



**AGRICULTURAL SCIENCES: PAPER II**

Time: 2½ hours

150 marks

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**PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY**

1. This question paper consists of 12 pages and an Answer Sheet of 2 pages (i–ii). Please ensure that your question paper is complete. Please ensure that your examination number is completed in the space provided on the Answer Sheet and that it is handed in with your Answer Book at the end of the exam session.
  2. This question paper consists of **TWO** sections, namely **SECTION A** and **SECTION B**.
  3. This question paper consists of **FOUR** questions.
  4. Question 1 must be answered on the Answer Sheet provided. Questions 2, 3, and 4 must be answered in your Answer Book.
  5. Read the questions carefully.
  6. Start **EACH** question on a **NEW** page.
  7. Number your answers exactly as the questions are numbered in the question paper.
  8. Use the total marks that can be awarded for each of Questions 2, 3 and 4 as an indication of the detail required.
  9. Non-programmable calculators may be used.
  10. It is in your own interest to write legibly and to present your work neatly.
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**SECTION A****QUESTION 1**

Answer the following questions on the Answer Sheet provided.

- 1.1 Various options are provided as possible answers to the following questions. Choose the answer and make a cross (X) in the block (A–D) next to the question number (1.1.1–1.1.10) on the attached Answer Sheet. NO marks will be awarded if more than one cross (X) appears for the answer.

EXAMPLE

|        |        |   |   |   |
|--------|--------|---|---|---|
| 1.1.11 | X<br>A | B | C | D |
|--------|--------|---|---|---|

- 1.1.1 Using cultural values would be the most effective way for a maize producer to increase the market for their produce. This can be done by encouraging ...
- A a pig producer to use more maize meal for feed mixtures.
  - B rural and urban communities to eat more porridge made from maize meal.
  - C vegetarians to eat more products made from maize.
  - D a dairy farmer to utilise more maize meal in their dairy rations.
- 1.1.2 One of the following is the first step in the development of the strategic management plan.
- A Setting goals and objectives
  - B Developing the vision
  - C Evaluation
  - D Developing the mission
- 1.1.3 When a red flower is crossed with a white flower and pink flowers are produced, the genetic interaction seen is ...
- A co-dominance.
  - B complete dominance.
  - C incomplete dominance.
  - D None of the above.
- 1.1.4 A farm owner observing and counting cattle and recording the data reflects the following management principle:
- A Motivation
  - B Coordination
  - C Leadership
  - D Control

1.1.5 A farmer wants to grow a crop of chickpeas in a camp that has clay soil and a problem with oats as a weed.

| Crop      | Weeds                                  | Rate (l/ha) |             |            |
|-----------|--|-------------|-------------|------------|
|           |  | Light soil  | Medium soil | Heavy soil |
| Chickpeas | Amaranthus<br>Kikuyu<br>Millet<br>Oats | 1,5         | 1,7         | 2,0        |

What rate of herbicide should the farmer use?

- A 1,5
- B 1,7
- C 2,0
- D 1,2

1.1.6 A Black Angus farmer had, for the first time in the history of the stud, a red calf born. Indicate the statement most relevant to the scenario.

- A The farm can expect to have more red calves born in the future.
- B The neighbour's bull jumped the fence.
- C This red calf is probably infertile.
- D It is a genetic mutation and shouldn't happen again.

1.1.7 This is one way in which a farmer can decrease the risk factors that will influence income.

- A Pawning capital items
- B Repairing capital items
- C Insuring capital items
- D Selling capital items

1.1.8 .... cause an individual to die or be badly deformed at birth.

- A Polygenes
- B Lethal genes
- C Recessive genes
- D Dominant genes

1.1.9 ONE of the following is NOT a form of capital:

- A Product capital
- B Working capital
- C Fixed capital
- D Movable capital

1.1.10 When crossing two double heterozygous individuals, the following is the expected phenotypic ratio of the offspring:

- A 1 : 2 : 1
- B 9 : 3 : 3 : 1
- C 1 : 2 : 1 : 2 : 4 : 2 : 1 : 2 : 1
- D 3 : 1

(20)

1.2 Choose a term/phrase from COLUMN B that matches a description in COLUMN A. Write only the letter (A–J) next to the question number (1.2.1–1.2.5) on the Answer Sheet provided, e.g. 1.2.6 K.

|       | <b>COLUMN A</b>   | <b>COLUMN B</b>                                       |
|-------|---|---|
| 1.2.1 | A cross between two homozygous individuals, which in a particular characteristic, produce heterozygous offspring similar to one of the parents. | A. Land<br>B. Co-dominance<br>C. Elasticity of supply |
| 1.2.2 | The place where consumers and producers meet.   | D. Machinery<br>E. Over supply                        |
| 1.2.3 | Medium term capital item.   | F. Market<br>G. Market equilibrium                    |
| 1.2.4 | A phenomenon that shows how the quantity of produced goods responds to a change in price at a market.   | H. Complete dominance<br>I. Surplus                   |
| 1.2.5 | A level in marketing where the amount demanded and the amount produced are equal.   | J. Farmers' association                               |

(10)

1.3 Give ONE word/term/phrase for each of the following descriptions. Write only the word/term/phrase next to the question number (1.3.1–1.3.5) on the attached Answer Sheet.

1.3.1 A sterile hybrid produced by crossing two individuals from different species.

1.3.2 A source of farm capital created by borrowing money from a financial institution.

1.3.3 The process of attracting public attention to a specific agricultural product or business through various forms of communication.

1.3.4 The management function that encourages farm workers to do their best at all times.

1.3.5 The modification of the DNA resulting in a change in the sequence of the genes.

(10)

1.4 Change the UNDERLINED WORD in each of the following statements to make the statements TRUE. Write only the correct word(s) next to the question number (1.4.1–1.4.5) on the attached Answer Sheet.

1.4.1 The business contract is an agreement to buy/sell a certain quantity of a product at a given price at a predetermined date in the future.

1.4.2 Prepotency is the appearance in a population of a characteristic determined by homozygous recessive gene.

1.4.3 In the stages of the marketing chain, accidents, theft and spoilage could be regarded as processing.

1.4.4 Homozygous is the improved performance of offspring created when breeding two individuals of different breeds.

1.4.5 Moveable capital refers to capital goods that are used for one production season only, for example fuel, fertiliser and feeds.

(5)

|                 |
|-----------------|
| <b>45 marks</b> |
|-----------------|

**SECTION B**

**QUESTION 2      AGRICULTURAL MANAGEMENT AND MARKETING**

Answer this question in your Answer Book.

2.1 The tables below represent the financial statements of two farmers involved in egg production.

**Farmer A:**

| Expenditure items/expenses (Rand) |        | Income (Rand)  |        |
|-----------------------------------|--------|----------------|--------|
| Cost price of layers              | 13 500 | Eggs           | 25 200 |
| Feed                              | 11 500 | Sale of layers | 6 700  |
| Electricity, water and wages      | 7 000  | Sale of manure | 5 400  |
| Gas for heating                   | 400    |                |        |
| Egg trays                         | 2 100  |                |        |
| Veterinary care                   | 1 200  |                |        |
| Maintenance                       | 800    |                |        |
|                                   | (A)    |                | (B)    |

**Farmer B:**

| Expenditure items/expenses (Rand) |        | Income (Rand)  |        |
|-----------------------------------|--------|----------------|--------|
| Cost price of layers              | 14 500 | Eggs           | 28 200 |
| Feed                              | 10 500 | Sale of layers | 7 800  |
| Electricity, water and wages      | 6 000  |                |        |
| Gas for heating                   | 400    |                |        |
| Egg trays                         | 2 500  |                |        |
| Veterinary care                   | 1 200  |                |        |
| Maintenance                       | 800    |                |        |
|                                   | (C)    |                | (D)    |

- 2.1.1 Calculate the values of A, B, C and D. (4)
- 2.1.2 Identify the most profitable farmer and show all your calculations. (3)
- 2.1.3 Make THREE recommendations on how Farmer A could reduce his/her costs. (3)
- 2.1.4 Describe TWO components of a cash-flow budget as it is presented in the data of Farmer A and B above. (2)

2.2 The table below shows data of the average number of layers that are laying eggs (%) in a farming district and data from actual averages of a number of layers (%) that are laying eggs at a specific farm.

| Layer age (weeks)  | 21 | 22 | 23 | 25 | 26 | 28 | 31 | 32 | 40 | 48 | 60 | 65 | 70 |
|--|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Average % of layers that are laying eggs (%)             | 5  | 10 | 18 | 52 | 65 | 84 | 94 | 88 | 83 | 77 | 73 | 70 | 70 |
| Actual farm average % of layers that are laying eggs (%) | 0  | 5  | 10 | 40 | 55 | 75 | 80 | 82 | 78 | 72 | 68 | 65 | 60 |

2.2.1 Using a line graph, plot the data in the table above. Put the age of the birds on the X-axis. (6)

2.2.2 Indicate whether the farmer in this example is performing better or worse than the district average. Give a reason from the data above to support your answer. (2)

2.2.3 Let us assume the farmer in this example has 10 000 laying hens. Calculate the number of eggs that will be produced during Week 32 of production. (3)

2.2.4 Assuming the farmer has 10 000 hens, calculate how much more money the farmer could have produced each day of Week 31, had the farm been producing at the same rate as the district average. Work on an average egg price of R7,50 per dozen. (7)

2.3 List FIVE main items that should be included in a good business plan. (5) [35]

**QUESTION 3 PRODUCTION FACTORS**

Start this question on a NEW page.

3.1 

Agricultural management can be defined as a comprehensive activity, involving the combination and coordination of human, physical and financial resources. These factors are combined in a way which produces a commodity or a service, which is both wanted and can be offered at a price which will be paid. This process also includes making the working environment agreeable and acceptable for those involved.

3.1.1 Identify FOUR main factors that need to be combined in the management of a farm. (4)

3.1.2 State FOUR external influences that may affect the farm as a business. (4)

3.1.3 Briefly describe FIVE economical characteristics of land. (5)

3.2 The advert below appeared in a newspaper under the heading: Vacancies/ Employment offered.

Farm manager and farm worker required for a progressive beef breeding farm and feedlot (two posts vacant). Apply by sending your CV to the owner at JoeBloggs@bloggsbeef.co.za. Competitive salaries and other benefits are offered.

The owner compiled the following brief summaries of the CVs from applicants:

| Candidate A  | Candidate B  |
|--|--|
| Computer literate, experience in export marketing, financial experience and has been a farm manager. Hard-working, self-motivated with good organisational skills. Agricultural degree in financial and business planning. | 10 years' experience working with sheep, cattle, horses, poultry and maize on different farms. Tractor operator and completed a basic course on maintenance of farm equipment. |

3.2.1 A panel was appointed to interview the candidates for each position. The following grid was provided to evaluate all the candidates that were selected for the interview. Evaluate EACH of the candidates mentioned above using the following grid.

Adopt the following rating: 3 = good; 2 = fair; 1 = weak

| Candidates  | Qualification level | Management skills | Technical skills |
|-------------|---------------------|-------------------|------------------|
| Candidate A |                     |                   |                  |
| Candidate B |                     |                   |                  |

(6)

3.2.2 Identify a candidate based on the evaluation in Question 3.2.1 that would be most suitable for each of the following positions on the farm and motivate for your choice in each case.

(a) Farm manager (2)

(b) Farm worker (2)



3.3 Refer to the income statement below to answer the questions that follow.

| <b>Farm income</b>  | <b>Rand</b>    | <b>Farm expenditure</b>        | <b>Rand</b>    |
|---------------------|----------------|--------------------------------|----------------|
| Beef sales          | 85 000         | Electricity and water          | 10 200         |
| Dry beans           | 15 000         | Bank charges                   | 1 440          |
| Maize sales         | 34 050         | Marketing costs                | 19 283         |
|                     |                | Feed                           | 26 420         |
|                     |                | Seed and seedlings             | 1 980          |
|                     |                | Telephone                      | 2 520          |
|                     |                | Rent paid                      | 4 000          |
|                     |                | Contractor costs               | 1 500          |
|                     |                | Livestock purchased            | 7 500          |
|                     |                | Fertiliser and lime            | 12 370         |
|                     |                | Weedicides and pesticides      | 15 000         |
|                     |                | Hired transport                | 2 000          |
|                     |                | Labour costs (wages)           | 55 400         |
|                     |                | Fuel, oil and grease           | 29 376         |
|                     |                | Insurance and licenses         | 10 560         |
|                     |                | Repairs and fixed improvements | 1 900          |
|                     |                | Other crop costs               | 297            |
| <b>Total income</b> | <b>134 050</b> | <b>Total expenditure</b>       | <b>201 746</b> |

3.3.1 Overheads are general expenses and not related to one enterprise in particular. Fixed costs do not vary with the level of production, but variable costs are affected by the level of production.

Choose ONE example of each of the following cost items from the table above and explain your choice:

- (a) Overheads (2)
- (b) Variable costs (2)
- (c) Fixed costs (2)

3.3.2 The income statement shows that labour is the largest expense of this farming enterprise. Suggest TWO ways to reduce this expense. (2)

3.4 State FOUR ways by which the farm manager can improve the living conditions of the workers. (4)

**[35]**

**QUESTION 4 BASIC AGRICULTURAL GENETICS**

Start this question on a NEW page.

4.1

The plant breeder conducted research work with two Bt maize cultivars to determine the lysine content of the seeds in the F<sub>1</sub> generation. The gene (A) for high lysine is dominant over the recessive gene (a) for low lysine content. The Bt maize cultivar with heterozygous high lysine content (Aa) was cross-pollinated with the Bt maize cultivar that had a low lysine content (aa) and the F<sub>1</sub> generation has 50% maize seeds with low lysine content.

4.1.1 Use the Punnett square to show the crossing of the two cultivars. (4)

4.1.2 Define the following genetic terms:

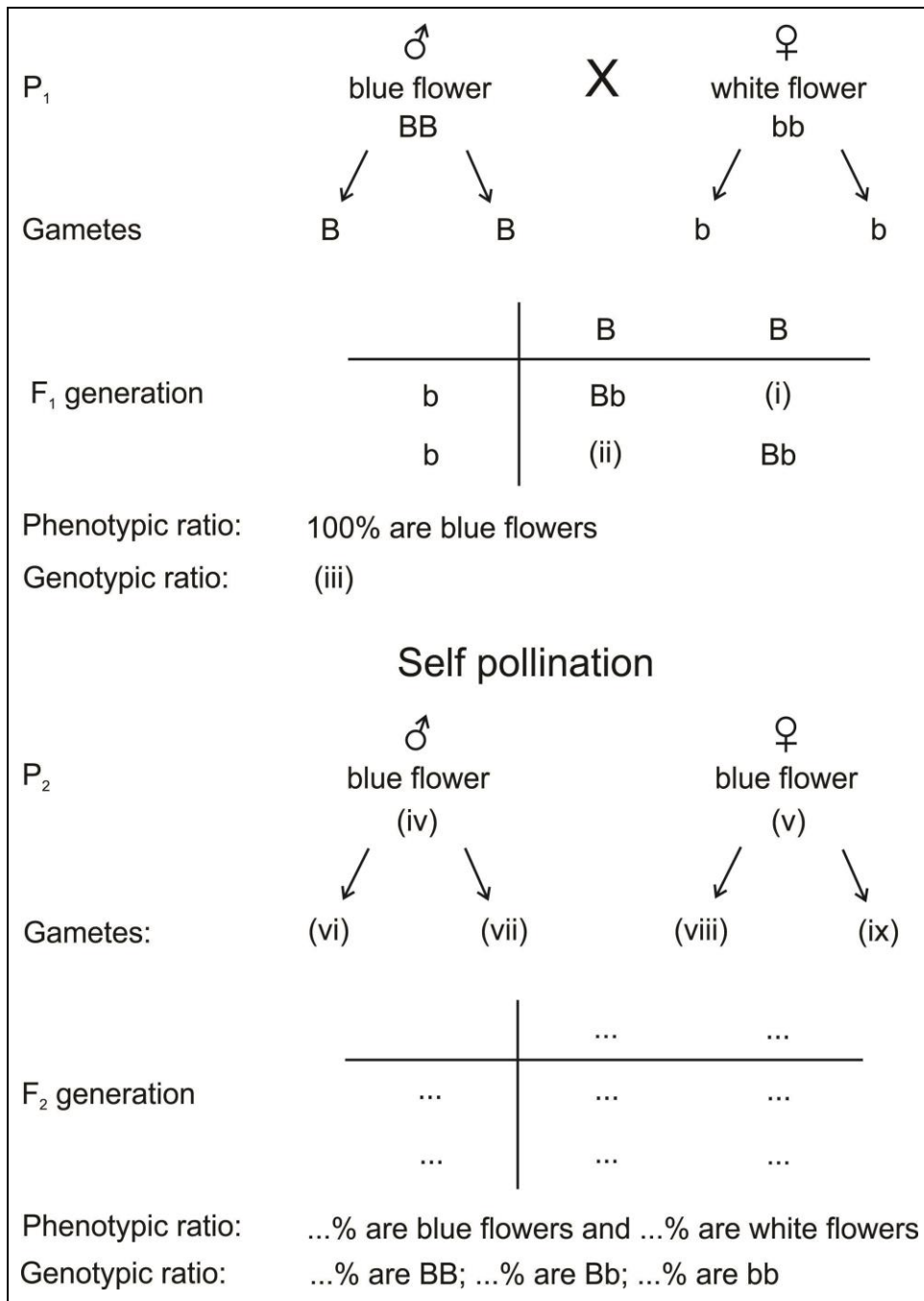
(a) Genotype (2)

(b) Phenotype (3)

(c) Recessive gene (2)

4.1.3 Apart from the lysine content mentioned above, name FOUR other characteristics of genetically modified maize that would make the plant hardier and better able to survive in harsh production environments. (4)

4.2 The blue lily (*Agapanthus africanus*) is an annual and ornamental plant that has two species that bear either blue (B) or white (b) flowers. The following schematic representation shows the crossing from P<sub>1</sub> to F<sub>2</sub>:



4.2.1 Identify the genotypes represented by labels (i) to (ix). (9)

4.2.2 Identify the genotypic ratio as a percentage of each genotype in the F<sub>1</sub> generation above. (2)

4.2.3 Determine the genotypic ratio as percentages of each genotype in the F<sub>2</sub> generation above. (3)

4.2.4 Indicate the percentage of white flowers in the F<sub>2</sub> generation. (1)

4.3

**Indigenous cattle breed of South Africa**

The Nguni Innovation Project launched in 2004 in the different provinces will reintroduce the Nguni cattle to emerging livestock farmers. These animals can survive in our country because they are resistant to a number of diseases, parasites and extreme heat conditions.

4.3.1 Deduce a reason from the passage above suggesting that Nguni cattle are indigenous. (1)

4.3.2 Name FOUR qualities of Nguni cattle that make it possible for them to survive in the climatic conditions of South Africa. (4)  
**[35]**

**105 marks****Total: 150 marks**