

Section One: Multiple-choice**30% (30 Marks)**

This section has 30 questions. Answer **all** questions on the separate Multiple-choice Answer Sheet provided. For each question shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square, do not erase or use correction fluid, and shade your new answer. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

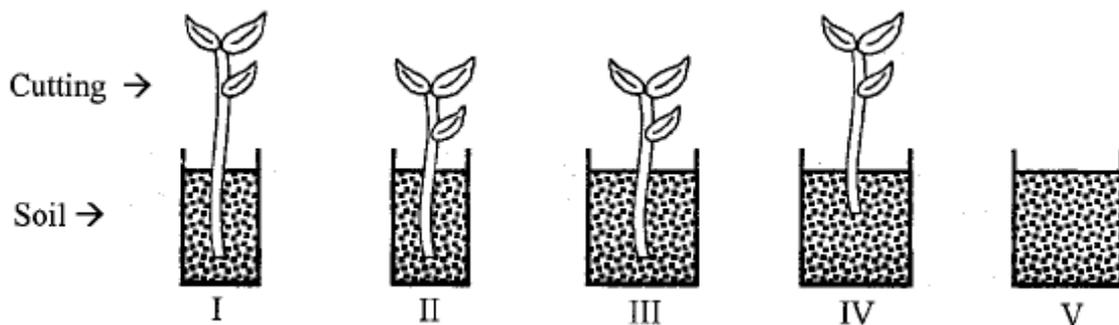
Suggested working time: 40 minutes.

1. In the current taxonomic classification system, families are grouped into

- a) Classes.
- b) Kingdoms.
- c) Orders.
- d) Phyla.

Questions 2 and 3 refer to the following information:

Five pots were set up with plant cuttings in soil mix. (NB: All diagrams are to the same scale.)



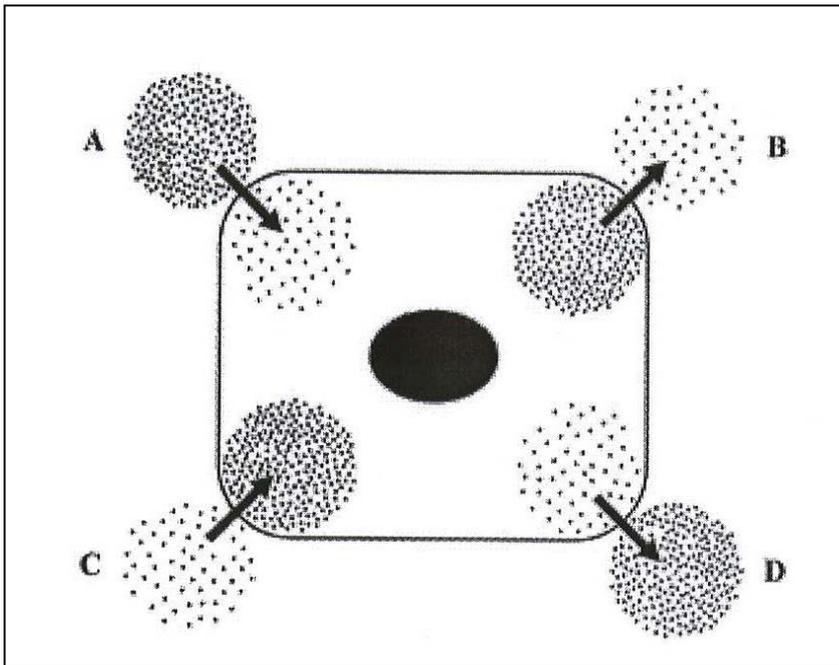
2. Which of the following pots would be the most useful to test the hypothesis that 'the deeper a cutting is planted the more likely it is to grow into a new plant'?

- a) Pots I and V.
- b) Pots III and V.
- c) Pots III and IV.
- d) Pots I and IV.

3. Which of the following changes to the procedure used would be least likely to improve the reliability of the above investigation?

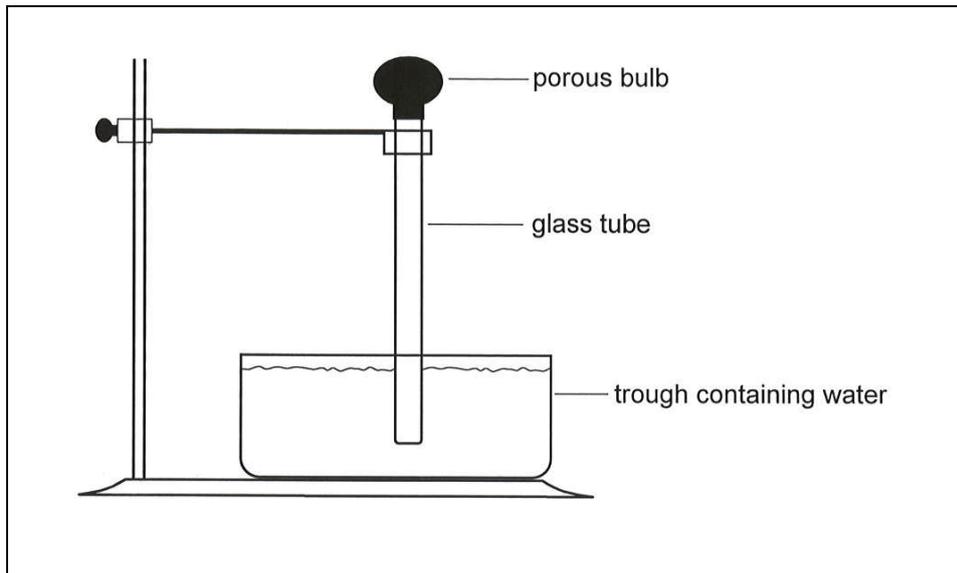
- a) Use the same species of plant in all five set-ups.
- b) Make several of each of the five types of set-up.
- c) Water the pots more often to promote growth.
- d) Repeat the experiment several times.

Question 4, 5 and 6 refer to the following diagram of substances moving in and out of a cell. Dots represent molecules.



4. If the cell is respiring aerobically, which arrow represents the movement of oxygen molecules?
- A.
 - B.
 - C.
 - D.
5. The process by which these oxygen molecules move in and out of cells is
- transpiration, a passive transport process.
 - osmosis, a passive transport process.
 - diffusion, a passive transport process.
 - pinocytosis, an active transport process.
6. The arrow labelled C represents
- Diffusion and could be oxygen moving into the cell.
 - Osmosis and could be water moving into the cell.
 - Active transport and could be nitrate ions moving into the cell.
 - Phagocytosis and could be sodium ions moving into the cell.

The following diagram shows a model that represents a process in a typical plant. Use this diagram to respond to questions 7 and 8.



7. If the bulb represents a leaf, what occurs at the bulb to produce an upward stream of water?
- water evaporates.
 - a vacuum is produced.
 - air forces the water out of the bulb.
 - there is more salt in the leaf (bulb) than there is in the trough.
8. What part of a plant would the glass tube represent?
- Phloem.
 - Root hair cells.
 - Stomata.
 - Xylem .
9. Translocation in a plant involves the movement of a substance **X** through structure **Y** using the energy from **Z**. Choose the correct alternative for X, Y and Z:
- Sugar, phloem and transpiration.
 - Starch, leaf cells, photosynthesis.
 - Sugar, phloem, respiration.
 - Water, xylem, no energy required.

The information below refers to Questions 10 and 11

The table shows the surface area and volume of four cells of different sizes.

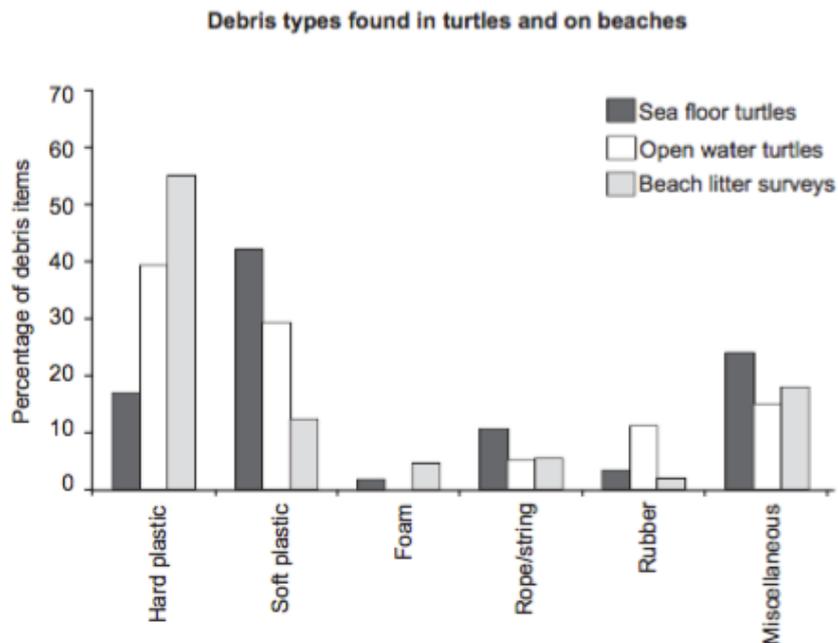
Cell	Surface area (mm ²)	Volume (mm ³)
1	2.70	0.135
2	0.54	0.027
3	1.50	0.125
4	0.06	0.001

10. The cell that has the greatest surface area to volume ratio is
- a) Cell 1.
 - b) Cell 2.
 - c) Cell 3.
 - d) Cell 4.
11. The diffusion of substances would be least efficient into
- a) Cell 1.
 - b) cell 2.
 - c) Cell 3.
 - d) Cell 3.
12. Which of the following is NOT a density-dependent factor influencing the population of birds in a forest?
- a) food availability.
 - b) number of nesting sites.
 - c) population of parasitic bird mites.
 - d) minimum night temperature.

13. Unicellular organisms rarely grow larger than 1mm in diameter. Beyond this size
- cells become visible to predators.
 - diffusion is too slow to supply cell requirements.
 - it is not possible for mitosis to occur.
 - cell membranes begin to disintegrate from cytoplasm pressure.
14. Sucker fish attach to the sides of sharks or other large fish. However, they do so only to gain protection and to pick up any food scraps falling from the mouth of the larger predator and do not hurt the larger fish. This relationship is an example of:
- Parasitism.
 - Commensalism.
 - Predator-Prey.
 - Mutualism.
15. A biologist wanted to estimate the density of the plant *Hibbertia cuneiformes* in a study area of 1000 m². The biologist counted all of the individuals of this species in two transects. Each transect was 1 m wide by 250 m long. Seventy individuals of *Hibbertia cuneiformes* were counted. On the basis of these data, the best estimate of the density of *Hibbertia cuneiformes* in the study area is
- 70 plants.
 - 140 plants.
 - 0.07 plants/m².
 - 0.14 plants/m² .
16. Many animals have open circulatory systems. Which of the following statements could NOT be true about an animal with an open circulation?
- It is aquatic and slow-moving.
 - It has short open vessels coming from a simple muscle pump.
 - It is terrestrial and have a bony skeleton.
 - It is terrestrial and have spiracles that open to the air.

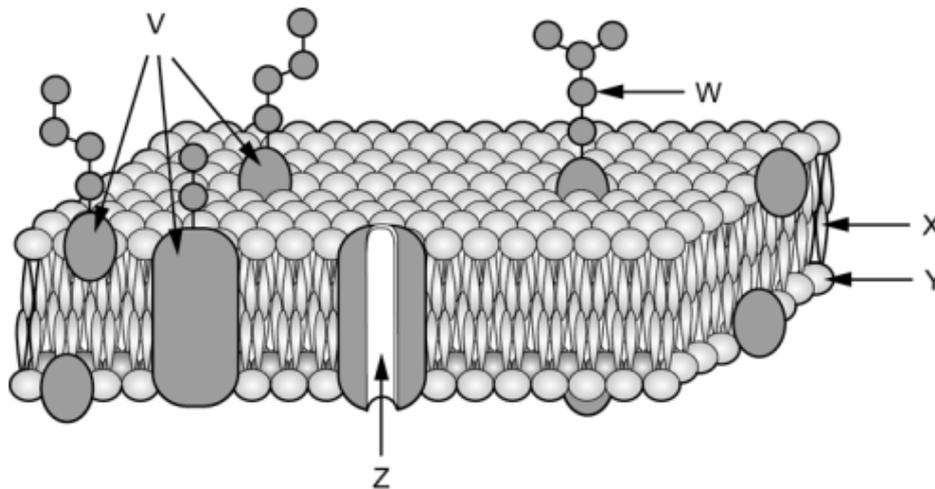
17. The information below refers to Questions 17, 18 and 19.

Sea Turtles often ingest plastic and other debris that can kill them. The graph below shows the amounts of different types of debris found in the intestine of 11 open water turtles, 22 sea floor turtles and in 25 beach litter surveys. The data are reported as averages of percentages of each type of debris found within each animal and in each beach litter survey. For example, on average, approximately 55% of the debris found in the 25 beach litter surveys was hard plastic.



17. On average, approximately what percentage of the debris found in the intestines of open water turtles was soft plastic?
- 43
 - 39
 - 30
 - 12
18. Assuming that the composition of the debris in the beach litter surveys was about the same as the composition of the debris on the sea floor where turtles had been feeding, the data in the graph suggests that sea floor turtles actively avoid ingesting
- Rubber
 - Soft plastic
 - Rope
 - Hard plastic

19. Which of the following statements about the data in the graph is most accurate?
- Foam was found in the intestines of sea floor turtles but not in the intestines of open water turtles.
 - Hard plastic was the most common type of debris in the intestines of open water turtles and sea floor turtles.
 - About the same percentage of rubber was found in the intestines of open water turtles and sea floor turtles.
 - There was a higher percentage of miscellaneous debris in the beach litter survey than in the intestines of the sea floor turtles.
20. Question 20 refers to the diagram below of a model of the cell membrane.



Refer to the labels on the diagram. Which row in the following table shows the correct labelling?

	V	W	X	Y
(a)	protein	carbohydrate	hydrophobic tail of a phospholipid	hydrophilic head of a phospholipid
(b)	phospholipid	glycolipid	hydrophobic tail of a carbohydrate	hydrophilic head of a carbohydrate
(c)	protein	glycolipid	hydrophobic tail of a phospholipid	hydrophilic head of a phospholipid
(d)	phospholipid	carbohydrate	hydrophilic tail of a protein	hydrophobic head of a protein

21. Organisms that recycle energy within ecosystems are
- a) Producers.
 - b) Consumers.
 - c) Decomposers.
 - d) non-existent.
22. The Little Brown bat lives in caves where it may reach a population size of several million. These mammals consume insects that are harmful to corn and cotton. It is estimated that a population of a million bats consumes 10 tons of insects each night. If a population of bats colonises a new cave, the biomass of nearby corn and cotton crops would likely:
- a) remain constant as the bats will have other food sources.
 - b) decrease as the bat population increases.
 - c) increase as the bat population increases.
 - d) increase by 10 tons a night once the bat population reaches a million
23. A population of 50 koalas in a forest experiences the following events in one year:
6 koalas move into the forest, 10 babies are born in Spring, 3 elderly koalas die of disease, 4 young males are run over on the road and two females move away to another population. What is the rate of population growth per hundred per year?
- a) 16
 - b) 14
 - c) 9
 - d) 7
24. The Australian Wildlife Conservancy is a non-profit organisation that relies on donations to purchase and maintain large areas of important habitat for conservation purposes. Some of its sites are surrounded by high, electrified mesh fences. Which of the following is least likely to be achieved by such fencing?
- a) exclusion of feral predators
 - b) prevention of all animal migration
 - c) control of human access to the area
 - d) better control of planned breeding programs

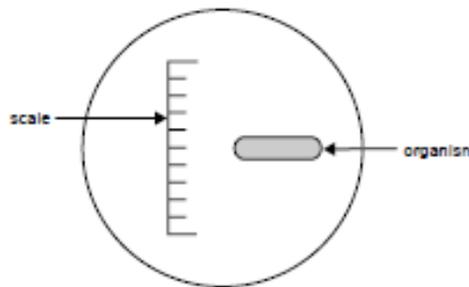
25. A student examined four different, appropriately stained cells with a light microscope at a high magnification (x 500). These were
- a paramecium (single-celled organism)
 - a human skin cell
 - a photosynthesising cell and
 - an onion epidermal cell.

A structure that could be seen in each cell at this magnification would be a

- a) chromosome.
- b) chloroplast.
- c) central vacuole.
- d) nucleus.

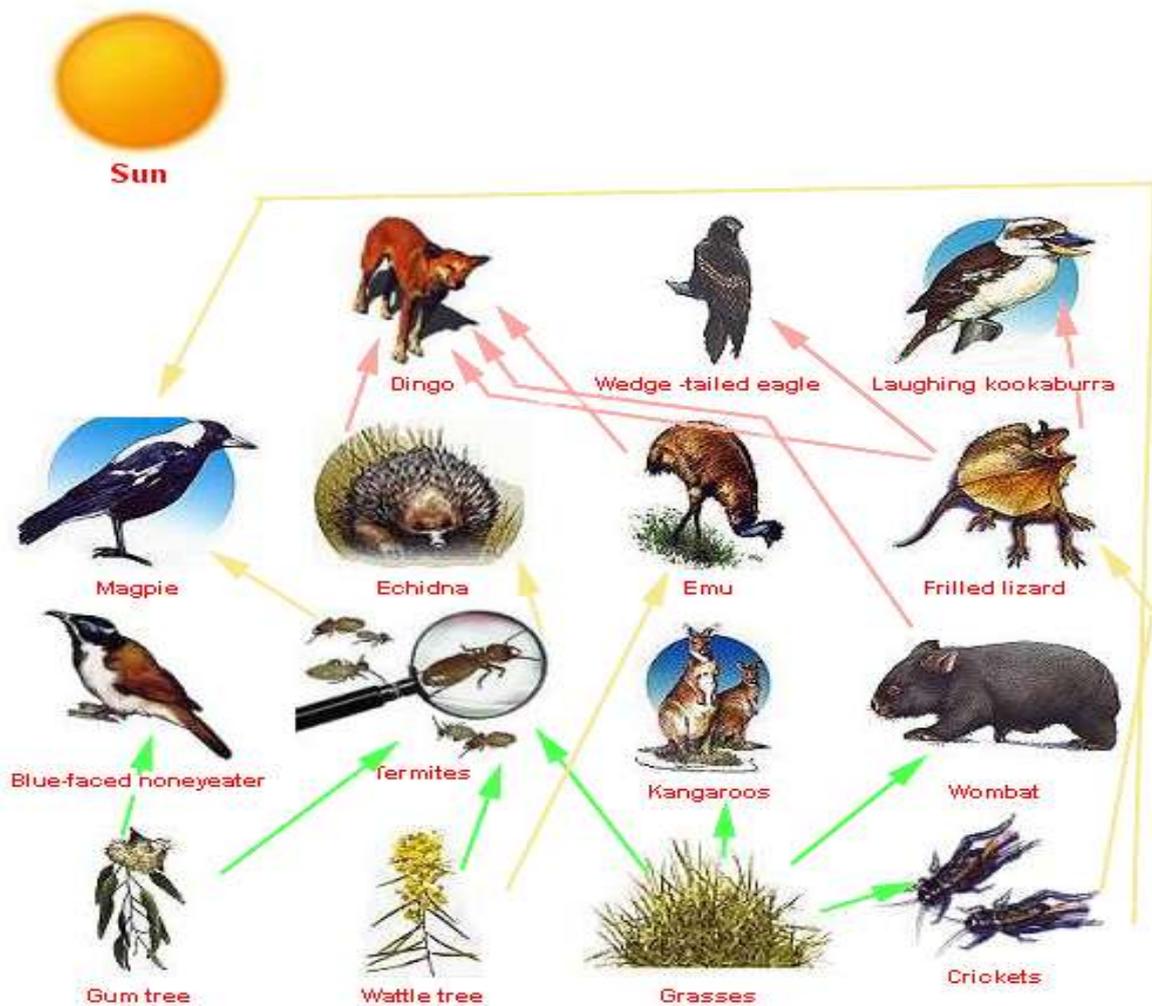
The following information is needed for Questions 26 and 27:

The diagram below represents the high-power field of a light microscope fitted with a 10 x eyepiece and a 40 x objective lens. The field contains a scale and an organism. Each scale division is 20 micrometres



26. The length of the organism is approximately
- a) 5 micrometres.
 - b) 20 micrometres.
 - c) 100 micrometres.
 - d) 40 000 micrometres.
27. If the objective lens were changed to x100, which of the following would be correct?
The field of view would change approximately to
- a) 80 micrometres.
 - b) 130 micrometres.
 - c) 320 micrometres.
 - d) 1260 micrometres.

The diagram below shows a simplified food web of an Australian grassland.



28. The alternative below that contains examples of organisms from more than one trophic level is:

- cricket, wombat, kangaroo, blue-faced honey eater
- blue-faced honey eater; termites; emu; kangaroo
- magpie, echidna, emu, frilled lizard
- wedge-tailed eagle; laughing kookaburra

29. A decrease in the population of termites would be most likely due to a:

- drop in the population of honey eaters.
- rise in the population of crickets.
- rise in the population of dingos.
- drop in the population of kangaroos

30. Which of the following statements about eutrophication is correct?
- a) It only occurs in bodies of freshwater.
 - b) It is caused by high levels of mineral nutrients in the water.
 - c) It only occurs in water bodies located in urban areas.
 - d) It is caused by low levels of oxygen in the water.

END OF SECTION ONE

Section Two: Short answer

80% (100 Marks)

This section has **eight (8)** questions. Answer **all** questions. Write your answers in the space provided in this Question/Answer Booklet. Wherever possible, confine your answers to the line spaces provided. Use a blue or black pen (**not** pencil) for this section.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

- Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.

Suggested working time: 90 minutes.

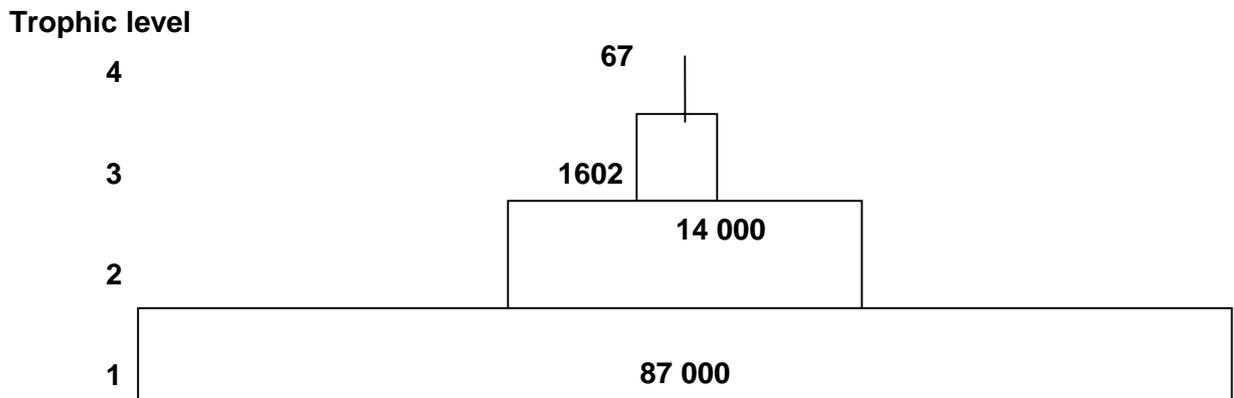
Question 31

[10 marks]

The diagram below (not to scale) shows a pyramid of energy for all organisms in a stream.

Four trophic levels are included - 1, 2, 3, and 4.

Energy is given as numbers in each trophic level bar, measured in $\text{kJ m}^{-2} \text{ year}^{-1}$.

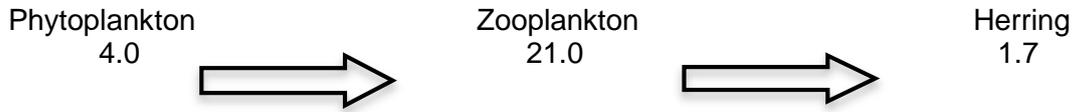


a) Name the type of organisms that would make up trophic level 2.

b) Between which two trophic levels is the energy transfer most efficient? _____ [1 mark]
 Explain your answer

[2 marks]

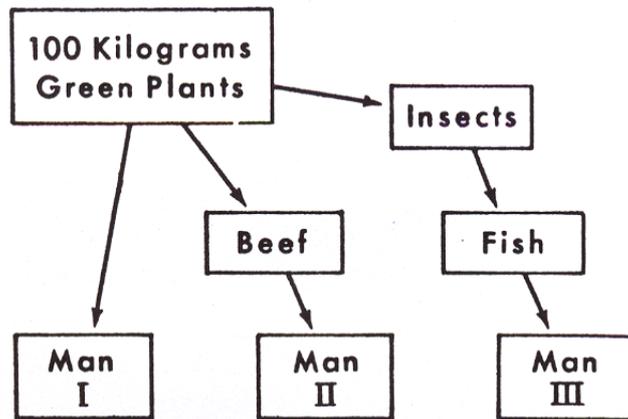
The herring is a fish found in the Indian Ocean. In the food chain below, the figures represent biomass in grams per cubic meter (gm^{-3}).



- c) In the food chain above, the phytoplankton reproduce very rapidly. Suggest why this rapid rate of reproduction is essential to sustain the food chain.

[2 marks]

- d) Three different food chains are shown in the diagram below. In which would the most energy be available to man, and why?



[2 marks]

- e) Draw a labelled diagram of the phosphorus cycle below.

[3 marks]

- (b) State a hypothesis for this investigation. [2 marks]

- (c) State the dependent variable in this investigation. [1 mark]

- (d) State the variable that was being investigated? [1 mark]

- (e) State three variables that should be controlled in this investigation. [3 marks]

- (f) Suggest ONE key improvement to the design of this experiment (not including controlling the variables you have stated above). Explain the reason for this improvement. [2 marks]

- (g) State a conclusion for this investigation. [2 marks]

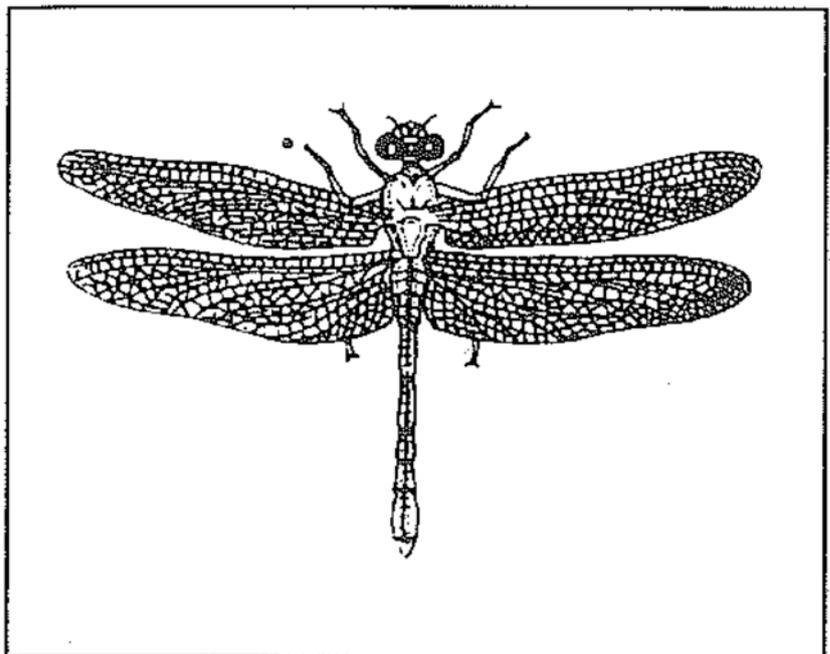
Question 33

[12 marks]

Classification:

Use the key below to identify the Order to which the pictured insect belongs. Write the steps you used to reach your decision by giving all the key alternatives you used. Answer lines are given on the next page

1a	Wings fully developed.	2
1b	Wings reduced or absent.	9
2a	One pair of wings.	3
2b	Two pairs of wings.	4
3a	Forewing reduced.	Order Strepsiptera
3b	Hindwings reduced.	Order Diptera
4a	Front pair of wings form a protective sheath over membranous forewings.	Order Coleoptera
4b	Both pairs of wings membranous.	5
5a	Fore and hind wings similar in size and venation.	6
5b	Fore and hind wings not similar.	10
6a	Wings narrow with hairs.	Order Thysanoptera
6b	Wings not narrow with hairs.	7
7a	Large head, large compound eyes.	8
7b	Head not as above.	11
8a	Wings held horizontally or vertically at rest.	Order Odonata
8b	Wings can be folded over body at rest.	Order Neuroptera



(a) Order of insect:

[1 mark]

(b) State steps used from key to obtain the answer for 33a:

[2 marks]

The binomial names and classification of three different bird species are shown below:

1. African stonechat *Saxicola torquatus*

Order Passeriformes; Family Muscicapidae; Genus *Saxicola*; Species *S. Torquatus*

2. White throated robin *Irania gutturalis*

Order Passeriformes; Family Muscicapidae; Genus *Irania*; Species *I. Gutturalis*

3. Red-throated Wood Rail *Aramides gutturalis*

Order Gruiformes; Family Rallidae; Genus *Aramides*; Species *A. gutturalis*

c) Which two birds would have the most features in common? Justify your answer.

[3 marks]

Read the following description of relationships between organisms and answer the questions following.

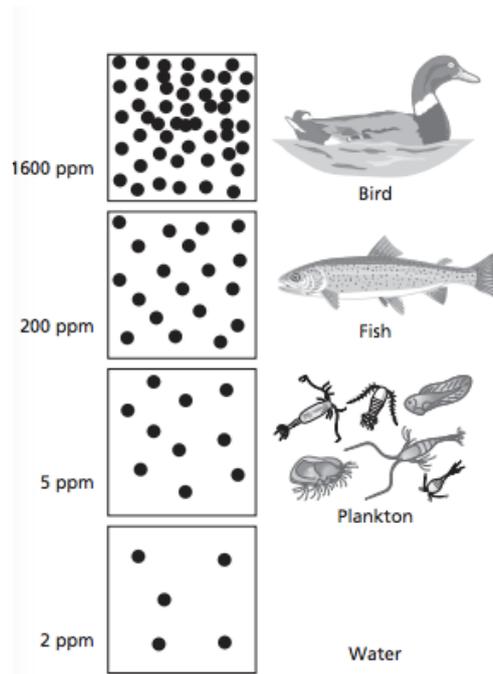
Leafcutter ants are species of ants that cut pieces of leaf and vegetation, and store the rotting leaves in large underground spaces in their nests. The ants do this to cultivate a particular edible fungus, feeding it with the plant material and keeping it free from pests and moulds. If a particular type of leaf is toxic to the fungus, the colony will no longer collect it. When the ants are out collecting leaves, they are at risk of attack by some species of phorid fly, that can lay egg into parts of the worker ants' heads. The fungus cultivated by the adult ants is used to feed the ant larvae, and the adults feed off the leaf sap. However, the ants must be careful to ensure that the wrong type of fungus does not grow as it could infect the ants themselves.

- (d) State and give the described examples of three different types of relationships in this passage.

[6 marks]

Question 34

[4 marks]



a) What biological process is illustrated in the diagram above?

[1 mark]

b) Explain why this process occurs.

[1 mark]

In the 1950s, the World Health Organisation sprayed DDT in Borneo as a way of controlling mosquitoes which carry malaria. The DDT killed the mosquitos, but also killed a species of wasp which normally eats caterpillars. The caterpillar is a problem as it feeds on the thatched roofs of houses.

c) Suggest an outcome that may have happened over time with the wasp numbers reduced.

[1 mark]

d) Gecko Lizards ate the poisoned mosquitos and wasps. They did not die, but village cats which ate the geckos did die. Suggest one effect of reducing the cat numbers in the villages.

[1 mark]

Question 35

[11 marks]

European rabbits (*Oryctolagus cuniculus*) were introduced by settlers into Australia in 1859, when 24 rabbits were released near Geelong. Very quickly, the rabbit population grew enormously across the continent. The rabbit's rapid spread led to the destruction of large areas of vegetation and the extinction of many plant species. Farmers attempted to control the rabbits by shooting, using poisons, destroying warrens and eventually introducing the Myxomatosis virus (in 1950), as a form of biological control. This virus, a natural parasite of the Brazilian forest rabbit, was lethal for European rabbits. It quickly reduced Australia's rabbits to a mere 5% of former numbers. However, this solution was not long-lasting and rabbit numbers recovered.

- a) Name and describe a procedure for estimating rabbit numbers in a particular area.

[4 marks]

- b) Suggest why rabbit numbers increased rapidly in the first 70 years.

[1 mark]

- c) Suggest why rabbits were introduced into Australia by settlers.

[1 mark]

- d) Describe two possible effects on an ecosystem when a plant species dies out.

[2 marks]

- e) Suggest one advantage and one disadvantage of biological control as a means of controlling pest populations.

[2 marks]

- f) Suggest why rabbit numbers eventually recovered after the introduction of the Myxomatosis virus.

[1 mark]

Question 36

[16 marks]

- a) There are four major types of biomacromolecule. Name two of these and complete the following table.

Name	Subunit	Example of a cellular function

[6 marks]

- b) Red blood cells do not gain or lose water when they are placed in a 0.9% NaCl solution. What term is used to describe the concentration of the solution compared to the concentration of the red blood cells?

[1 mark]

- c) State whether the following solutions would be considered hypertonic or hypotonic to red blood cells.

(i) 15% NaCl

(ii) 0.001% NaCl

[2 marks]

- d) Name two processes that occur in either plant or animal cells which require the use of enzymes.

[2 marks]

- e) List two environmental factors that can change the activity of an enzyme.

[2 marks]

- f) Advertisements for washing powder sometimes promote the product's inclusion of enzymes, which are reported to boost its power. Suggest why enzymes are added to washing powder.

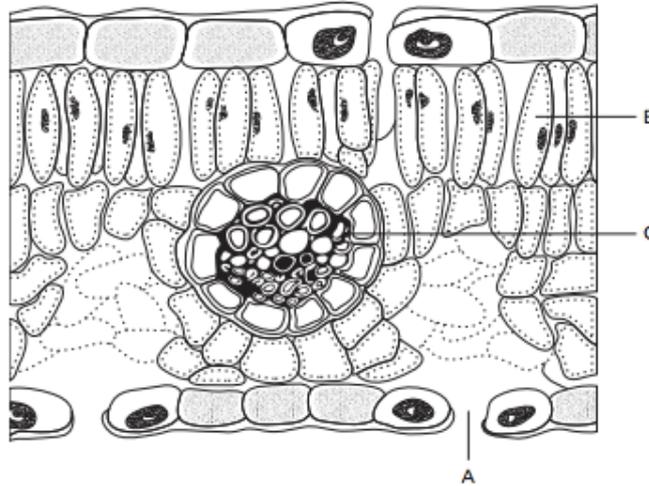
[2 marks]

- g) The instructions for using these washing powders recommend a wash of 40°C. Suggest what would happen to the enzymes if you used a hot wash of 85°C.

[1 mark]

Question 37**(16 marks)**

The diagram below shows a section through a leaf.



- a) State the name of the opening labelled 'A'.

[1 mark]

- b) Describe the function of the opening labelled 'A'.

[2 marks]

- c) State the name of the cells labelled 'B'.

[1 mark]

- d) State the function of the cells labelled 'B'.

[1 mark]

- e) State the name of the round group of cells labelled 'C'.

[1 mark]

- f) State two function(s) of the group of cells labelled 'C'.

[2 marks]

g) Write a chemical word equation that summarises the process of photosynthesis.

[2 marks]

h) Photosynthesis is divided into two distinct stages. Complete the following table by giving information about these stages.

Name of stage	Site within a chloroplast

[4 marks]

i) Suggest two ways of improving the rate of photosynthesis in tomato plants that are grown in a greenhouse.

[2 marks]

Question 38**[15 marks]**

- a) State the difference in heart structure you would expect between a frog (amphibian) and a tuna (a fish). (Use correct biological terms for all structures)

i) frog _____

ii) tuna _____

[2 marks]

- b) Describe and explain why the circulation of a mammal such as a human is more efficient than that of both the tuna and the frog.

[4 marks]

- c) Give four key properties of a respiratory surface and/or structure, that enable fast diffusion of gases.

[4 marks]

- d) Give two reasons why terrestrial animals have their gas exchange surfaces inside their bodies.

[2 marks]

- e) Fish have gills rather than lungs as their respiratory organ. Describe and explain ONE adaptation specific to gills that fits them for gas exchange in water.

[3 marks]

Section Three: Extended answer**20% (40 marks)**

Section Three consists of two parts each with three questions. You must answer **two** questions from each part.

Part A questions are below

Part B questions commence on page 38

Use blue or black pen for written answers and pencil for diagrams. Crossing out of incorrect material is acceptable and preferred to using correction fluid.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or additional space if required to continue and answer

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- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.

Suggested working time: 50 minutes.

Part A

Answer any **two (2)** parts from 39 a), b) or c)

(20 marks)

Indicate the questions you will answer by ticking the boxes next to the question. Write your answers on the pages provided. When you have answered your first question, write the number of the second question you will answer on that page. Then turn to page 38 to select your next two questions.

Question 39**39a)****(10 marks)**

Describe the travels of a red blood cell on one complete circuit around the body starting with a red blood cell that has just released its oxygen in the big toe.

Include in your description the types of vessels it would travel in, as well as the names of key vessels and any major organs and organ parts it would definitely have to pass through on the journey.

39b)**(10 marks)**

Protein synthesis involves two stages, **transcription** and **translation**. Describe the main steps in each of these processes.

39c)**(10 marks)**

Compare and contrast the processes of photosynthesis and respiration, including reactants needed, products produced, energy used or released, and the structures within a cell required for each process.

Include a diagram of cell structures in your answer.

Part B

Answer any **two (2)** Questions from 40 a), b) or c).

(20 marks)

Indicate the questions you will answer by ticking the boxes next to the questions. Write the question number at the top of the page that you will answer.

Question 40**40a****(10 marks)**

In this course you have studied the concept of biodiversity at three different levels. Describe these three levels giving examples of each. Explain why it is important to maintain biodiversity at each of these levels

40b**(10 marks)**

Biologists are becoming increasingly involved in projects to monitor, conserve and maintain natural ecosystems.

Explain what biologists mean by the term '**ecosystem**' and name **two** specific examples of ecosystems that are under threat from human activity. One example must be terrestrial and the other aquatic.

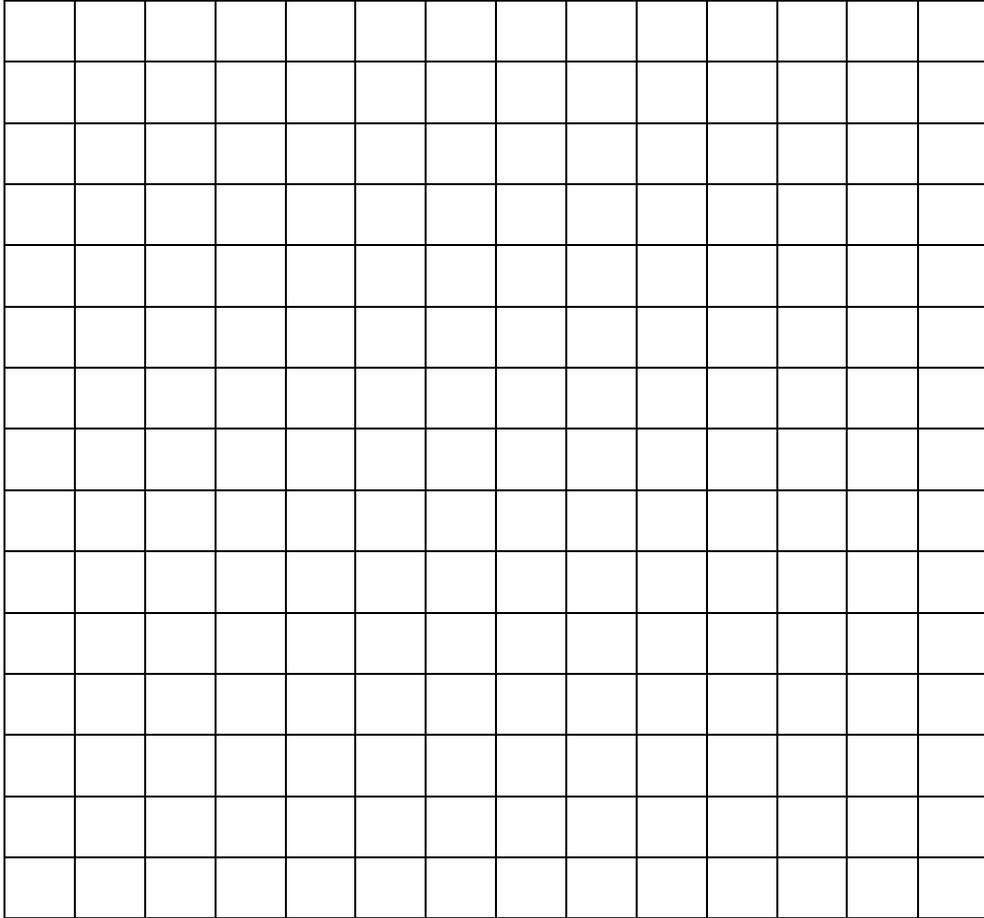
Outline briefly **one** important problem that each of your named ecosystems faces and describe **one** strategy that biologists are using to address or minimize the problem. The problems and strategies you describe must be significantly different for each ecosystem.

40c**(10 marks)**

Enzymes are molecules that are essential for all organisms to survive. They control the rate of reactions in many biological processes.

Describe the properties and actions of enzymes and explain the induced fit and lock and key models.

Explain how change in temperature and pH can affect the rates of reactions that are controlled by enzymes.





Methodist Ladies' College
Year 11 ATAR Biological Sciences
Semester 2 Examination 2016

NAME _____

MULTIPLE CHOICE ANSWER SHEET:

Use blue or black pen to shade the alternative of your choice

1	[A]	[B]	[C]	[D]
2	[A]	[B]	[C]	[D]
3	[A]	[B]	[C]	[D]
4	[A]	[B]	[C]	[D]
5	[A]	[B]	[C]	[D]
6	[A]	[B]	[C]	[D]
7	[A]	[B]	[C]	[D]
8	[A]	[B]	[C]	[D]
9	[A]	[B]	[C]	[D]
10	[A]	[B]	[C]	[D]
11	[A]	[B]	[C]	[D]
12	[A]	[B]	[C]	[D]
13	[A]	[B]	[C]	[D]
14	[A]	[B]	[C]	[D]
15	[A]	[B]	[C]	[D]
16	[A]	[B]	[C]	[D]
17	[A]	[B]	[C]	[D]
18	[A]	[B]	[C]	[D]
19	[A]	[B]	[C]	[D]
20	[A]	[B]	[C]	[D]
21	[A]	[B]	[C]	[D]
22	[A]	[B]	[C]	[D]
23	[A]	[B]	[C]	[D]
24	[A]	[B]	[C]	[D]
25	[A]	[B]	[C]	[D]
26	[A]	[B]	[C]	[D]
27	[A]	[B]	[C]	[D]
28	[A]	[B]	[C]	[D]
29	[A]	[B]	[C]	[D]
30	[A]	[B]	[C]	[D]

