



Coimisiún na Scrúduithe Stáit  
State Examinations Commission

Leaving Certificate Examination Sample Paper

# Agricultural Science

Ordinary Level

2 hours 30 minutes

300 marks

Examination Number

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Day and Month of Birth

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For example, 3rd February  
is entered as 0302

Centre Stamp

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## 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 two questions. Each question carries 10 marks.

**Section B**      Answer any **four** questions from this section.  
Each question carries 50 marks.

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

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.

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

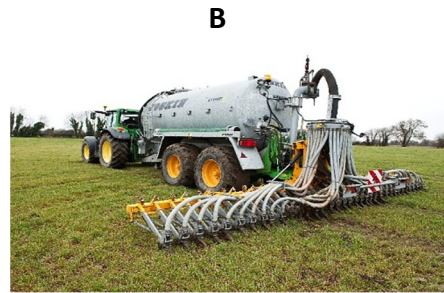
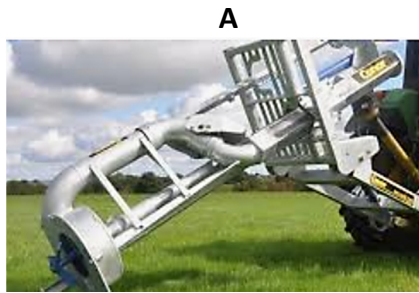
There is extra space at the end of Section A and at the back of the booklet. Label any extra work clearly with the question number and part.

**Section A****100 marks**

Answer all **ten** questions.  
Each question carries 10 marks.

**Question 1**

Two examples of farm equipment are shown in the photographs.



- (a) State the function of each of the two pieces of farm equipment.

A:
B:

- (b) Outline **one** precaution a farmer takes when using machine A.


- (c) Describe **two** ways in which machine B reduces the environmental impact of farming.

1.
2.

**Question 2**

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

List	Sub-soiler	Loam	Brown Earth	Sand	Clay
------	------------	------	-------------	------	------

(a) Soil that contains equal amounts of sand, silt and clay is known as a .....

(b) A soil that drains easily has a high proportion of .....

(c) The smallest type of soil particle is .....

(d) This may be used to break up the soil if the soil is compacted .....

(e) A suitable soil type for crop production is .....

**Question 3**

In the table below there is a description of each of the named breeds in the list.

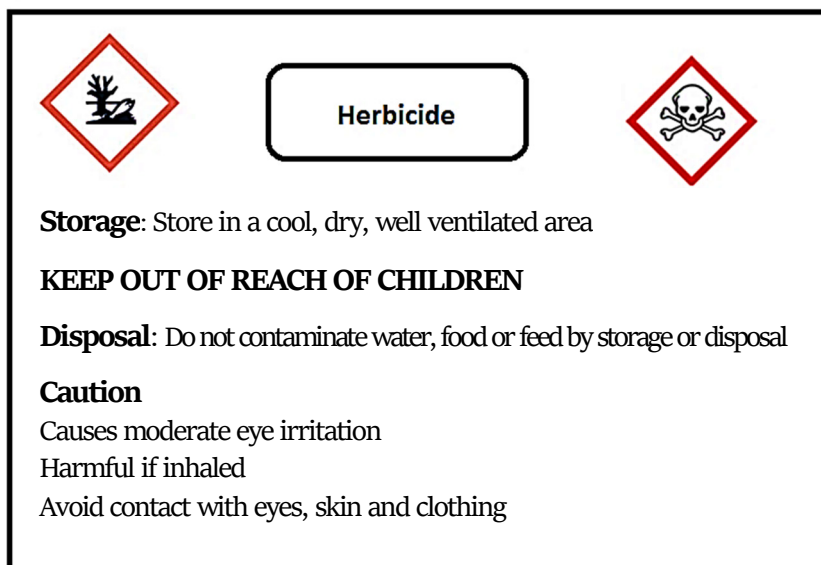
Match **each** description with a breed name. *The first one has been done as an example.*

List	Wicklow Cheviot	Limousin	Jersey	Hereford	Kerry	Suffolk
------	-----------------	----------	--------	----------	-------	---------

Name of breed		Description of breed
	Jersey	A dairy breed with high milk solids
(a)		A continental beef breed
(b)		A lowland sheep breed with a black face
(c)		A native Irish dairy breed
(d)		A hardy mountain sheep breed
(e)		A British beef breed

### Question 4

The diagram shows a portion of the label of a chemical herbicide used on a farm.



(a) Answer the questions below by placing a tick (✓) in the box beside each correct answer.

(i) Why are herbicides used by farmers?

To kill aphids and other insect pests	
To kill broadleaf weeds in grassland	
To kill blight and other fungal diseases	
To fertilise grass and other crops	

(ii) What do the chemical warning symbols on the label mean?

Corrosive and toxic	
Environmental hazard and flammable	
Explosive and poisonous	
Environmental hazard and toxic	

(b) (i) Suggest **two** pieces of personal protective equipment (PPE) which should be worn when preparing this chemical.

1.
2.

(ii) Recommend how this chemical herbicide should be safely stored to prevent children accessing it.


### Question 5

Some common diseases of cattle and sheep caused by organisms are listed in the table. Complete the table by either stating which type of organism is responsible for causing each disease and/or one method of prevention or treatment for each disease.

*The first one has been completed as an example.*

Disease		Type of organism	Prevention or Treatment
<i>Example</i>	<i>Mastitis</i>	<i>Bacteria</i>	<i>Dry cow therapy</i>
<b>(a)</b>	Orf	<i>Viral</i>	
<b>(b)</b>	Sheep scab		<i>Sheep dip or injection</i>
<b>(c)</b>	Ringworm	<i>Fungus</i>	
<b>(d)</b>	TB		

**Question 6**

Four named crops are illustrated by the pictures.

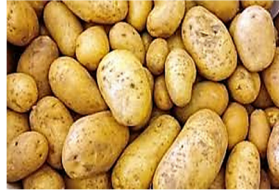
**Maize**



**Grass**



**Potatoes**



**Barley**



Choose **one** named crop that you have studied to answer the questions.

Chosen crop:
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**(a)** State the preferred soil type for your chosen crop.

--

**(b)** Describe the seedbed preparation for your chosen crop.


**(c)** Outline what weed control measures could be used with your chosen crop.


**(d)** Discuss **one** method of controlling diseases in your chosen crop.


**(e)** Explain how your chosen crop is harvested.


**Question 7**

The following satellite images (A and B) are of two different farmyard layouts. Analyse the pictures and answer the questions which follow.



- (a) Select which farmyard layout is designed to reduce the workload of the farmer. Justify with **one** reason for your choice.

Farmyard:
Reason:

- (b) Determine which farmyard is more environmentally sustainable. Justify with **one** reason for your choice.

Farmyard:
Reason:

- (c) List **one** feature of building C which benefits the health and wellbeing of animals.




**Question 8**

Answer either (a) or (b).

- (a) Stages of the cow's digestive process are outlined in the table. Complete the table using the numbers 2, 3, 4, 5, and 6 to indicate the correct order of the digestive process.

*The first (1) and last (7) are done for you.*

Stages of the cow's digestive process	Order
The cow eats grass.	1
Enzymatic breakdown of protein occurs in the abomasum.	
The reticulum regurgitates food back to the cow's mouth for chewing, "chewing the cud".	
Faeces is egested from the large intestine.	7
Water is absorbed in the omasum.	
Symbiotic microbes help to digest cellulose in the rumen.	
Food is passed into the small Intestine for further digestion & absorption.	

**Or**

- (b) (i) Name a type of tooth which is responsible for the grinding of food in a ruminant animal.

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- (ii) State **two** differences between a monogastric and ruminant stomach.

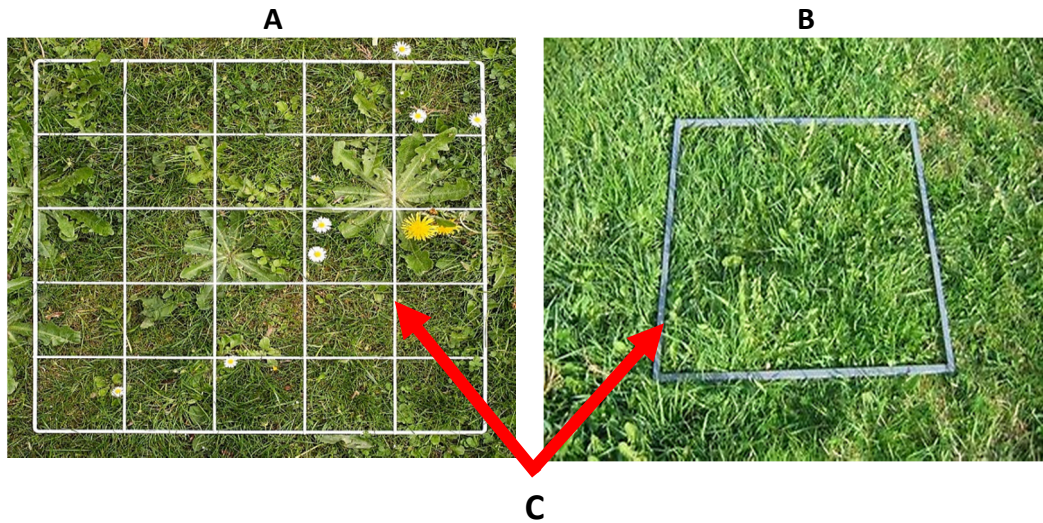
1.
2.

- (iii) Name a disorder of the ruminant digestive system **and** state how it can be treated.

Name:
Treatment:

**Question 9**

A student carried out an investigation to investigate the botanical composition of an old permanent pasture and a new ley.



(a) Identify the piece of equipment labelled C.

(b) Select which picture A or B represents the permanent pasture.

(c) State **one** reason for your answer in (b).




(d) Analyse the results from the botanical composition of A and answer the following questions.

	1	2	3	4	5	6	7	8	9	10	Total
Dandelion		✓		✓		✓	✓	✓			5
Daisy	✓			✓			✓			✓	4

(i) Calculate the % frequency of the daisy for this investigation.

(ii) State **one** error that could have occurred while carrying out the investigation.

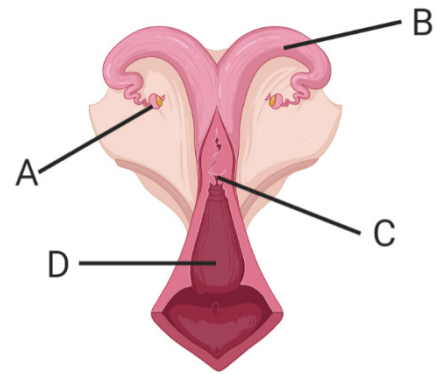
**Question 10**

Answer either (a) and (b) or (c) and (d).

The diagram shows the reproductive system of a cow.

(a) Name the labelled parts A, B, C and D.

A:
B:
C:
D:



(b) Outline **one** cause of infertility in cattle.

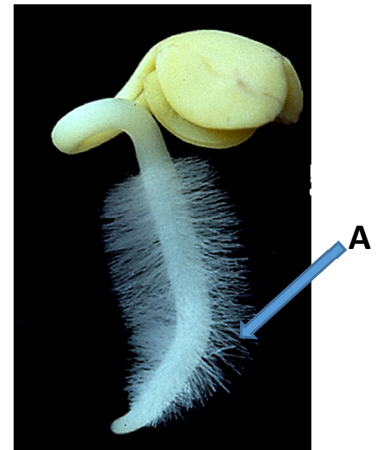

Or

(c) The diagram shows a germinating seed.

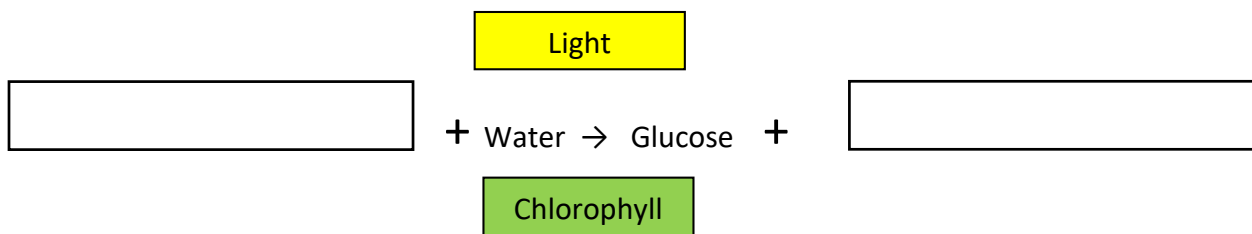
(i) Identify the structure labelled A.

--

(ii) State its function of A.

(d) (i) Complete the following word equation for photosynthesis.



(ii) Name the plant tissue which is responsible for transporting glucose in the plant.

--





**Section B****200 marks**

Answer any **four** questions.  
Each question carries 50 marks.

**Question 11**

The photographs show some common breeds of dairy and beef cattle.

(a) Identify each breed using the list of names and write your answer in the space provide.

<i>List</i>	Holstein Friesian	Charolais	Norwegian Red	Hereford
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1.
2.
3.
4.

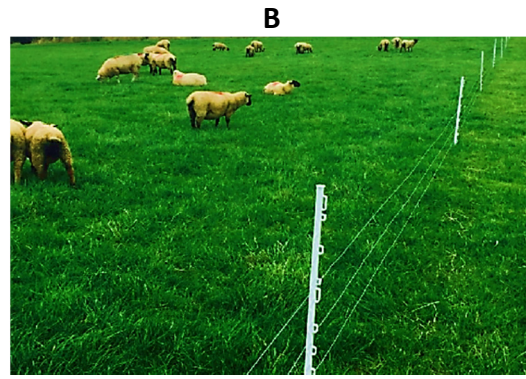
(b) (i) The conformation of beef and dairy breeds differ.  
State **two** conformation differences between a dairy and a beef breed.

1.
2.

(ii) Irish beef is mainly reared on a grass-fed diet.  
Identify **two** advantages of producing beef from grass-fed cattle.

1.
2.

(c) The pictures are of two different types of grazing systems used on Irish farms.



(i) Name the **two** types of grazing systems shown in the pictures.

A:
B:

(ii) Explain **one** advantage and **one** disadvantage of each grazing system (A and B).

**Grazing System A**

Advantage:
Disadvantage:

**Grazing System B**

Advantage:
Disadvantage:

**(iii)** Describe **one** way in which the grazing of animals has an impact on each of the following: the biological, chemical and physical properties of a soil.

Biological:

Chemical:

Physical:

**(iv)** Describe **one** environmental impact of animal production on farms.


**(v)** Discuss **one** way in which the environmental impact described in (iv) could be made more sustainable to the environment.

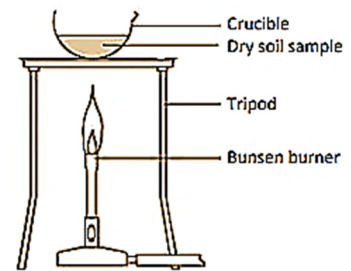



**Question 12**

(a) The diagram shows an investigation to determine the percentage (%) organic matter in a soil sample.

(i) Identify **two** measurements that must be recorded during this experiment.

1.
2.



(ii) State **one** safety precaution a student should take when carrying out this experiment.

--

(iii) The following is a list of the results.

Analyse the results and place a tick (✓) in the correct box to show which of the soil samples is from a peaty soil.

Soil Sample	% Organic Matter	Peaty soil
A	8.5	
B	12.5	
C	16.5	
D	20.5	

(iv) Justify your choice in part (iii).

--

(v) Convert the percentage organic matter that you have chosen in part (iii) to organic carbon (*Soil Organic Matter* × 0.58). Show all calculations.

--

(vi) Explain why maintaining soil organic matter is important in soil carbon sequestration.


(b) Agriculture contributes a significant amount towards greenhouse gas emissions.

(i) State any **two** greenhouse gases produced in agriculture **and** state **one** possible source of each.

Gas 1:
Source:
Gas 2:
Source:

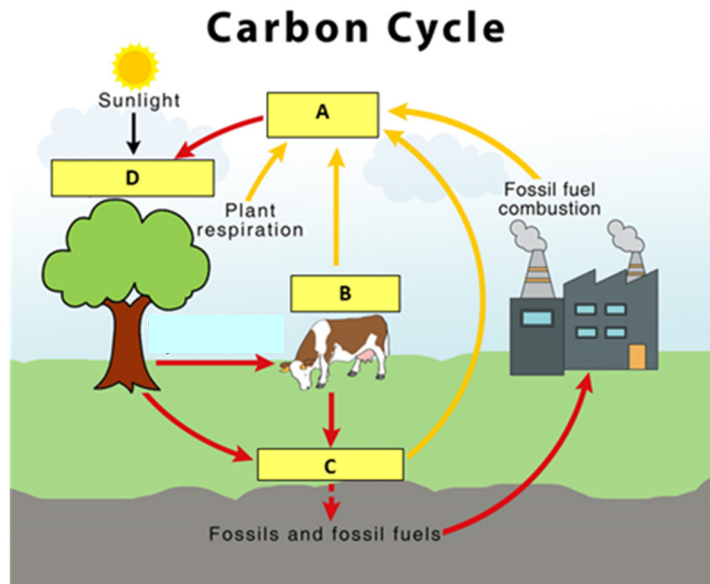
(ii) Outline any **one** action a farmer could take to reduce the impact of agricultural practices on the emissions of greenhouse gases as stated in part (i).


(iii) Identify **two** ways how farmers can reduce the impact of agricultural practices on the environment.

1.
2.

(iv) The diagram is of the carbon cycle.

Analyse the diagram and identify what is represented by A, B, C and D on the diagram.



A:
B:
C:
D:

### Question 13

Read the following article and answer the questions which follow.

With the fine weather during spring 2019, farmers should be considering some reseeding on their farm. Reseeding is extremely important to increase the productivity of a farm. Reseeded pasture can carry more stock, increase live-weight gain, regrow faster, use nitrogen fertiliser more efficiently, begin growing earlier in the year and also growth later in the year. Reseeding also helps to improve silage quality. With silage being the main feed on farms over the winter months it is important to have the highest quality possible. Increase silage DMD % from 68-72% will reduce meal feeding by 1kg/head/day.



Reseeding can be done either in autumn or spring. On most dry stock and beef farms spring reseeding has more advantages than autumn. Lower stocked farms can afford to have a block of grazing/silage grounds closed during reseeding and not find themselves with a grass deficit. Old swards will in fact grow more grass after spring reseeding than they would have grown had they not been reseeded. Opportunity to graze the reseeded land several times over the summer months allows the sward to tiller and thicken out meaning the following spring the sward will be of higher quality than a reseed carried out in the autumn.

*(Adapted from Teagasc Publication - Grassland Reseeding 2019)*

(a) (i) Define the underlined term in the article.


(ii) Explain why it is important for farmers to know the Dry Matter Digestibility % (DMD %) of their silage.


(iii) State **three** reasons for reseeding grassland in Ireland.

1.
2.
3.

(iv) Select **two** reasons from the article why spring reseeding is recommend.

1.
2.

(v) Name **two** plant species commonly found in a grass seed mixture.

1.
2.

(vi) Suggest **one** method of reseeding grassland in shallow stony soils and state **two** reasons for your answer.

Method:

Reason 1:
Reason 2:

(b) Farmers experienced two extreme sets of weather conditions during the spring/summer of 2020. During the spring/early summer there was a very dry spell of weather. The weather in contrast was very wet in the summer which resulted in saturated land and severe flooding in some places. Jane wanted to carry out an investigation on her farm. She decided to investigate the effect of weather and soil conditions on the percentage germination of an agricultural seed.

(i) Outline why Jane used two equal sized batches of seeds.

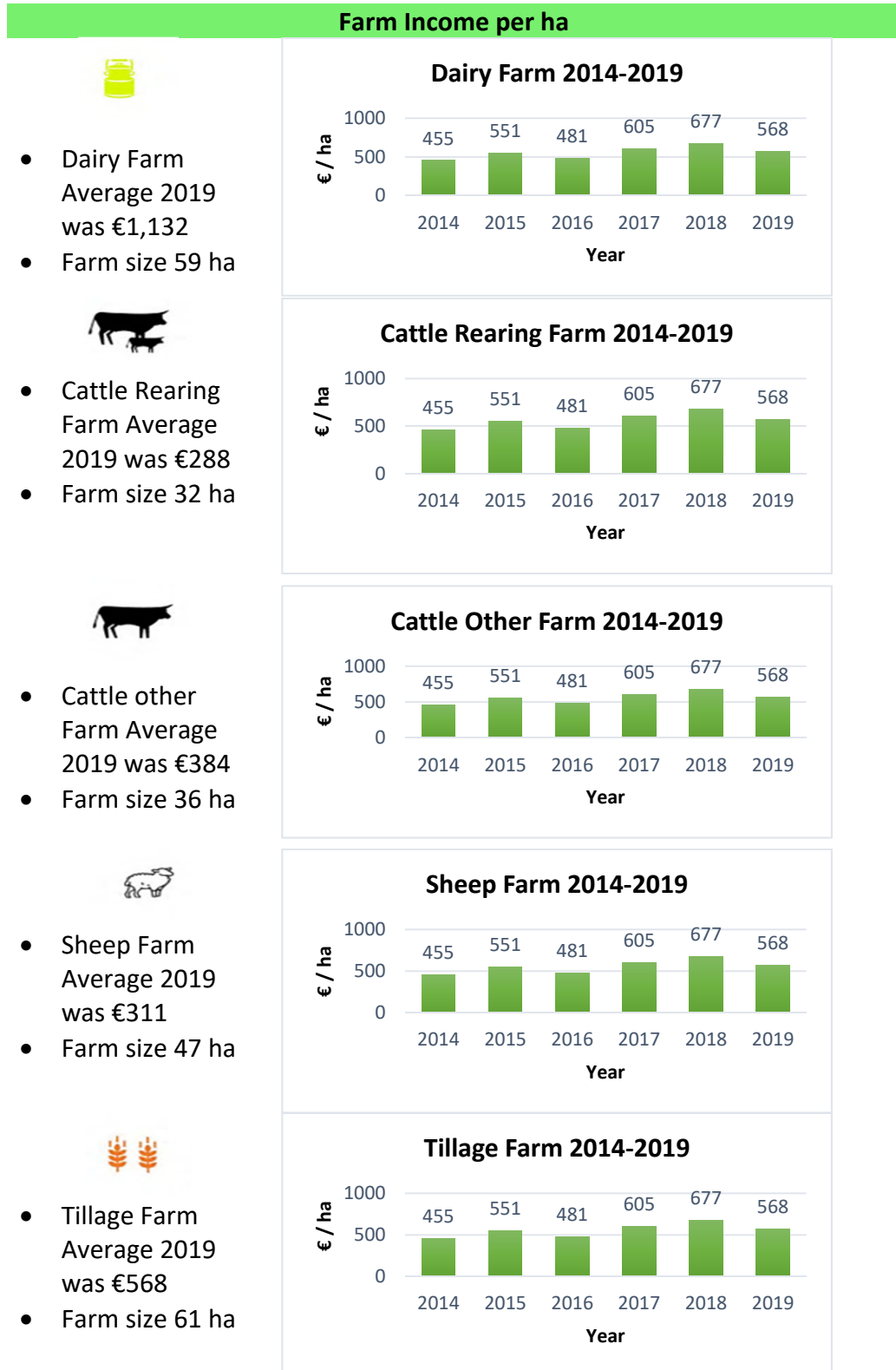

**(ii)** Describe the procedure Jane would use in order to carry out the investigation.


**(iii)** Predict what result(s) Jane would expect to get from her investigation.


**(iv)** Identify **one** error that could have occurred in the investigation.


**Question 14**

- (a) The table contains the preliminary results from the “National Farm Survey 2019”. The average farm income per hectare for a number of different agricultural enterprises are stated. Using the information in the table answer the following questions.



- (i) Interpret which agricultural enterprise has the highest average farm income per hectare.

--

- (ii) State a possible reason why the average tillage farm income increased in 2018.


- (iii) Identify which year was the most profitable for sheep farmers over the 5 years.

--

- (iv) In 2019, deduce which enterprise was the least profitable?  
State **one** reason for your answer.

Enterprise:
Reason:

- (v) List **one** export market for Irish produce.  
State **one** reason why Irish agriculture relies heavily on the export market.

Export Market:
Reason:

- (b) A recent development in the dairy industry is the introduction of the Jersey–Holstein Friesian crossbred to achieve hybrid vigour.



- (i) Explain what meant by the term hybrid vigour.


- (ii) Describe **two** genetic improvements this breed of animal has inherited from its parents.

1.
2.

- (iii) Outline **two** safety precautions you would take when working with animals.

1.
2.



- (c) John brought five 22 month old Charolais cross heifers to the factory.

The table is a copy of the kill out sheet John received from the factory.

Factory Kill Out Sheet					
Tag	Sex	Age	Conformation	Fat	Cold Kgs
212343456898	E – Heifer 1	U 24	R+	3+	378
234578902112	E – Heifer 2	U 24	R+	3+	365
244560093332	E – Heifer 3	U 24	R=	3+	345
212343456789	E – Heifer 4	U 24	U+	3+	375
212343456790	E – Heifer 5	U 24	R=	4+	362

Heifer Factory Price					
Grade (Conformation and fat class)	U+3+	R+3+	R=4+	R=3+	R=2+
Cent / kg	418	404	383	398	390

- (i) Using the heifer price table, calculate the money John got paid for his animals.

Heifer	Calculations from part (i)	Calculations from part (ii)
1		
2		
3		
4		
5		

- (ii) If John's heifers were all graded at U+3+ determine how that would affect his overall profit?


- (iii) Justify why did the factory give a price reduction for the heifer grading at R=4+.


### Question 15

Read the following extract and answer the questions which follow based on the extract.

#### Robotic milking machines

The dairy farmer's day focuses on the fact that his or her cattle need to be milked twice a day in order to ensure that their udders are comfortable and not straining and painful due to being too full. With the automatic milking machines, the cows can be milked whenever they want to be. The cows come into the sheds themselves and can enter the milking machine without the help of the farmer. Not only does the machine milk the cows, but it also has the ability to monitor:

- The volume of milk
- Quality of their milk
- Give vital feedback as to the performance of each cow
- Monitor the cow's health



The identification collar the cow wears can monitor the cows chewing rate and lactose measurements. Both of these can indicate if the cow is getting sick. Hormone samples may also be taken which can indicate when the cow may be coming into heat.

*(Adapted from Irish Farmers Journal, 2019)*

(a) (i) Explain what is the importance of the identification collar.


(ii) Other than milking, identify **two** useful features of the automatic milking machine.

1.
2.

(iii) Describe **one** other advancement in modern technology that you have studied, which has improved farm management and/or health and welfare of farm animals.


(iv) Propose **two** reasons for culling cows from the dairy herd.

1.
2.

**(b)** Answer the following questions in relation to how you would investigate the quality of a sample of milk over time.



**(i)** State a hypothesis for this investigation.


**(ii)** Sketch a labelled diagram in the space provided of how the equipment was assembled in order to carry out the investigation.

--

**(iii)** Suggest what result will indicate that the milk sample is of good quality.


(c) Rainfall levels vary in Ireland. In 2019 the rainfall was recorded in Athenry (Co. Galway) and in Johnstown Castle (Co. Wexford). The results are shown in the table.

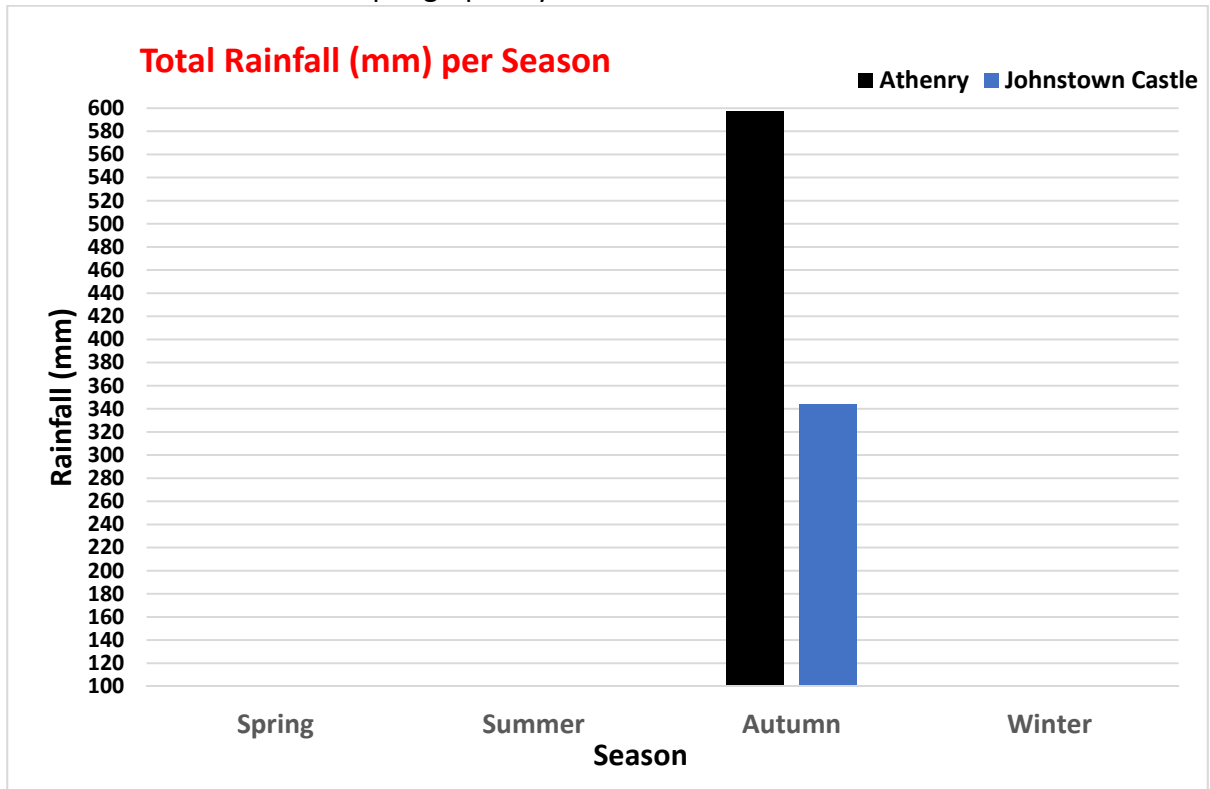
Season	Total Rainfall/mm/Season	
	Athenry	Johnstown Castle
Spring	300	280
Summer	180	140
Autumn	597	344
Winter	340	300

(i) An incomplete bar chart for the two areas is shown below.

Complete the bar chart in the space provided using the data from the table for Spring, Summer and Winter.

Use the shading black for Athenry and blue for Johnstown Castle as per graph key.

(Adapted from Met Éireann)



(ii) Identify what implications the difference in rainfall would have on the type of farming enterprise carried out in these two areas.


(iii) Describe the relationship between soil water and soil temperature.






## Acknowledgements

### Images

Images on page 3	plantmeciireland.com; agriland.ie
Images on page 5	State Examinations Commission
Images on page 8	googlemaps.ie
Images on page 7	ec.europa.eu; popularmechanics.com; irishgraingrowers.ie; shutterstock.com
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Images on page 14	thatsfarming.com; agriland.ie
Images on page 15	independent.ie; agriland.ie
Images on page 17	microbiologyclass.com
Image on page 22	teagasc.ie
Image on page 24	rossmoredairy.ie
Image on page 26	agriland.ie
Image on page 28	met.ie

### Text

Text on page 19	McKenna, Nicholas. <i>Grassland Reseeding</i> . < <a href="https://www.teagasc.ie/publications/2019/grassland-reseeding.php">https://www.teagasc.ie/publications/2019/grassland-reseeding.php</a> > (24 May 2019).
Text on page 26	Irish Farmers Journal. <i>Robotic milking machines</i> . Vol 17 No. 48. < <a href="https://www.thefarmersjournal.ie">https://www.thefarmersjournal.ie</a> >. (30 November 2019).

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Leaving Certificate Examination Sample Paper – Ordinary Level

**Agricultural Science**

2 hours 30 minutes