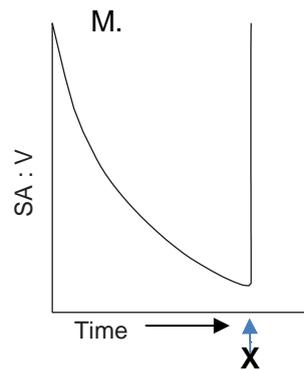
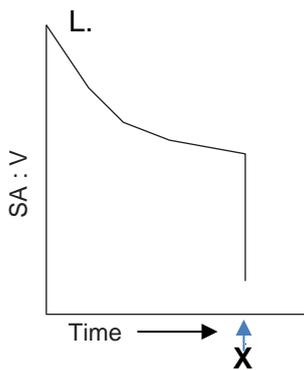
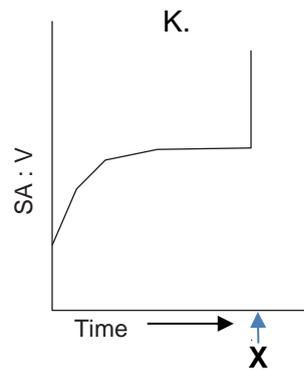
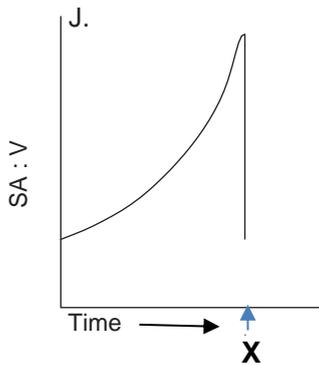


Stage 2 Biology

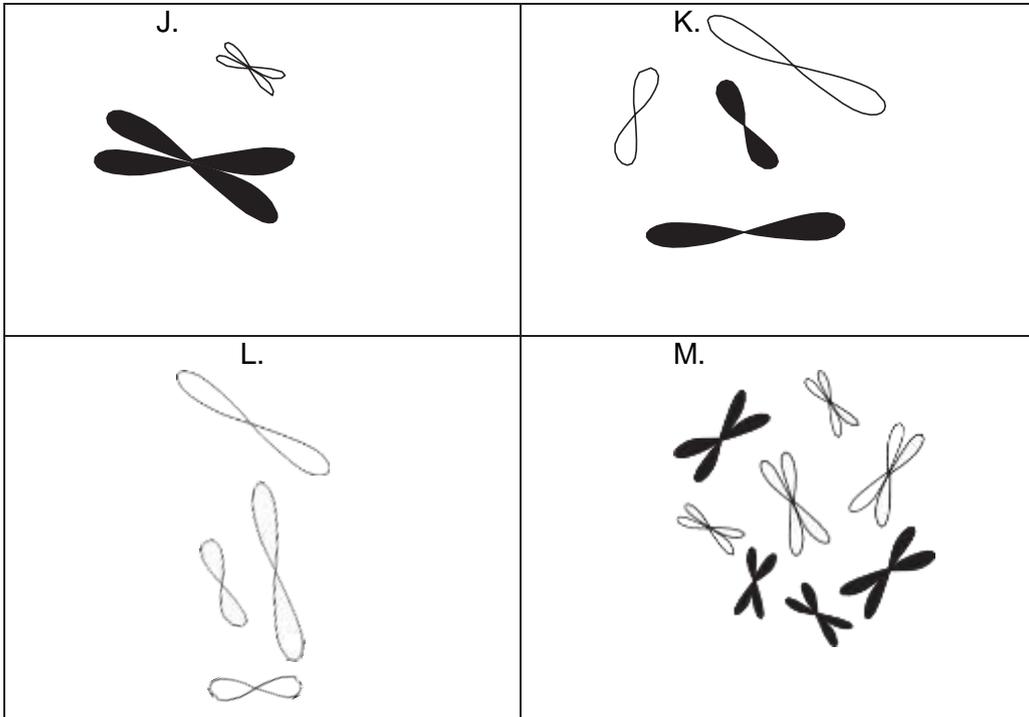
The following examination-style questions are suitable for assessing evidence of learning in **Topic 2**. They do not constitute a complete test.

1. Which one of the following graphs shows the change in the surface area-to-volume ratio (SA : V) of a cell as it grows until time **X**, when it divides in two?



2. The Australian native daisy plant *Brachyscome dichromosomatica* has a diploid number of 4. In the diagrams below, maternal chromosomes are shown in white, and paternal chromosomes are shown in black.

Which one of the following diagrams represents the chromosomes in a leaf cell of this plant?



3. The intracellular environment of cells is different from the extracellular environment of cells. Intracellular concentrations of ions are maintained

- J. because active transport requires sodium ions.
- K. by the diffusion of ions across the membrane.
- L. by the selective exchange of materials.
- M. by the transfer of ions during osmosis.

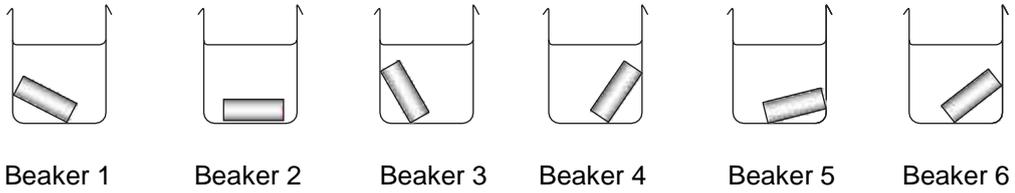
4. Which one of the following combinations correctly compares the DNA of prokaryotic cells and eukaryotic cells?

	<i>Prokaryotic cells</i>	<i>Eukaryotic cells</i>
J	Circular DNA	Linear and circular DNA
K	No circular DNA	Linear and circular DNA
L	Circular DNA	No circular DNA
M	Linear and circular DNA	No circular DNA

5. Which one of the following outcomes is associated with mitosis but **not** meiosis?
- J. The cells produced are diploid.
 - K. Homologous chromosomes are separated.
 - L. Sister chromatids are separated.
 - M. The number of chromosomes in a daughter cell is different from the number of chromosomes in the parent cell.

6. Refer to the following information, which relates to a practical investigation:

Six pieces of potato of similar size were each weighed and then immersed in sucrose solutions of different concentrations in separate beakers. After 30 minutes, the pieces of potato were removed from the beakers and weighed again. The percentage change in the mass of each piece of potato was recorded in the table below.



Beaker	Sucrose concentration (%)	Change in mass of potato (%)
1	0.0	+39
2	0.1	+33
3	0.4	+18
4	0.5	+14
5	0.8	-12
6	1.0	-18

(a) State the dependent variable in this investigation.

_____ (1 mark)

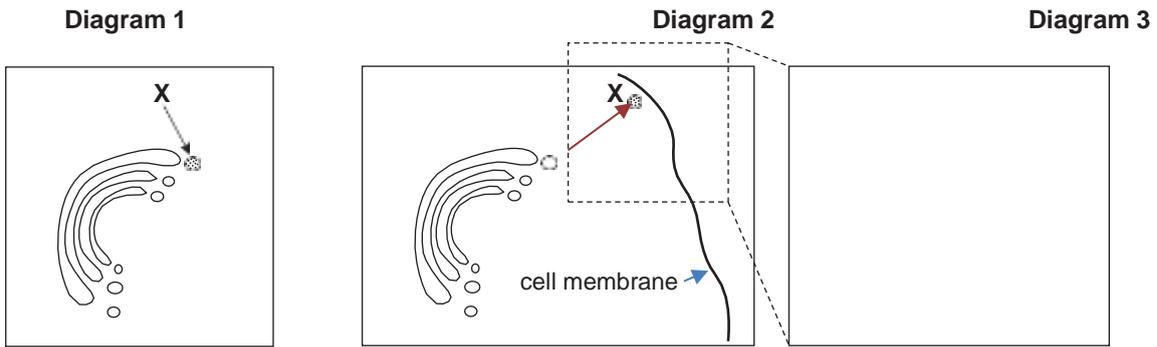
(b) Explain how the movement of water resulted in a change in the mass of the piece of potato in Beaker 5.

 _____ (3 marks)

(c) State *one* way in which the design of this investigation could be improved. Give a reason for your answer.

 _____ (2 marks)

Diagrams 1 and 2 show a cellular organelle. Structure X is associated with this organelle and is shown moving closer to the cell membrane in Diagram 2. Structure X contains a product of the cell.



(a) State the name of the cellular organelle shown in Diagrams 1 and 2.

_____ (1 mark)

(b) In the box labelled Diagram 3, draw a diagram showing the contents of Structure X leaving the cell. (1 mark)

(c) State *one* way that the process by which the contents of Structure X leave the cell *is similar to* active transport.

 _____ (1 mark)

(ii) State *two* ways in which the process *differs from* active transport.

 _____ (2 marks)

7. Much of our understanding about how breast cancer cells behave has been gained from a tissue culture known as MCF-7, which was isolated in 1970 from a woman called Frances Mallon.

(a) State *one* condition required for the successful culture of human tissue. Justify your answer.

(3 marks)

(b) (i) State *two* factors within the body that regulate cell division.

(2 marks)

(ii) State *one* external environmental factor that may upset the normal controls of cell division.

(1 mark)

(c) MCF-7 cells are commercially available for medical research around the world.

(i) State *one* reason why it is important that all of the MCF-7 cells used in medical research experiments are genetically identical.

(1 mark)

(ii) Explain why researchers can assume that the cells in each sample of a successful tissue culture are genetically identical.

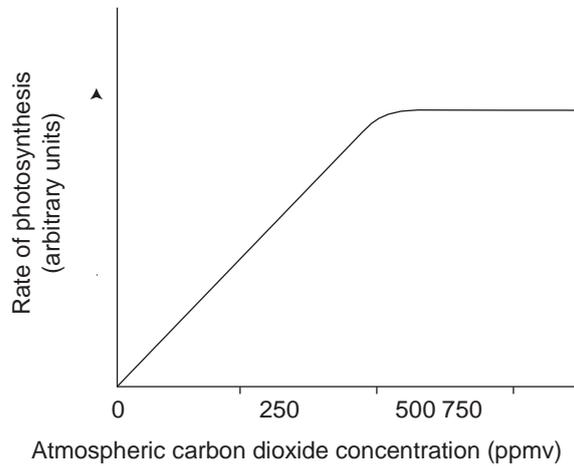
(2 marks)

8. (a) Write a balanced chemical equation for *one* aerobic process that produces carbon dioxide in living cells.

_____ (2 marks)

- (b) Refer to Graph 1, which shows the changes in the rate of photosynthesis with increasing atmospheric carbon dioxide concentration for the plant species *Setaria palmifolia*:

Graph 1



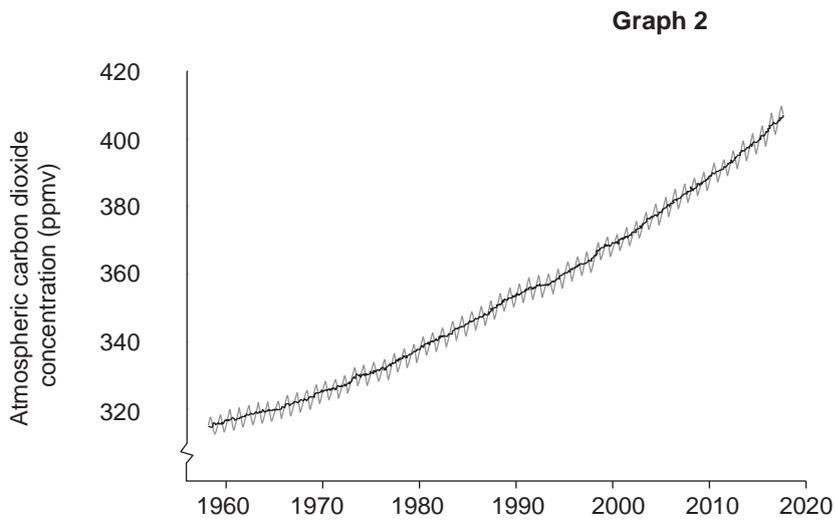
- (i) (1) State *one* factor other than carbon dioxide concentration that may affect the rate of photosynthesis of *Setaria palmifolia*.

_____ (1 mark)

- (2) Describe the pattern of the results shown by Graph 1.

(2 marks)

- (ii) Refer to Graph 2, which shows the atmospheric carbon dioxide concentration at Mauna Loa Observatory, Hawaii between the years 1955 and 2017:



Source: Adapted from NOAA ESRL Global Monitoring Division, Boulder, Colorado, USA, viewed 8 September 2017, esrl.noaa.gov/gmd

Scientists predict that atmospheric carbon dioxide concentration will continue to increase.

Using information from Graphs 1 and 2, predict the effect of increasing atmospheric carbon dioxide concentration on the rate of photosynthesis in *Setaria palmifolia* over the next 10 years. Explain your answer.

(3 marks)

9. (a) State *one* reason why plants require energy.

_____ (1 marks)

(b) Modern banana plants are the product of cross-hybridisation and cannot reproduce sexually.

The most common variety of banana, the Cavendish banana, is under threat from a fungal disease called 'black sigatoka'.

(i) Explain why a plant species that only reproduces asexually may be at greater risk of a disease such as black sigatoka than a plant species that reproduces sexually.

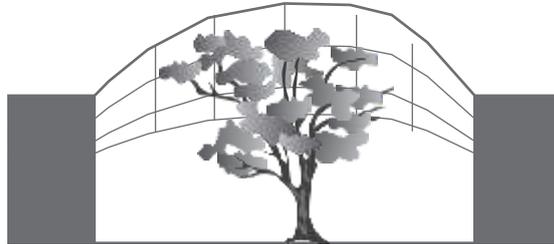
_____ (3 marks)

(ii) Banana plants with leaves damaged by black sigatoka may yield up to 50% less fruit than healthy plants.

Explain why leaf damage affects fruit yield.

(2 marks)

10. In a redevelopment and expansion of a shopping centre, an attempt was made to preserve a very tall, old tree in the middle of the shopping centre. The tree was enclosed by a glass roof.



Within months the tree looked stressed. Efforts to save the tree included injecting it with a nutrient solution containing phosphate. However, 2 years after the redevelopment was completed the tree was dying, and it was cut down.

Explain why a tree needs phosphate in order to survive.

(6 marks)

11. Many plants synthesise amino acids in a metabolic process that involves several consecutive steps. Glyphosate is a widely used weedkiller that prevents an enzyme from functioning properly in one of these steps, and this results in the death of the plant.

Explain why a metabolic pathway such as the production of amino acids in plants often involves many steps.

(4 marks)