Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use Total EMPA mark	
Examiner's Initials	
Section	Mark
Task 1	
Task 2	
Section A	
Section B	
TOTAL EMPA MARK	

General Certificate of Education
Advanced Level Examination
June 2010

Biology BIO6X

Unit 6X A2 Externally Marked Practical Assignment

Written Test

For submission by 15 May 2010

For this paper you must have:
- Task Sheet 2, your results and your calculations
- a ruler with millimetre measurements
- a calculator.

Time allowed
- 1 hour 15 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 36.
- You will be marked on your ability to:
  – use good English
  – organise information clearly
  – use scientific terminology accurately.

Section A

These questions are about your investigation into the effect of sodium chloride concentration on the growth of roots in lettuce seedlings.

Use your Task Sheet 2 and your results and your calculations to answer them.

Answer **all** questions in the spaces provided.

6 You were provided with 0.2 mol dm^{-3} sodium chloride and distilled water. Describe how you would use these to make up 10 cm^3 of a solution of concentration 0.15 mol dm^{-3}.

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(1 mark)

7 (a) How did you decide how many lettuce seeds to use in each Petri dish?

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(1 mark)

7 (b) How did you arrange the lettuce seeds in each Petri dish? Why did you choose this arrangement?

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(1 mark)

8 (a) The Petri dishes should have been covered to prevent evaporation. Why is it important to prevent evaporation in this investigation?

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(2 marks)

8 (b) You used 5 cm^3 of sodium chloride solution in your investigation. Suggest why it was important that the solution did **not** completely cover the seeds.

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(2 marks)

Turn over for the next question

9 A student carried out a similar investigation to yours. The table shows her results.

Concentration of sodium chloride / mol dm^{-3}	Percentage of lettuce seeds which started to grow roots	Mean root length / mm (± standard deviation)
0.00	100	20.1 (±0.38)
0.05	100	14.5 (±0.25)
0.10	92	7.8 (±0.33)
0.15	60	6.2 (±0.24)
0.20	9	2.0 (±0.05)

9 (a) Describe what these data show.

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(3 marks)

(Extra Space) .....

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9 (b) Suggest an explanation for the effect of sodium chloride concentration on the germination of seeds.

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(3 marks)

(Extra Space) .....

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10 Lettuce is classified in the same family as dandelions. Dandelions commonly grow on roadside verges and may accidentally be sprayed with salt when salt is added to the road in winter.

Describe how you could use a transect to investigate whether the distribution of dandelions changed with increased distance from the road.

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(4 marks)

(Extra Space) .....

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Turn over ▶

Resource Sheet

Resource A

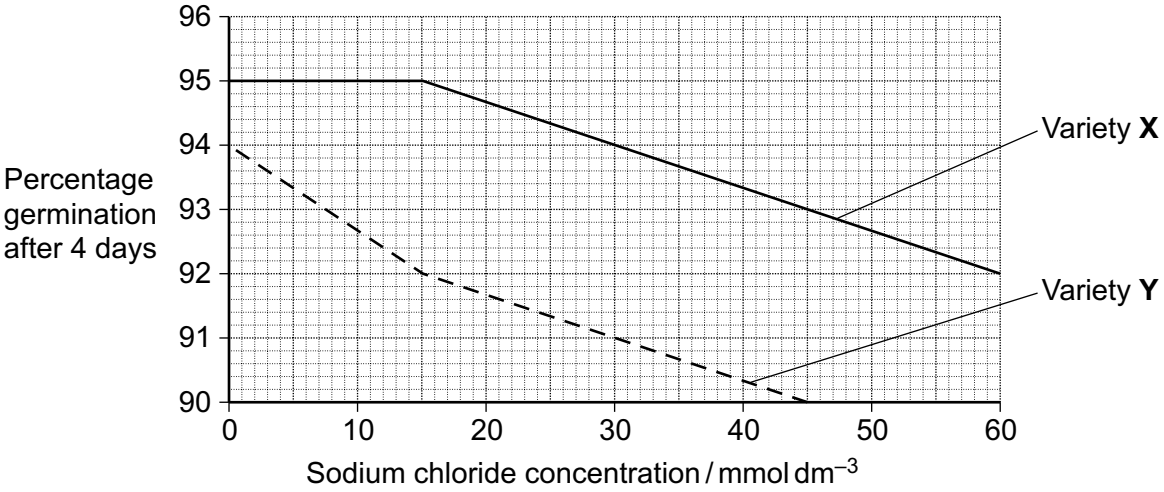
Lettuce growers investigated the best conditions for germinating lettuce seeds. They soaked lettuce seeds for 8 hours in distilled water at different temperatures. They then germinated some of the seeds at 20 ºC and some at 35 ºC. The table shows their results.

Temperature at which seeds were soaked / ºC	Percentage of seeds which germinated	
	at 20 ºC	at 35 ºC
20	100	89
25	100	43
30	41	1
35	21	0

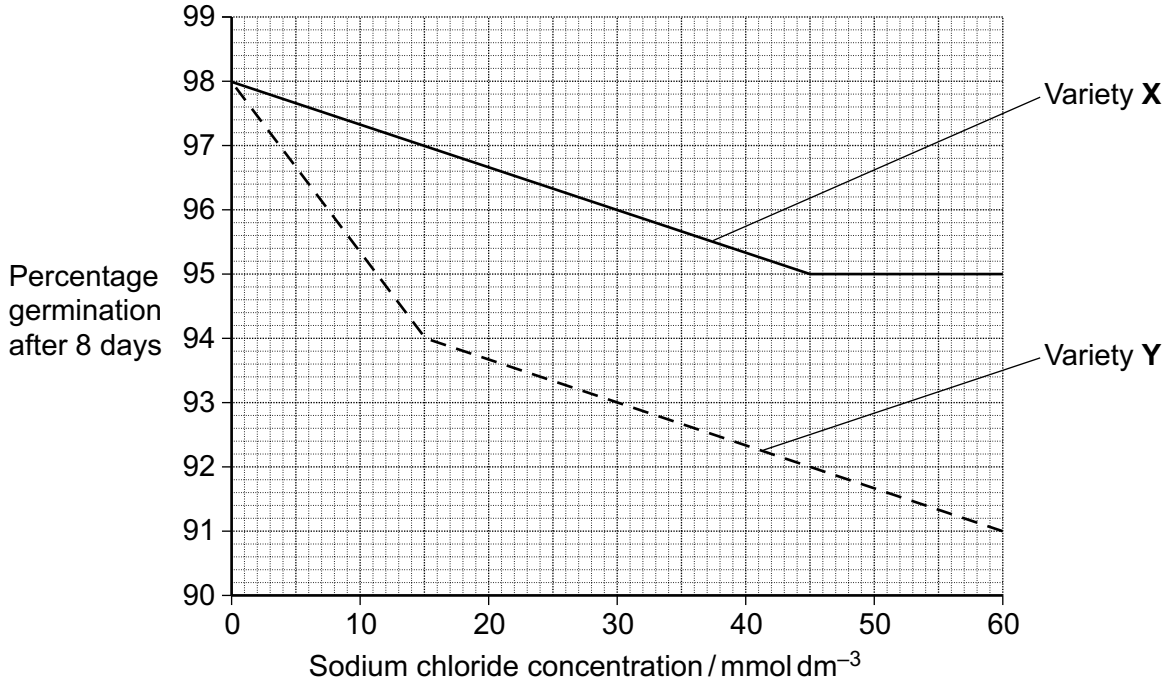
Resource B

Scientists investigated the effects of different concentrations of sodium chloride on the germination of the seeds of two varieties of barley. The seeds were soaked for one hour in different concentrations of sodium chloride solutions and then germinated in distilled water at 25 °C. The scientists found the percentage of germinated seeds after 4 days and again after 8 days.

Percentage germination of barley seeds after 4 days

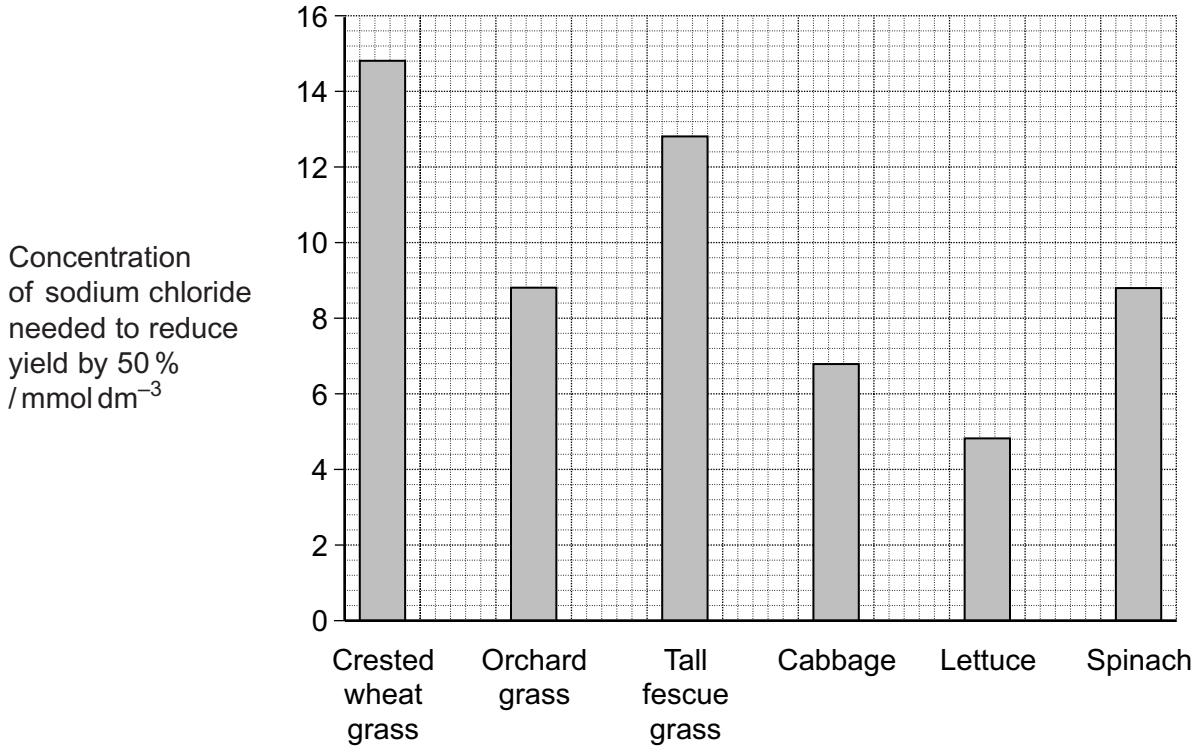


Percentage germination of barley seeds after 8 days



Resource C

The Food and Agriculture Organisation is investigating the effect of salt on plant growth. In some countries the water used to irrigate crops contains sodium chloride. The graph shows the effect of sodium chloride on the growth of some grasses and crop plants.



Resource D

Salt is used frequently on the roads in Canada during the winter months. The Highways Agency wants to plant salt-tolerant trees on roadside verges. They surveyed a range of roadside trees to determine how salt-tolerant they were. In the survey each tree was growing in soil with a similar salt concentration.

Tree Species	Number of trees surveyed	Percentage of trees in each class			Mean concentration of chloride ions in the tissues of roadside trees / arbitrary units
		Healthy	Slightly injured	Moderately to severely injured	
Red oak	108	100	0	0	0.02
Paper birch	3	100	0	0	1.15
Black cherry	36	92	8	0	0.09
Basswood	54	57	41	2	0.90
Red maple	282	63	11	26	1.01
Red pine	140	9	15	76	1.08

Turn over for Question 11

Section B

You should use the information on the Resource Sheet to answer these questions.

Answer **all** questions in the spaces provided.

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11 (a) Use Resource **A** to describe and explain the effect of temperature on lettuce seed germination.

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(3 marks)

(Extra Space) .....

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11 (b) Explain why the lettuce growers measured germination as a percentage.

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(1 mark)

12 Describe what the data in Resource **B** show about the effect of sodium chloride concentration on germination in these two varieties of barley.

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(3 marks)

(Extra Space) .....

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13 Yield can be determined by measuring the dry mass of plants.

13 (a) Suggest how you could determine the dry mass of a sample of plant material.

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(2 marks)

13 (b) What is the advantage of using dry mass and not fresh mass to compare the yield of plants?

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(2 marks)

Turn over ▶

14 The scientists concluded that red oak and paper birch are salt-tolerant but that the other species of tree are not. Use the data in **Resource D** to evaluate their conclusion.

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(4 marks)

(Extra Space) .....

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15 Farmers have suggested that using salt on the roads in winter is damaging the yield from their land. Do the data in the Resource Sheet support this claim?

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(4 marks)

(Extra Space) .....

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END OF QUESTIONS

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