

**GENERAL CERTIFICATE OF SECONDARY EDUCATION**  
**ENVIRONMENTAL AND LAND-BASED SCIENCE**  
Plant Cultivation (Higher Tier)

**B491/02**

Candidates answer on the question paper.

**OCR supplied materials:**

None

**Other materials required:**

- Electronic calculator
- Pencil
- Ruler (cm/mm)

**Tuesday 28 June 2011**  
**Morning**

**Duration: 45 minutes**



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Answer **all** the questions.
- Do **not** write in the bar codes.

**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**.
- This document consists of **16** pages. Any blank pages are indicated.

Answer **all** the questions.

- 1 To keep a plant healthy it must be grown in the correct conditions.

The conditions can be monitored using sensors.

**phosphate sensor**

**light sensor**

**oxygen sensor**

**carbon dioxide probe**

**soil moisture probe**

A grower notices problems with some plants.

The sensors may be faulty.

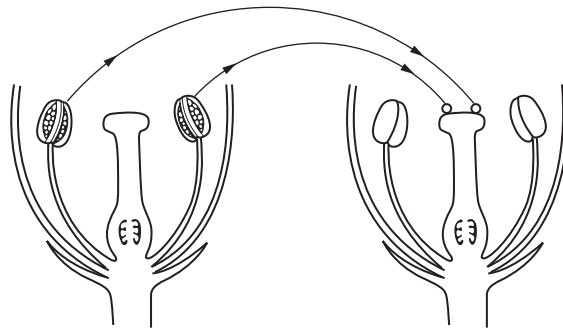
For each of the following **problems**, which **sensor** might be faulty?

Choose from the list to complete the table.

<b>problem</b>	<b>sensor</b>
the plants are wilting	
the plants have purplish leaves	
the plants are tall and leggy (etiolated)	

[3]

2 The diagram shows pollination in a flowering plant.



Which **one** of the following statements about pollination is correct?

Put a tick (✓) in the box next to the correct statement.

Pollen is transferred from:

the stigma of one flower to the anther of another flower of the same species

the anther of one flower to the stigma of another flower of the same species

the stigma of one flower to the anther of another flower of a different species

the anther of one flower to the stigma of another flower of a different species

[1]

3 The diagram shows a germinating seed.



On the diagram,

- label the plumule with the letter **P**
- label the radicle with the letter **R**

Make sure the letters can be clearly seen.

[2]

4 Which **one** of the following, **A, B, C** or **D**, best describes the term phenotype?

- A** the organism produced from a genetic cross
- B** the genes in an organism
- C** the appearance of an organism
- D** the stronger characteristics in an organism

Answer **A, B, C** or **D** ..... [1]

5 The photograph shows a spider plant producing a runner with daughter plantlets at the end.



Which **one** of the following statements about the daughter plantlets, **A**, **B**, **C** or **D**, is true?

- A** It will be better adapted to its environment than the parent plant.
- B** It will never need to grow roots because it always gets its nutrients from the parent plant.
- C** It will be more disease resistant than the parent plant.
- D** It will have the same characteristics as the parent plant.

Answer **A**, **B**, **C** or **D** ..... [1]

6 This question is about the breeding of flowering plants.

The following Punnet squares show different genetic crosses.

**A**

	<b>W</b>	<b>W</b>
<b>R</b>	RW	RW
<b>r</b>	rW	rW

**B**

	<b>w</b>	<b>w</b>
<b>R</b>	Rw	Rw
<b>r</b>	rw	rw

**D**

	<b>r</b>	<b>r</b>
<b>R</b>	Rr	Rr
<b>r</b>	rr	rr

**C**

	<b>R</b>	<b>R</b>
<b>R</b>	RR	RR
<b>r</b>	rR	rR

A heterozygous (hybrid) red flowered plant was crossed with a homozygous (pure breeding) white flowered plant.

Which Punnet square, **A**, **B**, **C** or **D**, shows the correct way of representing this cross?

Answer **A**, **B**, **C** or **D** ..... [1]

7 Some students were investigating the germination of clover seeds.

The students wanted to find out the effect of watering the seeds with tea.

	clover		
	number of seeds sown	number of seeds which germinated	% germination
water	97	44	45
tea	77	11	(a)

(a) Complete the table to show the percentage (%) germination when the seeds were watered with tea.

Give your answer to the nearest whole number.

Answer .....% [1]

(b) The tea contains a chemical called tannin.

The students concluded that tannin reduced germination success.

Suggest how tannins might prevent seed germination.

.....  
 ..... [1]

- 8 The table shows the effect of adding different nutrients to potato and wheat crops.

plot	fertiliser added (kg/hectare)			crop yield (tonnes/hectare)	
	N	P	K	wheat	potatoes
<b>A</b>	0	0	0	1.7	9.5
<b>B</b>	96	0	0	3.7	8.3
<b>C</b>	0	77	107	2.0	16.7
<b>D</b>	96	77	107	6.6	38.6

- (a) Which plot, **A**, **B**, **C** or **D**, was used as a control?

Explain your answer.

**plot** .....

**explanation** .....

..... [2]

- (b) Look at the crop yield for **wheat**.

Using data from the table, describe the effect of adding P and K

**without N** .....

.....

**with N** .....

..... [2]

- (c) A farmer pays £100 per hectare for N fertilizer on plot **B**.

He sells his wheat for £100 a tonne.

How much profit does the farmer make?

Put a (ring) around the correct answer.

£170

£370

£270

£0

[1]



(d) The farmer used NPK fertilizer on plot **D**.

The NPK fertilizer costs £150 a tonne.

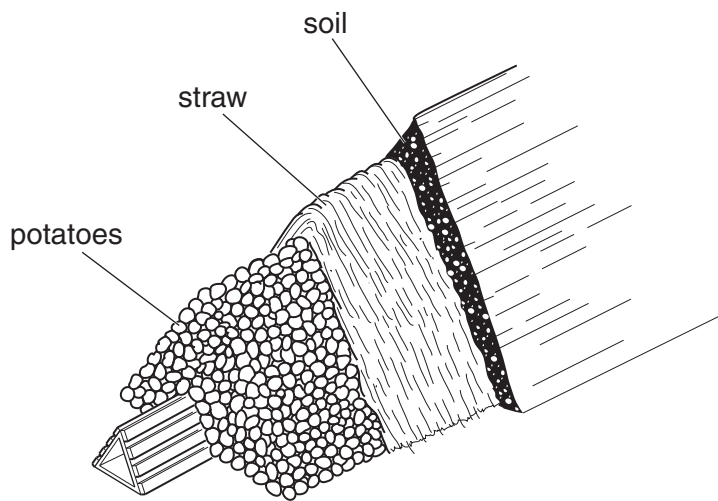
He sells his wheat for £660.

How much **extra** profit does the farmer make compared with plot **B**?

.....

[1]

9 The diagram shows potatoes being stored in a clamp.

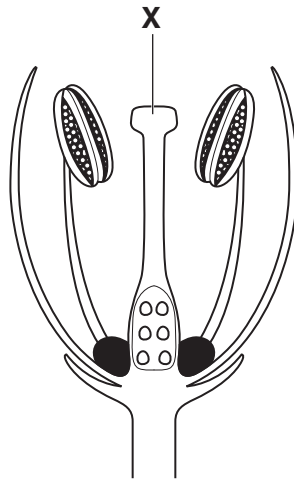


Suggest **one** reason why keeping potatoes in a clamp extends storage life.

.....

..... [1]

10 The diagram shows a cross-section of a flower.



The structure labelled **X** has been damaged.

Give **two** effects this will have on reproduction in this plant.

.....

.....

.....

..... [2]

11 The table shows the effect of adding nitrate fertiliser to a field of wheat.

nitrate fertiliser applied (kg/hectare)	yield (tonnes/hectare)
0	3.0
50	3.5
100	4.0
150	4.5
200	3.7

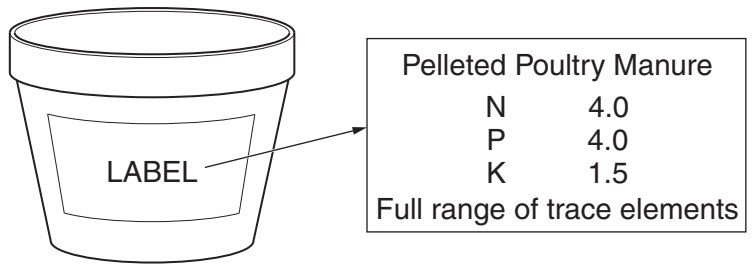
Suggest a reason for the result when applying **excess** nitrate fertiliser at 200 kg/hectare.

.....

..... [1]

12 The diagram shows a container containing pellets of poultry manure.

This is used as an **organic** fertiliser.



Samantha wants to apply some of this fertiliser to her allotment.

She buys it from the local garden centre because it is cheap and readily available.

State **two** other reasons why Samantha should use **this** organic fertiliser rather than an inorganic fertiliser.

1 .....

.....

2 .....

..... [2]

13 The photograph shows a bearded iris.

These plants can be propagated asexually from rhizomes.



Commercial growers often propagate plants from rhizomes because it is quick, cheap and relatively easy to do.

State one other **advantage** and one **disadvantage** of propagating plants using rhizomes.

advantage .....

.....

disadvantage .....

..... [2]

14 A farmer is growing oil seed rape.

The farmer has noticed that in recent years the field has produced smaller and smaller yields.

The soil has become **waterlogged**.

Based on this observation suggest, with reasons, what the farmer could do to increase crop yield.

.....

.....

.....

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.....

.....

..... [3]

15 The photograph shows sap-sucking insects on a crop plant.



These insects can reduce crop yield.

Suggest **two** reasons why.

.....

.....

.....

..... [2]

16 Describe and explain the processes that occur **after pollination** which result in seed and fruit production.

.....

.....

.....

.....

.....

.....

..... [3]

17 Plants need water and fertiliser to produce a good yield.

Many gardeners dissolve fertiliser in a watering can so that they can water and feed their plants at the same time.

Write about **two** other ways that plants can be provided with the correct levels of water and fertiliser.

You may write about garden plants or field crops in your answer.

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..... [3]

**END OF QUESTION PAPER**

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