STUDENT NUMBER/NAME: .....

TEACHER: ……..……...

NORTH SYDNEY GIRLS HIGH SCHOOL

2014

Preliminary Course

Yearly Examination

BIOLOGY

General Instructions

- Reading Time – 5 minutes
- Working Time – 2 hours
- Write using black or blue pen
- Draw diagrams using pencil
- Board-approved calculators may be used
- Write your student number, and that of your teacher, at the top of this booklet and on the multiple choice answer sheet

Total Marks – 75

Section I – 20 Marks

- Attempt questions 1- 20

Section II – 55 Marks

- Attempt questions 21-29

Plan your answers in order to write neat, concise and scientifically correct answers.

Make it easy for the marker to recognise the quality of your work.

Section I – 20 marks

Attempt Questions 1 - 20

Use the multiple-choice answer sheet.

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

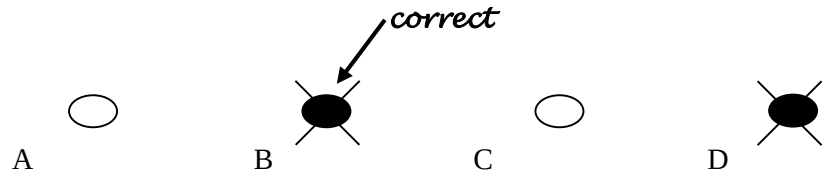
Sample: 2 + 4 = (A) 2 (B) 6 (C) 8 (D) 9



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:



Multiple choice questions start on the next page

1 On a marine rock platform, which factor is *abiotic?*

(A) Predation from crustaceans
(B) Tidal movements
(C) Viral disease of rock cod
(D) Competition for space between mollusc species

2 The general word equation for plant *photosynthesis* is shown, but two parts are missing.

$$\text{Carbon dioxide + water} \xrightarrow[X]{\text{Sunlight}} \text{Y + oxygen}$$

What two alternatives best complete parts X and Y, respectively?

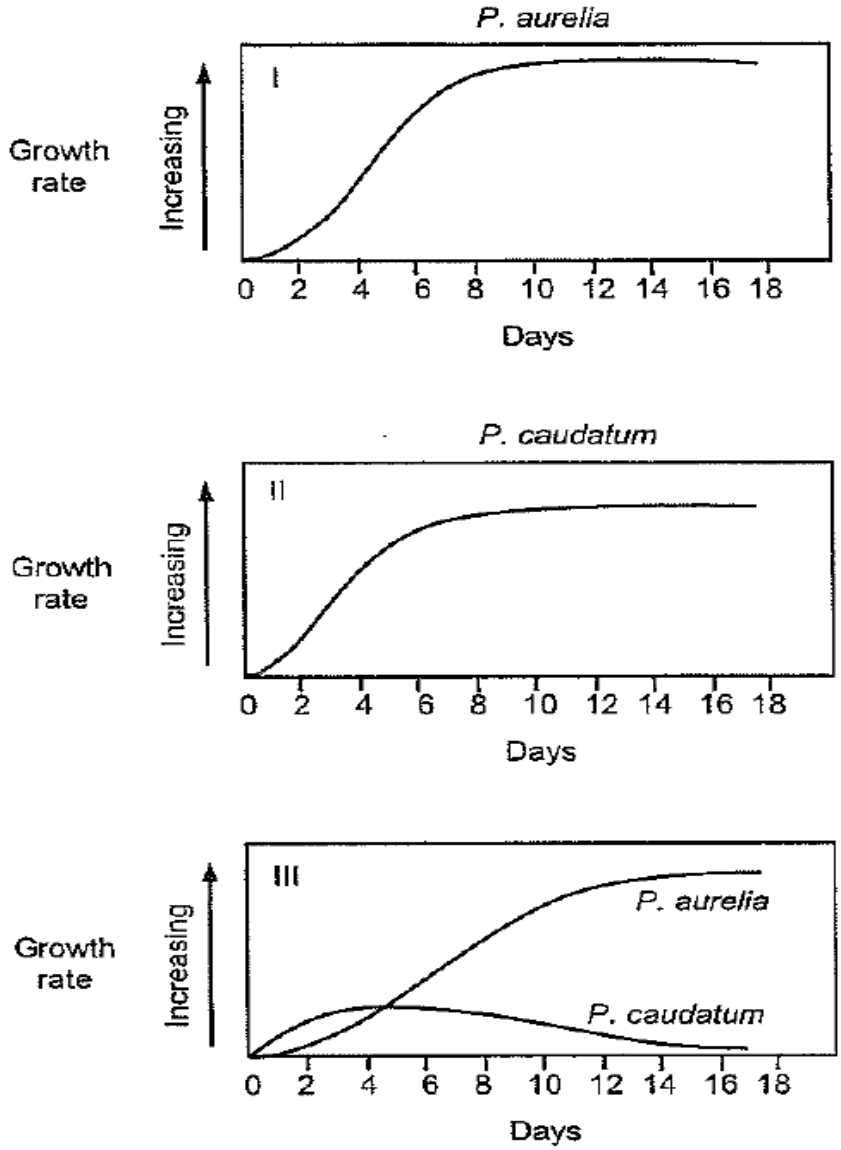
(A) Chloroplasts and sucrose
(B) Glucose and energy
(C) Chloroplasts and energy
(D) Chlorophyll and glucose

3 What is the best definition for the term *adaptation?*

(A) When organisms develop new features to survive, in response to sudden changes in environmental conditions
(B) Any feature of an organism that helps it to survive to reproduce in its environment
(C) When groups of organisms become isolated over time and evolve into new species.
(D) When different species co-exist and exhibit behaviours that help each other in a changing environment

4 *Paramecium aurelia (P. aurelia)* and *Paramecium caudatum (P. caudatum)* are both protozoan species.

The graphs below show the population density of these protozoa versus time, when grown separately OR together in an area with finite resources.



Which of the following would be the best description for the relationship shown in the graphs?

(A) Neutralism
(B) Mutualism
(C) Competition
(D) Commensalism

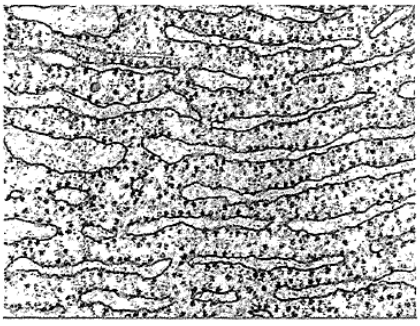
5 The table below compares the generalised structure of four different kinds of cells.

Cell	Nucleus	Cell membrane	Cell wall	Cytoplasm	Chloroplast	Vacuole
W	✓	✓	✓	✓	✗	✓
X	✓	✓	✓	✓	✓	✓
Y	✓	✓	✗	✗	✗	✗
Z	✗	✓	✓	✓	✗	✗

From the information above which row correctly identifies the different kinds of cells.

	Type of cell			
	Animal	**Plant**	**Fungal**	**Bacterial**
(A)	W	Z	X	Y
(B)	X	Y	W	Z
(C)	Y	X	Z	W
(D)	Y	X	W	Z

Refer to the electron micrograph of rough *endoplasmic reticulum* to answer Questions 6 and 7.



6 What are the *small dark structures* seen attached to the endoplasmic reticulum?

(A) Cell membranes
(B) Golgi bodies
(C) Lysosomes
(D) Ribosome

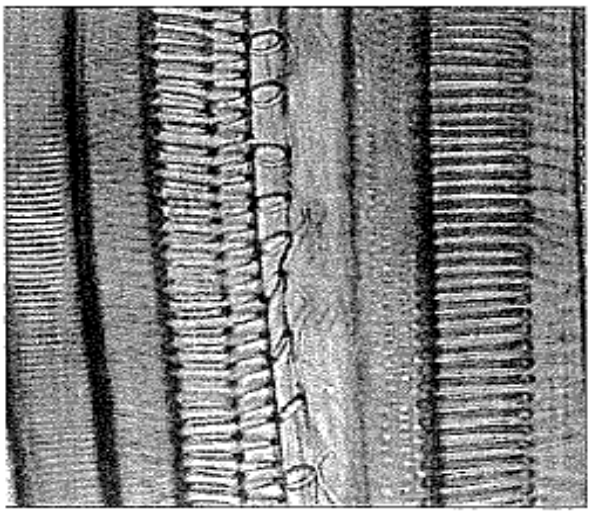
7 What is the *function* of these small dark structures?

(A) To break down waste material and cell debris
(B) The manufacture of proteins
(C) To transport materials in the cytoplasm
(D) The site of photosynthesis in the cell

8 What distinguishes *autotrophs* from *heterotrophs?*

(A) Heterotrophs cannot photosynthesise.
(B) Autotrophs do not produce wastes like heterotrophs-, ..
(C) Autotrophs do not undergo respiration like heterotrophs.
(D) The biomass of heterotrophs is always far greater than autotrophs.

9 Plant *xylem vessels* are shown in this micrograph.



What is the main function of xylem vessels?

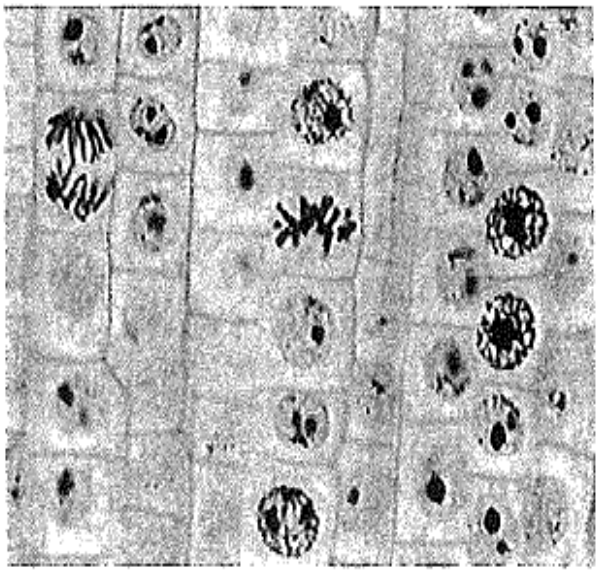
(A) To transport food from leaves to other parts of the plant
(B) To transport water and minerals from the roots to the leaves
(C) To store food for use in cell respiration
(D) To store water during drought conditions

10 The invention of the microscope was a major advance in the field of Biology. Subsequent refinements of the microscope have led to further discoveries and advancements in this field.

Which microscope was responsible for the discovery of the nucleus?

(A) Robert Hooke's microscope
(B) Robert Brown's microscope
(C) Modern light microscope
(D) Transmission electron microscope

11 Where would you most likely find the cells seen in the micrograph below?



(A) In xylem tissue in a stem
(B) In the outer bark of old stems
(C) In the waxy cuticle of a leaf
(D) In a growing plant root tip

12 What was the contribution of the Harold Urey and Stanley Miller experiments to our understanding of the nature and practice of Science?

(A) Their experiments disproved the earlier hypotheses on the origin of organic molecules in early Earth.
(B) Their experiments produced a repeatable model, to show that organic molecules could have arisen under the conditions hypothesised in early Earth.
(C) They showed that organic molecules are common in the solar system and life is possible on other planets.
(D) They developed a hypothesis to demonstrate that simple life could have developed on other planets and meteorites, and from there "seeded" Earth.

13 A major stage in the evolution of organisms, from unicellular eucaryotic cells to multicellular organisms, must be cooperation amongst these cells to form which of the following?

(A) Colonial organisms
(B) Membranes
(C) Organic molecules
(D) Procaryotic cells

14 Why is *genetic variation* important within a species?

(A) Genetic variation allows different species to crossbreed, thus improving their chances of survival.
(B) Genetic variation results in members of a species developing similar characteristics and therefore becoming better adapted to their environment.
(C) Genetic variation slows down change within a population, reducing the chances of extinction.
(D) Genetic variation allows a species to survive to reproduce if environmental conditions change

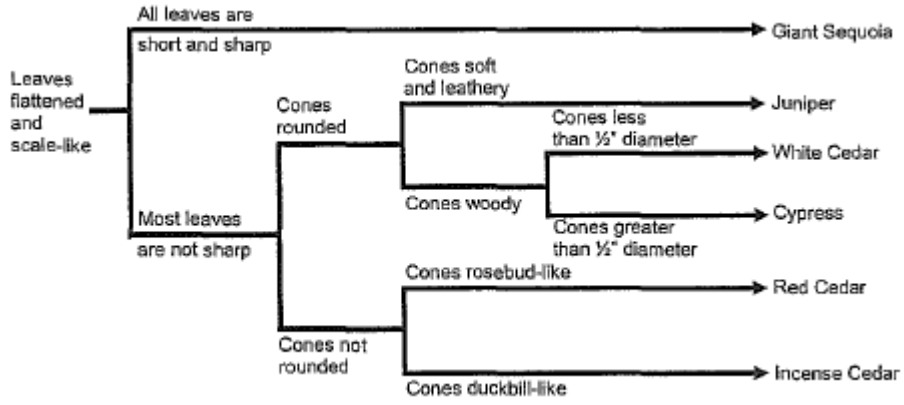
15 Why do scientists study past environments, when predicting the impact of humans in Australia today?

(A) The impact of humans on environments today can only be assessed when we compare them to past environments before humans arrived in Australia.
(B) The Australian climate and rainfall has changed very little over hundreds of millions of years, so past environments provide a good comparison.
(C) Australia is an island continent and isolated, so Australian fauna and flora have changed very little over hundreds of millions of years.
(D) It is much easier for scientists to use instruments to study fossil life and use radiometric dating to gather information in a laboratory, than in the field.

16 What is one piece of *biological* evidence that supports the theory that Australia was once part of a giant supercontinent, called Gondwana?

(A) Matching continental margins of Gondwanan continents
(B) Position of mid-ocean ridges
(C) Fossils in common on Gondwanan continents
(D) Spreading zones between continental plates

17 Observe the following *dichotomous key*.



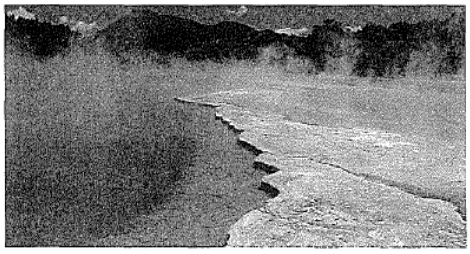
What are the characteristics of a Juniper tree?

(A) The leaves are short and sharp.
(B) The leaves are not sharp but the cones are rounded, soft and leathery.
(C) The leaves are not sharp; cones are not rounded but rosebud-like.
(D) The leaves are not sharp; cones are not rounded but duck-bill like.

18 At which level in the hierarchical system of classification are organisms, in the same grouping, most similar?

(A) Kingdom
(B) Class
(C) Family
(D) Species

19 Observe the image of hydrothermal springs in Rotorua, New Zealand.

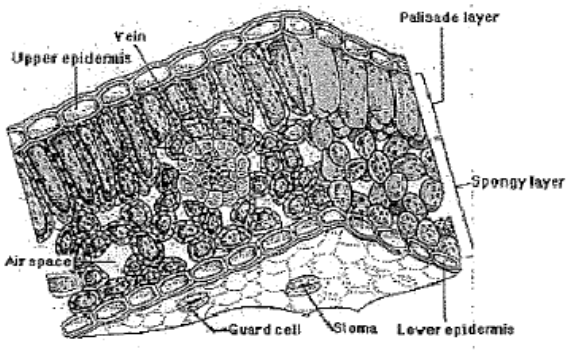


The 70°C hot springs contain a group of microscopic organisms that do **not** have membrane-bound organelles, do **not** require sunlight for photosynthesis, **but** use sulfur as a source of energy.

What group do these organisms most likely belong to?

(A) Eucaryotic autotrophs
(B) Procaryotic chemotrophs
(C) Eucaryotic heterotrophs
(D) Procaryotic autotrophs

20 Observe the plant leaf cross-sectional diagram below.



Why are *palisade cells* usually found packed closely together towards the upper layer in a plant leaf?

(A) To protect the leaf from impact damage
(B) To protect the leaf from insect attack by forming a protective insulative layer
(C) To maximise exposure to sunlight for photosynthesis by the chloroplasts
(D) To reduce water loss through leaf transpiration

STUDENT NUMBER/NAME: ..... .

Section II

55 marks
Attempt Questions 21-29
Allow about 1 hour and 20 minutes for this section
Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.

Question 21 (14 marks)

A group of school students undertook a field study of a marine rock platform ecosystem.

Their first task was to estimate, by using random quadrats, the abundance of four different populations of mollusc found on the rock platform.
Their data is shown below.

Mollusc species	Abundance of molluscs					
	Quadrat (all one square metre)					
	1	2	3	4	5	6
chiton	3	9	55	32	5	0
mussel	0	0	0	12	19	0
limpet	0	6	13	1	40	0
barnacle	0	3	30	150	200	0

The total area of the marine rock platform was estimated as 2 000 m^2

Question 21 continues on the next page

Question 21 (continued) **Marks**

(a) (i) Estimate the size of the population of limpets on the platform (show working). **2**

……

……

(ii) Explain why random quadrat sampling would probably **not** be the best sampling method for organisms such as red rock crabs. **1**

……

……

……

(iii) Is the data *valid and reliable* in estimating abundance on the rock platform? Justify your answer. **2**

……

……

……

……

……

(iv) List TWO *safety* precautions the students should take when working on the marine rock platform. **2**

……

……

……

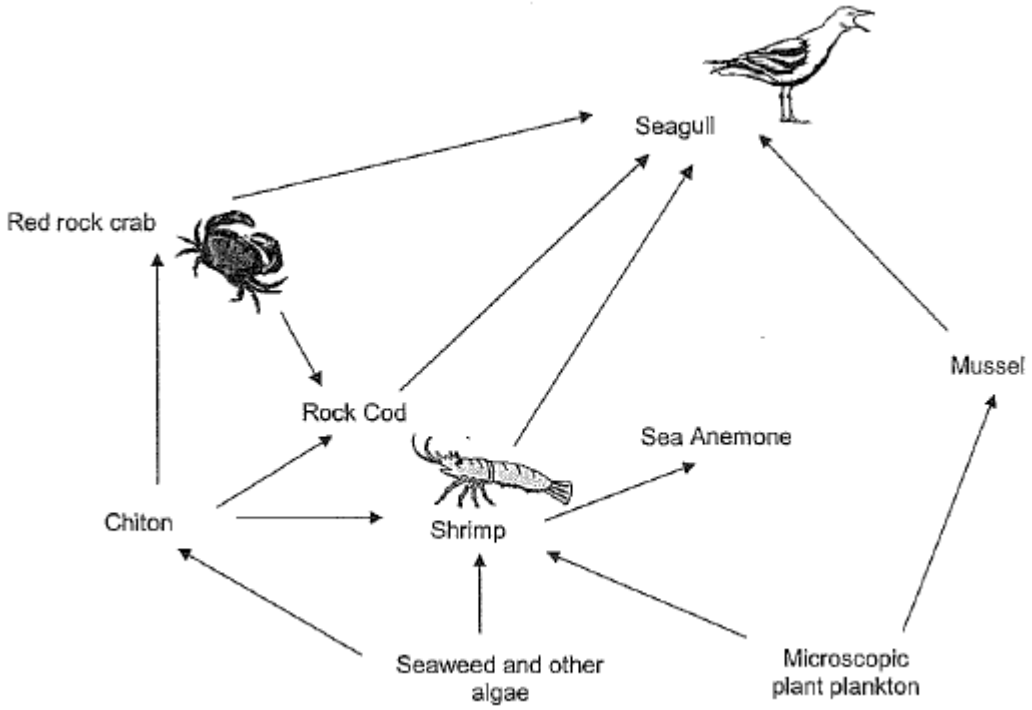
……

……

Question 21 continues on the next page

Question 21 (continued) **Marks**

(b) The students constructed a *food web* from organisms observed on the marine rock platform.



This food web identifies the main producer and consumer organisms.

(i) What other important group of organisms is missing? **1**

…….

(ii) Explain why this missing group of organisms is an essential component of nearly all ecosystems. **2**

……

……

……

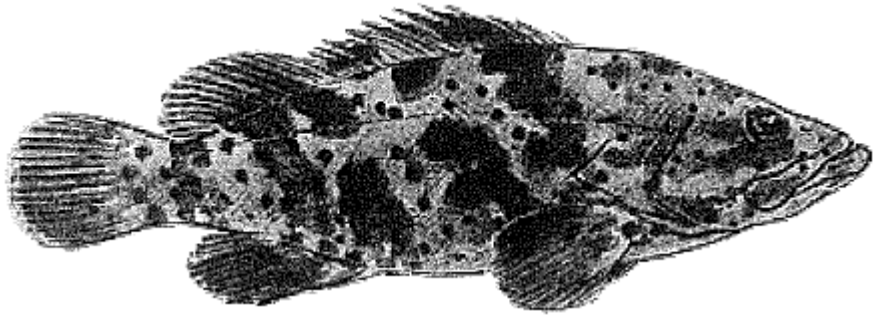
……

Question 21 continues on the next page

Question 21 (continued) **Marks**

(iii) Draw a labelled *biomass pyramid* from the students' marine food web.
(include 4 organism levels) **2**

(iv) Observe the image of the rock cod *(Latella rhacina).*



What would be TWO possible effects on the students' food web if a viral disease killed all the rock cod? **2**

……

……

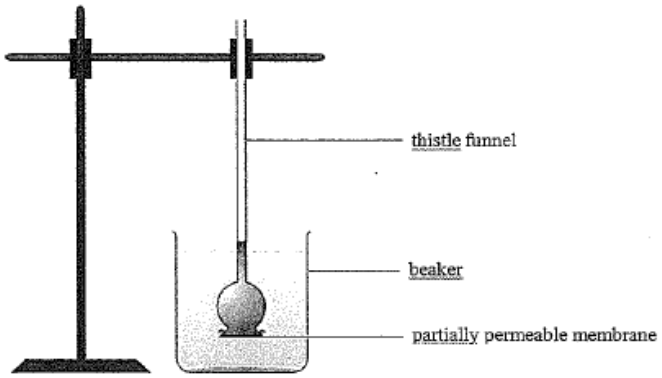
……

……..

End of Question 21, Question 22 begins on the next page

Question 22 (6 marks) **Marks**

A student set up the apparatus below to demonstrate the action of osmosis.



{a) Two solutions need to be added to the experiment to demonstrate *osmosis.* Name each solution AND where it needs to be added. **2**

.....

.....

.....

.....

(b) Describe what you would expect to happen to the level of solution in the thistle funnel after a few hours. Explain your answer. **2**

.....

.....

.....

.....

(c) How does this osmotic process differ from *diffusion?* **1**

.....

.....

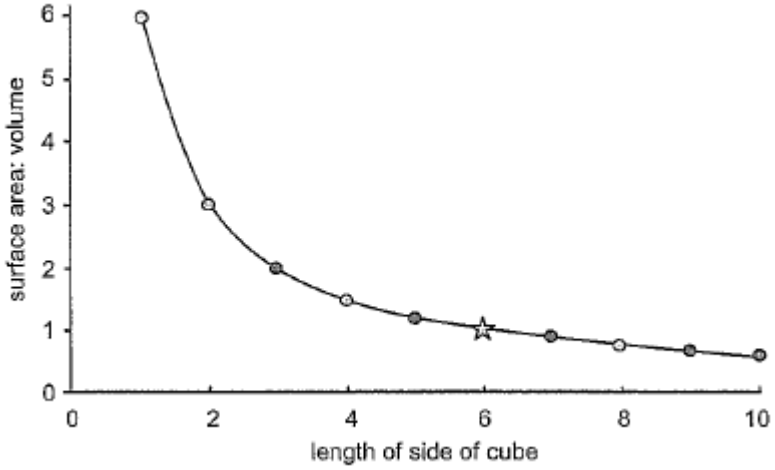
(d) Why do scientists use *models* such as this to explain osmosis? **1**

.....

.....

Question 23 (3 marks) **Marks**

The graph below is:
surface area: volume ratio *versus* size of a cube (of six equal-length, square sides)



(a) What conclusion can you draw from this graph? **1**

……

……

(b) What implications does your conclusion have for the movement of materials into, and out of, cells? **2**

……

……

……

……

Question 24 is on the next page

Question 24 (8 marks) **Marks**

(a) Use examples to explain two roles of teeth in the process of digestion? **2**

……

……

……

……

(b) Assess the reasons for Megafauna decline on the Australian continent, with reference to climate change and human impact. **6**

……

……

……

……

……

……

……

……

……

……

……

……

Question 25 is on the next page

Question 25 (2 marks) **Marks**

Draw a table comparing two features of mitosis and meiosis **2**

Question 26 (4 marks)

(a) Briefly explain how the Earth's atmosphere changed from anoxic to oxic. **1**

……

……

……

(b) Describe one piece of evidence that helped determine when the atmosphere changed from anoxic to oxic. **1**

……

……

……

(c) Explain why the change in Earth's atmosphere from anoxic to oxic was significant in the evolution of living things. **2**

.....

.....

.....

.....

.....

Question 27 (6 marks)

(a) Compare the light phase (photolysis) with the light independent phase of photosynthesis. **3**

.....

.....

.....

.....

.....

.....

.....

(b) Contrast (point out differences only) photosynthesis with respiration. **3**

.....

.....

.....

.....

.....

.....

.....

Question 28 (8 marks)

(a) Complete the table on fertilisation processes. **4**

Internal fertilisation	*External fertilisation*
Large numbers of male gametes and relatively few female gametes produced	
Occurs mainly in terrestrial environments	
	Low chance of individual gamete fertilisation because male gametes are released into an open environment
	Most fertilised gametes are predated on or moved away by water currents

(b) Describe one advantage of asexual reproduction and one of sexual reproduction in plants. **2**

……

……

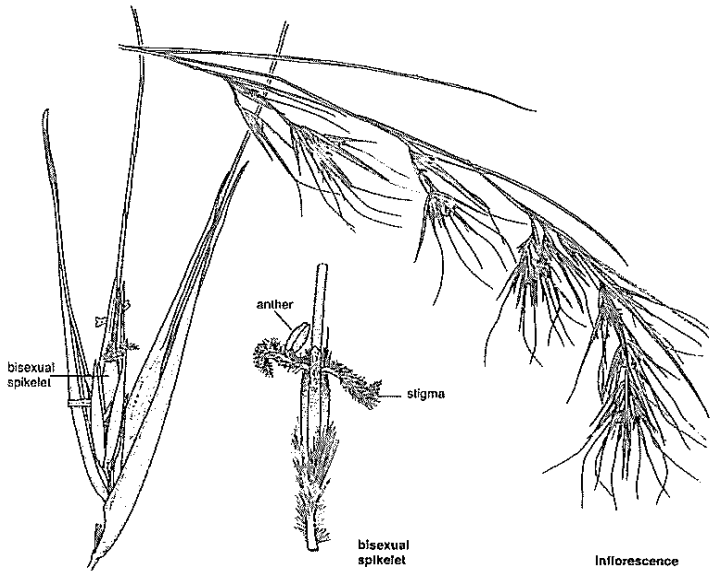
……

……

Question 28 continues on the next page

(c) The diagram is that of the a plant you saw on your excursion to the Royal Botanic Gardens:

Themeda australis
Kangaroo Grass



What is the most likely pollinator of this flower? Justify your answer. **2**

……

……

……

……

Question 29 is on the next page

Question 29 (4 marks) **Marks**

For the following examples of Australian fauna, describe some *mechanisms* found in EACH to ensure:

- Fertilisation and embryonic development
- Survival of the embryo and of the young after birth **4**

Red Kangaroo:

……

……

……

……

……

Stumpy-tail lizard:

……

……

……

……

……

End of paper