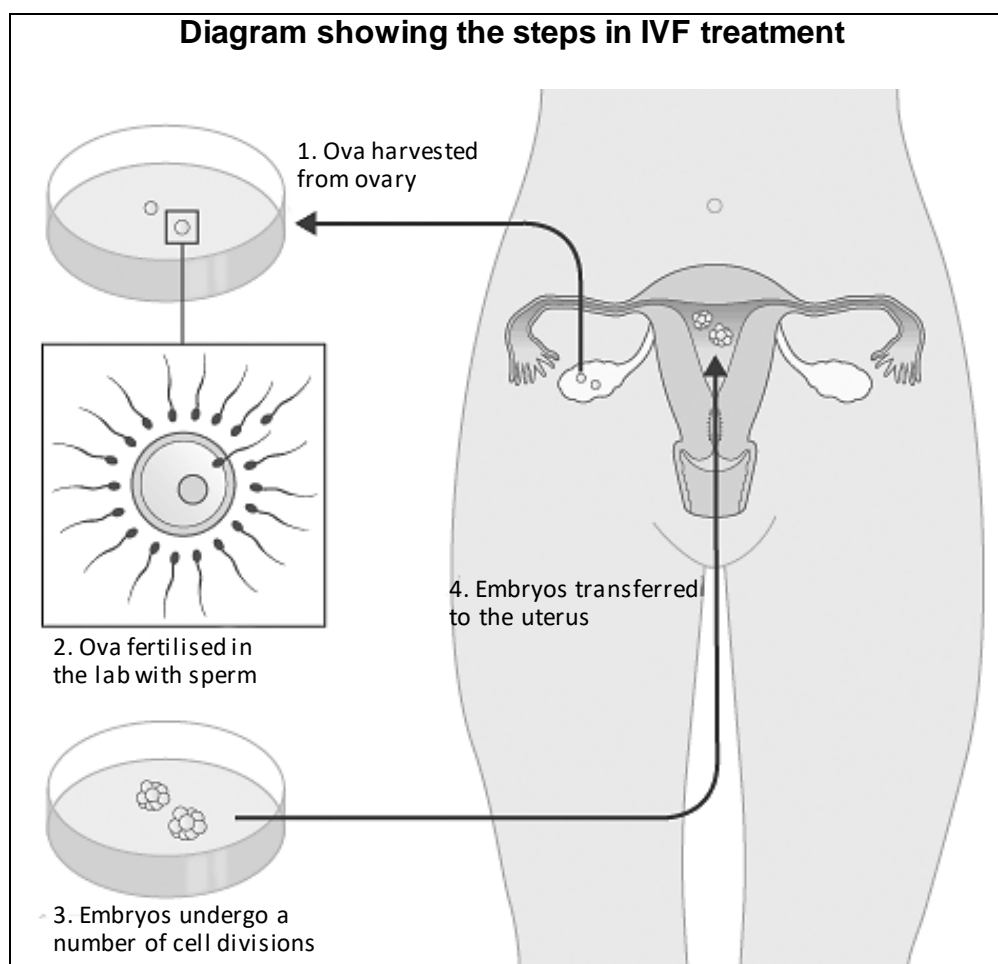
The five statements in the table on the next page refer to the graphs shown above. For each statement decide whether:

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

	Statement	A, B or C
(a)	Infertility is a bigger problem among women than men.	
(b)	Almost two thirds of women receiving IVF were aged 37 years and younger.	
(c)	Causes of infertility are sometimes unknown.	
(d)	Women older than 45 years are less likely to need IVF as they already have children.	
(e)	There is only ever one factor that causes infertility.	

(5)

1.3.2 The diagram below shows the process involved in IVF (in-vitro fertilisation). This process is used when a couple may be experiencing infertility problems.

[Source: <<http://www.medicalcentreindia.com>>]

- (a) If fertilisation took place naturally, indicate with an "X" on the diagram a place where this could occur. (1)
- (b) Provide the correct name for the structure you identified in Question 1.3.2 (a). (1)

- (c) Give the correct biological term for:

the lining of the uterus where the embryos are implanted.

\_\_\_\_\_ (1)

the type of cell division in 3.

\_\_\_\_\_ (1)

- (d) If all the embryos shown in the diagram were transferred to the uterus and survived, how many fetuses would develop?

\_\_\_\_\_ (1)

1.3.3 Read the text below and answer the questions that follow:

**Barcode semen for error-free IVF**

Though rare, IVF mix-ups do happen. In February, it emerged that a woman in Poland had given birth to another woman's child, after her husband's sperm was mistakenly used to fertilise someone else's ovum.

How can a couple undergoing IVF be sure that the right ovum and sperm have been used?

A personalised barcode for their sex cells could be the answer.

A team of scientists have succeeded in labelling semen using barcodes made from polysilicon. Each tag is about a tenth the width of a human ovum. Thousands of barcode copies are pumped into semen samples. They aim for at least one barcode per microlitre of semen used in IVF. A microscope can be used to verify that the semen from the correct male is used.

[Adapted: New Scientist, 23 May 2015]

- (a) What is semen?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ (2)

- (b) The human ovum is 0,1 mm in diameter. Calculate the size of the tag. Show your working.

(3)

- (c) Use the information in the text to explain the benefit of barcoding semen for use in IVF.

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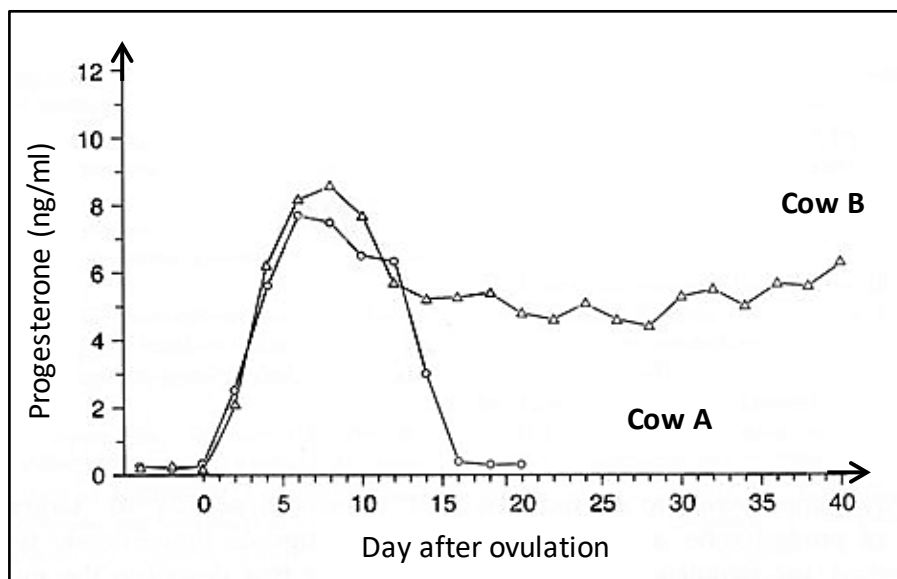
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(2)

- 1.4 The graph below shows the progesterone levels in a pregnant and a non-pregnant cow.

[Adapted: <<http://www.tankonyvtar>>]

- 1.4.1 State TWO functions of progesterone.

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(2)

- 1.4.2 What is the progesterone level in cow B nine days after ovulation?

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(2)

- 1.4.3 What event in the cow results in the increase in progesterone levels?

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(1)

- 1.4.4 (a) Which line represents the pregnant cow?

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(1)

- (b) Explain how you arrived at your answer to Question 1.4.4 (a).

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(1)

1.4.5 Describe the difference in the appearance of the corpus luteum 5 days after ovulation in cow A and cow B.

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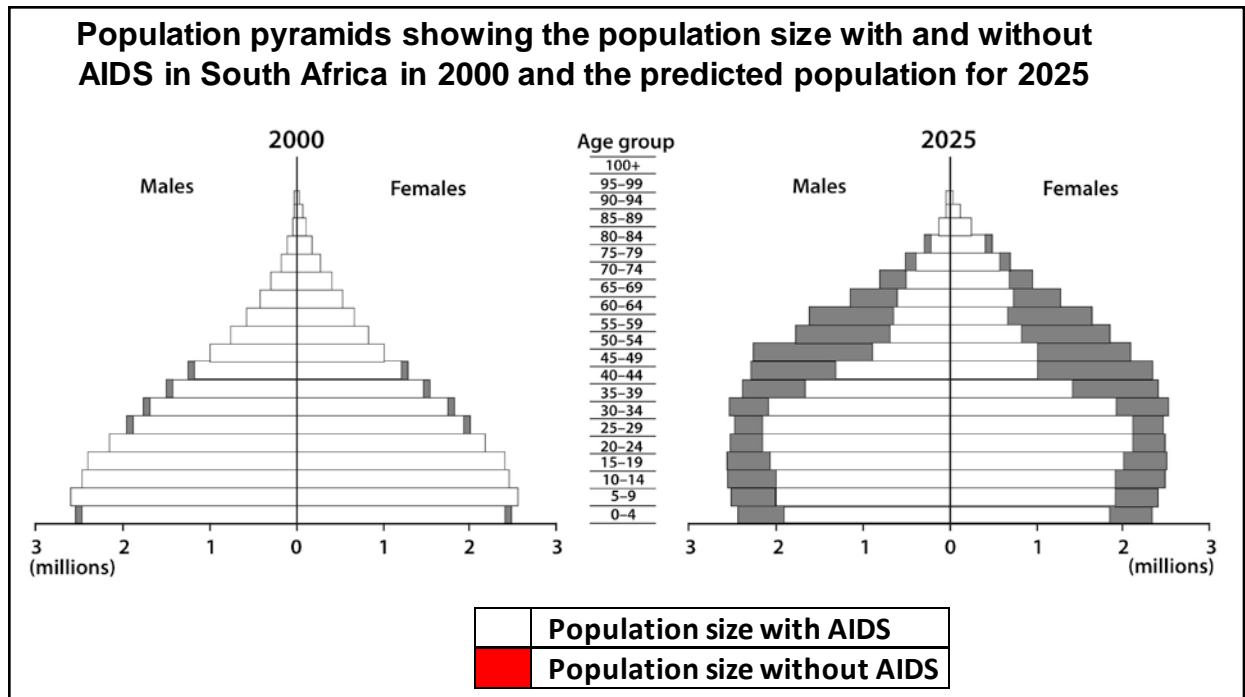
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(2)

1.5 The population pyramids shown below indicate the South African population in 2000 and the projected population in 2025. The darker shaded areas indicate the impact of AIDS on population size.



[Adapted: <<http://data.unaids.org>>]

1.5.1 List FOUR population parameters that affect population size.

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(4)

1.5.2 List THREE facts provided by the pyramid graph for South Africa in the year 2000.

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(3)



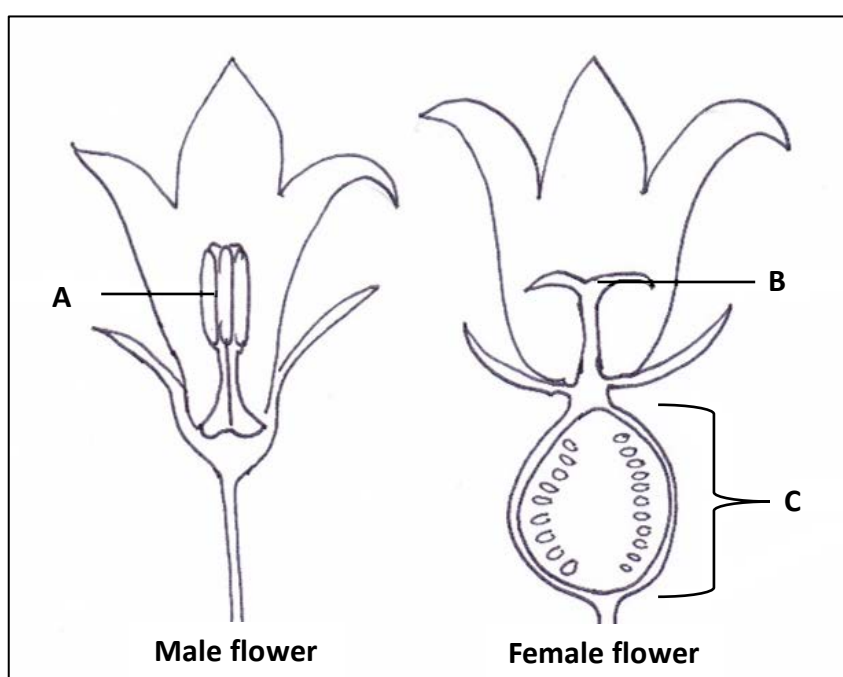
1.5.3 Which gender will be most affected by AIDS in 2025?

\_\_\_\_\_ (1)

1.5.4 Discuss ONE predicted impact that AIDS will have on South Africa after 2025.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ (2)

1.6 Pumpkin plants produce separate male and female flowers.



[Adapted: <<https://www.daf.qld.gov.au>>]

1.6.1 Provide labels for structures A, B and C in the diagram above.

A \_\_\_\_\_

B \_\_\_\_\_

C \_\_\_\_\_

(3)

1.6.2 Indicate with a cross on the diagram, ONE place where meiosis would take place.

(1)

1.6.3 (a) Which flower (male or female) would produce the fruit?

\_\_\_\_\_ (1)

- (b) Give a reason for your answer to Question 1.6.3 (a).

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(1)

- 1.6.4 For pumpkin fruit production to take place, insects must be present as well as both male and female flowers. Explain clearly why this is the case.

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(4)

- 1.6.5 Pumpkin seeds are a good food source for humans.

- (a) Name the structure present in the flower which develops into the seed.

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(1)

- (b) Suggest a biological reason why seeds are rich in nutrients.

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(1)

- 1.6.6 Pumpkins can also be produced by tissue culture. List TWO advantages of producing new pumpkin plants using this method.

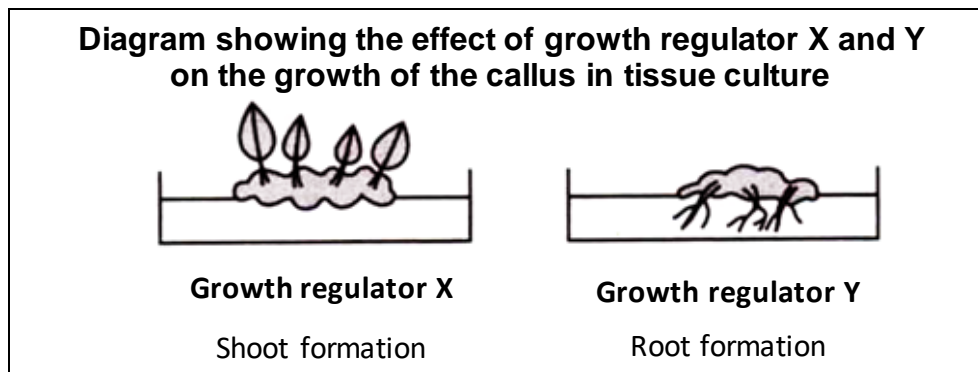
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(2)

- 1.6.7 Growth regulators are used in the tissue culture process. The diagram below shows the effect of two different growth regulators (X and Y).



[Adapted: <<http://www.yourarticlelibrary.com>>]

Using the information provided in the diagram above, what can you conclude about the function of:

- (a) Growth regulator X?

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(1)

- (b) Growth regulator Y?

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(1)

- 1.7 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.**

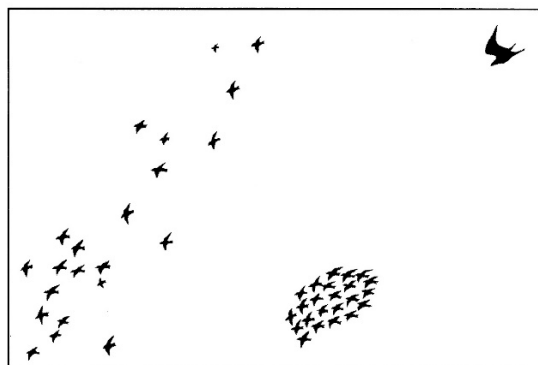
Write down your choice in the space provided in the "answer" column, making use of the following codes:

- 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. Evolution by acquired characteristics 2. Visited Galapagos Islands	Lamarck	
1. Evidence of common ancestor 2. Divergent evolution	Pentadactyl limb	
1. Study of embryology 2. Evidence for evolution	Biogeography	
1. Occurs due to geographical barriers 2. Gene flow occurs between populations	Sympatric speciation	
1. Modification by descent 2. The Origin of Species	Darwin	

(5)

- 1.8 Study the image shown below. The left side of the image shows how starling birds normally fly in loose flocks. The right side shows their response when under attack by a peregrine falcon.



[Source: <<http://www.zo.utexas.edu>>]

- 1.8.1 Explain the advantage of this behaviour to the starlings.

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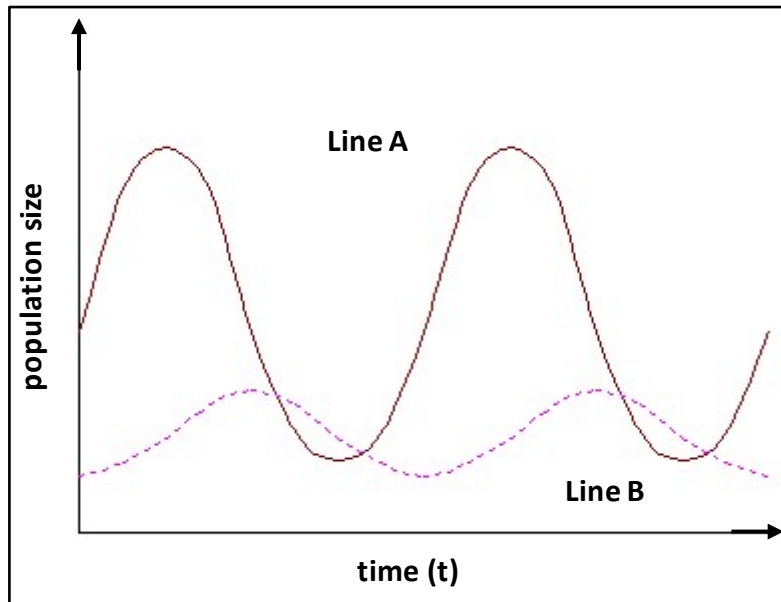
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(2)

- 1.8.2 The graph below shows the numbers of starlings and peregrine falcons over a period of time.



[Adapted from: <<http://ealbiologytasis.blogspot.co.za>>]

- (a) Differentiate between the terms "predator" and "prey".

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(2)

(b) Which line represents the number of starlings?

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(1)

(c) Give ONE reason for your answer in Question 1.8.2 (b).

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(1)  
**[80]**