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Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2024

Agricultural Science

Ordinary Level

Monday 17 June Afternoon 2:00 - 4:30

300 marks

Examination Number

Date of Birth / /

For example, 3rd February 2005 is entered as 03 02 05

Centre Stamp

Instructions

There are **two** sections to this examination.

It is recommended that you spend about 50 minutes on Section **A** and 100 minutes on Section **B**.

Section **A** Answer **ten** questions from this section. There is internal choice in **four** questions. Each question carries 10 marks.

Section **B** Answer any **four** questions from this section. There is internal choice in **two** questions. Each question carries 50 marks.

Write your Examination Number and your Day, Month and Year of Birth in the boxes on the front cover.

Write your answers in blue or black pen. You may use pencil for sketches, graphs and diagrams only.

Write your answers in the spaces provided to all parts of the examination into this answerbook.

This answerbook will be scanned and your work will be presented to an examiner on screen. Anything that you write outside of the answer areas may not be seen by the examiner. You are not required to use all the space provided.

There is extra space at the end of Section **A** and at the back of the booklet. Label any extra work clearly with the question number and part.

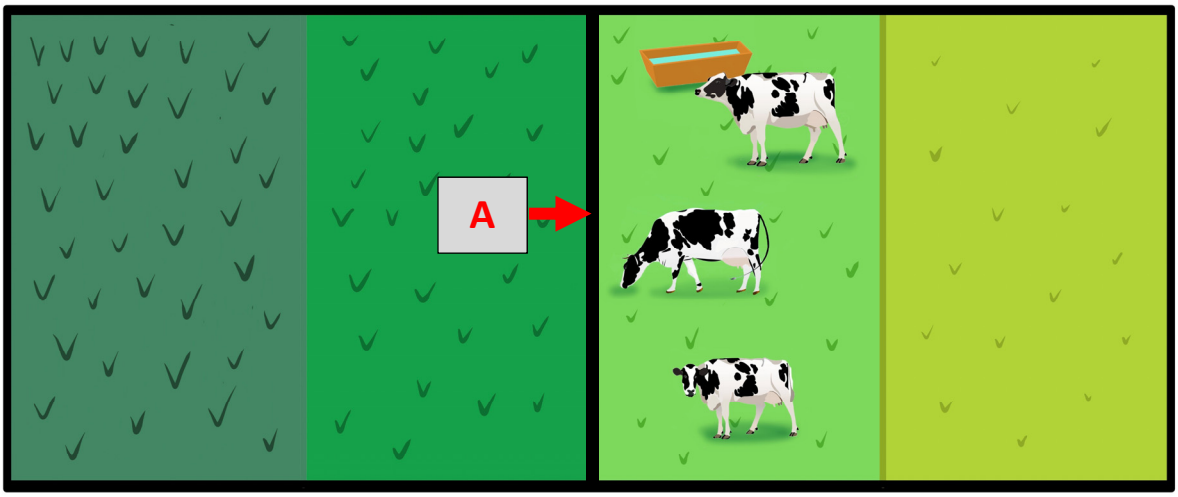
Section A — 100 marks

Answer any **ten** questions.

Each question carries 10 marks.

Question 1

The diagram below shows a type of grazing system.
Analyse the diagram and answer the questions that follow.



(a) Place a tick (✓) in the correct box below to show the direction of grazing in the above diagram.

→	
←	

(b) Label **A** in the diagram.

(c) Identify the type of grazing system shown in the diagram.

(d) Outline **one** advantage of this grazing system.

Question 2 Answer **either** (a) **or** (b).

(a) Identify the machine from the photographs below that is involved in the farming practices listed in the table.

Plough	Baler
	

Plate cooler	Slurry tanker
	

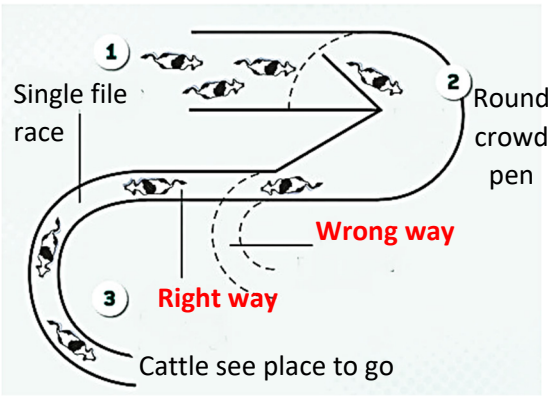
Farming practice	Machine name
Spreading animal waste on land	
Reducing the temperature of milk	
Turn and break up soil	
Compacts material into shape for storage	

Or

(b) The picture shows different cattle handling facilities.
Analyse the pictures and answer the questions that follow.

A

B



(i) State **one** use for the cattle handling facilities on the farm.

(ii) Briefly explain **one** reason why handling facility **B** is better for animal movement.

(iii) Outline **one** reason why the head gate labelled in picture **A** above is important when handling animals.

(iv) Apart from using a crush, outline **one** other safety precaution taken when handling animals.

Question 3

Indicate if the following are true or false by placing a tick (✓) in the correct box.

The first one has been done as an example.

		True	False
Example	***Organic matter is located in the C horizon in soil***		✓
(i)	Freeze thaw is a type of physical weathering in soil	☐	☐
(ii)	Clay has the largest soil particles	☐	☐
(iii)	Topography refers to the slope of the land	☐	☐
(iv)	Iron pans are found in brown earth soil profiles	☐	☐
(v)	Subsoil has a rich dark colour	☐	☐

Question 4

Complete the sentences below in relation to animal diseases using words from the list.

Pneumonia	Red water fever	Magnesium	Orf	Foot rot

(a) Cows suffering from grass tetany are lacking in …….

(b) Footbaths are used in the treatment of …….

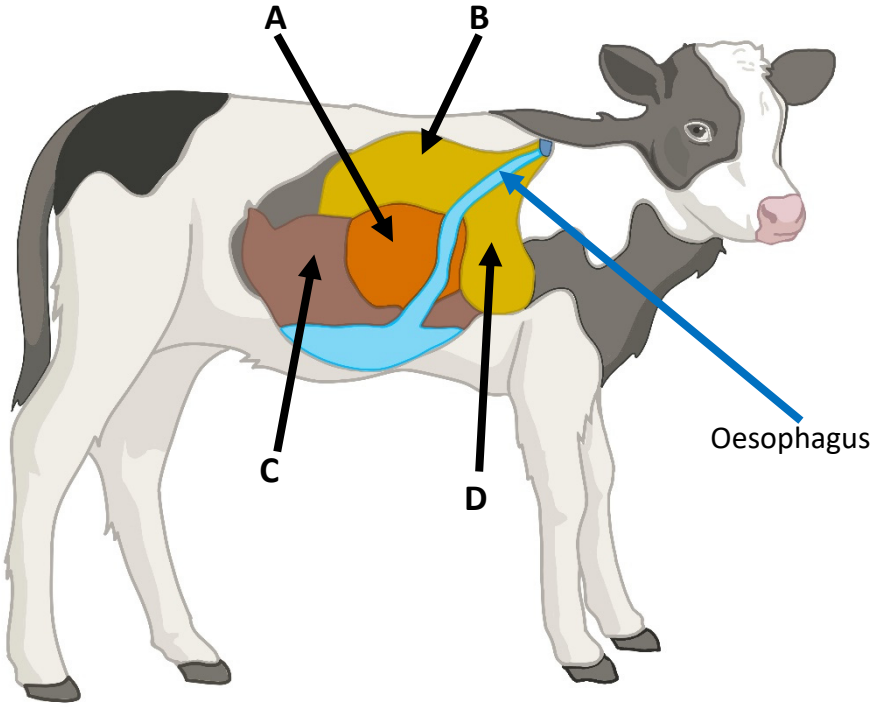
(c) Cows passing blood in their urine is an indicator of …….

(d) Rapid breathing and coughing in calves is an indicator of …….

(e) Lesions on the mouth, udder and nose of young lambs is …….

Question 5

The diagram shows the digestive system of a calf.
Analyse the diagram and answer the questions that follow.



(a) Label **any three** parts of the diagram using the words in the list below.

Omasum	Abomasum	Rumen	Reticulum

A:
B:
C:
D:

(b) Identify the first feed required by the calf by placing a tick (✓) in the correct box.

Hay	
Colostrum	
Milk	
Barley	

Question 6 Answer **either** (a) **or** (b).

(a) **(i)** The photographs below show some breeds of sheep found on Irish farms. Identify **any three** of the following breeds using the list below.

Texel	Suffolk	Charolais	Border Leicester

A

B

C

D

A:
B:
C:
D:

(ii) Outline **one** reason why any named breed in part (i) above is suitable for sheep meat production.

Named breed:

Or

(b) Read the article and answer the questions that follow.

Traditional cows to help bring mountainside back to life after devastating fires

Traditional Luing cattle are set to aid the recovery of a section of the Mourne Mountains in Co Down which was devastated by fire in April 2021.

The National Trust has been trialling different methods to bring the land back to full health for the plants and animals that live there.

The herd of six cows will trample bracken and eat through the dominant purple moor grass that has grown since the fire, providing the space for native plants and heather to return, and creating habitat for newts, lizards, ground-nesting birds and hares. These cows are not selective grazers, unlike sheep.

The animals will wear special collars with GPS tracking, which allows virtual fences to be created to allow targeted conservation grazing in particular areas without the need for fencing.

(Adapted from Irish Independent, 2023)

(i) Explain the underlined term.

(ii) Briefly outline the role of the herd of Luing cattle.

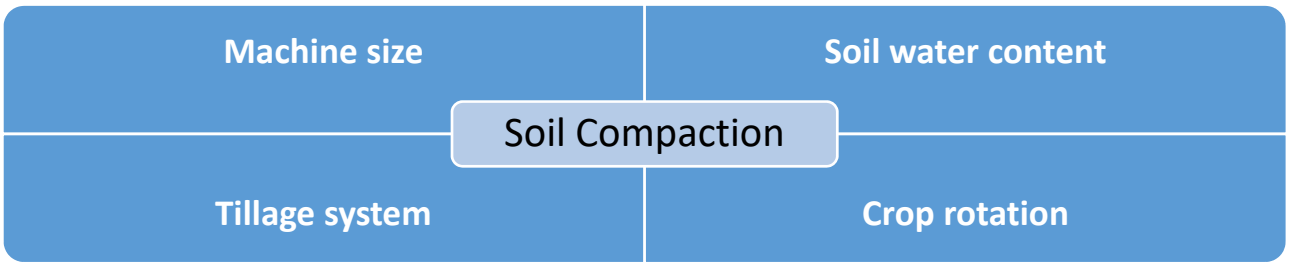
(iii) Outline **two** advantages of the virtual fencing.

1.

2.

Question 7

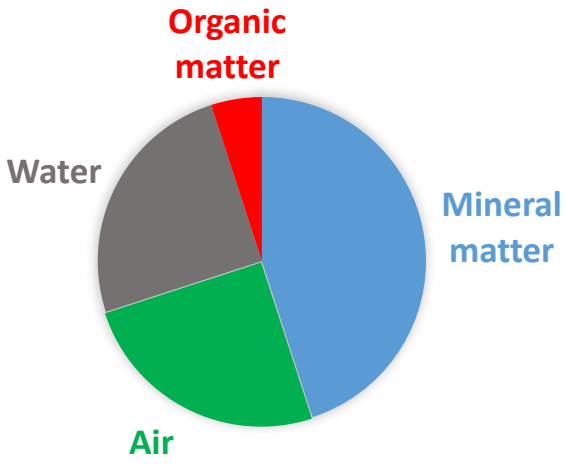
Soil compaction is an important factor that affects the productivity of the land.
Analyse the diagram below and answer the questions that follow.



(a) Using the four headings in the diagram above in relation to soil compaction, briefly describe how **any three** affect the growth of crops on the land.

1.
2.
3.

(b) Identify the % air in the ideal soil composition below by placing a tick (✓) in the correct box.



45%	
25%	
5%	

Question 8

Calf and sheep jackets make significant differences in the health and welfare of the animals.

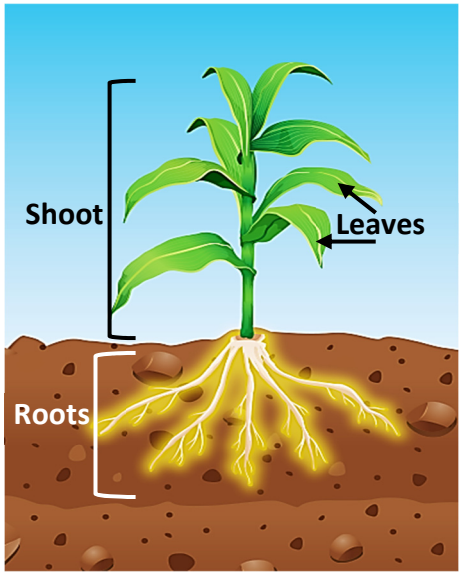
(a) Briefly outline **any three** advantages of using jackets to improve the health and welfare of animals under the headings provided in the diagram below.

1.
2.
3.

(b) Briefly explain how **one** piece of technology you have studied can improve animals' health and welfare on the farm.

Question 9 Answer **either** (a) **or** (b).

(a) The diagram shows the structure of a plant.
Analyse the diagram and answer the questions that follow.



(i) Identify the part of the plant that is involved in nutrient absorption.

(ii) List **two** nutrients absorbed by plants.

1.
2.

(iii) Identify the bacteria found in clover roots which fix atmospheric nitrogen into nitrates to be used by the plant by placing a tick (✓) in the correct box.

Lactobacillus	
Rhizobium	
Clostridium	

Or

(b) The Environmental Protection Agency (EPA) report in June 2023 has shown there is no improvement in water quality in Ireland in 2022.

State **two** agricultural practices which contribute to water pollution and outline **one** way of protecting water quality from each of these practices.

Agricultural practice	Protecting water quality
1.	
2.	

Question 10

Macroom Buffalo has Ireland's first and only herd of milking water Buffalo. Macroom Buffalo Mozzarella is an artisan product and is made from fresh buffalo milk produced on the farm which is turned into cheese and dispatched the same day.

(Adapted from bordbia.ie)

(a) Explain the underlined term.

(b) Macroom Buffalo Mozzarella is an example of a product being supplied to a niche market. Identify the meaning of niche market by placing a tick (✓) in the correct box below.

Country or group of countries to which goods and services from another country are sold	
Specialised market with products aimed at satisfying the specific needs of consumers	
General direction in which a market is moving	

(c) The table below shows the composition of buffalo versus cow's milk. Analyse the table and answer the questions that follow.

Content	Cow	Buffalo
Water (%)	**M**	84
Energy (kcal)	61	97
Protein (g)	3.2	3.7
Fat (g)	3.4	6.9

(Adapted from researchgate.net)

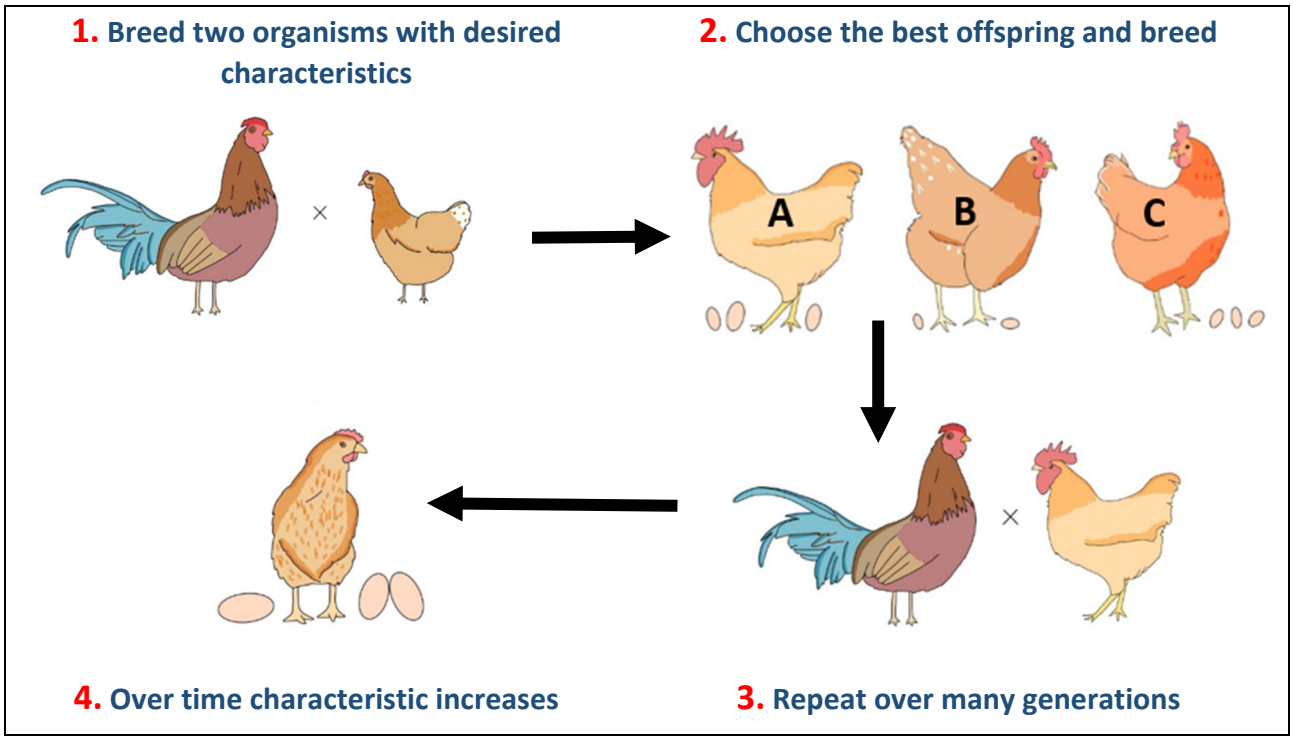
(i) Using your knowledge of the composition of cow's milk (**M**), place a tick (✓) in the correct box to show if the % of water in cow's milk is higher or lower than in buffalo's milk.

Higher	
Lower	

(ii) Buffalo's milk is suitable for different types of cheese production. State which nutrient makes it most suitable for cheese production.

Question 11

(a) Selective breeding has been done for thousands of years to improve characteristics of plants and animals.
Analyse the diagram in relation to egg production and answer the questions that follow.



(i) Identify the desired characteristic being selectively bred.

(ii) In step 2, state which hen **A**, **B** or **C** is the best offspring to breed future generations.

(iii) Using your knowledge of selective breeding, identify **two** characteristics of dairy cattle from the list below that could be chosen to improve production, by placing a tick (✓) in the correct boxes.

Marbling in meat	
Milk volume	
Early maturing	
Milk protein	

Or

(b) The picture shows the Belgian Blue beef breed.
Analyse the picture and answer the questions that follow.

(i) Identify **two** physical characteristics of the Belgian Blue.

1.
2.

(ii) State with reason which cow **A** or **B** a farmer would choose to cross with the Belgian Blue bull shown in the picture above.

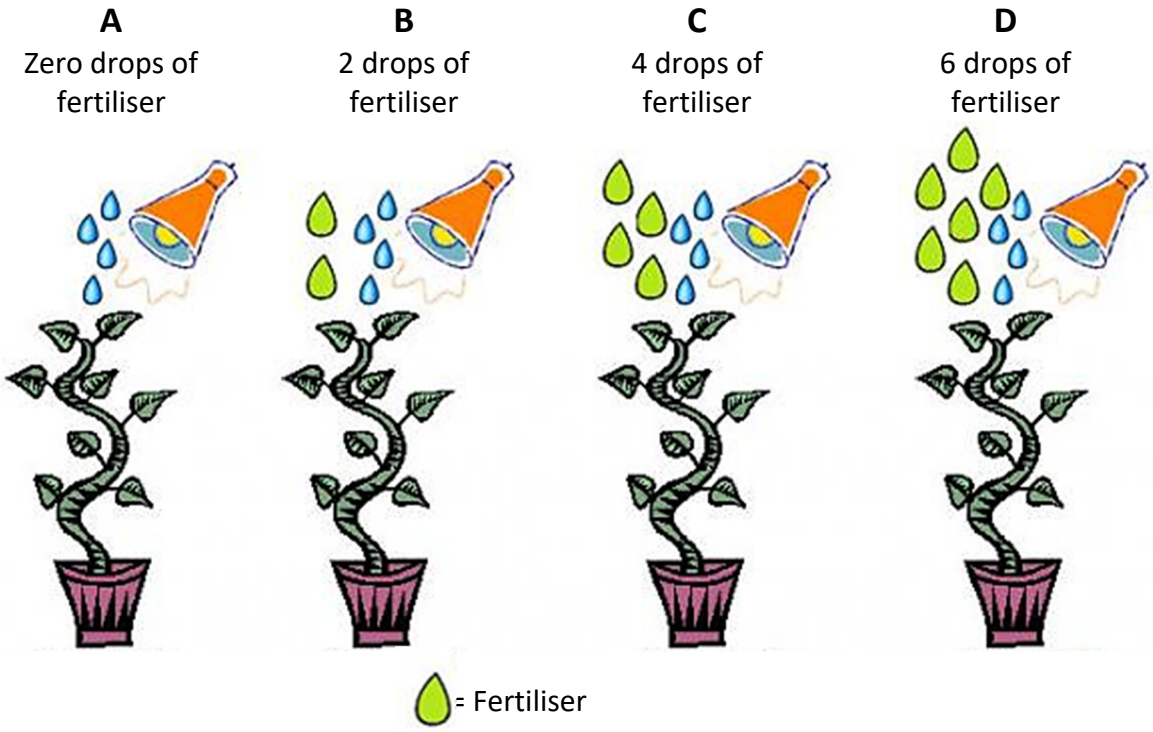
A

B

Cow:
Reason:

Question 12

The diagram below shows the variables in an investigation to determine the effect of the amount of fertiliser on plant growth. Four identical plants (**A**, **B**, **C** and **D**) are used in the investigation. Analyse the diagram and answer the questions that follow.



(a) Identify each of the following variables in the investigation.

Control	
Independent	
Dependent	

(b) Briefly explain the relationship between the independent and dependent variables in this investigation.

Additional writing space for **Section A**.
Label all work clearly with the question number and part.

Section B — 200 marks

Answer any **four** questions.

Each question carries 50 marks.

Question 13

(a) Lisa was renting 40 hectares of land for her organic dairy farm. She carried out a number of tests to determine its productivity. One of the areas Lisa decided to investigate was the botanical composition of the land.

Describe with the aid of a labelled diagram how she would carry out this investigation.

Labelled diagram:

(ii) Lisa found the following plants in the grassland.
Identify **any three** of the plants using the list of words in the box below.

Broad leaf dock	Perennial ryegrass	Nettle	White clover

A

B

C

D

A:
B:
C:
D:

(b) The results from the investigation are shown in the table below.
Analyse the table and answer the questions that follow.

Plant	1	2	3	4	5	6	7	8	9	10	Average % frequency
Dock leaf		X		X			X			X	**A**
Perennial ryegrass	X	X	X	X	X	X	X	X	X	X	100
Nettle	X				X					X	30
White clover	X		X	X	X	X		X		X	70

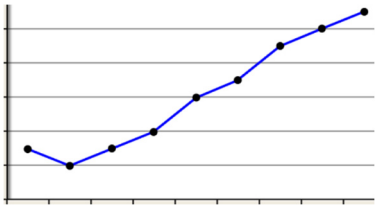
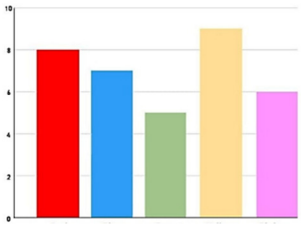
(i) Calculate the average % frequency **A** for the dock leaf.

Calculation:

(ii) State with reason if the results shown in part (i) are qualitative or quantitative.

State:
Reason:

(iii) Identify the most suitable chart or graph to display the above results by placing a tick (✓) in the correct box.

A	B	C
		

(iv) State with reason if this investigation is accurate.

State:
Reason:

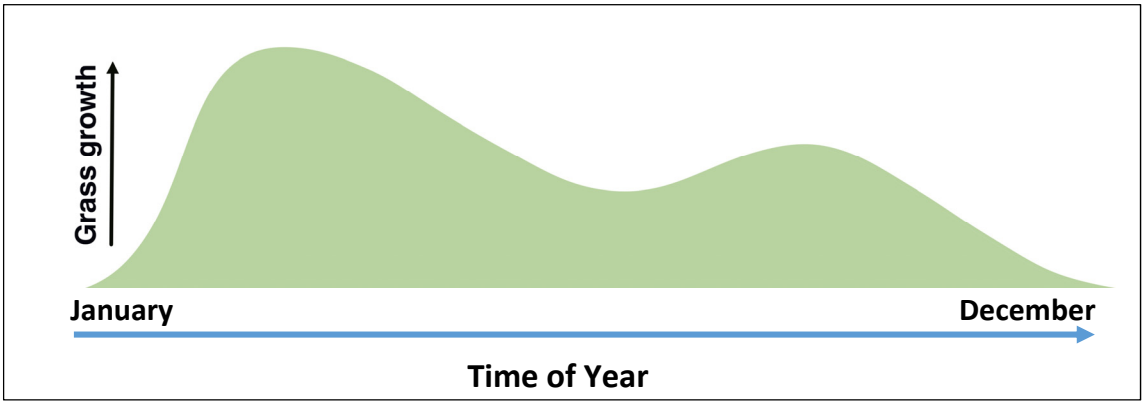
Question 14

Silage making is a very important aspect of farm life as it is an essential feedstuff for ruminant animals on farms.

(a) **(i)** Ensuring good grass growth is essential to achieve good yields.
Briefly describe **two** ways a farmer could ensure a good grass yield at harvesting.

1.
2.

(ii) Identify the best time of the year to cut grass for silage by placing an **X** on the diagram.



(iii) Briefly describe **one** disadvantage of the grass being cut at the wrong growth stage.

(b) **(i)** Identify the correct stage of cutting the grass for silage by placing a tick (✓) in the correct box.

A

B

(ii) Briefly outline **one** reason for your choice in part (i).

(iii) Identify the growth stage of plant **B** by placing a tick (✓) in the correct box.

Inflorescence	
Vegetative	
Elongation	

(c) **(i)** One measure of silage quality is to measure the dry matter (DM)%.
Describe how a student carried out this investigation in the school laboratory.

(ii) Briefly describe **two** other ways to measure the quality of silage.

1.
2.

(d) Hay and silage are common feeds on livestock farms and are both a method of preserving grass.
Compare the preserving of grass as hay and silage under the headings that follow using the list of words in the box.

Dehydration	24 hours	Under plastic	Shed	5 - 7 days	Fermentation

	Hay	**Silage**
Length of drying		
Method of preservation		
Storage		

Question 15 Answer both (a) **and** (b) with **either** (c) **or** (d).

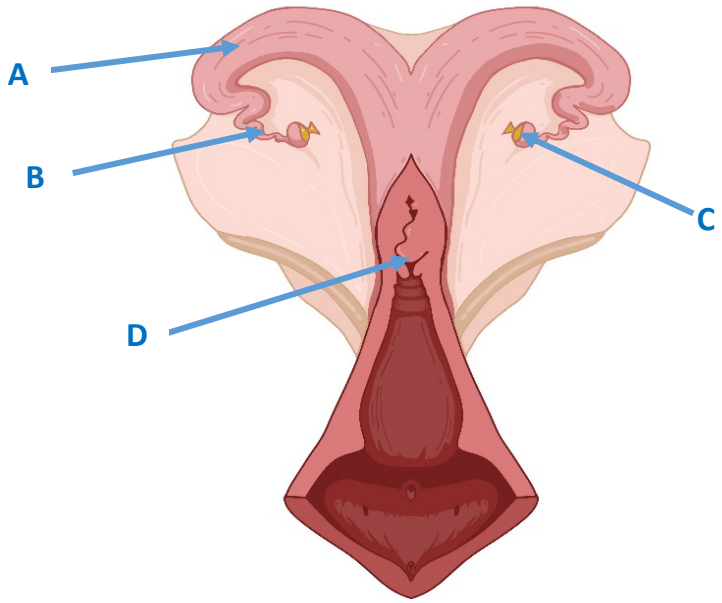
The breeding season is an important and busy time on sheep farms to ensure successful lamb production.

(a) **(i)** Outline the management practices of the ewe at mating under the headings that follow.

Feeding	
Health	

(ii) Label the diagram of the ewe reproductive system using the list of words in the box below.

Ovary
Uterus
Fallopian tube
Cervix



A		**C**	
B		**D**	

(b) **(i)** The ram is an important part of a flock and needs to be looked after and checked. Briefly describe **two** things farmers would check in advance of the breeding season.

1.
2.

(ii) At mating, farmers place a raddle on the ram. Explain the purpose of the raddle.

(iii) State how often a raddle colour would be changed by placing a tick (✓) in the correct box below.

13 – 15 days	
22 – 24 days	
28 – 30 days	

(iv) Using the colours in the box below, list the colours in order of sequence used by the farmer during mating.

A

B

C

1st colour	
2nd colour	
3rd colour	

(c) **(i)** Identify the average ratio of rams to ewes in a mid-season lambing flock by placing a tick (✓) in the correct box below.

1:80	
1:40	
1:100	

(ii) Explain the importance of dagging the ewes prior to mating.

Or

(d) Sheep are <u>seasonal polyestrous</u> breeders.
Explain the underlined term.

Question 16

(a) Organic matter content is very important in soil health.

(i) Explain the underlined term.

(ii) Briefly describe **two** ways of increasing the organic matter content of soils.

1.
2.

(iii) Describe the functions of soil organic matter under the headings that follow.

Function	Description
Effect on soil pH	
Water retention (holding)	
Soil compaction	

(iv) Briefly explain **two** factors that influence the amount of organic matter in a soil.

1.
2.

(b) Describe with the aid of a labelled diagram how a student could carry out an investigation to determine the percentage organic matter in a 100g sample of soil.

Labelled diagram:

(c) The results of the investigation are shown in the box below.

Mass of organic matter	25g

(i) Calculate the % organic matter of the soil sample tested in part (b).

Calculation:

(ii) Based on the results in part (i), state if the soil type is more likely to be a peat soil or brown earth soil.

(iii) All organic matter contains carbon.
Calculate the % soil organic carbon in the soil sample using the equation shown in the box below.

% Soil Organic Carbon = % Soil Organic Matter X 0.58

Calculation:

Question 17

(a) Read the article and answer the questions that follow.

40-year-old straws used to sire calves on Tipperary farm

A County Tipperary farm is currently home to some of the most unique calves in Ireland because the calves in question were sired by a Canadian bull that was born 46 years ago.

The farmer chose this bull as he was classed by other farmers as *'the best sire they had ever used*', due to his superb conformation.

The farmer used sexed semen and flushed five cows from the one straw to get one bull calf and one heifer calf.

(Adapted from Agriland, 2023)

(i) Sexed semen is when the X chromosome (female) and the Y chromosome (male) are separated in the sperm.
Explain why this technology is an advantage on farms.

(ii) Outline **one** advantage of using straws from the Canadian bull that were 40 years old.

(iii) Briefly describe **two** advantages and **two** disadvantages of Artificial Insemination (AI) in cattle.

Advantages	Disadvantages
1.	1.
2.	2.

(b) **(i)** Based on a named food crop (other than grass) you have studied, describe its growth cycle under the headings that follow.

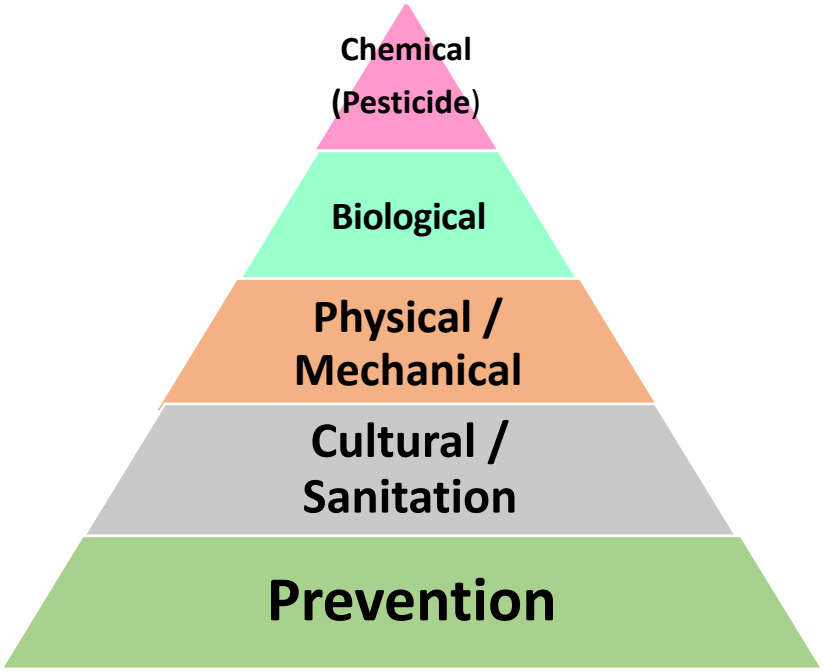
Named food crop:	
Germination	Labelled diagram:
Ripening	Labelled diagram:

(ii) Describe how the food crop named in part (i) above is harvested and stored.

Harvested:
Stored:

(iii) Outline **one** safety precaution that should be taken during harvesting this crop.

(c) Integrated pest management systems are used to farm in a more sustainable way. Analyse the diagram and answer the questions that follow.



Using the list of words below, state to which category of pest management they belong.

Fans	Predators	Machine hygiene	~~Pesticides~~	Crop rotation

The first one has been done as an example.

Category	
Chemical	***Pesticides***
Biological	
Physical / Mechanical	
Cultural / Sanitation	
Prevention	

Question 18 Answer both (a) **and** (b) with **either** (c) **or** (d).

(a) Calving is a very busy time on all beef and dairy farms so it is important for farmers to prepared in advance.

(i) Outline **three** ways dairy farmers can prepare for the calving season in order to ensure the survival of healthy calves.

1.
2.
3.

(ii) Briefly explain **two** practices carried out on the calf at birth.

1.
2.

(iii) Identify the breed of dairy cow shown in the picture below.

(b) Using the target weights given in the list below, match the weights to the growth stage of the dairy animals.

600kg	90kg	40kg	200kg	350kg

Birth	
Weaning	
1st housing	
Mating	
1st calving	

(c) Correct feeding of the dairy cow throughout her lactation is very important to ensure maximum output or high milk yields.
Explain the feeding of a dairy cow in the first 10 weeks of lactation during the period of negative energy balance.

Or

(d) State the duration of each of the following in dairy cows.

	Number of days
Lactation	
Dry period	
Gestation	

Additional writing space for **Section B**.
Label all work clearly with the question number and part.

Acknowledgements

Image(s)

Page 3	State Examinations Commission
Page 4	futurefarming.com; agriland.ie; milldairyservice.co.uk; ncengineering.com
Page 5	donovaneng.ie; darachcroft.com
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Page 34	dairyherd.com; progressivegenetics.ie
Page 35	therio.vetmed.lsu.edu

Texts

Page 8	Black, R. *Traditional cows to help bring mountainside back to life after devastating fires.* Irish Independent (14 June 2023).
Page 15	*Macroom Buffalo Cheese Products.* https://www.bordbia.ie/farmhouse-cheese/profiles/macroom-buffalo. 2023.
Page 31	Ryan, C. *40 year old straws used to sire calves on Tipperary farm.* https://www.agriland.ie/farming-news/40-year-old-straws-used-to-sire-calves-on-tipperary-farm. 29 September 2023.

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Leaving Certificate – Ordinary Level

Agricultural Science

Monday 17 June

Afternoon 2:00 - 4:30