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Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

SEPTEMBER 2012

LIFE SCIENCES P1

MARKS: 150

TIME: 2½ hours



This question paper consists of 16 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

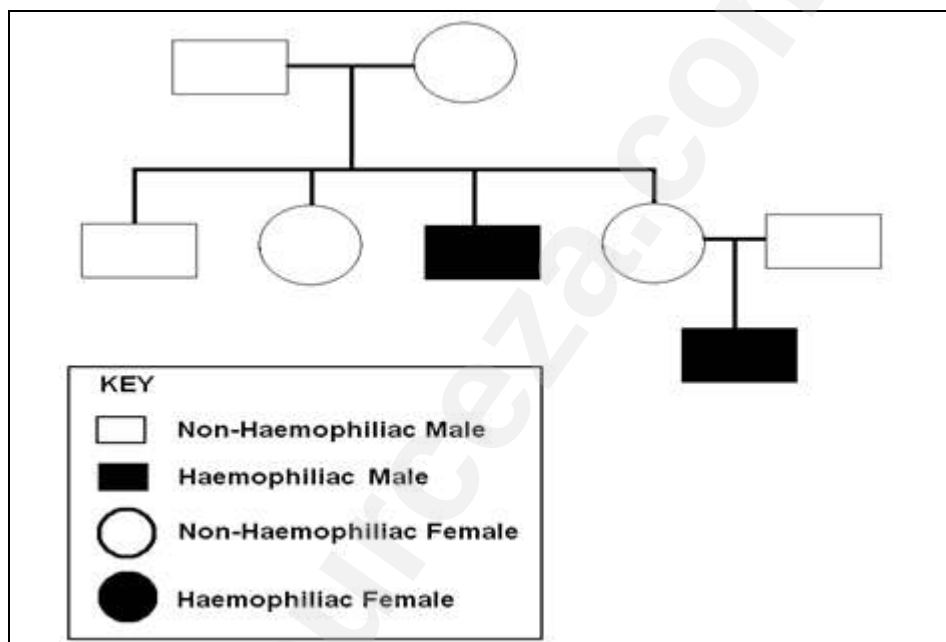
1. Answer ALL the questions.
2. Write ALL the answers on your ANSWER BOOK.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Present your answers according to the instructions of each question.
5. Do ALL drawings in pencil and label them in blue or black ink.
6. Draw diagrams or flow charts 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 may use a non-programmable calculator, protractor and compass.
10. Write neatly and legibly.

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 number (1.1.1 – 1.1.9) in the ANSWER BOOK, for example 1.1.11 D.

1.1.1 The following pedigree diagram shows that ...



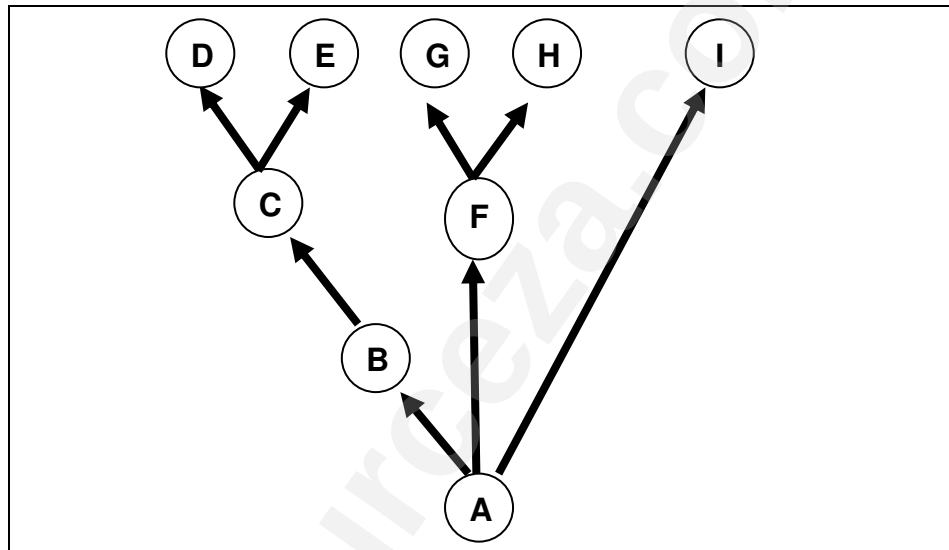
- A a girl only inherits haemophilia when she inherits both recessive genes for the condition.
 B girls will never inherit the condition.
 C all boys always inherit the condition.
 D girls can never be carriers of this condition. (2)
- 1.1.2 The greatest number of offspring in most populations is produced by organisms that are ...
- A always the strongest.
 B usually the best adapted.
 C usually the largest in size.
 D the most intelligent. (2)

- 1.1.3 Finches on the Galapogas islands are different but closely related and display similar physical/structural characteristics. This supports the conclusion that these birds ...

- A have the ability to interbreed randomly.
- B have descended from a common ancestor.
- C occupy the same niche on the same island.
- D have acquired traits through use or disuse.

(2)

- 1.1.4 The diagram below shows the evolutionary pathways of 9 different species.

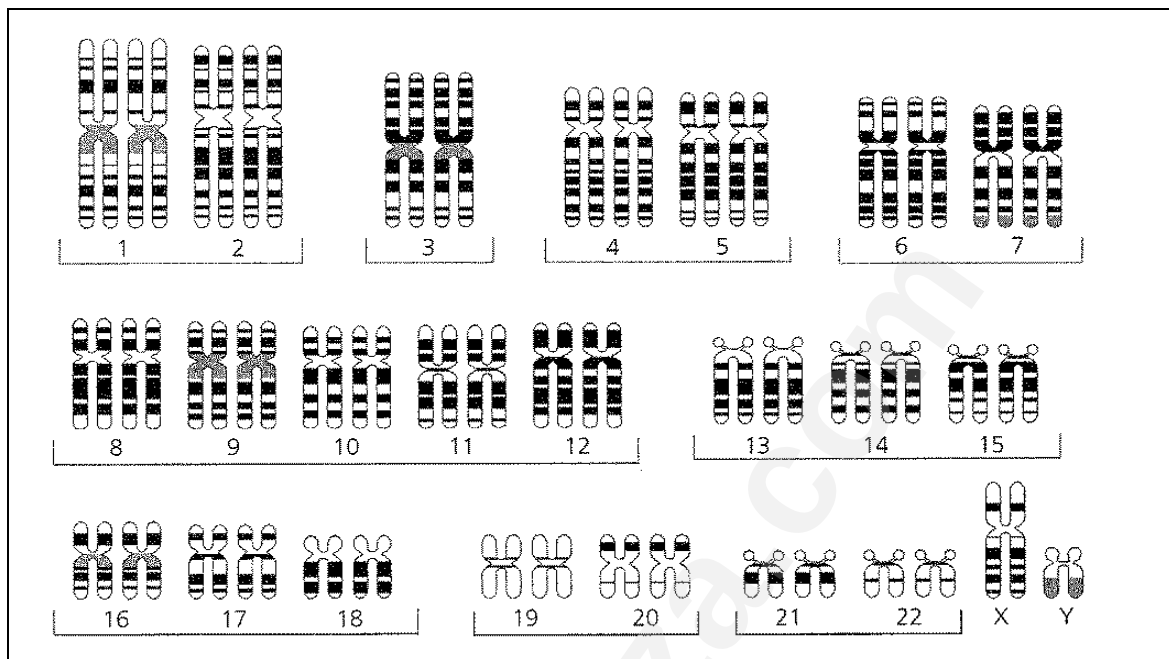


Which TWO organisms are most closely related?

- A D and E
- B D and G
- C G and I
- D I and E

(2)

1.1.5 The following human karyotype contains ...



- A 46 gonosomes.
- B a pair of gonosomes.
- C 46 autosomes.
- D a pair autosomes. (2)

1.1.6 Which ONE of the following features is incorrect with regard to primates?

- A Binocular and stereoscopic vision
- B Thumbs that works in the same direction as the fingers
- C Hands that have nails instead of claws
- D Prolonged caretaking of offspring (2)

1.1.7 Creation theories cannot be accepted as scientific theories because they are ...

- A based on a belief system rather than on evidence.
- B myths and stories used to explain the origins of life.
- C propagated from generation to generation by indoctrination.
- D not observable, measurable and testable. (2)

1.1.8 The body of the woolly mammoth was preserved for millions of years because it ...

- A was trapped in tar pits.
- B became petrified.
- C was frozen in mud and ice.
- D was embedded in amber. (2)

- 1.1.9 In the 19th century, in Manchester city, England, the population of black peppered moths increased during industrialisation because the black smoke from the factories collected as soot on the tree trunks and on the surrounding buildings.

Which ONE of the following statements is incorrect regarding micro-evolution that occurred amongst the moth population?

- A The white moths were least adapted to survive because they were easily spotted by birds when they sat on the dark back ground.
 - B The black moths were well adapted to survive because they were not easily spotted by the birds when they sat on the black back ground.
 - C Natural selection always favours the least adapted organisms.
 - D Nature always selects the best adapted organism to survive.
- (2)

- 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 – 1.2.6) in the ANSWER BOOK.

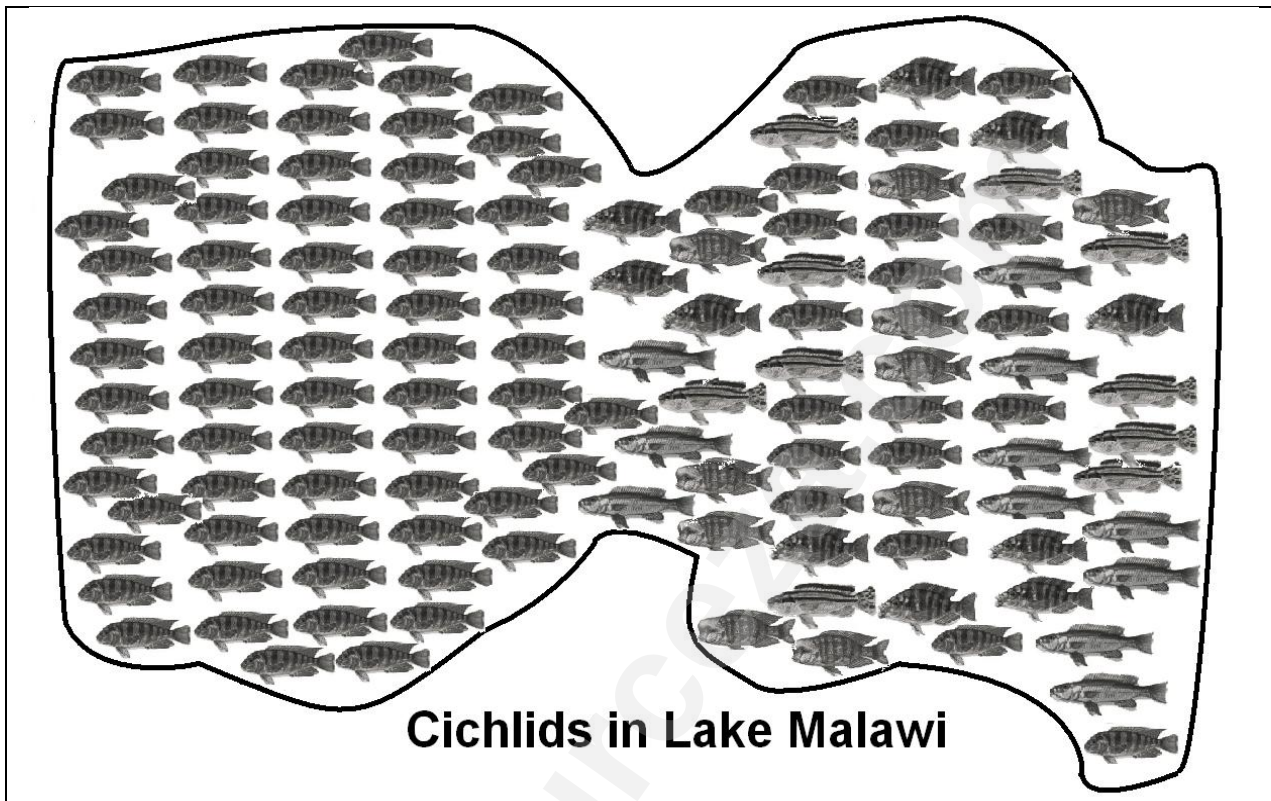
- 1.2.1 The origin of a new species during evolution (1)
- 1.2.2 Evolution of a new species due to geographical isolation (1)
- 1.2.3 The species to which all humans belong (1)
- 1.2.4 Having a pointed face because of projecting jaws and nose (1)
- 1.2.5 The name of a 3,2 million year-old fossil discovered in 1974 by Donald Johanson, Yves Coppan and Tim White in Ethiopia (1)
- 1.2.6 A group that includes only primates with human-like features (1)

- 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 number (1.3.1 – 1.3.8) on the ANSWER BOOK.

	COLUMN I		COLUMN II
1.3.1	The process by which organisms that are not closely related independently acquire similar characteristics	A	Convergent evolution
		B	Divergent evolution
1.3.2	All living forms have been created by some Supreme Being	A	Lamarck's theory
		B	Darwin's theory
1.3.3	Diversity of life that exists on earth could only have come about because each one has been cleverly designed	A	Creationist theory
		B	Intelligent design theory
1.3.4	The DNA from the Y-chromosomes is used	A	To trace male lineage of our ancestry
		B	To trace female lineage of our ancestry
1.3.5	Sickle-cell anaemia	A	A genetic disease of the red blood cells which become deformed
		B	Not a sex-linked disorder
1.3.6	Able to make and use tools	A	<i>Australopithecus afarensis</i>
		B	<i>Sahelanthropus tchadensis</i>
1.3.7	<i>Foramen magnum</i> positioned at the back of the skull	A	A bipedal animal
		B	A quadruped animal
1.3.8	Average brain size 1 200 ml – 1 800 ml	A	<i>Homo habilis</i>
		B	<i>Homo erectus</i>

(8x2) (16)

- 1.4 The diagram below represents a particular type of speciation that takes place in Lake Malawi. A large variety of different species of beautiful and brightly colourful cichlid fishes are being discovered annually. Study the diagram and answer the following questions.



- 1.4.1 What type of speciation is represented in the above diagram? (1)
- 1.4.2 Explain the type of speciation mentioned in QUESTION 1.4.1. (3)
- 1.4.3 Although the newly evolving species of cichlid fishes live in the same lake, they are unable to interbreed with other closely related species. Supply a reason or mechanism that prevents them from interbreeding with other species of cichlid fishes. (1)
- 1.4.4 Mention FIVE examples of the mechanism that you mentioned in QUESTION 1.4.3 that prevents evolving species from interbreeding. (5)

TOTAL SECTION A: 50

SECTION B**QUESTION 2**

2.1 Study the newspaper report below and answer the following questions.

X-ray shows legs on snake fossil

ULTRA-SHARP 3-D x-ray imaging of a 95-million-year-old fossil found in Lebanon has shed light on the evolution of snakes from limbed lizards.

French scientists said yesterday the 50 cm fossil of *Eupodophis desouensi* shows a small hind leg attached to the animal's pelvis.

It had been buried beneath its body and was only visible thanks to the new technique.

The find adds powerfully to theories that snakes evolved from lizards, but needed legs less and less - and eventually lost them entirely - after succeeding in habitats where crawling or slithering gave them an advantage.

The new image shows that *E. desouensi*, at this point in the Cretaceous period, was at a pathway stage in the change.

[Source: Daily Dispatch Newspaper, 10 February 2011]

- 2.1.1 What scientific name was given to the fossil that was excavated in Lebanon? (1)
- 2.1.2 What is the estimated age of the fossil? (1)
- 2.1.3 What technique was used to determine the age of the fossil? (1)
- 2.1.4 Name the period when the transition from lizards to snakes might have taken place. (1)
- 2.1.5 What evidence is put forward to support the evolution of snakes from lizards? (1)
- 2.1.6 What technique is used to obtain this evidence? (1)
- 2.1.7 Briefly explain Lamarck's theory of evolution using the above newspaper report. (3)
- 2.1.8 Why was Lamarck's theory discarded? (3)

2.2 Read the article below and answer the following questions.

**Business development
SA produces more GM crops**

Michael Appel

28 February 2008

Since the adoption of "biotech" crops in 1996, the amount of genetically modified (GM) maize, soya beans and cotton planted in South Africa, in terms of area planted, has increased to 1,8-million hectares.

"White GM maize totalled 1,04-million hectares, an increase of 48% over 2006/07, representing a market share of 62%," "Yellow maize increased from 528 000 hectares to 567 000 hectares, up 7%." Agri-SA president Lourie Bosman said on Wednesday.

GM crops are engineered to withstand environmental factors such as drought. Certain seeds have a dominant trait of herbicide tolerance, allowing farmers to make use of herbicides without harming their crops.

"Agri-SA is positive about genetically modified agricultural crops and is enthusiastic about the contribution they can make in the future towards increased production," Bosman said.

The most popular GM trait in South Africa was Bt insect resistant maize, with 1,1-million hectares planted, followed by RR herbicide tolerant maize, with 373 000 hectares planted. Stacked traits Bt+RR sales commenced in 2007 and 80 000 hectares have been planted to date.

Field trials of drought-resistant maize varieties - a trait that has since been incorporated into other crops as well - are already under way in South Africa, and the technology is expected to be commercially viable by 2011.

[Adapted and modified from

<http://www.southafrica.info/business/trends/newbusiness/gmmaize-280208.htm>]

- 2.2.1 According to the data provided in the article, predict the future trend regarding the use of modified crops on South African farms. (1)
- 2.2.2 With reference to the article, mention FOUR beneficial traits that could be incorporated in to crops, to raise the competitive edge of the South African Agricultural sector. (4)
- 2.2.3 Name THREE genetically modified crops mentioned in the article that are being planted in South Africa. (3)
- 2.2.4 Give a reason why high priority is given to the development of drought resistant crops in South Africa. (2)
- 2.2.5 Mention any FOUR objections against the introduction of genetically modified crops. (4)
- 2.2.6 If you are a fruit and vegetable distributor, which THREE traits would you like to be incorporated in to agricultural products? (3)
- 2.2.7 What public concern could be addressed by labelling all GM foods in our super markets? (1)

[30]

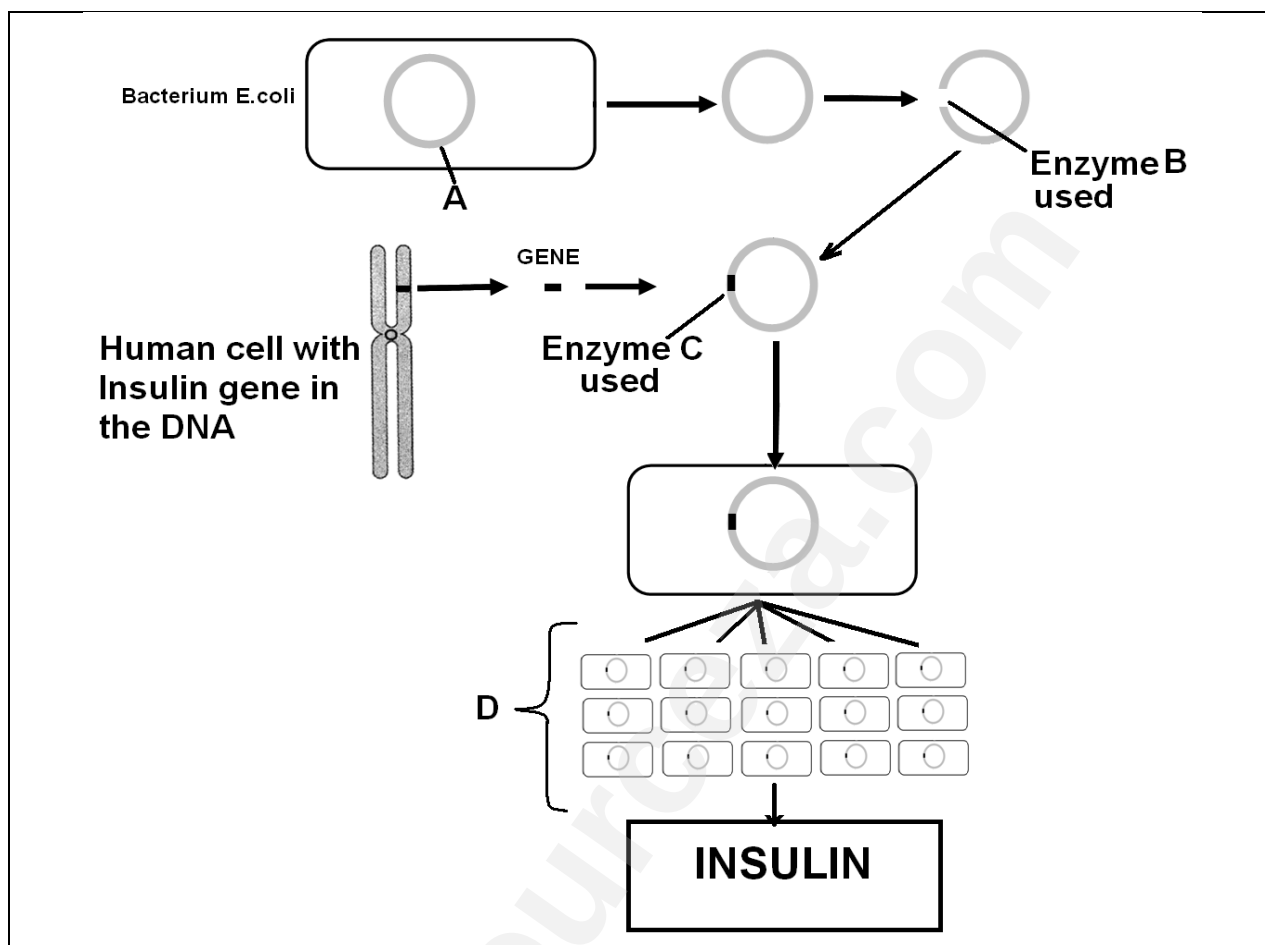
QUESTION 3

- 3.1 The diagram below shows a genetic cross between two black mice. Study the diagram and answer the following questions. Use the symbols **B** and **b** for the alleles of fur colour.



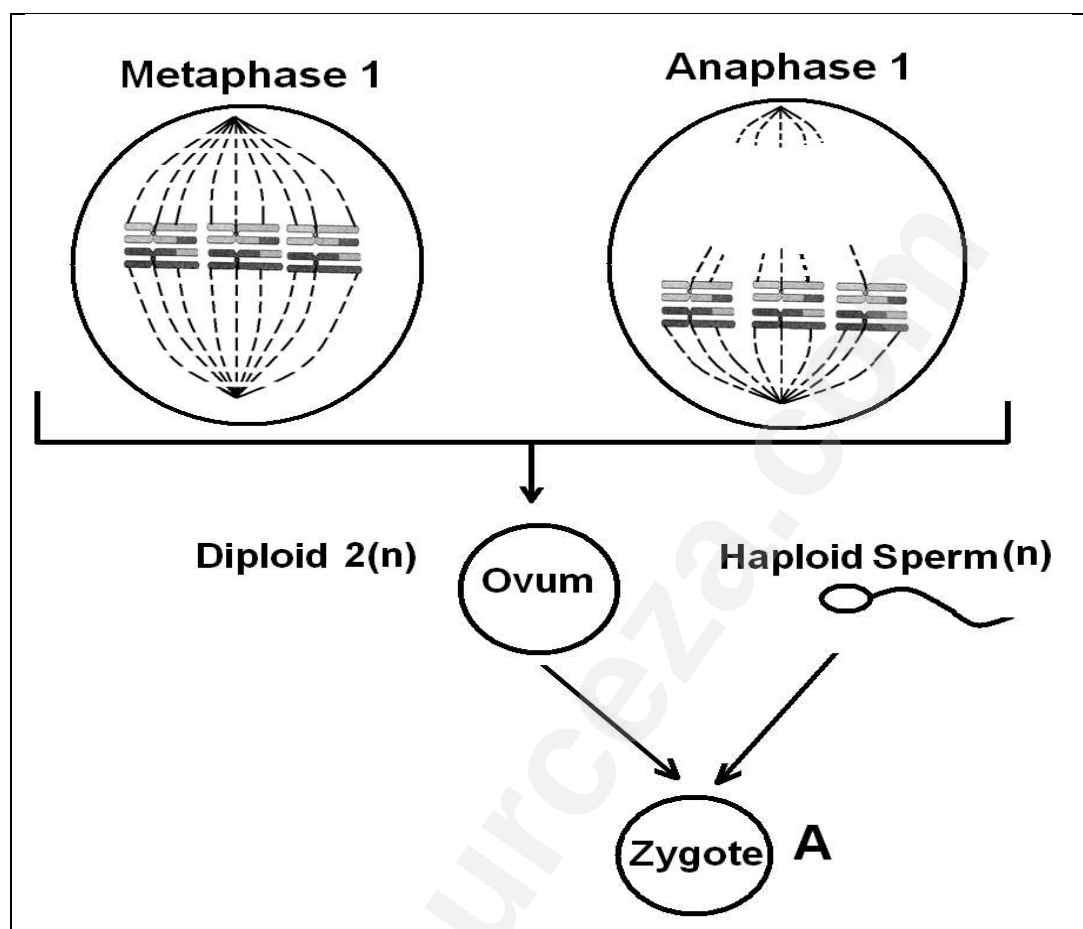
- 3.1.1 Give the genotype of the male and the female parents respectively. (2)
- 3.1.2 What percentage of the F₁ generation is recessive? Show your working. (2)
- 3.1.3 What is the phenotype ratio of the F₁ generation? (1)
- 3.1.4 By using a genetic crossing diagram, show the possible genotypes and phenotypes of a cross between the white mouse in the F₁ generation and the female parent in the P₁ generation. (7)

- 3.2 The diagram below shows a modern technique to manufacture insulin. Study the diagram and answer the following questions.



- 3.2.1 Name the technique used in the manufacturing of insulin. (1)
- 3.2.2 Identify the part labelled A. (1)
- 3.2.3 Supply the names of the enzymes B and C. (2)
- 3.2.4 What type of cell division takes place at D? (1)
- 3.2.5 Mention any TWO advantages of the above technique. (2)
- 3.2.6 Name another unicellular organism that can be used in the above process. (1)
- 3.2.7 Supply ONE reason for the use of the unicellular organism mentioned in QUESTION 3.2.6. (1)

- 3.3 The diagram below represents certain stages of a meiotic division in a certain plant. Study the diagram and answer the following questions.



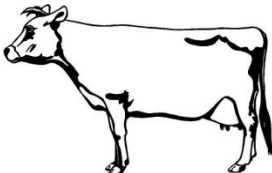
- 3.3.1 Mention an observable characteristic feature of Metaphase 1. (1)
- 3.3.2 Name the process that takes place in Prophase 1 that leads to variation in the off-spring. (1)
- 3.3.3 What error occurred in Anaphase1? (1)
- 3.3.4 Name the error that you described in QUESTION 3.3.3. (1)
- 3.3.5 What will the chromosome number in A be? (1)
- 3.3.6 What is this phenomenon in A known as? (1)
- 3.3.7 Mention any TWO advantages of the phenomenon named in QUESTION 3.3.6 in plants. (2)
- 3.3.8 What is the significance of this process in the evolution of plants? (1)
- [30]

TOTAL SECTION B: 60

SECTION C

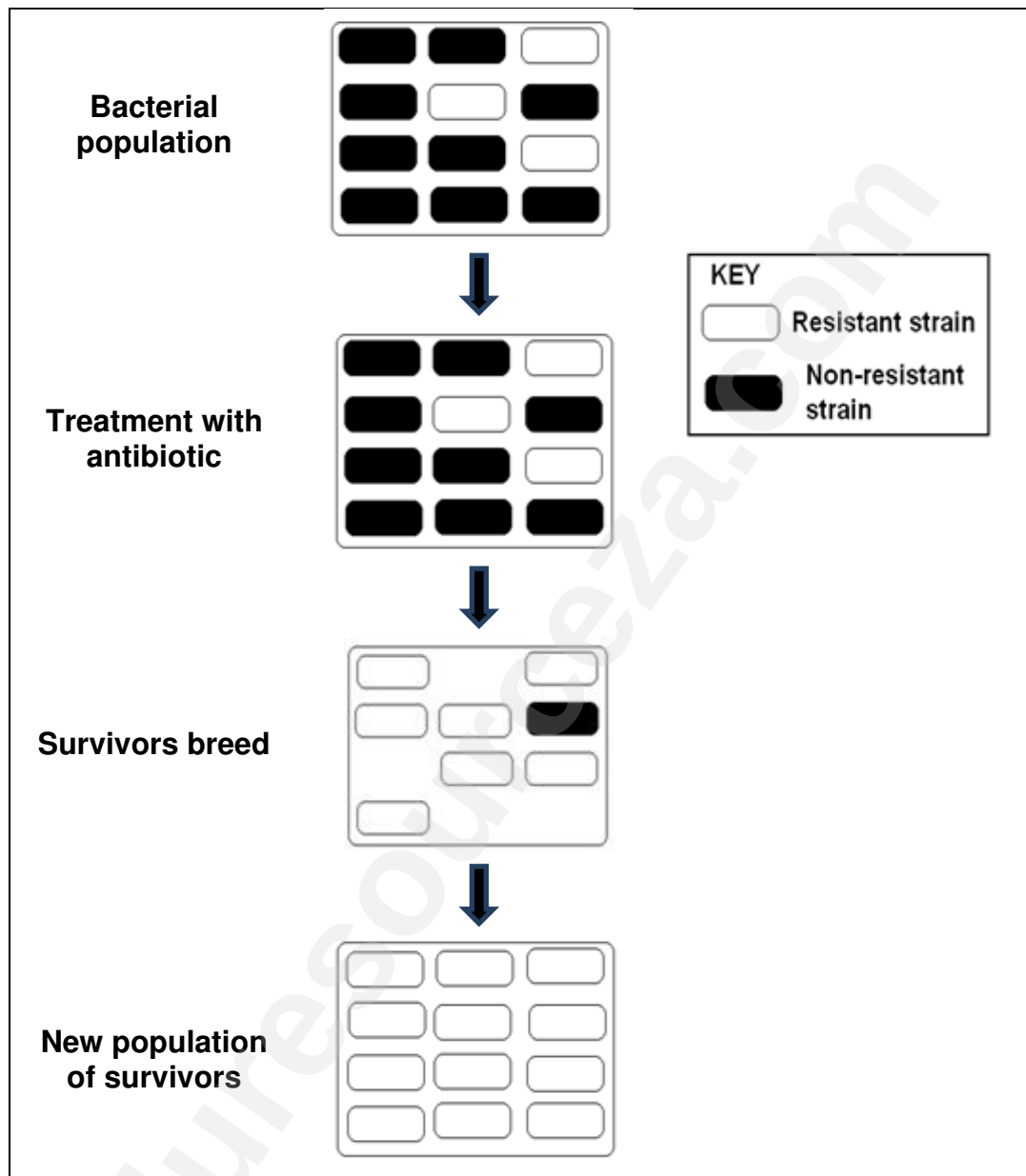
QUESTION 4

- 4.1 The table below shows the results from an experiment to investigate the effect of selective breeding (artificial selection) for the protein content in milk of two varieties of milk producing cows.

Number of generations of artificial selection (selective breeding)	Percentage of protein content in the milk	
	COW A  (Selected for high protein content)	COW B  (Selected for low protein content)
Start	5	5
10	10	7
20	12	8
30	15	8
40	17	6
50	20	4

- 4.1.1 Supply a possible hypothesis for the experiment. (2)
- 4.1.2 Plot TWO line graphs on the same axes to reflect the results of the experiment. (10)
- 4.1.3 What is the increase in percentage of protein content in the milk of COW A from generations 10 to 40? (1)
- 4.1.4 What is the difference in the percentage of the protein content in the milk between COW A and B after 40 generations of selective breeding? (1)
- 4.1.5 To what extent did the selective breeding influence the milk-protein content of COW A? (1)
- 4.1.6 Which modern scientific technique can be used to increase the number of cows with a high milk protein content in their milk within a short period of time? (1)

- 4.2 The result of a laboratory investigation shows the response of a bacterial population to the use of certain antibiotics. Study the diagrammatic presentation of the investigation and answer the following question.



Explain how the above sequences of diagrams show natural selection. (4)

- 4.3 Write a short essay in which you explain how changes may occur in the DNA sequence during replication and how these changes can affect protein synthesis. Also, indicate how these changes may lead to any THREE genetic disorders. (17)

Synthesis: (3)

TOTAL SECTION C: 40

GRAND TOTAL: 150