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Surname

Other names

Pearson Edexcel
International
Advanced Level

Centre Number

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Candidate Number

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Biology

Advanced Subsidiary

Unit 2: Development, Plants and the Environment

Monday 4 June 2018 – Afternoon

Time: 1 hour 30 minutes

Paper Reference

WBI02/01

You must have:

Calculator, HB pencil, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 80.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
– *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*
- Candidates may use a calculator.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Answer ALL questions.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

- 1** Clownfish live in sheltered reefs. They are often found swimming amongst the tentacles of sea anemones.

The photograph below shows a clownfish and a sea anemone.



Magnification $\times 0.2$

- (a) The table below gives some descriptions of adaptations of clownfish and sea anemones.

Complete the table by stating whether each adaptation is behavioural, physiological or anatomical.

(4)

Description of adaptation	Type of adaptation
Sea anemones produce a poison.	
The poison produced by sea anemones is located in the tips of tentacles.	
Clownfish are brightly coloured, this attracts small fish to the sea anemone.	
Clownfish feed on dead sea anemone tentacles.	



(b) Using the information in the table, describe the niches of the clownfish and the sea anemone.

(3)

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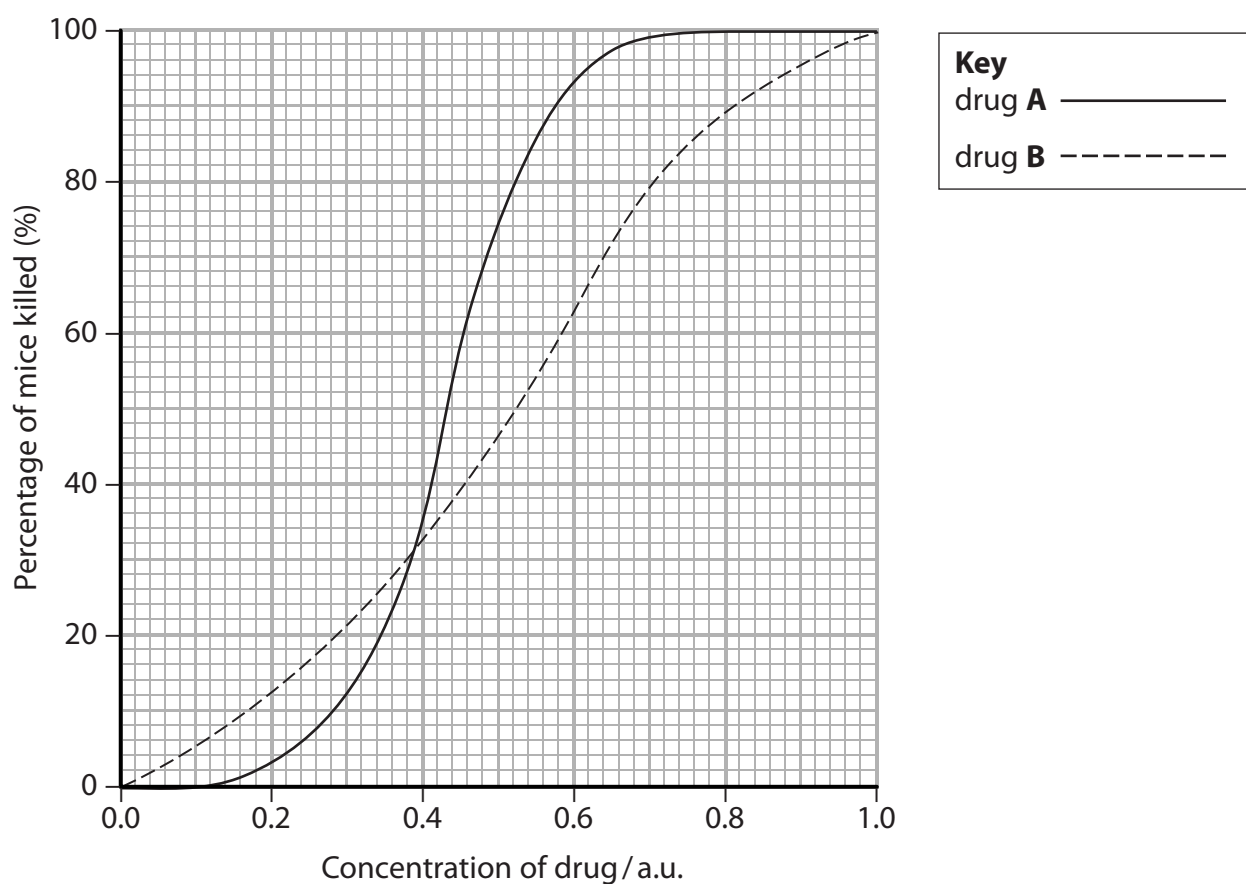
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(Total for Question 1 = 7 marks)



2 Drug testing protocols involve a number of stages, including the use of animals.

- (a) The graph below shows the results of testing different concentrations of two drugs, drug **A** and drug **B**, on the percentage of mice killed.



- (i) Using the information in the graph, describe the effect of drug **A** on the percentage of mice killed.

(2)

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(ii) The LD_{50} value of a drug is a measure of the lethal dose of a drug.

The LD_{50} is the dose required to kill 50% of the mice.

Compare the LD_{50} of drug **A** with the LD_{50} of drug **B**.

(2)

(b) Clinical trials are performed on drugs that successfully pass the animal testing stages.

Describe three-phased testing.

(4)

(Total for Question 2 = 8 marks)



3 Living organisms can be classified according to their cell structure.

(a) Read through the following passage about the classification of living organisms.

Write on the dotted lines the most appropriate word or words to complete the passage.

(4)

Living organisms are made up of either eukaryotic cells

or cells.

Living organisms made up of eukaryotic cells belong to the domain Eukarya.

All other organisms belong to one of the other two domains. These domains are called and

Classification of living organisms into domains is based partly on their DNA and protein structure. This type of classification is called



(b) The table below gives information about some cell organelles.

Complete the table by filling in the empty boxes with either the name of the organelle, a description of its structure or its role.

(8)

Name of organelle	Structure of organelle	Role of organelle
centrioles	1 2	formation of spindle fibres
.....	1 inner membrane folded to form cristae 2 contains circular DNA	aerobic respiration
Golgi apparatus	1 2	
.....	1 consists of two subunits 2 made of protein and RNA	translation
.....	1 surrounded by a single membrane 2 contains hydrolytic enzymes	destruction of bacteria

(Total for Question 3 = 12 marks)



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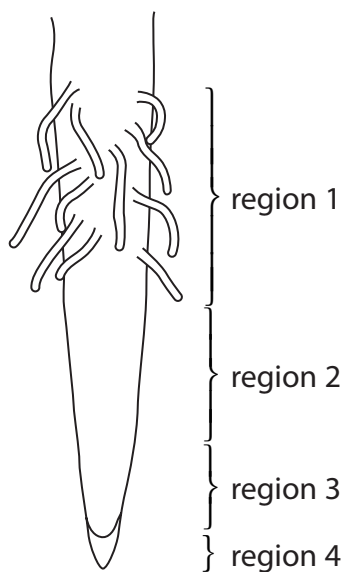
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4 The diagram below shows part of a plant root.

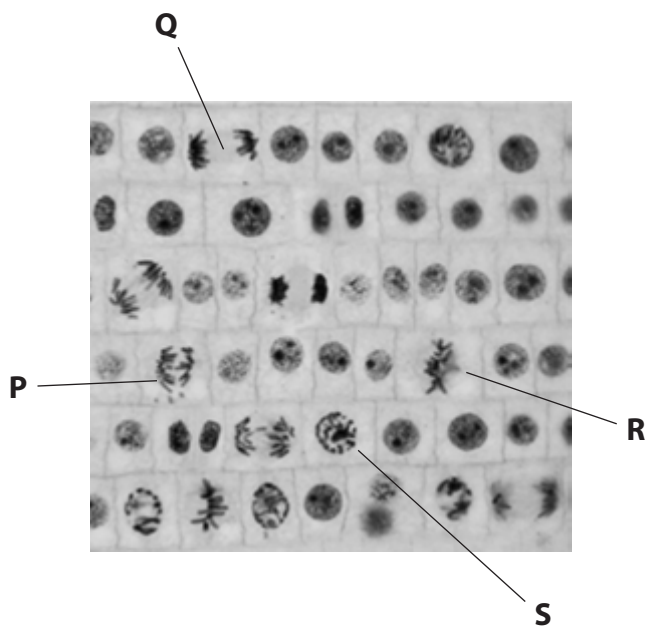


(a) Region 1 contains xylem tissue.

Explain why xylem is described as a tissue.

(2)

- (b) The photograph below shows a section through region 3 as seen using a light microscope. Cells in four stages of mitosis are labelled.



Magnification $\times 200$

- (i) Name a stain that can be used to show the chromosomes in mitosis.

(1)

- (ii) Put a cross ☒ in the box next to the letters that give the order of the stages in the process of mitosis.

(1)

- ☒ **A** P Q R S
- ☒ **B** Q P R S
- ☒ **C** R Q P S
- ☒ **D** S R P Q



(iii) Draw and label a diagram of a chromosome as it would appear in cell **R**.

(3)

*(c) A student suggested that **only** region 3 of the root contains cells that are totipotent.

Describe an investigation that the student could carry out to test this suggestion.

(5)

(Total for Question 4 = 12 marks)



P 5 1 8 5 3 A 0 1 1 2 4

- *5 Several species of giant tortoises have evolved on the Galápagos Islands.

The saddleback tortoise and the domed tortoise are two species found on different islands in the Galápagos.

The table below gives some information about these tortoises and the islands where each is found.

Information	Saddleback tortoise	Domed tortoise
Photograph Not to the same scale		
Relative size	Small	Large
Description of islands where the tortoises are found	Small islands with dry habitats. Limited food availability near the ground.	Large islands with humid habitats. Abundant vegetation near the ground.



Using the information in the table, and your own knowledge, explain why these two species of tortoise are found on different islands.

(6)

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(Total for Question 5 = 6 marks)

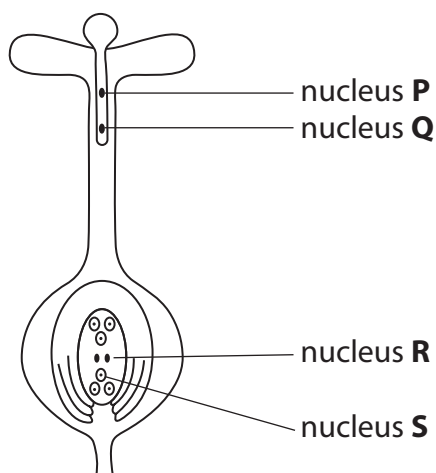


6 Reproduction in plants involves meiosis and mitosis.

(a) Explain the importance of meiosis in plants.

(2)

(b) The diagram below shows a pollen grain growing on the female reproductive organ of a plant.



(i) Put a cross ☒ in the box next to the row in the table that correctly describes the nuclei **P**, **Q**, **R** and **S**.

(1)

	Nucleus P	Nucleus Q	Nucleus R	Nucleus S
☒ A	diploid	diploid	diploid	diploid
☒ B	diploid	haploid	haploid	haploid
☒ C	haploid	haploid	haploid	diploid
☒ D	haploid	haploid	haploid	haploid



(ii) Put a cross ☒ in the box next to the order of tissues through which the pollen tube grows.

(1)

☐ **A** stigma → micropyle → style

☐ **B** stigma → style → micropyle

☐ **C** style → micropyle → stigma

☐ **D** style → stigma → micropyle

(iii) As the pollen tube grows, nucleus **P** divides by mitosis.

Explain the importance of this division.

(3)

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- (c) In an investigation, pollen was germinated in different concentrations of sucrose solution for 18 hours.

After 18 hours, the mean length of the pollen tubes in each sucrose solution was recorded.

The table below shows the results of this investigation.

Concentration of sucrose solution (%)	Mean length of pollen tube / μm
2	8
4	15
6	28
8	40
10	30

- (i) Using the information in the table, calculate the fastest mean rate of growth in this investigation.

(1)

..... $\mu\text{m hour}^{-1}$

- (ii) Further experiments were carried out to determine the optimum concentration of sucrose solution for the maximum rate of growth of pollen tubes.

Put a cross ☒ in the box next to the concentrations that should be used in these experiments.

(1)

- ☒ **A** 0% to 10%
- ☒ **B** 6% to 10%
- ☒ **C** 7% to 9%
- ☒ **D** 8% to 10%

(Total for Question 6 = 9 marks)



- 7 Bioplastics can be made from the polysaccharides starch and cellulose. These can be used to replace plastics derived from oil.

(a) The table below shows some features of starch and cellulose.

For each feature, put **one** cross ☐ in the appropriate box in each row, to show whether the feature is found in starch only, cellulose only, both starch and cellulose or in neither.

(4)

Feature	Starch only	Cellulose only	Both starch and cellulose	Found in neither starch nor cellulose
consists of two different polysaccharides	☐	☐	☐	☐
made from β glucose	☐	☐	☐	☐
1,4-glycosidic bonds present	☐	☐	☐	☐
hydrogen bonds between molecules	☐	☐	☐	☐

(b) Explain the advantages of using bioplastics compared with using plastics derived from oil.

(2)

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(c) A study was carried out into the effect of adding cellulose to a starch-based plastic.

The tensile strength of the plastic was measured.

The table below shows the results of this study.

Starch : cellulose ratio	Mean tensile strength / MPa	Standard deviation / MPa
100:0	10.0	± 0.5
100:2.5	13.9	± 0.9
100:5	14.0	± 1.5
100:10	26.8	± 0.8
100:15	26.0	± 1.2

(i) Using the data in the table, describe the results of this study.

(3)



(ii) Describe an investigation that could be carried out to confirm these results.

(4)

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(Total for Question 7 = 13 marks)



8 Two years ago, 2493 species of plants were thought to be critically endangered.

(a) Critically endangered plants account for 11% of all identified plant species.

Calculate the total number of identified plant species.

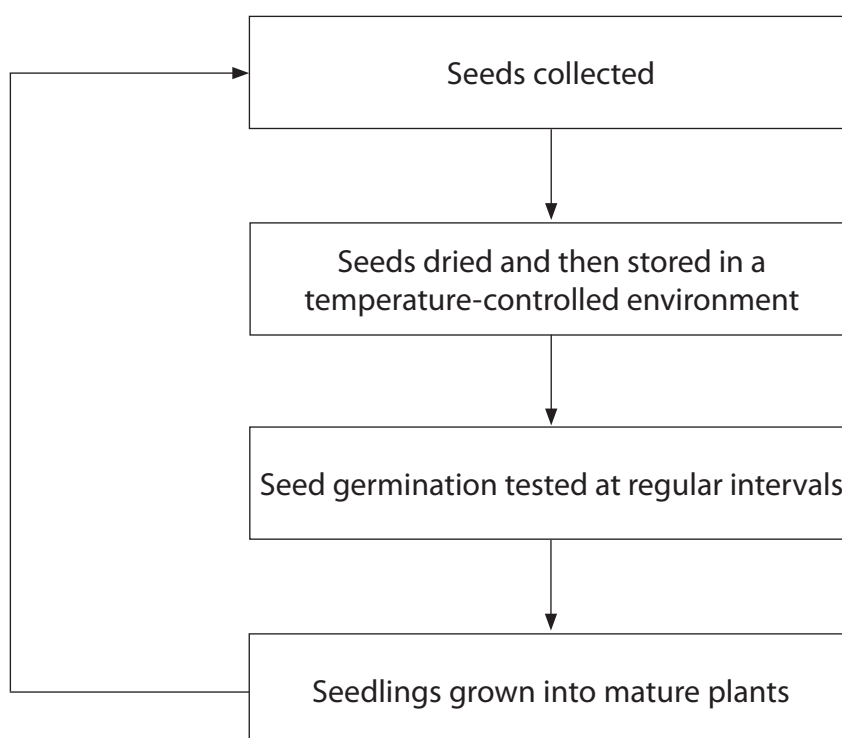
Show your working.

(2)

..... species

(b) Seed banks have been set up to help conserve rare plant species.

The diagram below shows some of the steps involved in storing seeds.



- (i) Explain why seeds are dried and then stored in a temperature-controlled environment.

(3)

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- (ii) Suggest why seed germination is tested at regular intervals.

(2)

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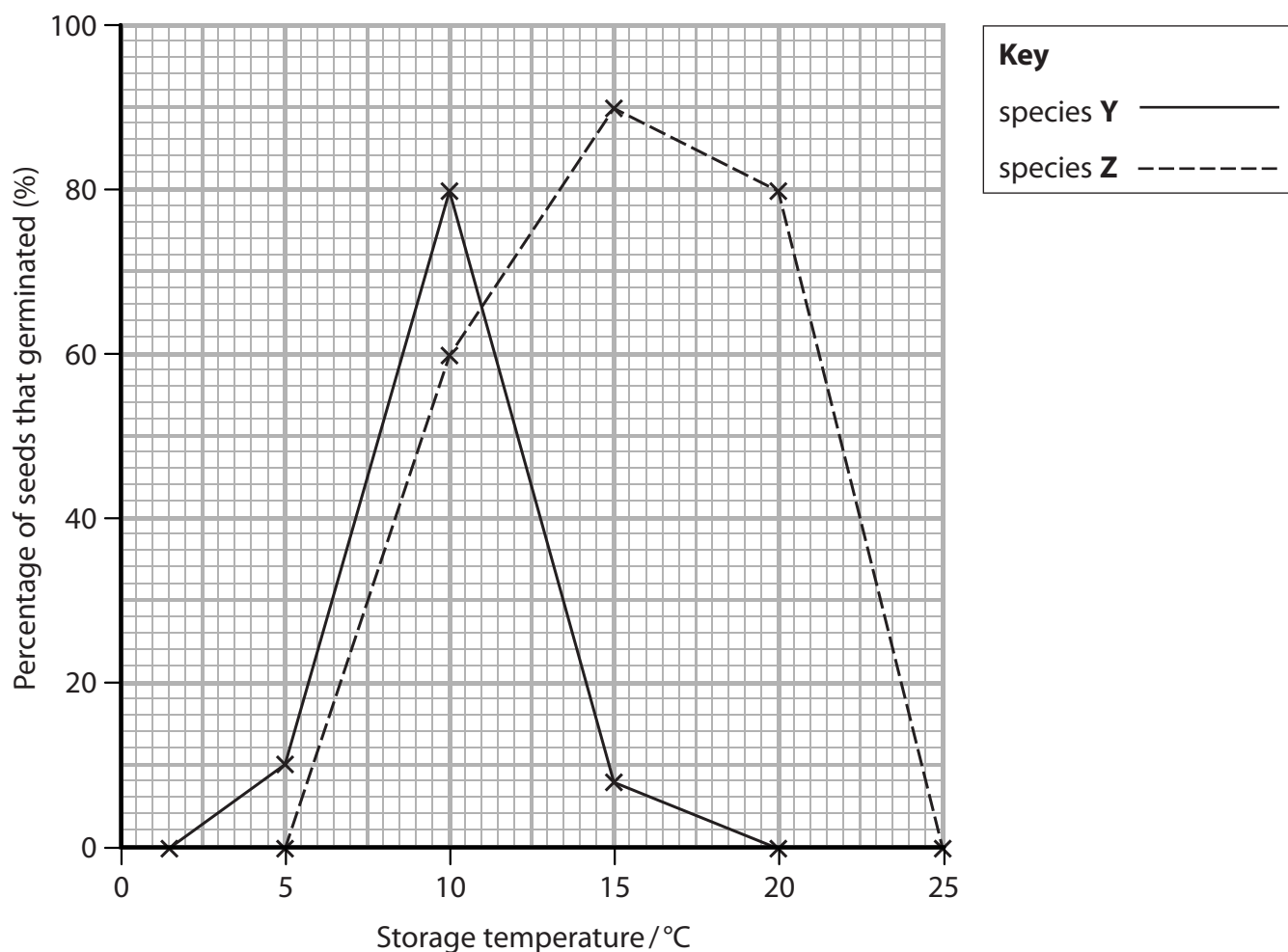
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- (c) A study investigated the effect of storage temperature on seed germination in two species of plant, species Y and species Z.

The graph below shows the results of this study.



- (i) Using the information in the graph, compare the effect of storage temperature on the germination of seeds from these two species.

(3)



- (ii) Suggest how results of studies such as this could be useful to scientists setting up seed banks.

(3)

(Total for Question 8 = 13 marks)

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