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Centre Number						Candidate Number				
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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION**

B491/02

**ENVIRONMENTAL AND
LAND-BASED SCIENCE**

**Plant Cultivation
(Higher Tier)**

MONDAY 22 JUNE 2009: Morning

DURATION: 45 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the question paper

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Electronic calculator

Pencil

Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **Use black ink. Pencil may be used for graphs and diagrams only.**
- **Read each question carefully and make sure that you know what you have to do before starting your answer.**
- **Answer ALL the questions.**
- **Write your answer to each question in the space provided, however additional paper may be used if necessary.**
- **There are no separate marks for the quality of written communication, but make sure that your answers are written in clear and well-structured English.**

INFORMATION FOR CANDIDATES

- **The number of marks is given in brackets [] at the end of each question or part question.**
- **The total number of marks for this paper is 36.**

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Answer ALL the questions.

- 1 The diagram shows the OUTSIDE of a germinating broad bean seed.



The part labelled X is the:

- A cotyledons
- B plumule
- C radicle
- D testa

Answer A, B, C or D _____ [1]

2 All plants need suitable conditions in order to grow.

Which of the following is NOT needed by a plant to grow?

A nutrients

B soil

C warmth

D water

Answer A, B, C or D _____ [1]

3 A gardener has two vegetables which are growing poorly.

- **cabbages with small, yellow leaves**
- **tomato plants with only a few small fruits.**

The following is a list of substances that the gardener can add to help growth.

**ammonium nitrate
superphosphate
lime
fresh farmyard manure
potash**

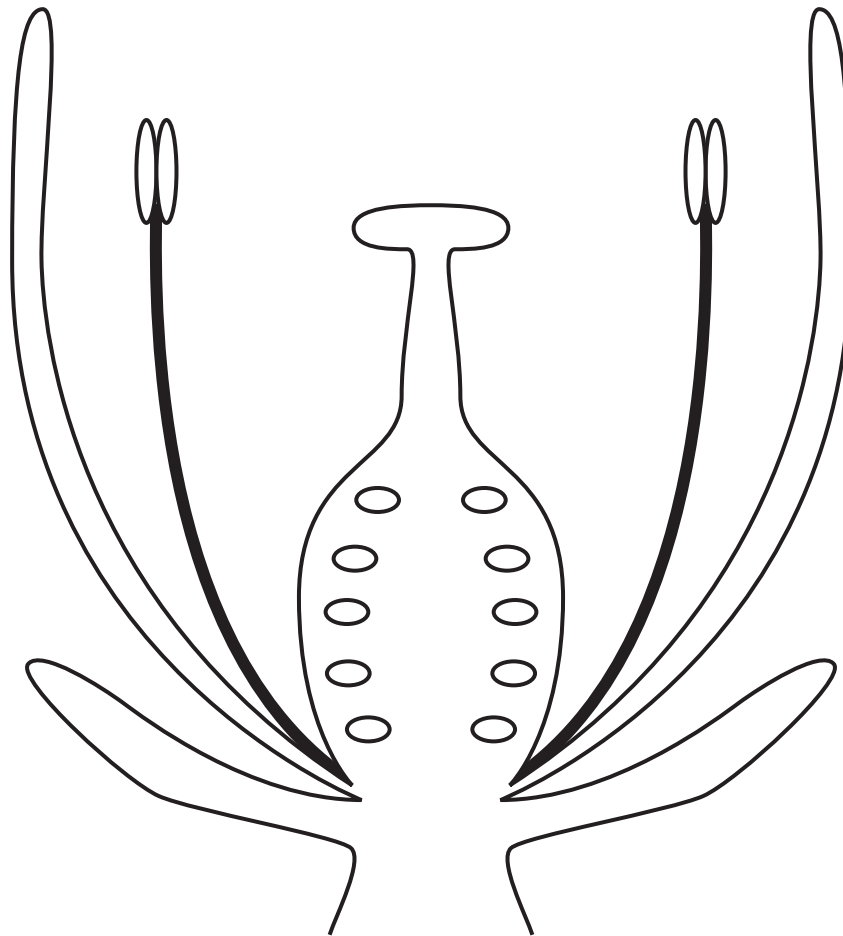
Choose from the list above which is the best substance to help growth:

of the cabbages

of the tomato plants.

[2]

4 The diagram shows a flower which is pollinated by insects.



Label S on the diagram to show the structure which protects the flower in bud.

Label P on the diagram to show where the pollen lands before it produces a pollen tube.

[2]

5 Plants can reproduce by asexual reproduction (vegetative propagation).

One type of asexual reproduction involves RUNNERS.

Which one of the following statements about runners is TRUE?

- A Runners are only produced by plants when the weather is very wet.**
- B Runners use food stored in a bulb for growth.**
- C Runners produce new plantlets from an underground stem.**
- D Runners produce offspring that are genetically identical to the parent plant.**

Answer A, B, C or D _____ [1]

6 Some flowers are pollinated by insects.

Which one of the following statements about insect pollinated flowers is TRUE?

- A During pollination, pollen will be transferred from a flower of a different species.**
- B The ovule will only develop into a seed after it has been fertilised.**
- C The flower produces large amounts of small, light pollen.**
- D The anthers hang outside this flower to catch wind borne pollen.**

Answer A, B, C or D _____ [1]

7 This question is about the breeding of pea plants.

The following Punnet squares show different genetic crosses.

A

	W	W
R	RW	RW
r	rW	rW
C	r	r
R	Rr	Rr
r	rr	rr

B

	w	w
R	Rw	Rw
r	rw	rw
D	R	R
R	RR	RR
r	rR	rR

A heterozygous (hybrid) pea plant with round seeds was crossed with a homozygous (pure breeding) pea plant with wrinkled seeds.

Which Punnet square shows the correct way of representing this cross?

Answer A, B, C or D _____ [1]

8 The diagram shows a bag of fertiliser.



This fertiliser is used to improve the growth of a crop.

The crop which would benefit most when this fertiliser is used is

- A cabbage
- B carrot
- C wheat
- D tomatoes

Answer A, B, C or D _____ [1]

9 The diagram shows another fertiliser bag.



Why might excess use of this fertiliser affect a crop?

Describe what the possible effects might be on the crop.

[2]

10 A gardener wishes to improve a sandy soil by adding garden compost.

Suggest TWO ways in which this could improve the sandy soil.

1 _____

2 _____

_____ **[2]**

11 There may be disadvantages of adding garden compost to a soil.

Suggest ONE possible disadvantage.

_____ **[1]**

12 Pot plants often become unhealthy.

State ONE way you could tell that a pot plant is unhealthy.

_____ [1]

13 Heated propagators can be used for germinating seeds.

Suggest ONE REASON why heated propagators could be better for seed germination than a glasshouse.

_____ [1]

14 Stored grain loses quality over time.

The table shows the effect of temperature on the length of time grain can be stored in months AT DIFFERENT MOISTURE CONTENTS.

Each column is for a different grain moisture content.

grain temperature °C	time (months) grain can be stored at different moisture contents					
	13%	14%	15%	16%	17%	18%
5	150.0	61.0	29.0	15.0	9.4	6.1
10	84.0	34.0	16.0	8.9	5.3	3.4
15	47.0	19.0	9.2	5.0	3.0	1.9
20	26.0	11.0	5.2	2.8	1.7	1.1
25	15.0	6.0	2.9	1.6	0.9	0.9

- (a) A farmer stores grain at 15 °C and at a grain moisture content of 15%.

How long can it be stored for?

_____ [1]

- (b) Another farmer stored grain at 15 °C and at a moisture content of 16% but then reduced the temperature of his stored grain to 5 °C.

How many times longer can this grain be stored now?

_____ [1]

15 Stored grain loses quality over time.

The table shows the effect of temperature on the length of time grain can be stored in months AT DIFFERENT MOISTURE CONTENTS.

Each column is for a different grain moisture content.

grain temperature °C	time (months) grain can be stored at different moisture contents					
	13%	14%	15%	16%	17%	18%
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10	84.0	34.0	16.0	8.9	5.3	3.4
15	47.0	19.0	9.2	5.0	3.0	1.9
20	26.0	11.0	5.2	2.8	1.7	1.1
25	15.0	6.0	2.9	1.6	0.9	0.9

A farmer wishes to increase the length of time the grain is stored.

Explain why reducing the moisture content of the store is a better choice than reducing the grain temperature.

What condition would you recommend and why?

USE FIGURES from the table to support your answer.

[2]

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16 Water can be supplied to plants by different methods.

The diagram opposite shows water being supplied by a drip irrigation system.

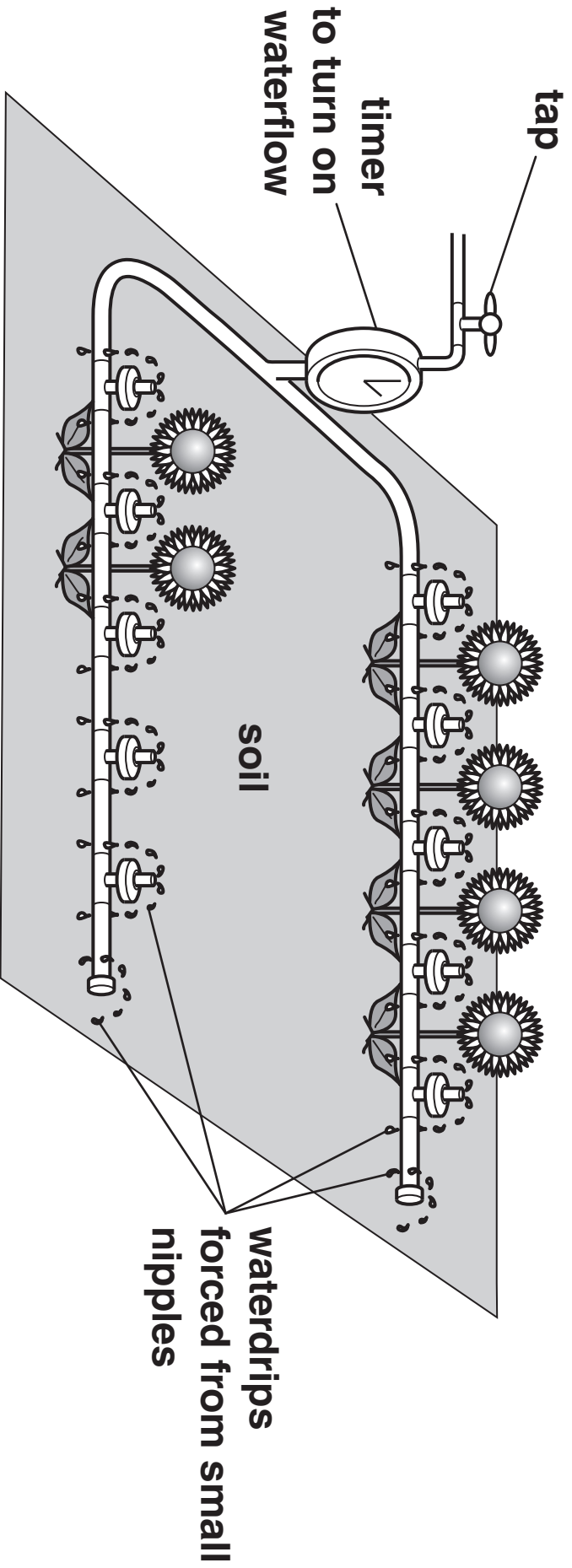
Plants can also be watered using a mist system.

Suggest TWO advantages of the drip irrigation system over a mist system.

advantage 1:

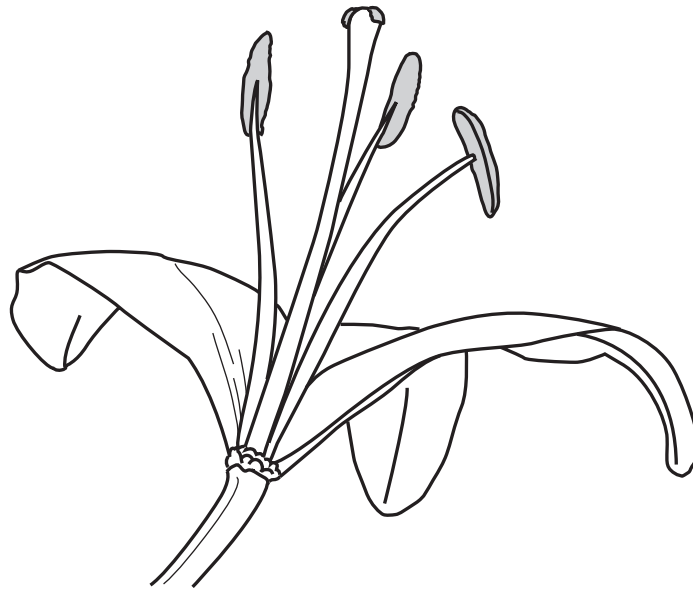
advantage 2:

[2]



17 The diagram below shows a flower of the Yellow Jessamine vine, *Gelsemium sempervirens*.

The flower is adapted to encourage cross-pollination.



(a) How is it adapted?

How does this feature encourage cross-pollination?

[2]

(b) Most plants have evolved using cross pollination rather than self pollination.

Suggest ONE reason for this.

[1]

18 The shaded areas show the pH values when important nutrients are most available in soil.

	soil pH value									
	acidic			neutral			alkaline			
	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5
nitrogen										
phosphorus										
potassium										
calcium										
magnesium										
sulphur										
iron										

The pH of a soil was increased from 8.0 to 9.0.

(a) Which nutrients became available?

_____ [1]

(b) Which nutrients became unavailable?

_____ [1]

Adding lime to a soil of pH 5.5 increases the availability of some nutrients.

(c) Explain why nutrients become more available.

 _____ [2]

19 Fruits, such as pineapples, are grown in the tropics.

They have to be transported long distances without spoiling.

Describe and explain how pineapples are treated when they are transported long distances.

[3]

20 A grower wants to improve the growing conditions in his glasshouse using ICT.

Give TWO examples of ICT in the glasshouse.

Explain how using them would improve plant growth.

1 _____

2 _____

_____ **[3]**

END OF QUESTION PAPER



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