Hornsby Girls High School

Year 11 Yearly Examination

Biology

BOOKLET 1

Student Number …….……

Total Assessment Weighting 40%

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 on the front of this booklet and on the multiple choice answer sheet.
- **Do NOT write in the margins – ask for a booklet if you require more room to complete a question and indicate on the exam paper that there is a booklet for that question.**

Total marks: 72
This exam has TWO sections has two parts: Section I and Section II

Section I – 20 marks (Multiple Choice)
• Attempt Questions 1–20.

Section II – 52 marks (Short Answers)
• Attempt Questions 21-30
• Section II is spread across Booklet 1 and Booklet 2

---------- **Teacher Use Only** ----------

Multiple Choice Marks

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q 10	Q 11	Q 12	Q 13	Q 14	Q 15	Q 16	Q 17	Q 18	Q 19	Q 20	Total MC

Booklet 1

Question	Max mark	Your mark
Q21	8	
Q22	6	
Q23	3	
Q24	8	

Booklet 2

Question	Max mark	Your mark
Q25	3	
Q26	7	
Q27	5	
Q28	4	
Q29	4	
Q30	4	
TOTAL		

Section 1

Part A – Multiple Choice 20 Marks (1 mark each)

Answer on the separate Multiple Choice Answer Sheet.

1 Why is the use of teeth to chew food an important part of the digestive process?

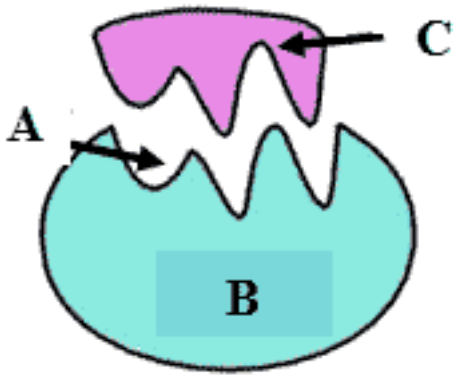
A. Chewing food reduces the need for further digestion by enzymes

B. Chewing food helps to increase the surface area over which digestive enzymes act.

C. Chewing food helps to decrease the surface area over which digestive enzymes act.

D. Chewing food helps to break down complex molecules such as starch and proteins.

2 The following diagram illustrates a biological substance that is important for all living things



The correct label for A is:

A. enzyme

B. substrate

C. active site

D. substrate –enzyme complex

3 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

4 Which statement best outlines the evolutionary theory of punctuated equilibrium?

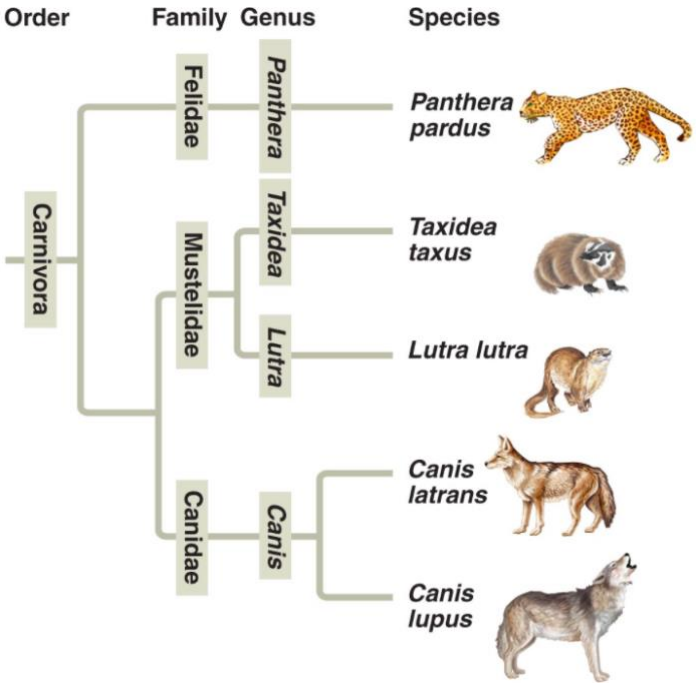
A. Periods of rapid evolution, disrupted by periods of evolutionary stability

B. Periods of evolutionary 'boom and bust' caused by biotic features within the environment

C. Sustained and gradual evolution over a long period of time, disturbed by the evolution of new species

D. The period of time in which the changes have occurred is minimal in comparison to the evolutionary change

5 Observe the phylogenetic tree below.



Which two organisms are most closely related?

A. *Panthera pardus* and *Lutra lutra*

B. *Taxidea taxus* and *Panthera pardus*

C. *Luntra lutra* and *Canis lupus*

D. *Canis latrans* and *Canis lupus*

6 Insects have an open circulatory system in which blood is not confined to blood vessels but flows in spaces in the tissues so that each cell is bathed in blood. Active insects can survive with this type of system because they do not rely on blood to transport oxygen. On the basis of this information, which one of the following would you expect to be absent from the blood of insects

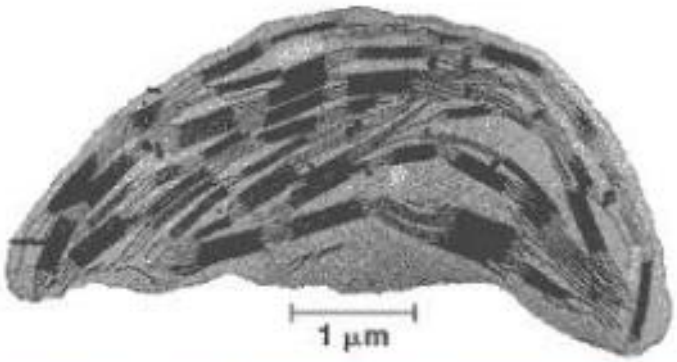
A. Oxygen.

B. White blood cells.

C. Red blood cells.

D. Glucose.

7 The actual size of the organelle shown is closest to:



Source: https://encrypted-tbn0.gstatic.com/images?q=tbn%3AANd9GcSn9lEcGvUq2JVEicWGqvrEv2AMHtvtgXpmg&usqp=CAU

A. 5 micrometres

B. 5 nanometres

C. 5 cm

D. 1 µm

8 Why do multicellular organisms grow by increasing the number of cells instead of the existing cells becoming larger?

A. Larger cells have a high surface area to volume ratio for diffusion

B. Small cells have a high surface area to volume ratio enabling rapid diffusion

C. If the surface area to volume ratio is small, the rate of diffusion is high

D. Cells with large volume do not have any diffusion of gases or wastes

9 The diagrams below two different forms of the one species, *Epacris impressa*.





What is the main consequence of variation within a species?

A. One form of the species will always take over from the other form.

B. The species has a lower chance of survival when there are environmental changes.

C. There is a chance that some members of the species will survive when there are environmental changes.

D. The organisms are adapted to the environment.

10 Three biotic factors that can affect the distribution and abundance of a particular species are:

A. competition, temperature and type of vegetation present

B. salinity, competition and available food

C. rainfall, available light and soil depth

D. predation, competition and disease

11 An organism is able to make organic compounds from water, sunlight and inorganic sources. Which type of organism is described above?

A. A heterotrophic organism

B. A eukaryotic organism

C. A prokaryotic organism

D. An autotrophic organism

12 Phagocytosis is the process by which a phagocyte cell engulfs a foreign particle within the body to defend the body against the pathogen.

What is phagocytosis an example of?

A. Exocytosis

B. Endocytosis

C. Active Transport

D. Passive Transport

13 The table shows one set of combined transect results for a dry sclerophyll forest ecosystem.

Transect segment (m)	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55
Number of *Angophora* trees (narrow-leaf)	5	2	3	2	1	0	1	1	0	0	0
Number of *Hakea* trees (broad-leaf)	0	0	1	1	2	3	4	3	4	3	4
Light intensity (lux)	1200	1150	1200	1250	1100	1200	1130	1210	1200	1100	1190
Slope (degrees)	0	0	0	5	10	10	30	10	15	20	15

According to this data, which abiotic factor has the most effect on the distribution of the *Hakea* trees?

A. The number of *Angophora* trees.

B. The amount of light.

C. The slope of the land.

D. The number of pollinators such as possums.

14 In which one of the following cellular activities do ribosomes play a main role?

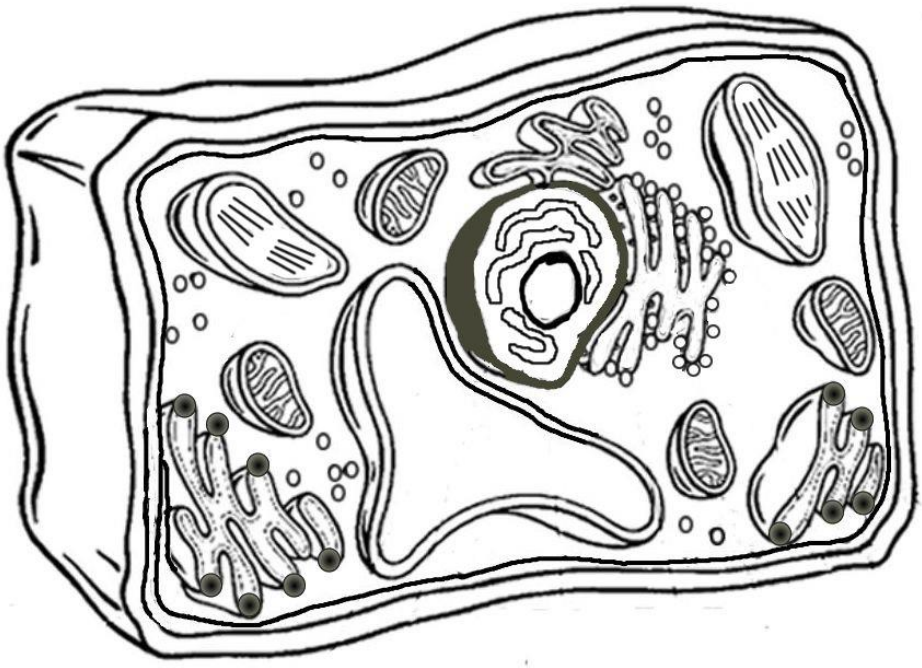
A. chemical respiration

B. digestion of cell debris

C. protein synthesis

D. maintaining cell turgidity

15 Questions 15 and 16 refer to the diagram, which shows a typical plant cell.



What is the function of the organelle labelled A?

A. Golgi body and transporting, modifying, and packaging proteins and lipids into vesicles for delivery to targeted destinations.

B. Mitochondrion and cell respiration.

C. Chloroplast and photosynthesis.

D. Smooth endoplasmic reticulum and synthesis, folding, modification, and transport of proteins

16 What is the correct name and function of the organelle labelled B?

A. Golgi body and transporting, modifying, and packaging proteins and lipids into vesicles for delivery to targeted destinations.

B. Mitochondrion and cell respiration.

C. Chloroplast and photosynthesis.

D. Smooth endoplasmic reticulum and synthesis, folding, modification, and transport of proteins

17 The 'Fluid Mosaic Model' is a representation of the structure and function of which cell organelle?

A. Cell wall

B. Mitochondria

C. Cell membrane

D. Endoplasmic reticulum

18 A species of unicellular green alga can be found inside the outer cells of the simple multicellular aquatic animal, Hydra.
The Hydra obtains oxygen and sugars from the alga's activities and the alga receives carbon dioxide and some essential minerals from the Hydra.
Such a relationship between these organisms would be called:

A. Parasitism.

B. Commensalism.

C. Mutualism.

D. Competition.

19 The dolphin and the shark have both evolved to have a dorsal fin, grey colouring, pectoral fin/flipper and fusiform torpedo shaped body. However, they are not related to each other. Dolphins are mammals and sharks are cartilaginous fish.

What type of evolution are the shark and the dolphin an example of?

A. Allegiant evolution

B. Insurgent evolution

C. Divergent evolution

D. Convergent evolution

20 Which of the following statements is most correct concerning the description below?

Short-beaked Echidna

This is an egg laying mammal with sharp, strong spines along its back and sticky tongue that can protrude from a rounded snout. The spins moult every year and the front feet contain claws that act like spades for digging. There are tiny electrical receptors in the snout to help detect ants in the soil. They can live up to 50 years and in alpine regions hibernate often for 28 weeks at a time.

A. The sticky tongue is a learnt trait picked up from the parents

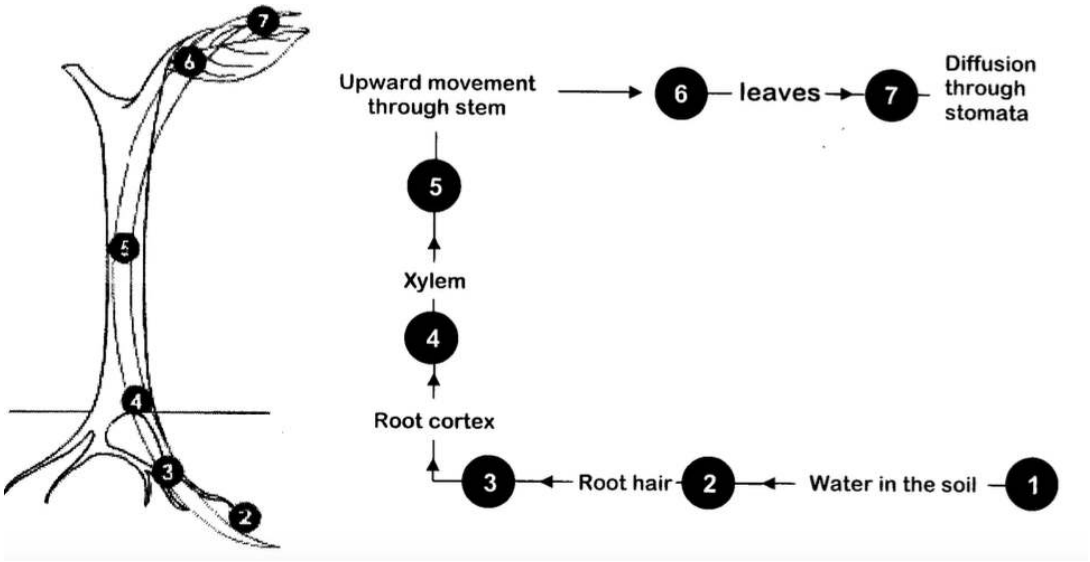
B. An egg-laying mammal like the echidna needs to sun itself on a regular basis to keep its body at optimum operating temperature.

C. The electrical sensors are an example of an adaptation

D. The echidna has a commensalism relationship with the ants

Section II Booklet 1
Attempt Questions 21 – 24 in this booklet.
Answer the questions in the space provided.
Do not write in the margins - if you require more space to complete a question, clearly note on the question that the answer continues then complete the question at the back of the section on the spare lined pages.

21 The diagram below follows the pathway of a water molecule from the soil to the leaves of a plant. (8 marks)



a) State the term for the diffusion of water from stomata in leaves?

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b) What label is missing at A?

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c) Using the above diagram and your knowledge of current theories explain how water moves in plants.

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d) Explain why the phloem tissue is NOT included in the process represented by the diagram.

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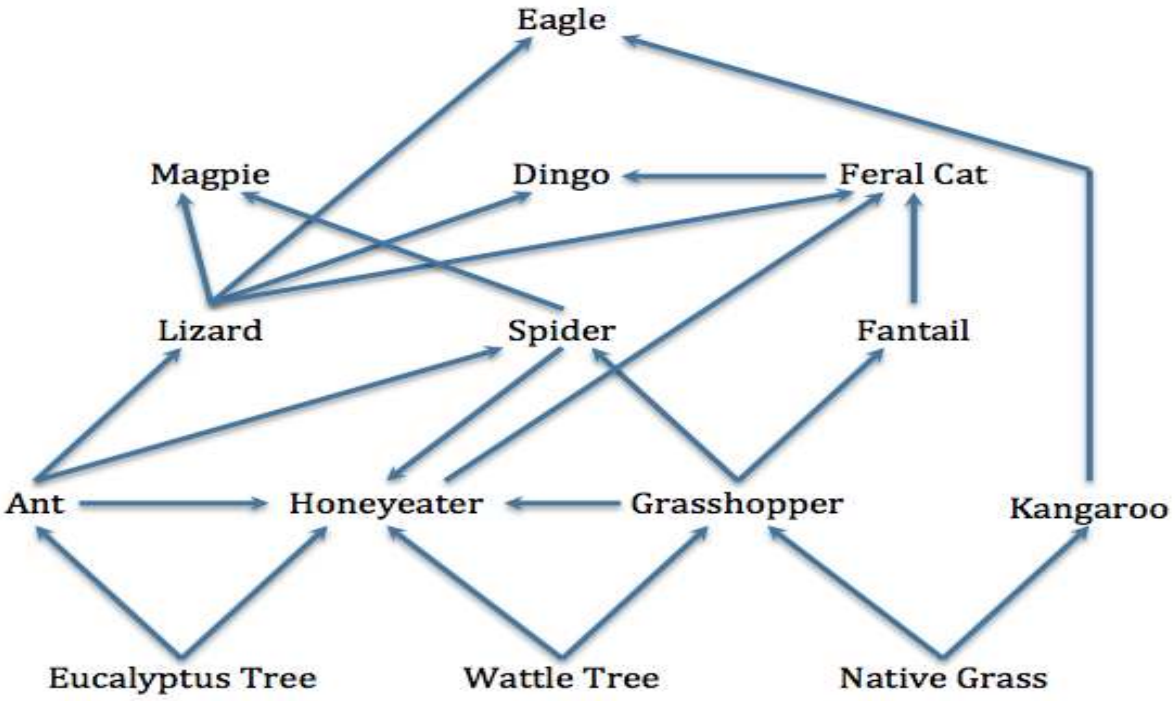
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22 This question refers to the food web shown below from a desert ecosystem. (6 marks)



a) Name the group of organisms, normally present in an ecosystem, but NOT represented in this food web.

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b) What is their function?

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Scientists wanted to estimate the feral cat population. They were able to capture 48 cats. These feral cats were tagged and released unharmed. Two weeks later another 16 feral cats were captured and of these 8 had been tagged.

c) Using the following equation estimate the feral cat population. Show working below.

Estimated Population = $\frac{1^{st} \text{ capture X } 2^{nd} \text{ capture}}{\text{no. of tagged in } 2^{nd} \text{ capture}}$

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d) If there was an increase in the population of the feral cat justify with evidence which organism would be most affected.

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23 Australian Indigenous rock art is characterised by the use of ochre, an inorganic mineral pigment that contains no carbon and as such it is very difficult to date however bone fossils are relatively easier to date as they contain carbon. (3 marks)

a) What is the name of the process that would be used to date the bones and explain how the dating process works? 3

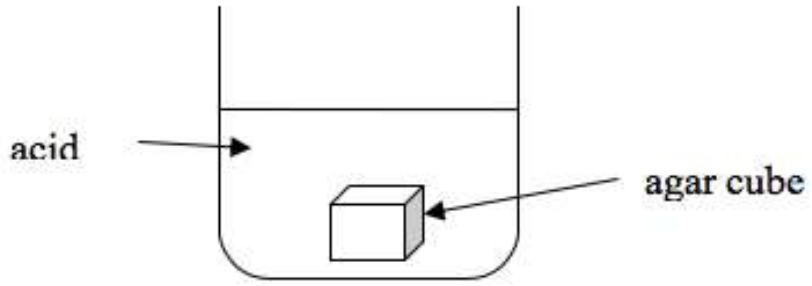
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24 A student set out to investigate the effect of Surface Area: Volume ratio on the rate at which an acid will diffuse into a series of agar cubes containing an indicator which changes from pink to clear in an acid solution. (8 marks)



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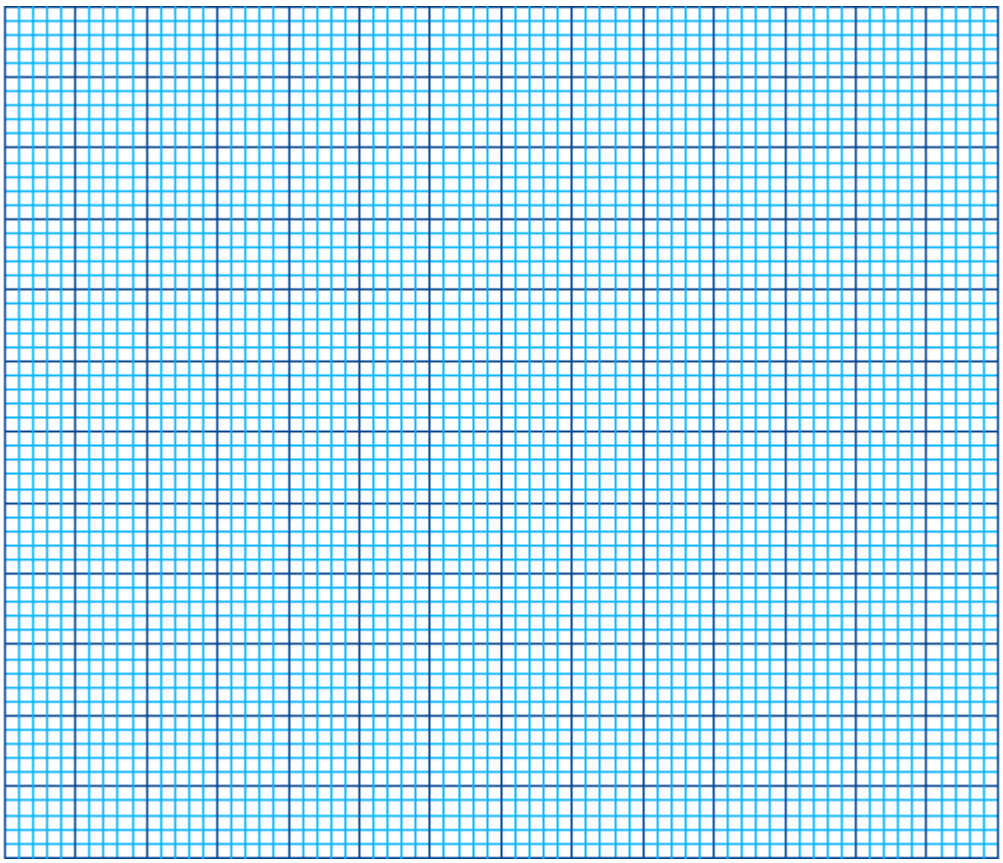
He prepared four cubes of agar of the dimensions shown in the table below by using a scalpel. He then carefully immersed them in the acid as shown above. He then recorded the time taken for the indicator in each cube to become completely clear.

Dimensions of each side of cube (cm)	Surface area of cube (cm^2)	Volume of cube (cm^3)	SA / V	Time taken for cube to become clear (s)
1	6	1	6	50
2	24		3	98
3		27	2	153
4	96	64	1.5	199

2

a) Calculate and fill in the two missing values in the table above.

b) Use the grid below to draw a graph showing the effect of SA/V on the time taken for the cube to become clear



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c) Describe TWO safety precautions that the student should have followed. 2

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Questions 25-30 in Booklet 2

Section II Booklet 2
Attempt Questions 25 – 30 in this booklet.
Answer the questions in the space provided.
Do not write in the margins - if you require more space to complete a question, clearly note on the question that the answer continues then complete the question at the back of the section on the spare lined pages.

25 The data below is a small sample of data collected from the WAIS Divide Ice Core in Antarctica. (3 marks)

Depth (m)	Ice Age (Years BP)	CO_2	Number of replicates
1818.264	10263	270.68	2
1955.203	11590	272.16	4
1985.181	11859	251.55	3
2015.235	12191	257.99	3
2045.244	12526	252.92	3
2075.174	128.60	250.94	3
2105.209	13178	244.71	3
2163.282	13818	247.86	2
2218.212	14453	240.60	4
2246.218	14771	245.73	3
2261.176	14945	234.53	3
2276.19	15126	234.63	3
2305.193	15488	232.27	3

a) Why have the scientists collected multiple replicates?

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b) Discuss the relationship between Depth (m) and CO_2 (ppm).

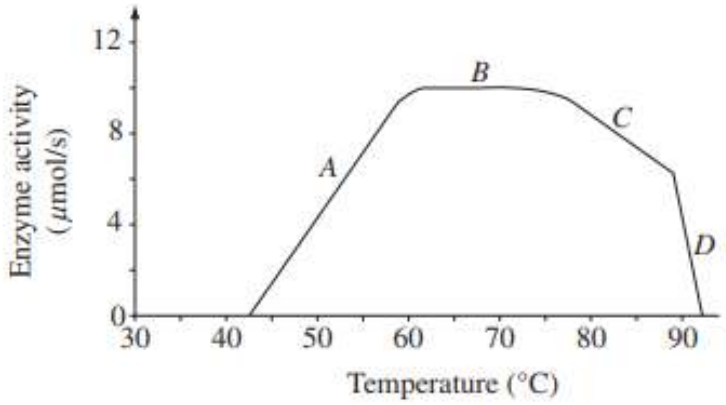
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26 The graph below shows the results obtained from testing the activity of a bacterial enzyme. (7 marks)



a) Name ONE variable, other than temperature, that would have been controlled in the experiment. 1

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b) For what temperature range does the enzyme display the maximum rate of change in activity? 1

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c) Account for the activity of the enzyme at the parts of the graph labelled A, B, C and D. 4

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Based on the information in the graph, suggest the type of environment in which these bacteria might survive. 1

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27 Below is an excerpt from a Murdoch University study on the evolution of kangaroos in Australia

The evolution of kangaroos has given a clear picture of Australia's changing climate, according to a new study conducted by Murdock University.
The study shows how the abundance and diversity of macropods – which includes kangaroos, wallabies and tree-kangaroos – matches the spread of woodlands and grasslands in Australia as forests retreated to the coast over millions of years.
Macropods have been around for at least 30 million years, but difficulties in working out which species are related and when certain lineages evolved have hampered research for more than a century. By comparing skeletons from 35 living and extinct macropod species, the researchers established that while early forms were adapted to the abundant soft-leaved forest plants, later macropods had to adapt to more arid conditions.
"The skull and teeth give us a good understanding of the sorts of food that was available in the environment. The postcranial skeleton, and in particular the feet, give us important clues about how far and fast the animals were moving, which in turn shows us whether the habitat was dense or open." said lead researcher Dr. Natalie Warburton

a) With reference to the excerpt and by using kangaroos as an example, explain Darwin's theory of evolution by natural selection. (5 marks) 5

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28 As Australia separated from the super continent Gondwana, temperature and rainfall changed dramatically in some areas of the continent. (4 marks) 4

a) Explain how a named piece of paleontological and geological evidence supports past changes within the environment.

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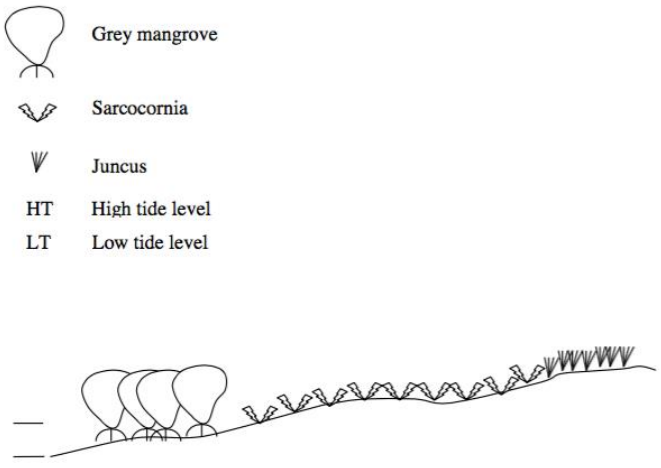
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29 The diagram below shows the distribution of plants along a transect taken by Alex in an estuary in the Sydney region. (4 marks)



a) Describe the distribution of plants shown in this transect at high tide 2

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b) Justify the use of a transect by Alex. 2

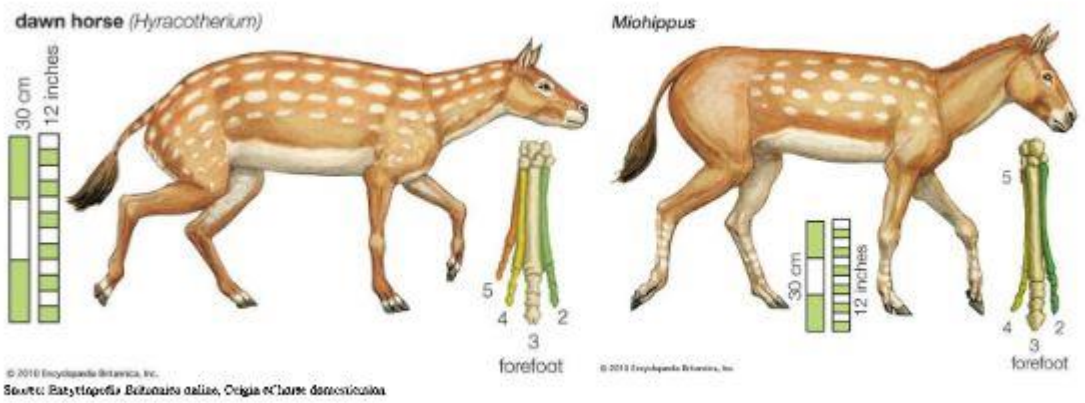
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30 Use the image below for Question 30 (4 marks)



a) Identify TWO differences between the horse ancestors, dawn horse (Hyracotherium) and Miohippus. 2

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b) Using the horse as an example, analyze how micro evolutionary changes can drive evolutionary changes and speciation. 2

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End of Paper

Extra Writing Booklet