NSW Education Standards Authority

2022 **HIGHER SCHOOL CERTIFICATE EXAMINATION**

Agriculture

General Instructions

- Reading time – 5 minutes
- Working time – 3 hours
- Write using black pen
- Draw diagrams using pencil
- Calculators approved by NESA may be used

Total marks: 100

Section I – 80 marks (pages 2–24)

This section has two parts, Part A and Part B

Part A – 20 marks

- Attempt Questions 1–20
- Allow about 30 minutes for this part

Part B – 60 marks

- Attempt Questions 21–27
- Allow about 1 hour and 45 minutes for this part

Section II – 20 marks (pages 25–26)

- Attempt ONE question from Questions 28–30
- Allow about 45 minutes for this section

Section I
80 marks

Part A – 20 marks
Attempt Questions 1–20
Allow about 30 minutes for this part

Use the multiple-choice answer sheet for Questions 1–20.

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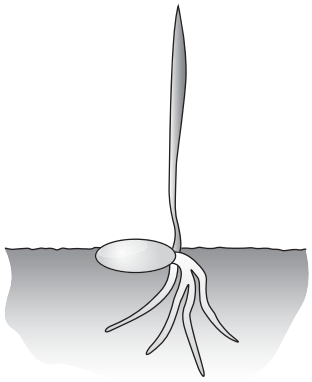
1 The diagram shows a seedling germinating in a paddock.



What type of plant is this?

A. Legume

B. Broad leaf

C. Dicotyledon

D. Monocotyledon

2 Which of the following is an essential input in the process of photosynthesis?

A. Oxygen

B. Glucose

C. Nitrogen

D. Carbon dioxide

3 Which of the following shows the correct order of the marketing chain?

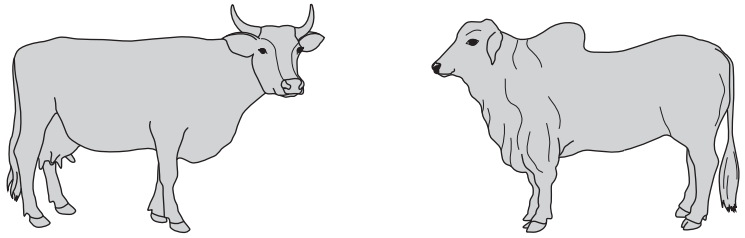
A. Producer → wholesaler → retailer → consumer

B. Producer → retailer → wholesaler → consumer

C. Consumer → retailer → wholesaler → producer

D. Consumer → wholesaler → retailer → producer

4 The diagram represents a breeding system used in cattle production.



Bos Taurus
(Breed *A*)

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Bos Indicus
(Breed *B*)

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Progeny *AB*

What type of breeding system is represented?

A. Line breeding

B. Hybrid vigour

C. Cross breeding

D. Genetic engineering

5 What type of marketing strategy involves a single owner controlling numerous parts of the marketing chain?

A. Contract selling

B. Direct marketing

C. Vertical integration

D. Cooperative marketing

6 Which of the following is a primary goal of an integrated pest management (IPM) program?

A. To save the farmer input costs

B. To minimise chemical resistance

C. To ensure the success of biological control

D. To reduce loss of efficacy of a genetic control

7 Which of the following is used in the calculation of a gross margin (GM)?

A. GM = profit – fixed costs

B. GM = profit – variable costs

C. GM = income – fixed costs

D. GM = income – variable costs

8 A student is conducting a test on soil and is using universal indicator and barium sulphate.

For what soil characteristic is the student most likely to be testing?

A. pH

B. Texture

C. Porosity

D. Organic matter

9 In which of the following do all items demonstrate *value adding*?

A. Sausages, whole chicken, grass-fed beef

B. Rump steak, chicken stir fry, pig carcase

C. Marinated steak, lamb carcase, chicken mince

D. Crumbed steak, chicken kebabs, vacuum-sealed beef

10 Which of the following is most likely to improve soil structure and break disease cycles in a cropping system?

A. Pasture ley

B. Riparian zone

C. Grassed waterway

D. Nutrient budgeting

11 Which of the following is an example of a government influencing agricultural production?

A. A farmer marketing through a cooperative

B. A farmer being prosecuted for the ill-treatment of animals

C. A farmer being levied for research related to their product

D. A farmer contributing to the funding of advertising by an industry group

Refer to the following to answer Questions 12–13.

Students were asked to design and conduct a trial to determine the effect of shade on plant growth.

They set up a trial in a treatment area, growing pots of radishes under the following three shade conditions:

- sheer black cloth cover
- sheer white cloth cover
- no cloth cover.

12 What could the students have done to provide replication?

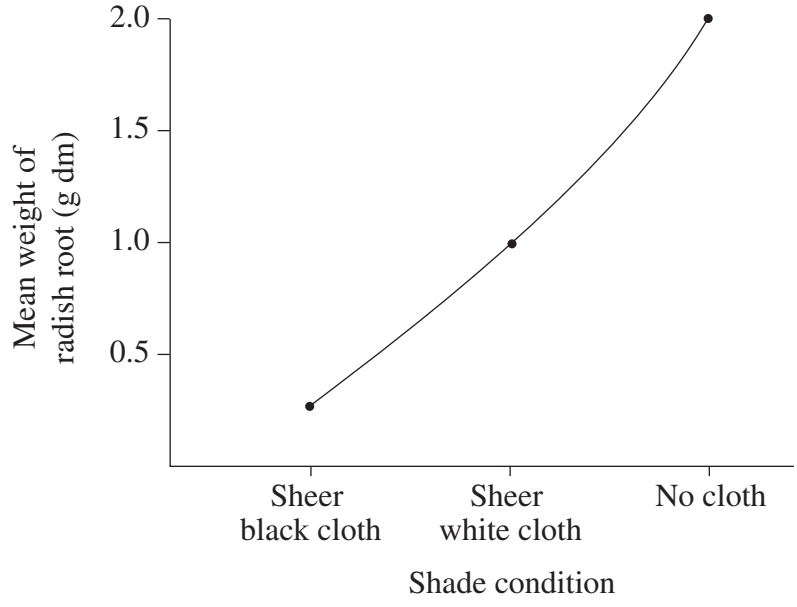
A. Grow some pots in full sun

B. Place at least three pots under each shade condition

C. Arrange the treatment pots 'by chance' in the treatment area

D. Grow all the pots in the treatment area under the same conditions of water and temperature

13 The students graphed the mean weight of radish roots in grams of dry matter (g dm), with respect to shade condition.



How can the graph be improved?

A. Change the scale on each axis

B. Plot the results as a column graph

C. Swap the horizontal and vertical axes

D. Include the correct units of measurement

14 Financial pressures often create a conflict for farmers, leading them to choose profit in the short-term over long-term sustainability.

Which of the following reflects this choice?

A. Applying high rates of urea for consecutive years

B. Planting a green manure crop in the cropping paddock

C. Rotating the cropping paddock with a pasture/legume mix

D. High stocking rates in paddocks on a rotational holistic grazing system

15 A student created a table to show four soil management techniques and an advantage for each in improving soil fertility.

Row	*Technique*	*Advantage*
1	Conservation tillage	Reduces soil structural decline and improves organic matter in soil
2	Inorganic fertiliser	Improves fertility while reducing the incidence of acidification
3	Green manuring	Rapidly improves nutrient loads within the soil
4	Crop rotation	Allows soil nutrients to replenish between crops

Which of the following shows the rows in the table where the student correctly matched a soil management technique with a corresponding advantage in improving soil fertility?

A. Rows 1 and 3

B. Rows 1 and 4

C. Rows 2 and 3

D. Rows 2 and 4

16 What type of hormone could be injected into a plant to allow for larger fruit?

A. Auxin

B. Cytokinin

C. Ethylene

D. Gibberellin

17 When analysing experimental results, standard deviation is a measure of the

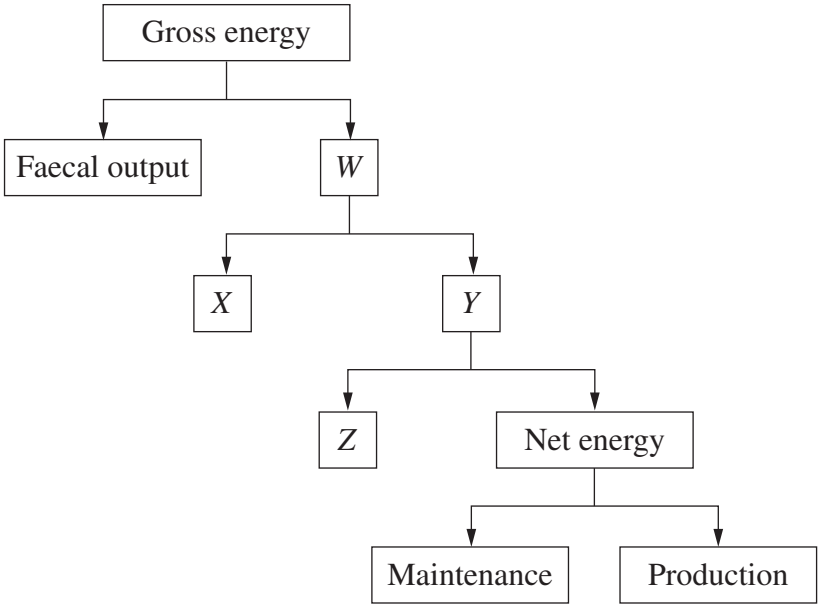
A. significance of the results.

B. probability of the results being correct.

C. spread of the results in relation to the mean.

D. difference between the highest and lowest results.

18 The following is a partially completed diagram showing the fate of energy in animal digestion.



Which row of the table correctly identifies the labelled components of the diagram?

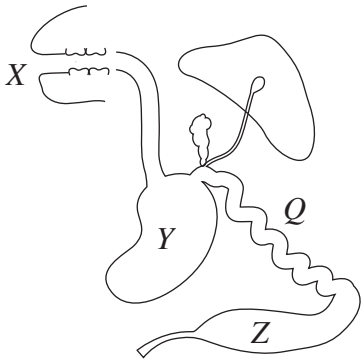
	W	*X*	*Y*	*Z*
A.	Urine	Heat	Digestible	Metabolisable
B.	Digestible	Urine	Metabolisable	Heat
C.	Digestible	Metabolisable	Urine	Heat
D.	Urine	Digestible	Heat	Metabolisable

19 A student was required to draw a monogastric digestive system and label the primary sites of digestion using the following key.

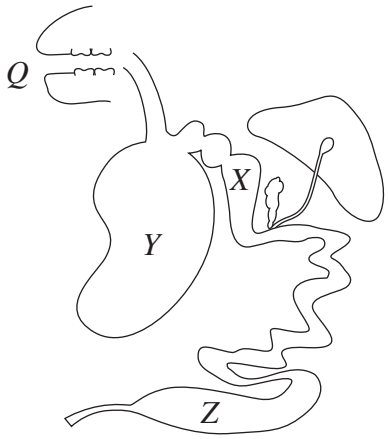
Q	Nutrient absorption
X	Mechanical digestion
Y	Chemical digestion
Z	Microbial digestion

Which diagram has been correctly drawn and labelled?

A.



B.



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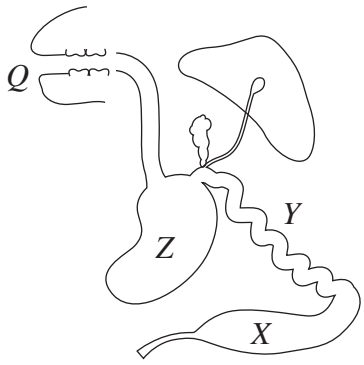
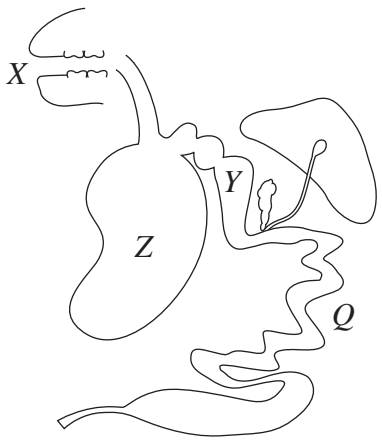
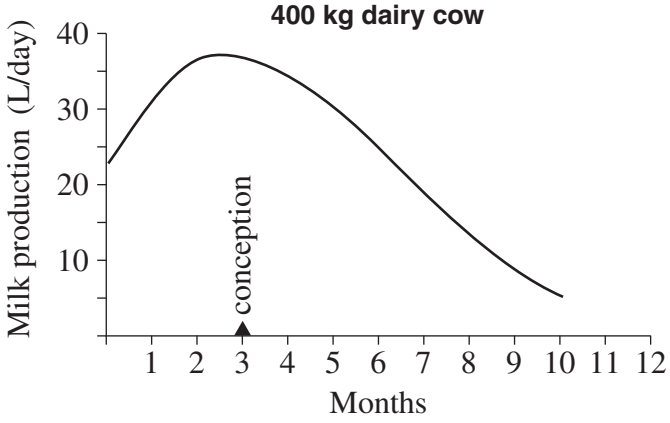


D.



20 The data on milk production and metabolisable energy (ME) requirements of dairy cattle is shown.

Typical lactation curve of a 400 kg dairy cow



Daily ME maintenance requirements (MJ/day)

Live weight (kg)	*ME* (MJ/day)
300	38
400	50
500	64

Daily ME requirement in pregnancy for a 400 kg dairy cow (MJ/day)

Month of pregnancy	*ME* (MJ/day)
6	8
7	14
8	25
9	40

Daily ME requirement (MJ/L/day) for 400 kg dairy cow to meet fat % and protein % constituents in milk

Fat (%)	*Protein* (%)			
	3.0	*3.2*	*3.4*	*3.6*
3.0	4.6	4.7	4.8	5.0
3.2	4.7	4.8	4.9	5.0
3.4	4.9	4.9	5.0	5.1
3.6	5.0	5.1	5.1	5.2

Using the data provided, what is the daily ME (MJ/day) requirement of a 400 kg dairy cow in the 6th month of pregnancy, producing milk with 3.4% fat and 3.4% protein?

A. 58 MJ/day

B. 63 MJ/day

C. 108 MJ/day

D. 183 MJ/day

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2022 **HIGHER SCHOOL CERTIFICATE EXAMINATION**

Centre Number

Student Number

Agriculture

Section I Part B
Answer Booklet

60 marks
Attempt Questions 21–27
Allow about 1 hour and 45 minutes for this part

Instructions

- Write your Centre Number and Student Number at the top of this page.
- Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.
- Show all relevant working in questions involving calculations.
- Extra writing space is provided at the back of this booklet. If you use this space, clearly indicate which question you are answering.

Please turn over

Question 21 (7 marks)

(a) Describe the role of ONE invertebrate in decomposition within the soil. **3**

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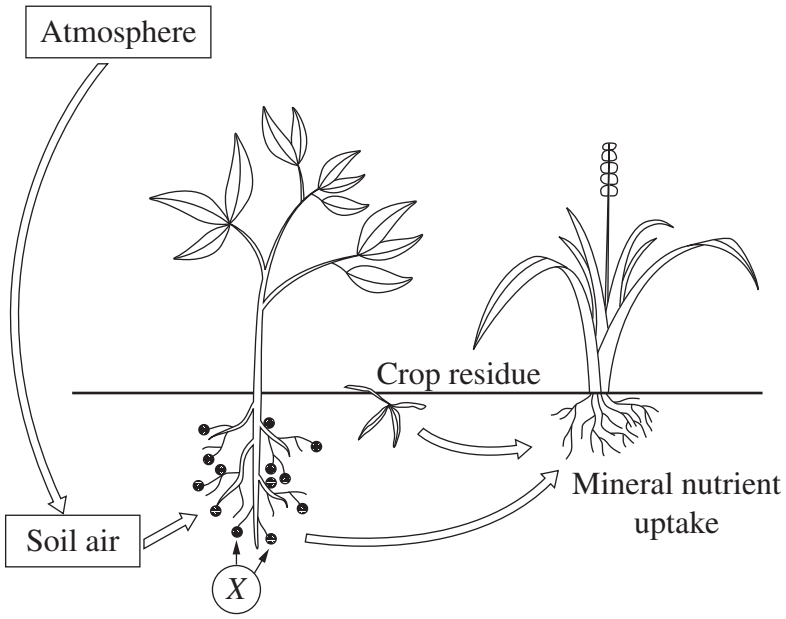
(b) The following diagram depicts part of a nutrient cycle. **4**



Identify the process occurring at *X* and explain how this process contributes to the cycling of the nutrient.

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Question 22 (7 marks)

(a) Describe ONE program which involves government and community groups working together to protect environmental resources. **3**

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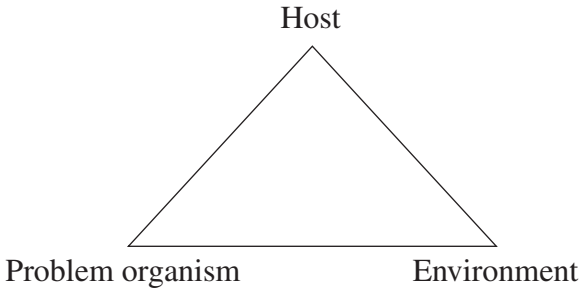
(b) The diagram shows the elements of a plant or animal disease. **4**



Describe the interactions between these elements in relation to a plant or animal disease.

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Question 23 (7 marks)

(a) Outline how the physical and behavioural characteristics of a particular animal species can influence how they are managed. **3**

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(b) Discuss ONE ethical issue that has an impact on an animal production system. **4**

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Question 24 (8 marks)

(a) Describe the changes in the proportion of muscle, fat and bone during the growth and development of an animal. **4**

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(b) Describe how environmental factors may affect the fertility of farm animals. **4**

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Question 25 (10 marks)

(a) Describe how both interest rates and the dynamic nature of markets influence the financial pressures on farmers. **4**

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(b) Discuss strategies available to farmers to market their farm products. **6**

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Question 26 (6 marks)

Explain how TWO plant breeding techniques have helped to develop new varieties which have improved aspects of plant production. **6**

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Question 27 (15 marks)

Answer parts (a)–(c) with reference to a product you have studied.

Name of product: .....

(a) Outline strategies for the advertising and/or promotion of this product. **3**

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(b) The supply of and demand for products is affected by various factors.

(i) Describe how ONE factor affects the supply of this product. **2**

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(ii) Describe how ONE factor affects the demand for this product. **2**

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Question 27 continues on page 21

Question 27 (continued)

(c) Evaluate management strategies that are used to meet market specifications for this product. **8**

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End of Question 27

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Section I Part B extra writing space

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Section I Part B extra writing space

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Agriculture

Section II

20 marks
Attempt ONE question from Questions 28–30
Allow about 45 minutes for this section

Answer the question in the Section II Writing Booklet. Extra writing booklets are available.

Your answers will be assessed on how well you:

- demonstrate knowledge and understanding relevant to the question
- communicate ideas and information using relevant examples
- present a logical and cohesive response

Please turn over

Question 28 — Agri-food, Fibre and Fuel Technologies (20 marks)

(a) (i) Why is there a need for research in the development of agricultural technologies? **4**

(ii) With reference to a research study you have analysed, describe aspects of the study's methodology. **4**

(b) Explain how ethical concerns can influence the use of biotechnologies in agricultural production. **12**

OR

Question 29 — Climate Challenge (20 marks)

(a) (i) Why is there a need for research into climate variability OR into management strategies for climate variability? **4**

(ii) With reference to a research study you have analysed, describe aspects of the study's methodology. **4**

(b) Explain how farmers use management techniques to minimise risk and maximise opportunities from climate variability. **12**

OR

Question 30 — Farming for the 21st Century (20 marks)

(a) (i) Why is there a need for research in the development of agricultural technologies? **4**

(ii) With reference to a research study you have analysed, describe aspects of the study's methodology. **4**

(b) Explain how new technological developments may assist agricultural industries. **12**

End of paper