SYDNEY GRAMMAR SCHOOL

HALF-YEARLY EXAMINATION

8.40am Wednesday 25th May, 2016

Biology

Total marks (105)

CHECKLIST	
Each boy should have the following:	
1 Question Paper	
1 Multiple Choice Answer Sheet	

EXAMINERS: DBD / HCKM / ACR/ GPW

Part A

Total marks (17)
Attempt ALL Questions
Allow about 20 minutes for this Part

Use the multiple-choice Answer Sheet.

Select the alternative A, B, C or D that best answers the question. Fill the response circle completely.

Sample 2 + 4 =

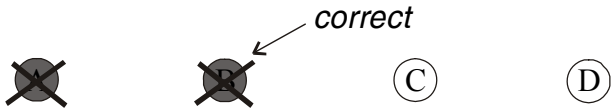
(A) 2 (B) 6 (C) 8 (D) 9

Ⓐ ● Ⓒ Ⓓ

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

Ⓐ ⊗ Ⓒ Ⓓ

If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and drawing an arrow as follows.



1 There are bacteria found living in the foregut of kangaroos, which gain nutrients by breaking down the cellulose fibres in the grass that the kangaroos eat. The bacteria release the products of the fibre digestion as volatile fatty acids, which the kangaroos in turn absorb and utilise as a source of energy. The bacteria are later digested as they pass through the kangaroo's digestive system.

Which of the following describes the relationship between the kangaroo and the microbes?

(A) Parasitism.
(B) Predation.
(C) Mutualism.
(D) Comensalism.

2 A change in the size of a population is determined by four variables:

- number of births (b)
- number of deaths (d)
- number of individuals immigrating into the population (i)
- number of individuals emigrating out of the population (e)

The overall rate of change in a population (increase or decrease) in a given period of time is given by which formula below?

(A) (b + e) – (d + i)
(B) (b + e) + (d + i)
(C) (b + i) – (d + e)
(D) (b + i) + (d + e)

3 Adaptations possessed by rock platform organisms include:

1. holding on
2. preventing drying out
3. breathing underwater
4. feeding by filtering water

The blue periwinkle, *Littorina unifasciata,* is found near the high tide mark of the Long Reef rock platform. It is exposed for much of the time and may suffer buffeting by waves at high tide.

Which of the adaptations above would you expect this species to have?

(A) 1 and 2
(B) 1 and 3
(C) 2 and 4
(D) 3 and 4

4 The tapeworm lives in the intestines of man and other animals. This invertebrate does not have a mouth or a gut.

Which of the following is the best explanation for this feature?

(A) It lives off its own stored food reserves.
(B) It does not require food because it is a parasite.
(C) It is an autotroph and can manufacture its own food.
(D) Nutrients are absorbed directly from the host organism directly through its body wall.

5 The list below contains common substances that exist in Earth's present day atmosphere.

1. methane
2. oxygen
3. nitrogen
4. ammonia
5. water vapour
6. hydrogen
7. carbon dioxide

Which of the substances from the list were thought to be the <u>most</u> abundant in the Earth's early atmosphere?

(A) 2, 4, 5, 6
(B) 1, 4, 5, 6
(C) 3, 4, 5, 6
(D) 2, 3, 4, 7

6 Genetic evidence about the origins of life on earth raises the possibility that life may not have evolved in warm, shallow pools but instead, could have evolved:

(A) On dry land.
(B) Near deep-sea vents.
(C) From viruses.
(D) From meteorites (panspermia).

7 Land animals probably evolved after land plants because plants:

(A) Were needed to provide oxygen for the animals.
(B) Are hardier and live longer than animals.
(C) Have much simpler organs than animals.
(D) Were a source of food for the animals.

8 A scientist discovered a rock containing a fossilised fish determined to be at least 200 million years old. This is important because the discovery:

(A) Increases our knowledge of geological history.
(B) Shows that the rock is older than the fossil fish.
(C) Shows that fish first appeared on earth 200 million years ago.
(D) Increases our knowledge of technologies needed to observe fossils.

9 Which of the following correctly identifies the change made when the 5 kingdom classification system was made into 6 kingdoms?

(A) Fungi were split into eubacteria and protists.
(B) Eubacteria were split into protists and archaea.
(C) Protists were split into eubacteria and fungi.
(D) Monera were split into eubacteria and archaea.

10 The following word equation for respiration can be corrected by:

Carbon dioxide + glucose → energy + oxygen + water

(A) Swapping oxygen and carbon dioxide.
(B) Swapping glucose and energy.
(C) Swapping water and glucose.
(D) Reversing the arrow.

11 During cytokinesis, which of the following processes happen?

(A) The cytoplasm divides separating the two daughter nuclei.
(B) The chromosomes line up along the equator of the cell.
(C) The spindle fibres attach to the centromeres of the chromosomes.
(D) The nuclear membrane breaks down.

12 Which of the following lists includes both biotic and abiotic factors?

(A) Wind, rainfall, humidity.
(B) Predation, competition, waste production.
(C) Predation, temperature, soil type.
(D) Waste production, decomposition, competition.

13 Organisms were originally classified based on which features?

(A) Physical appearance.
(B) Biochemical processes.
(C) Cellular structure.
(D) Genetic similarities.

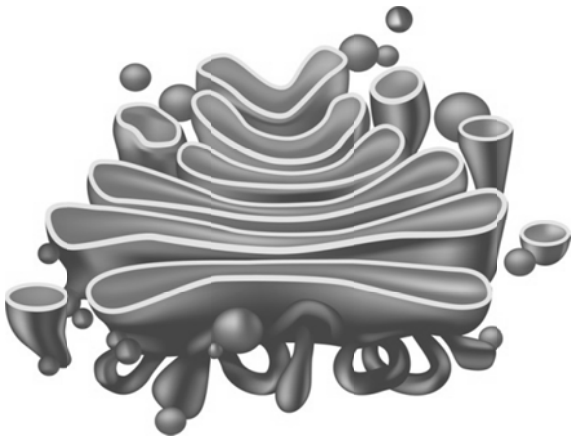
14 An important feature of the microscope is its resolution or resolving power. The best definition of resolution is:

(A) The size of the image compared to the actual specimen.
(B) The ability to still detect colour variations.
(C) The brightness of the image.
(D) The ability to distinguish two close points or structures as being separate.

15 When testing for glucose, the following reagent would prove most useful:

(A) Biuret.
(B) Benedict's.
(C) Silver chloride.
(D) Toluidine.

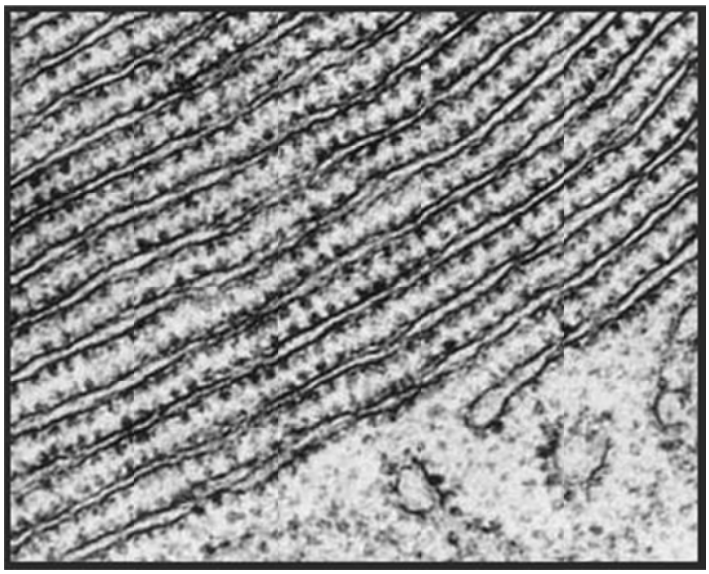
16 The structure below is an organelle found in many cells.



The role of this organelle is:

(A) Control of the cell's metabolic activity.
(B) Storage of carbohydrates.
(C) Release of carbon dioxide.
(D) Secretion of materials.

17 When using an electron microscope to investigate pancreatic cells, the following organelle was observed in abundance:



From this electron micrograph, it is most likely that this organelle is:

(A) The nucleus.
(B) A Golgi Body.
(C) The Rough Endoplasmic Reticulum.
(D) A Lysosome.

Blank Page

Class

Name

Part B

Total marks (88)
Attempt ALL Questions
Allow about 1 hour and 40 minutes for this Part

Answer the questions in the spaces provided
Show all relevant working in questions involving calculations

---

Question 18 (3 marks) **Marks**

Describe a specific example of allelopathy and explain the advantage this provides.

3

Question 19 (3 marks)

The protection of natural habitats and endangered species from human activities is a high priority in all biodiversity management programs.

Using a named example, discuss a current effort to monitor and manage biodiversity in Australia.

3

Class

Name

Question 20 (6 marks) **Marks**

Fisheries authorities conducted a capture-mark-recapture study to estimate the number of rainbow trout in Eucumbene dam in the Snowy Mountains. Initially, 1000 trout were captured, marked and released. One week later, 100 fish were caught and 5 were found to be marked.

(a) Estimate the number of trout in the dam from the information given. Show all working. **2**

(b) Outline two assumptions in the capture-mark-recapture method which if not met would lead to errors in the population estimate. **2**

(c) One year after the initial study, a fisherman caught 3 fish, one of which was marked. From a quick calculation the fisherman estimated that the population levels must have crashed.

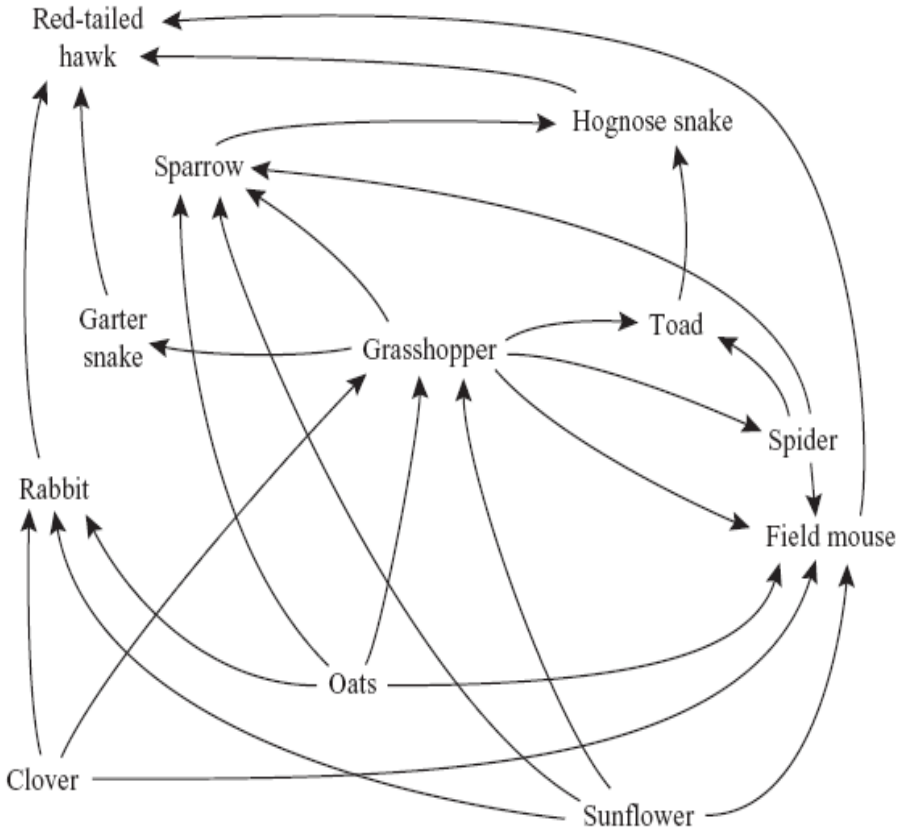
Evaluate the fisherman's claim. **2**

Class

Name

Question 21 (6 marks) **Marks**

The diagram below shows a food web for a rural ecosystem.



(a) Identify the producer/s in this ecosystem. **1**

(b) State which organism is the top consumer in this food web and determine the highest trophic level that it occupies. **1**

Question 21 continued on next page.

Class

Name

Question 21 continued. **Marks**

(c) With reference to the food web, explain how the transfer of energy in the ecosystem impacts on the trophic levels. **2**

(d) What would happen in this food web if grasshoppers were completely eliminated with insecticides? Justify your answer. **2**

Class

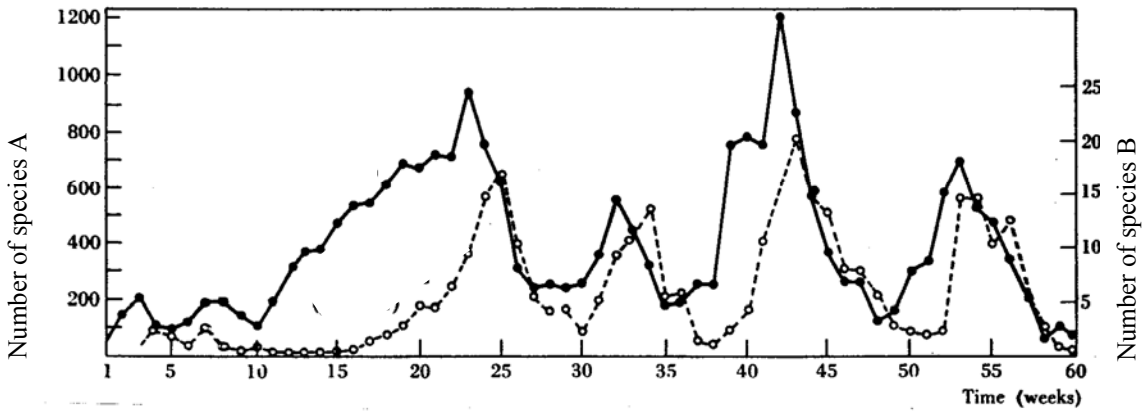
Name

Question 22 (3 marks) **Marks**

The diagram below shows the change in population size of species A and species B over a 60 week period.

Species A ●——●——●

Species B ○ – ○ – ○



Analyse the data presented to determine the nature of the relationship between these two species. Give two different reasons to support your conclusion.

3

Class

Name

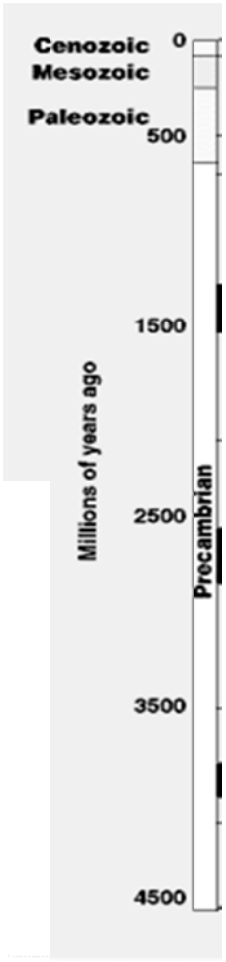
BLANK PAGE

Class

Name

Question 23 (7 marks) **Marks**

Use the timeline below to complete the following questions.



(a) Mark on the timeline shown above the approximate location of the following events:

i) The formation of prokaryotic autotrophic cells.
ii) The formation of eukaryotic cells.
iii) The formation of prokaryotic heterotrophic cells.
iv) The formation of colonial organisms.

4

Question 23 continued on next page.

Class

Name

Question 23 continued.

Marks

(b) Identify when there was a change from an anoxic atmosphere to an oxic atmosphere and explain why this change was significant. **3**

Question 24 (4 marks)

(a) Describe a piece of palaeontological evidence which is used to suggest when life first originated. **2**

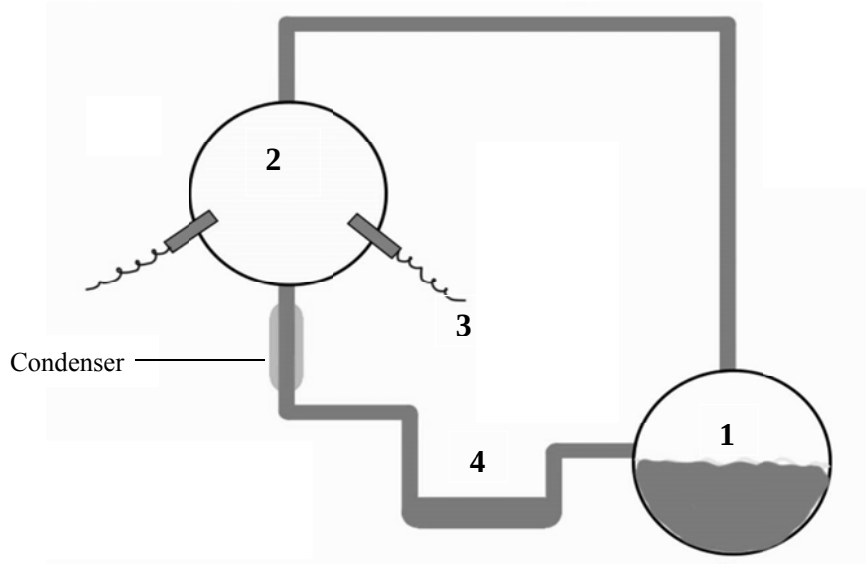
(b) Identify a recent technology that has furthered our understanding of the first cells on Earth and describe how our understanding has been improved as a result of the findings. **2**

Class

Name

Question 25 (6 marks) **Marks**

A student draws the following to represent the experiment carried out by Urey and Miller in 1953.



(a) Complete the table below to briefly outline of what is being modelled at the stages labelled 1-4. **4**

Stage	Outline
1	
2	
3	
4	

Question 25 continued on next page

Class

Name

Question 25 continued

(b) Outline the significance of this experiment **2**

Question 26 (5 marks)

Traditional classification systems were restricted by the technology available to the scientists of the time.

Discuss the influence of advances in technology on the classification of individual or groups of species. Use a named example to support your answer. **5**

Class

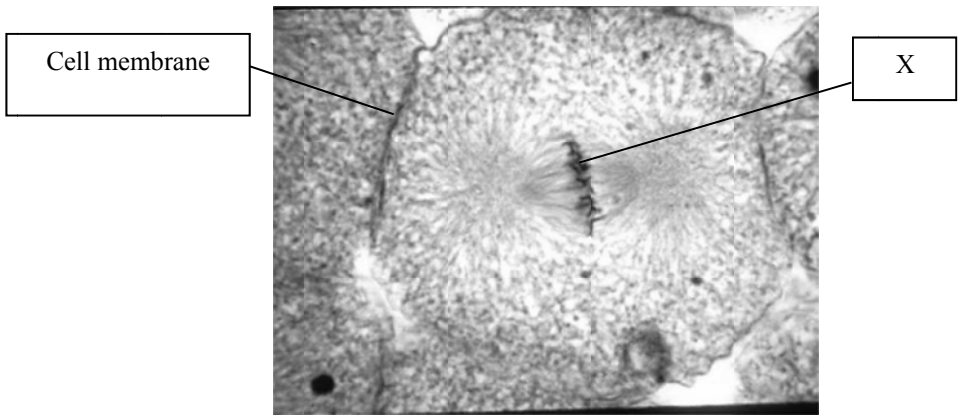
Name

Question 27 (6 marks) **Marks**

Before a cell divides, it prepares for this process by doubling the amount of genetic material found in the nucleus.

(a) Explain the importance of doubling the genetic material in relation to the role of mitosis. **2**

During your course you have observed cells in various stages of mitosis. The image below shows a cell in one of these phases of division.



(b) Name the structures labelled X.

1

Question 27 continued on next page

Class

Name

Question 27 continued

(c) Describe the changes that follow this phase of mitosis that will lead to complete cell division.

3

Question 28 on next page

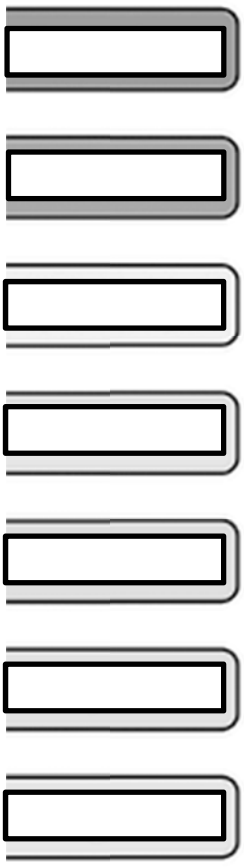
Class

Name

Question 28 (2 marks) **Marks**

The diagram below shows the hierarchy of classification for *Homo sapiens*.

Complete the diagram by filling in the left hand column to label each level of the hierarchy.



Homo sapiens
Members of the genus Homo with a hightforehead and thin skull bones.

Homo
Hominids with upright posture and large brains.

Hominids
Primates with relatively flat faces and three-dimensional vision.

Primates
Mammals with collar bones and grasping fingers.

Mammals
Chordates with fur or hair and milk glands.

Chordates
Animals with a backbone.

Animals
Organisms able to move on their own.

2

Class

Name

Question 29 (3 marks) **Marks**

3

Complete the table to outline the specific role of mitosis in various tissues.

Organism	**Site of mitosis**	**Role of mitosis**
Plant		
Mammal	Skin at the site of a cut	

Question 30 on next page

Class

Name

Question 30 (7 marks)

(a) Describe the process of photosynthesis and explain the importance of this process in ecosystems. **2**

.

(b) Photosynthesis takes place chloroplasts. Relate the structure of this organelle to its function. **2**

(c) A student writes in their exam:

"The main difference between plants and animals is that plants only photosynthesise whereas animals only perform respiration."

Evaluate this statement. **3**

Class

Name

Question 31 (2 marks) **Marks**

Look at the diagram below showing an invertebrate. Use the key identifying the phyla of invertebrates to answer the questions that follow.

1a. Animal has bilateral symmetry. (2 sides look like mirror images).	*Go to 2*
1b. Animal does not have bilateral symmetry.	*Go to 3*
2a. Body has hard outer covering (exoskeleton) and jointed legs.	***Arthropoda***
2b. Animal does not have a hard outer covering and no jointed legs.	*Go to 4*
3a. Radial symmetry (looks the same 360^{o} around central axis)	***Cnidaria***
3b. No radial symmetry	***Porifera***
4a. Internal skeleton protecting its central nervous system	**Chordata**
4b. No internal skeleton protecting its central nervous system	*Go to 5*
5a. Body consists of a series of very similar segments	***Annelida***
5b. Body does not consist of a series of very similar segments	***Mollusca***

(a) Name the phylum of the organism shown above. **1**

_____

(b) Use the key to describe the structural features of the organism you have named. **1**

_____

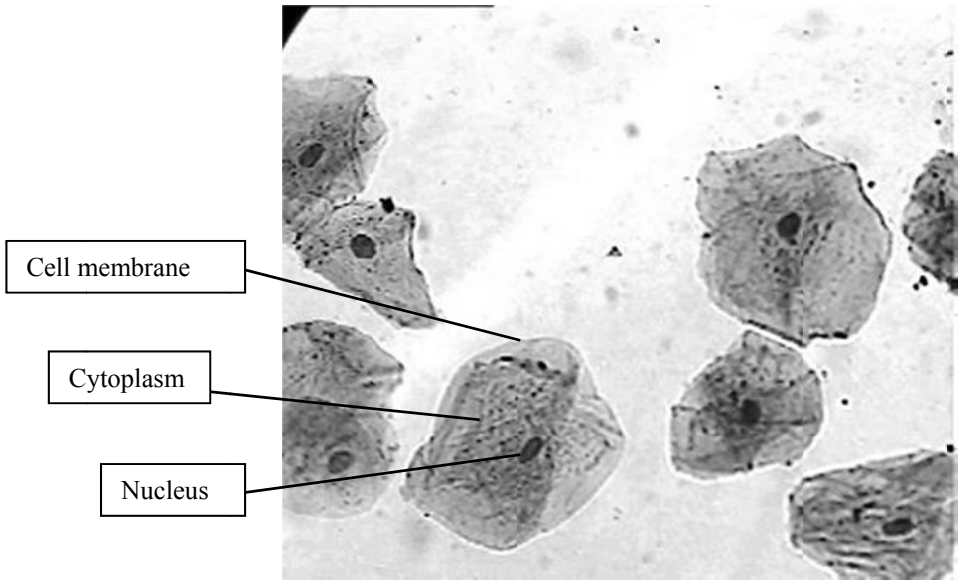
_____

Class

Name

Question 32 (2 marks) **Marks**

Below is a standard image of epithelial cells as seen with a light microscope. The key features that are visible are labelled.



A student analysing this image states that:

"The cell labelled cannot be a plant cell."

Using your knowledge of cell structure as seen with a light microscope, justify this statement.

2

Class

Name

Blank Page

Class

Name

Question 33 (3 marks) **Marks**

(a) Describe how you would test for the presence of starch. **2**

(b) State the role of starch in plant cells. **1**

Question 34 on next page

Class

Name

Question 34 (5 marks) **Marks**

(a) Describe, with the aid of a labelled diagram, the currently accepted model of the structure of the cell membrane. **3**

(b) Give two reasons why the cell membrane is important to the survival of a cell. **2**

Class

Name

Question 35 (5 marks) **Marks**

The development of the cell theory took many years to formulate and proved crucial to our understanding of cells.

Outline the currently accepted cell theory and describe the evidence that supports this.

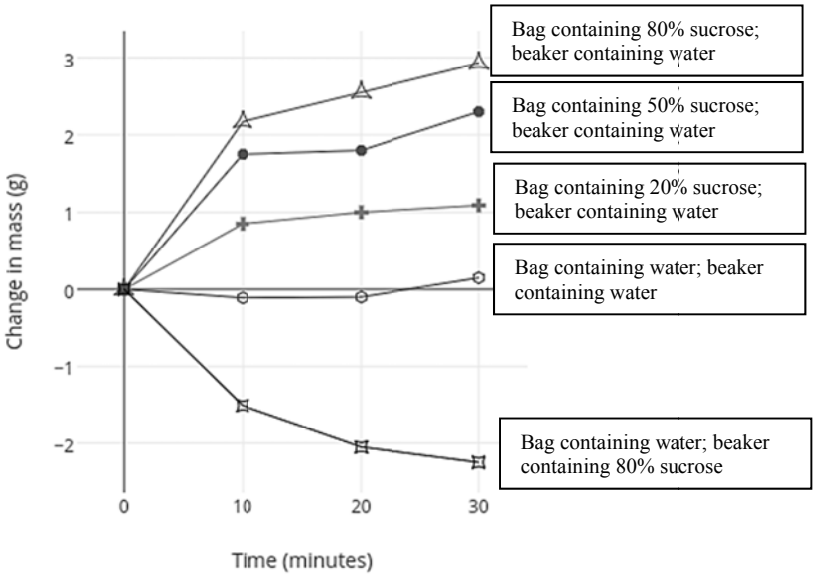
5

Class

Name

Question 36 (10 marks) **Marks**

An experiment was carried out to determine the effect of the relative internal and external solute concentrations on the movement of molecules across membranes. Dialysis tubing was made into bags and filled with different solutions. Each bag was placed in a beaker containing either water or sucrose solution of different concentrations. The change in mass was recorded every 10 minutes for 30 minutes. The results are shown in the graph below. The data plot is labelled to show the conditions of the experiment.



(a) Identify the independent and dependant variable in this experiment **2**

Dependant: _____

Independent: _____

(b) Identify some of the variables that need to be controlled for this experiment. **1**

_____

_____

Question 36 continued on next page.

Class

Name

Question 36 continued.

(c) Analyse and explain the results from this experiment, using appropriate biological terminology. **5**

(d) Justify the use of dialysis tubing to demonstrate the movement of molecules across membranes in living cells. **2**

Class

Name

END OF PAPER