Please paste the barcoded label here	TOTAL MARKS

NATIONAL SENIOR CERTIFICATE EXAMINATION
MAY 2024

AGRICULTURAL SCIENCES

EXAMINATION NUMBER													

Time: 3 hours 300 marks

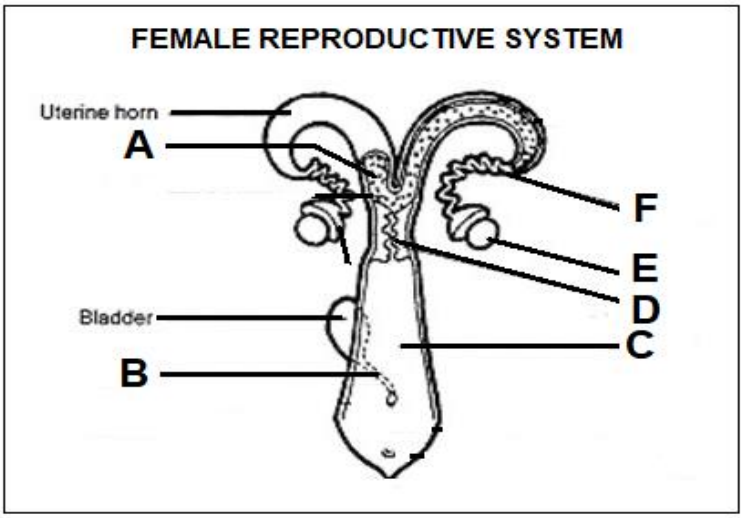
PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 32 pages. Please check that your question paper is complete.
2. Write your examination number in the blocks provided above.
3. This question paper consists of **THREE** sections, namely **SECTION A**, **B** and **C** that, together, have six questions.
4. ALL SIX questions must be answered in the spaces provided on the question paper.
5. Read the questions carefully.
6. Use the marks awarded for each question as an indication of the detail required.
7. Non-programmable calculators may be used.
8. Show all your calculations, including formulae and units, where applicable.
9. It is in your own interest to write legibly and to present your work neatly.
10. One blank page, (page 32), is included at the end of the paper. If you run out of space for a question, use this page. Clearly indicate the number of your answer should you use this extra space.

SECTION A

QUESTION 1

1.1 The diagram below represents the reproductive system of a cow. Study the functions of different reproductive organs listed below and match each with the correct organ (A–F) from the diagram.



1.1.1 The site where oogenesis occurs _____

1.1.2 An organ where fertilisation takes place _____

1.1.3 Prevents microbial contamination of the uterus _____

1.1.4 Allows urine to exit from the bladder through the vagina _____

1.1.5 Receives the penis and semen during mating _____

1.1.6 Retains and nourishes the embryo and the foetus _____

(12)

1.2 Various options are provided as possible answers to the following questions. Choose the answer and make a cross (X) in the block (A to D) next to the question number (1.2.1 to 1.2.10). NO marks will be awarded if more than one cross (X) was made for an answer.

1.2.1 In South Africa we use the soil classification system that has two levels of classes, namely …

A soil forms and soil families. ☐

B soil profiles and soil families. ☐

C soil horizons and soil forms. ☐

D soil profiles and soil horizons. ☐

1.2.2 The natural resource legislation that promotes the wise use of soil, water, vegetation and combating of invader plants, is called the …

A Agricultural Products Standards Act, No. 119 of 1990. ☐

B Fencing Act of 1993. ☐

C Subdivision of Agricultural Land Act, No. 70 of 1970. ☐

D Conservation of Agricultural Resources Act, No. 43 of 1983. ☐

1.2.3 Physical analysis of soil during surveying and planning involves …

A testing soil samples for chemical composition. ☐

B removing all vegetation from soil. ☐

C building contour walls. ☐

D digging a soil pit to determine soil profile. ☐

1.2.4 Notifiable diseases are diseases that …

A must by law be reported to the authorities when diagnosed. ☐

B can be transmitted from animals to humans and vice versa. ☐

C are non-infectious. ☐

D are caused by nutritional deficiencies. ☐

1.2.5 … is the failure of farm animals to show any signs of oestrus and it is a cause of infertility in cows.

A Anoestrus ☐

B Repeat breeders ☐

C Oestrus ☐

D Met-oestrus ☐

1.2.6 Hybridisation is a plant-breeding method that involves two different varieties of a plant from the same species, and it enables plant breeders …

(i) to create plant varieties that produce more seeds.
(ii) to produce plants that grow better.
(iii) to change the DNA sequence and characteristics of an organism.
(iv) to develop plants that produce more fruit.

Choose the correct combination

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

1.2.7 The diagram below represents vegetative propagation known as …

A rhizomes. ☐
B stolons. ☐
C tubers. ☐
D bulbs. ☐

1.2.8 Use of technology and remote-sensing devices to monitor farming processes.

A Greenhouse farming ☐
B Precision farming ☐
C Organic farming ☐
D Aerial farming ☐

1.2.9 A heterozygous Swiss bull (Tt) was mated with a heterozygous Swiss cow. The expected genotypic ratio in their F1 generation will be …

A	2 : 2	☐
B	1 : 3 : 1	☐
C	3 : 1	☐
D	1 : 2 : 1	☐

1.2.10 Which of the following would be problematic in a business plan?

(i) Being vague with too much information.
(ii) Overambitious or unrealistic projections.
(iii) Enough technical details.
(iv) Not highlighting potential competition.

Choose the correct combination.

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

(20)

1.3 In the table below, a description and TWO possible answers are given. Indicate whether the description in COLUMN B relates to **A only**, **B only**, **Both A and B** or **None** of the concepts in COLUMN A. Write your answer in the last column of the question number (1.3.1–1.3.6).

	COLUMN A	COLUMN B	ANSWER
1.3.1	A: Atavism B: Epistasis	Masking of the phenotypic effect of alleles at one gene by alleles of another gene.	
1.3.2	A: Nuclear transfer B: Embryo transfer	A process where one organism with superior heritable traits is cloned to produce offspring that are genetically identical to the original organism.	
1.3.3	A: Monopoly B: Monopsony	A market that has one seller and many buyers.	
1.3.4	A: Protozoa B: Bacteria	Lumpy wool and ringworm are examples of diseases caused by this micro-organism.	
1.3.5	A: Production B: Marketing	Types of agricultural co-operatives.	
1.3.6	A: Mutation B: Variation	The differences in the phenotype of plants or animals of the same species under the influence of genes and the environment.	

(12)

1.4 Give the correct term for each of the following descriptions. Write only the term next to the question number (1.4.1 – 1.4.6).

1.4.1 The labour legislation that aims to develop the skills of the South African workforce.

_____

(2)

1.4.2 An advanced technology that allows breeders to manipulate and make precise genetic changes to impart beneficial traits to an organism.

_____

(2)

1.4.3 The modification of the DNA resulting in a change in the sequence of the gene.

_____

(2)

1.4.4 A tube that transports sperm cells from epididymis to the urethra.

_____

(2)

1.4.5 The financial statement that summarises the assets and liabilities of a farming business.

_____

(2)

1.4.6 Keeping animals in isolation for a fixed period of time to enable officials from the Department of Veterinary Services to test for and detect diseases.

_____

(2)

1.5 Change the UNDERLINED WORD(S) in each of the following statements to make the statements TRUE. Write only the correct word(s) on the line provided.

1.5.1 Germination is the transfer of pollen from the male part of a plant to the female part of a plant, enabling later fertilisation and the production of seeds.

_____

(2)

1.5.2 Fixed capital is the type of capital represented by livestock on a farm.

_____

(2)

1.5.3 The falling of many flowers and fruitlets to reduce the amount of fruit set is known as parthenocarpy.

_____

(2)

1.5.4 Mitosis is a reduction division of sex cells that gives rise to four haploid daughter cells.

_____

(2)

1.5.5 Liabilities are physical items of economic value that could be converted to cash if sold by the farmer.

_____

(2)

1.5.6 The breeding method where purebred males of a specific breed are mated generation after generation with inferior females is inbreeding.

_____

(2)

1.6 Choose a term/phrase from COLUMN B that matches a description in COLUMN A. Write only the letter (A–L) next to the question number (1.6.1 – 1.6.6).
Example: 1.6.7 T

	COLUMN A	COLUMN B
1.6.1	The membrane that helps to eliminate waste products from a foetus before it is born.	A: Drenching gun B: Chorion C: Asexual D: Physical E: Direct marketing F: Allantois G: Co-dominance H: Stock sales marketing I: Balling gun J: Chemical K: Sexual L: Incomplete dominance
1.6.2	Soil degradation type involving over-utilisation of commercial fertilisers in the soil.	
1.6.3	The reproduction method of growing plants from parts, other than seeds, of the plant.	
1.6.4	Products and services are sold on auction to the highest bidder.	
1.6.5	An instrument used by farmers to give liquid medication to farm animals.	
1.6.6	The phenotype of the offspring is intermediate between the two parents.	

1.6.1 _____

1.6.2 _____

1.6.3 _____

1.6.4 _____

1.6.5 _____

1.6.6 _____

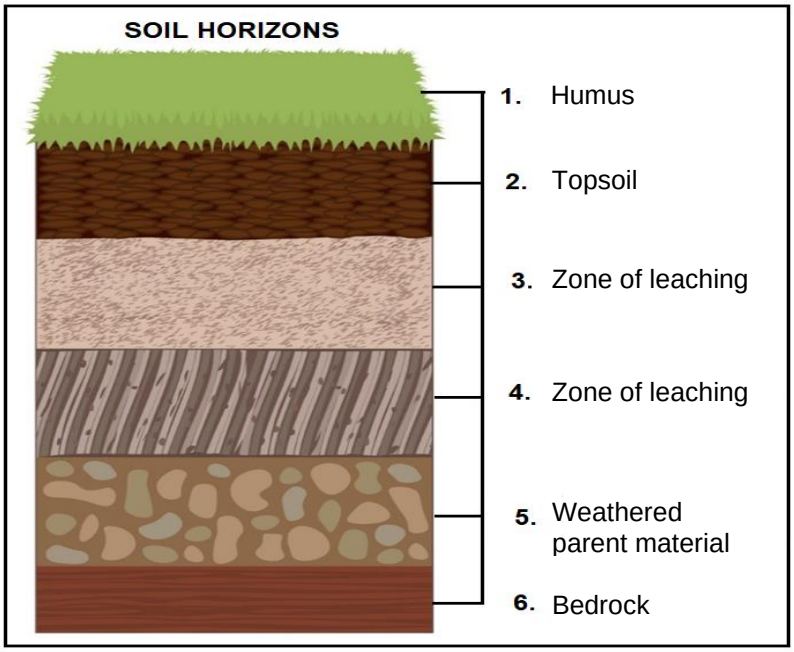
(12)

80 marks

SECTION B

QUESTION 2

2.1 The two best-known soil classification systems in the world are the World Reference Base (WRB) and the USDA Soil Taxonomy (a system developed in the USA). These two systems are used throughout the world to classify soils. Unfortunately, these systems do not make provision for the full variety of South African soils. As a result, South Africa has developed its own system.



2.1.1 Give the name of the vertical section of the soil from the ground surface downwards to where the soil meets the underlying rock as shown in the picture above.

_____

(2)

2.1.2 Name the soil classification system that is used in South Africa.

_____

(2)

2.1.3 Identify soil horizons labelled 1 to 6 from the picture above.

1: _____

2: _____

3: _____

4: _____

5: _____

6: _____

(6)

2.1.4 Indicate THREE reasons for classifying soil.

(3)

2.1.5 Differentiate between soil form and soil family.

(4)

2.2 Soil surveys commonly identify the more important soil characteristics that determine the limitations and qualities of the soil.

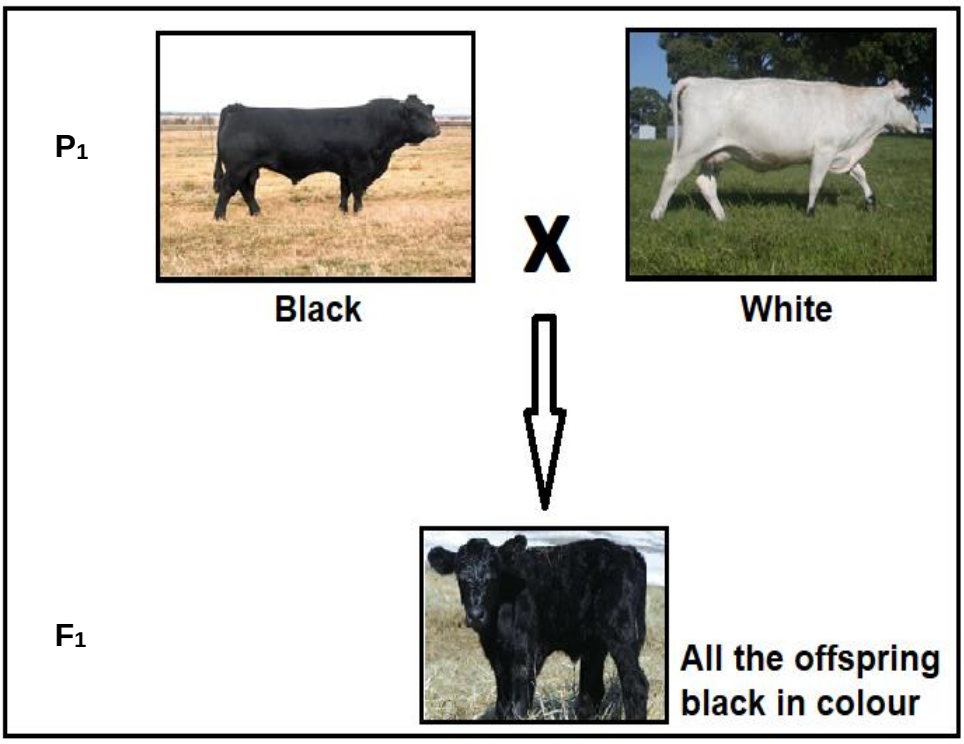
2.2.1 Indicate TWO aims of soil surveys in the agriculture industry.

(2)

2.2.2 Describe the soil survey process in agriculture and the steps that need to be followed during soil surveying.

(6)

2.3 The diagram below shows a genetic crossing between a pure-bred black bull (B) and a pure-bred white cow (b).



2.3.1 (a) Identify the type of crossing illustrated above.

_____

(1)

(b) Justify the answer.

_____

_____

(2)

2.3.2 Determine the genotype of the:

(a) bull

_____

_____

(2)

(b) cow

_____

_____

(2)

2.3.3 Indicate the type of inheritance illustrated in the crossing.

(1)

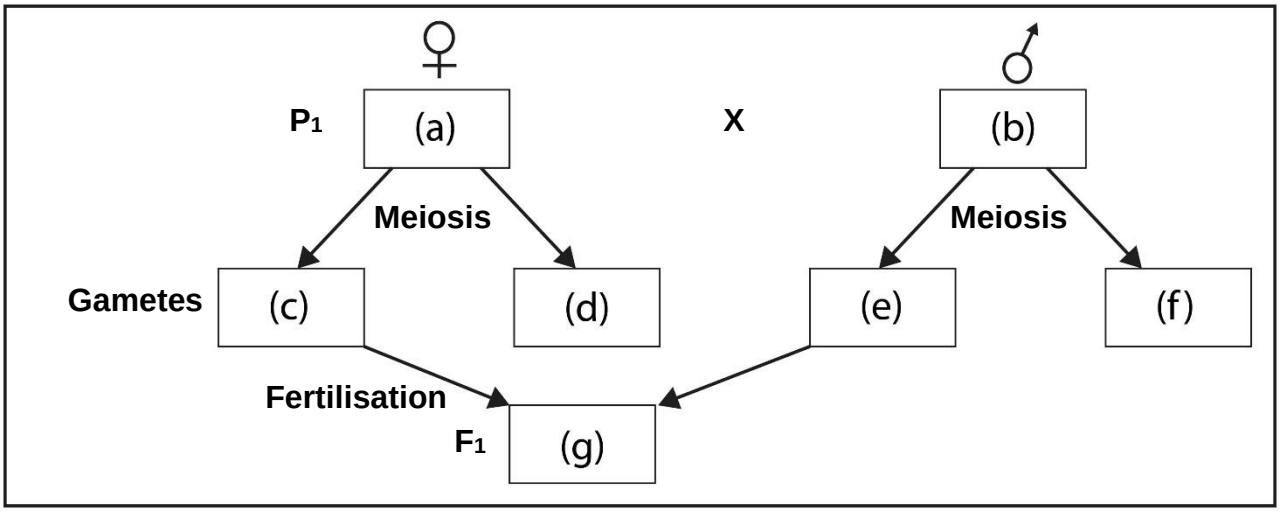
2.3.4 Suppose the F_1 offspring interbreed: draw a Punnet square to determine possible genotypic and phenotypic ratios of the F_2 generation.

(6)

2.3.5 Calculate the percentage of the white offspring in the F_2 generation.

(2)

2.4 The genetic crossing of a black (BB) male animal and a white (WW) female farm animal resulted in a heterozygous grey offspring in the F_1 generation, then the same offspring were allowed to breed amongst themselves. Their offspring in the F_2 generation had a phenotypic ratio of 1:2:1



2.4.1 Name the type of dominance represented above.

_____

_____

(2)

2.4.2 Give TWO reasons to motivate your answer to Question 2.4.1.

_____

_____

_____

_____

(2)

2.4.3 Complete the genetic crossing above by supplying the missing genotype at **(a)**, **(b)**, **(c)**, **(e)** and **(f)**.

(a) _____

(b) _____

(c) _____

(e) _____

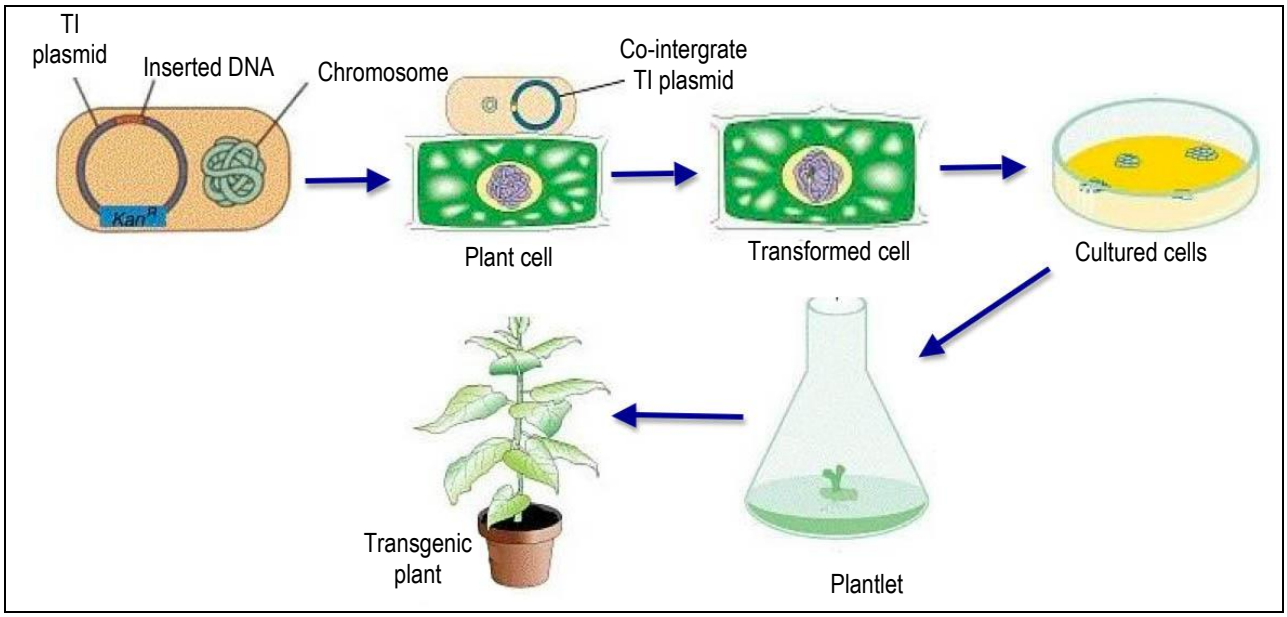
(f) _____

(5)

[50]

QUESTION 3

3.1 Agricultural biotechnology is an advanced technology that allows plant and animal breeders to make precise genetic changes to impart beneficial traits to the crop plants or animals we rely on for food and fibre. Geneticists utilise a number of techniques to genetically modify plants.



3.1.1 Identify the genetic modification technique illustrated above.

(2)

3.1.2 Indicate any other THREE genetic modification techniques used in plants. Exclude the technique identified in Question 3.1.1 above.

(3)

3.1.3 List THREE ways in which genetically modified organisms pose a threat to the safety of food for human consumption.

(6)

3.1.4 South Africa is a developing country clouded by challenges when it comes to improving the livelihood of its emerging farming community within the prevailing conditions of global warming.

Explain TWO ways in which the introduction of GMO could be beneficial to these farmers.

_____

_____

_____

_____

(4)

3.2 The illustration below represents different methods of selection used by farmers and breeders.

SELECTION METHODS USED BY BREEDERS

A Farmers and breeders simply select animals from each generation that display desirable charecteristics	**B** Selection based on the record of an individual's ancestors on both the mother's and father's sides
C Mating of individuals based on analysis of the qualities of relatives	**D** Involves selection of the individuals based on the records of their offspring

3.2.1 Indicate the category of selection represented by the table above.

_____

_____

(2)

3.2.2 Identify the selection methods represented by **A**, **B**, **C** and **D** in the illustration above.

A: _____

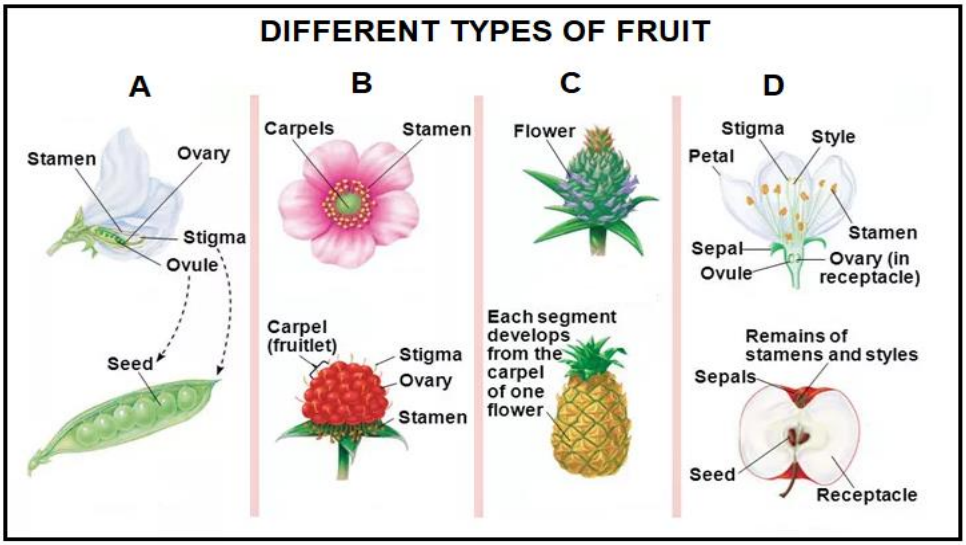
B: _____

C: _____

D: _____

(4)

3.3 The diagram below shows different types of fruit:



[Source: <https://www.google.com/search?q=fruit+classification>]

3.3.1 Identify the types of fruit labelled **A**, **B**, **C** and **D**.

A: _____

B: _____

C: _____

D: _____

(4)

3.3.2 Classify the fruit listed below into the categories identified in Question 3.3.1 above.

Strawberries: _____

Apples: _____

Pineapples: _____

Grapes: _____

(4)

3.4 The following is a representation of a dihybrid crossing.

Trait No. 1 (Horn conformation)	**Trait No. 2** (Hair colour)
A: Polled (without horns) a: Horned (with horns)	B: Black b: Red

♀ \ ♂	AB	Ab	aB	ab
AB	[1]AABB	[2]AABb	[3]AaBB	[4]AaBb
Ab	[5]AABb	[6]AAbb	[7]AABb	[8]Aabb
aB	[9]AaBB	[10]AaBb	11	[12]aaBb
ab	[13]AaBb	14	[15]aaBb	[16]aabb

3.4.1 State the genotype of the following individuals:

(a) Number 11

_____

_____

(2)

(b) Number 14

_____

_____

(2)

3.4.2 Determine the phenotype of the following individuals:

(a) Number 6

_____

_____

(2)

(b) Number 12

_____

_____

(2)

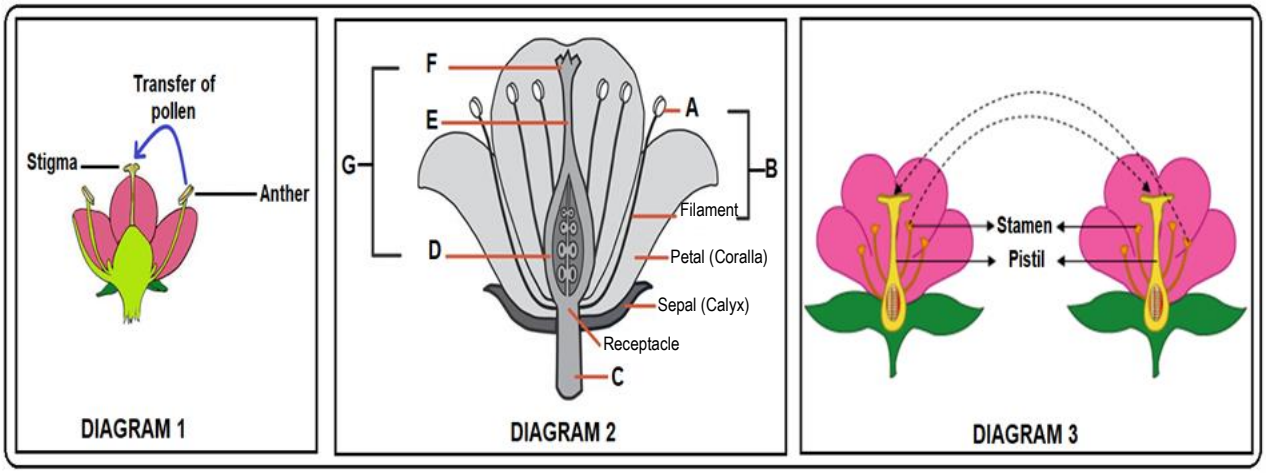
3.4.3 Indicate the phenotypic ratio from the cross above.

_____

_____

(2)

3.5 The diagrams below represent sexual reproduction. Read and analyse the information and then answer the questions that follow:



3.5.1 Identify the process illustrated above in Diagrams 1 and 3.

_____

_____

(2)

3.5.2 The process identified in Question 3.5.1 can be divided into different types, as illustrated by Diagrams **1** and **3** above. Name the type represented by:

(a) Diagram 1

_____

(1)

(b) Diagram 3

_____

(1)

3.5.3 Identify the letter of the part of flower in Diagram 2 responsible for the following functions:

(a) Acts as a female reproductive organ of a flower _____

(b) It develops into a fruit _____

(c) Sticky tip that serves to trap pollen grains _____

(d) Serve the purpose of a male reproductive organ _____

(e) Slender tube that transports pollen to the ovary _____

(5)

3.5.4 Give TWO agents of the process identified in Question 3.5.1.

_____

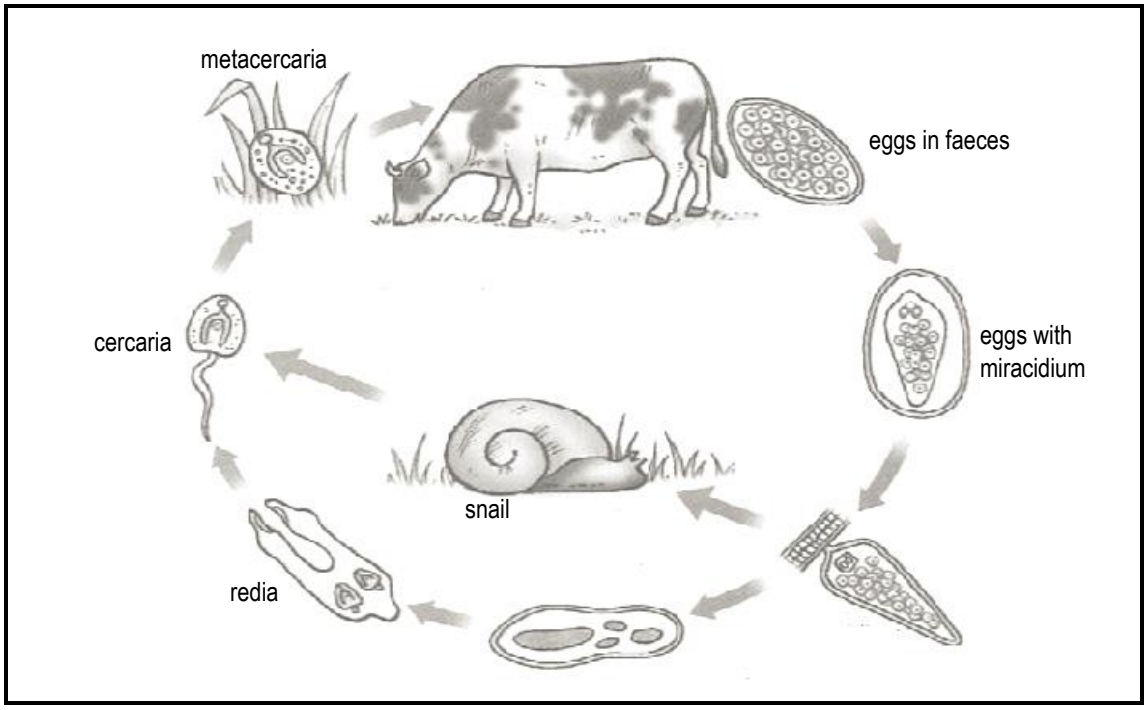
_____

(2)

[50]

QUESTION 4

4.1 Internal parasites are divided into three main groups. The schematic representation below shows the life cycle of a parasite.



4.1.1 Identify the type of internal parasites represented in the schematic representation above.

_____

(2)

4.1.2 Name the intermediate host in the schematic representation above.

_____

(2)

4.1.3 Indicate the TWO other main classes of internal parasites not mentioned in Question 4.1.1.

_____

_____

(2)

4.1.4 State TWO financial implications and detrimental effects of internal parasites.

_____

_____

(4)

4.1.5 Suggest TWO measures related to pasture management that can be used to control the type of parasite identified in Question 4.1.1.

(4)

4.2 The table below shows the quantities of oranges that were bought per week at different prices.

Price (R/bag)	Quantity of oranges bought per week (bags)	Total revenue (R)
5	2 500	12 500
10	1 000	10 000
15	500	7 500
20	300	6 000
25	20	1 000
30	15	450

4.2.1 Draw a line graph to illustrate the price and quantities of oranges bought per week.

(8)

4.2.2 Compare the demand and supply of oranges with reference to the price.

(3)

4.3 A farmer realises that farm workers' social and financial problems have an influence on productivity. The farm workers are paid low wages, they have long working hours and most of them are not skilled; all factors leading to a low morale. He has appointed a full-time nurse for primary health care and a social worker to deal with the emotional burdens of these workers. He established a training centre to address the training and educational needs of workers. He also provided improved wages and sufficient housing.

4.3.1 Identify TWO labour challenges in the case study above.

_____

_____

(2)

4.3.2 Identify, in the case study above, the issues relating to the following legislation:

(a) Basic Conditions of Employment Act

_____

_____

(2)

(b) Skills Development Act

_____

_____

(2)

4.3.3 Refer, in the case study above, to THREE aspects that the farmer addressed to motivate his employees.

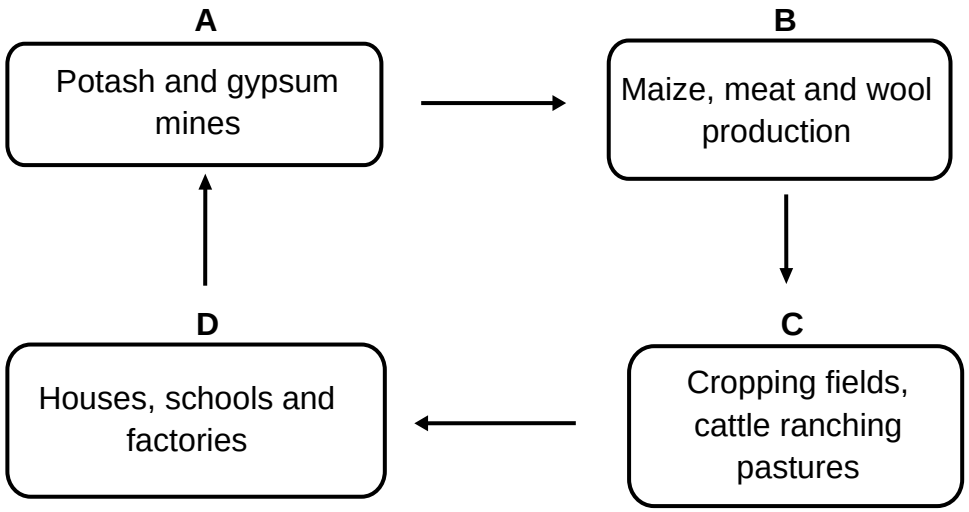
_____

_____

_____

(3)

4.4 The flow chart below represents the characteristics of land as a production factor.



4.4.1 Name a function of land represented by **A**, **B**, **C** and **D**.

A: _____

B: _____

C: _____

D: _____

(4)

4.4.2 State TWO measures a farmer can take to improve the productivity of land.

_____

_____

_____

_____

(2)

4.5

Below is a list of activities on a farm:

- Construction of tunnels for vegetable production
- Wool shearing
- Cultivation of fields with a tractor

Identify the activity from the list above that needs to be done by each of the following labourers:

4.5.1 Casual labourer

_____

(2)

4.5.2 Permanent labourer

_____

(2)

4.5.3 Seasonal labourer

_____

(2)

4.6 Indicate TWO forms of credit and the purpose of each form.

_____

_____

_____

(4)
[50]

QUESTION 5

5.1 The table below represents the price of lamb and the number of lambs sold by a farmer in a period of six months. Lambs are marketed at a slaughtering mass of 27 kg.

MONTHS	**SEPT**	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**
PRICE (R/kg)	79	81	87	110	75	79
Number of lambs sold	55	60	65	45	50	35

5.1.1 Deduce from the table above the month in which the farmer had the highest income from the sale of lambs.

_____

(2)

5.1.2 Calculate the price per lamb for the month of October.

_____

_____

_____

(3)

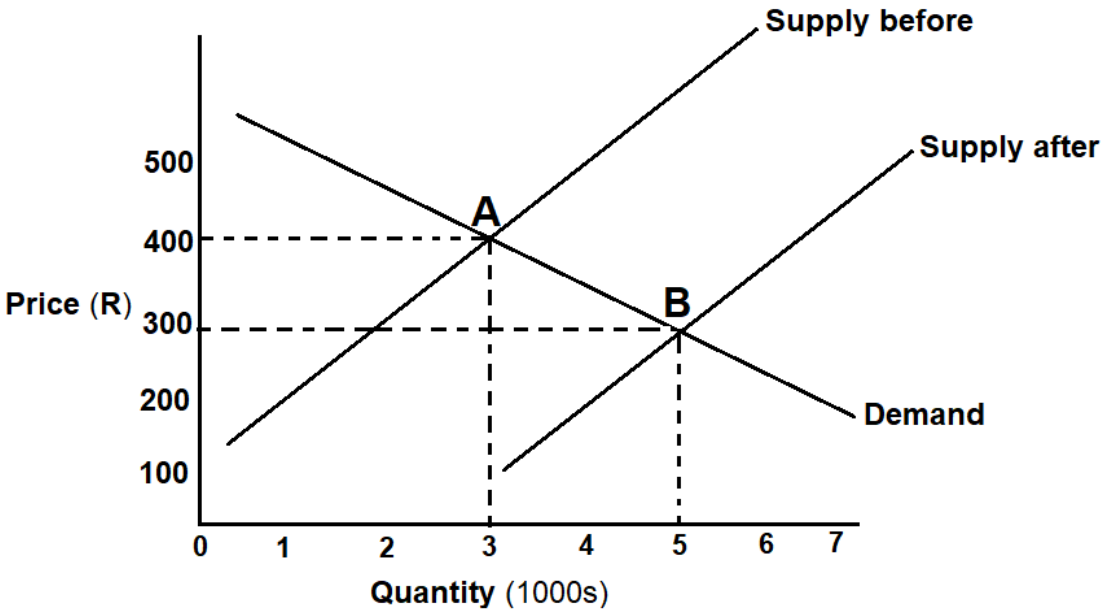
5.1.3 Suggest an economic reason for the decrease in the lambs sold by the farmer in February.

_____

_____

(2)

5.2 The graph below shows changes in the price of fruit as quantity supplied changes:



5.2.1 Indicate the equilibrium price when the quantity supplied was 5 000.

_____

(2)

5.2.2 Identify the quantity demanded when the price was R400,00.

_____

(2)

5.2.3 In summer the supply of fruit increases because most fruit is seasonal. Motivate the statement by referring to the data supplied above.

_____

_____

_____

(2)

5.2.4 Briefly explain the inelasticity of the supply of agricultural products in the short term.

_____

_____

_____

_____

(2)

5.2.5 Name TWO advantages of processing to the farmer.

(2)

5.3 The information below shows the assets and liabilities on a farm.

- Value of farm: R3 500 000
- Tractor loan: R365 000
- Overdraft: R150 000
- Bond balance: R1 800 000
- Cash on hand: R500 000

Assets	Value (R)	Liabilities	Value (R)
Total value of assets		**Total value of liabilities**	

5.3.1 Identify the financial statement above.

(2)

5.3.2 Complete the table using the information provided. (7)

5.3.3 Calculate the net worth of the farm.

(3)

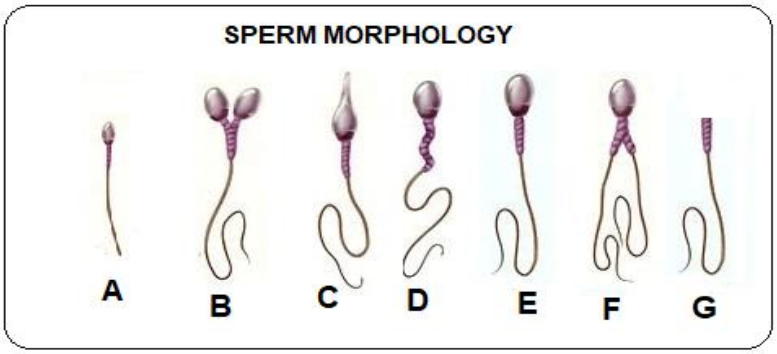
5.3.4 Indicate whether this farming business is economically viable.

(2)

5.3.5 Justify your answer to Question 5.3.4.

(2)

5.4 The diagram below illustrates different sperm cells.



5.4.1 Identify the letter (A–G) from the diagram above that represents a sperm cell with normal morphology.

_____

(1)

5.4.2 Name the process by which sperm cells are formed in the male testis.

_____

(1)

5.4.3 Explain how sperm cells **A** and **G** can cause infertility in a bull.

_____

_____

(2)

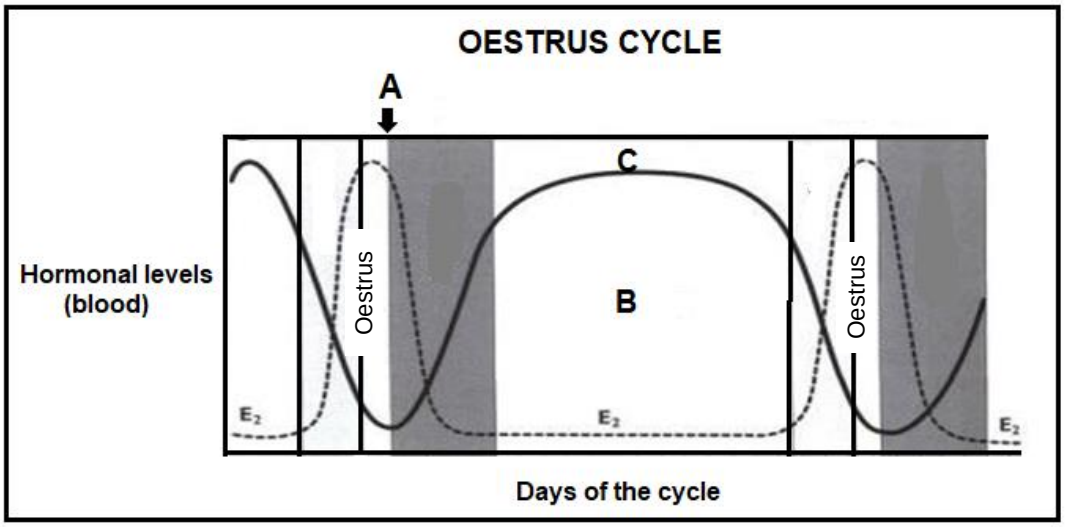
5.4.4 List TWO characteristics of good-quality semen.

_____

_____

(2)

5.5 The graph below represents the levels of hormones at different stages in the oestrus cycle of a cow.



5.5.1 Name the hormone labelled **C**.

_____

(1)

5.5.2 Indicate, with a reason, the stage of the oestrus cycle indicated by the letter **B**.

_____

_____

(2)

5.5.3 Name the process represented by **A** in the graph above.

_____

(1)

5.5.4 Name TWO visible signs of a cow in oestrus.

_____

_____

(2)

5.6 Re-arrange the stages of mating presented in the list below into its chronological order using letters.

A Penetration of the vagina.
B Male animal jumps off.
C Bull shows interest in cows due to increased level of pheromones.
D Male animal stands on his hind legs with his chest on the female animal's rump.
E Bull releases sperm into vagina.

_____

(5)
[50]

200 marks

SECTION C

QUESTION 6

Read the following scenario and then answer the question that follows:

A market system is the network of buyers, sellers and other actors that come together to trade in a given product or service. The participants in a market system include:

- Direct market players such as producers, buyers, and consumers who drive economic activity in the market
- Suppliers of supporting goods and services such as finance, equipment and business consulting
- Entities that influence the business environment such as regulatory agencies, infrastructure providers and business associations

A market system can be specific to a product (coffee, mangoes, dairy) or a cross-cutting sector (finance, labour, business development services). A market system's strength depends on how well the participants obtain financing, launch businesses and adopt new technologies and best practices. Free markets are characterised by a spontaneous and decentralised order of arrangements through which individuals make economic decisions. Based on its political and legal rules, a country's free-market economy may range between very large or entirely black market.

Discuss a free-market system and include the following sub-headings in your discussion:

- Definition of a free-market system and examples
- Advantages of a free-market system
- Disadvantages of a free-market system
- Market channels of a free-market system

20 marks

Total: 300 marks

ADDITIONAL SPACE TO ANSWER QUESTIONS. REMEMBER TO CLEARLY INDICATE AT THE QUESTION THAT YOU USED THE ADDITIONAL SPACE TO ENSURE THAT ALL THE ANSWERS ARE MARKED.