

DAPTO HIGH SCHOOL

2009 PRELIMINARY EXAMINATION – BIOLOGY

MARKING GUIDELINES

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	A	C	B	B	B	B	D	B	D	C	B	B	A	D

Section II

Question 16(a)

Criteria	Marks
<ul style="list-style-type: none"> Sequence of organisms outlined Sequence related to nature of rock platform 	2
<ul style="list-style-type: none"> Sequence of organisms outlined 	1

Answers may include: Nodiwinks are found at and just below the extreme high tide mark. Barnacles cluster on the rock below them. Limpets, algae and starfish occupy the next zone below, and below them, leading down to the extreme low tide mark, are sea squirts.

Question 16(b)

Criteria	Marks
<ul style="list-style-type: none"> Appropriate biotic factor named Distribution of named organism linked to that factor 	2
<ul style="list-style-type: none"> Appropriate biotic factor named 	1

Answers may include: One biotic factor which might affect the downward distribution of the barnacles is competition for growing space with algae and limpets.

Question 16(c)

Criteria	Marks
<ul style="list-style-type: none"> 3 appropriate species linked (must be producer, herbivore and carnivore) Chain drawn correctly 	2
<ul style="list-style-type: none"> One of the above 	1

Answers may include: Algae → limpets → starfish

Question 16(d)

Criteria	Marks
<ul style="list-style-type: none"> Quadrat method described <ul style="list-style-type: none"> multiple quadrats numbers counted population density calculated OR <ul style="list-style-type: none"> Capture recapture method correctly described. 	3
<ul style="list-style-type: none"> 1-2 aspects of method described 	1-2

Answers may include: The quadrat method should be used. This involves randomly placing a number of quadrats within the area to be surveyed and counting the number of nodiwinks in each quadrat. The population density can then be determined by dividing the average number per quadrat by the area of the quadrat.

Question 17 (a)

Criteria	Marks
<ul style="list-style-type: none"> Both molecules correctly labelled 	1

Answers may include: Glucose - large molecule, water - small molecule.

Question 17 (b)

Criteria	Marks
<ul style="list-style-type: none"> Movement of glucose described Movement of water described 	2
<ul style="list-style-type: none"> One of the above 	1

Answers may include: Glucose molecules move about, but don't pass through the membrane, they remain on the one side of it. Water molecules move through the membrane. There is greater net movement of water from right to left.

Question 17 (c)

Criteria	Marks
<ul style="list-style-type: none"> Effect of growth on SA/V ratio explained Effect of SA/V ratio on exchange of materials explained 	2
<ul style="list-style-type: none"> One of the above OR <ul style="list-style-type: none"> Both done less well 	1

Answers may include: As an object increases in size, its surface area increases at a smaller rate than its volume. Therefore its SA/V ratio decreases. The quantity of materials that cells need to exchange is a function of their volume. They exchange over their surface, so their ability to exchange is a function of their surface area. As they grow, SA/V decreases, therefore their ability to exchange what they need to, decreases.

Question 18 (a)

Criteria	Marks
<ul style="list-style-type: none"> Correct plot, histogram Correct axes (x = head and beak length, y = no. of birds) Correct labels 	3
<ul style="list-style-type: none"> 1-2 of the above 	1-2

Question 18 (b)

Criteria	Marks
<ul style="list-style-type: none"> Importance of genetic variation in changing conditions outlined Link made between this and survival of species 	2
<ul style="list-style-type: none"> One of the above OR <ul style="list-style-type: none"> Both less well done 	1

Answers may include: Genetic variation is essential for the survival of a species in changing conditions. The genetic variants which are best suited to new conditions survive and reproduce – allowing species to survive.

Question 19

Criteria	Marks
<ul style="list-style-type: none"> One old idea about an Australian species outlined One newer idea outlined Explanation of how new evidence brought about the change in ideas. 	3
<ul style="list-style-type: none"> 1-2 of the above 	1-2

Answers may include: The platypus was first thought to be a hoax when specimens were sent to European biologists. Once they had determined that it wasn't a hoax they classified it as a placental mammal on the basis of its physical characteristics. Subsequently it was reported that platypus's reproduced by laying eggs. This caused scientists to change their ideas about them and classify them in a new sub class of mammals, the monotremes.

Question 20(a)

Criteria	Marks
<ul style="list-style-type: none"> Correct sequence 	1

Answers may include: BADC

Question 20(b)

Criteria	Marks
<ul style="list-style-type: none"> Explanation given of how each stage made the next stage possible (3 explanations) 	3
<ul style="list-style-type: none"> 1-2 of the above OR <ul style="list-style-type: none"> 2-3 done less well 	1-2

Answers may include: The first procaryotic organisms obtained their nutrition from organic materials present in the 'primordial soup'. They gave rise to autotrophic procaryots which could manufacture organic compounds from CO₂, hydrogen and a source of energy. Without these earlier procaryots the first photosynthetic organisms, the cyanobacteria would not have evolved. Photosynthetic organisms use light energy to separate hydrogen from water.

These cyanobacteria then made the change to an oxic atmosphere happen – they released oxygen as a product of photosynthesis and it accumulated in the atmosphere.

The presence of oxygen in the atmosphere allowed the evolution of more efficient, aerobic respiration pathways. This in turn allowed the evolution of the larger, more efficient eucaryots.

Question 21(a)

Criteria	Marks
<ul style="list-style-type: none"> Evidence given including existence of lunar craters and radiometric dating of lunar rocks from these craters. 	2
<ul style="list-style-type: none"> One of the above 	1

Answers may include: Craters on the moon are the main evidence for the LHB. Radiometric dating of rocks from these craters date from 3.9 to 4.1 billion years old.

Question 21(a)

Criteria	Marks
<ul style="list-style-type: none"> Outline of role of plate tectonics in recycling crust Explanation of how this accounts for absence of crater evidence. 	2
<ul style="list-style-type: none"> Outline of role of plate tectonics in recycling crust 	1

Answers may include: The surface of the Earth is almost all younger than 3.9 billion years old. This is due to plate tectonics – new crust is constantly being made and then destroyed in subduction zones. Any cratered crust from the LHB has long since been destroyed.

Question 21(c)

Criteria	Marks
<ul style="list-style-type: none"> Panspermia outlined Chemical evolution theory outlined Links made between LHB and each theory Assessment given of extent to which each theory is supported or opposed by the LHB. 	4
<ul style="list-style-type: none"> Panspermia outlined Chemical evolution theory outlined Links made between LHB and each theory No assessment given 	3
<ul style="list-style-type: none"> Theories outlined OR <ul style="list-style-type: none"> One theory outlined and links made 	2
<ul style="list-style-type: none"> One theory outlined 	1

Answers may include: The theory of panspermia proposes that the organic chemicals needed for life came from outer space on asteroids or meteorites. The evidence of the LHB provides strong support for panspermia as a theory. It shows that there was a huge number of asteroid impacts with the Earth at this critical time in the Earth's history, making 'seeding' of the Earth with organic chemicals very likely if it is possible to happen. The theory of chemical evolution proposes that the organic chemicals of early life arose here on Earth as a direct result of the conditions which existed here. This theory also receives some support from the evidence of the LHB as these asteroid impacts might have helped create environments such as impact craters, where chemical evolution might have happened.

Question 22(a)

Criteria	Marks
<ul style="list-style-type: none"> Explanation given in terms of remoteness of cells from environment. Contrast made with single celled and simple multicelled organisms. 	2
<ul style="list-style-type: none"> One of the above 	1

Answers may include: Large multicellular organisms have specialised cells which are grouped into tissues and organs. These have the same requirements in terms of O₂ and food as single cells, but are situated where they are unable to obtain these requirements directly by diffusion from the environment. Transport tissues are needed to transport these requirements from the outside environment to the cells which need them. Single celled organisms, or simpler multicellular organisms are able to exchange materials directly with their environment.

Question 22(b)(i)

Criteria	Marks
<ul style="list-style-type: none"> At least two features of xylem tissue described 	2
<ul style="list-style-type: none"> Xylem named, or one feature described 	1

Answers may include: Water and mineral salts are transported in the xylem. Mature xylem tissue consists of dead cells with no end walls – leaving long tubes along which water can move. Their cell walls are thickened with lignin to give them rigidity and keep them from collapsing.

Question 22(b)(ii)

Criteria	Marks
• At least two features of phloem tissue described	2
• Phloem named, or one feature described	1

Answers may include: The products of photosynthesis are transported in the phloem. Phloem tissue consists of cells with living cytoplasm. The main transport cells are called sieve elements, they have sieve-like end walls to allow materials to pass to the next cell. Sieve elements are always found in conjunction with companion cells which are thought to play a role in aiding the function of the sieve elements.

Question 23

Criteria	Marks
• Internal and External fertilisation correctly contrasted for all 3 characteristics	3
• Internal and External fertilisation correctly contrasted for 1-2 characteristics	1-2

Answers may include:

	Internal fertilisation	External fertilisation
Site	Inside body of female	Outside of body.
Relative no. of young	few	Many
Environment suited to.	terrestrial	aquatic

Question 24

Criteria	Marks
• Accurate representation • 4 structures visible under light microscope drawn • 4 structures correctly labelled	3
• 2 of the above OR • all 3 less well done.	1-2

Question 25(a)

Criteria	Marks
• Description of how named technology operates • Explanation of how results can be interpreted to infer degree of relatedness.	2-3
• One of the above	1

Answers may include: DNA-DNA hybridisation works by heating the DNA of the two species to be investigated. Heating causes the double stranded DNA to split into single stranded molecules. The DNA of the two species is then mixed and cooled. On cooling, the single strands join up to make double stranded molecules again. They join up due to the complementarity of their bases. The extent to which the strands of the 2 species pair up is a measure of the extent to which their DNA is similar. The greater the amount of pairing, the more similar they are genetically.

Question 25(b)

Criteria	Marks
• Explanation that classification is based on evolutionary relationships. • Explanation that this information reflects those relationships.	2
• One of the above	1

Answers may include: The more similar two species are genetically, the more recently they shared a common ancestor and hence the more closely related they are.

Classification schemes seek to group species according to their degree of relatedness, so this information can be very useful in classification.

Question 26

Criteria	Marks
• Respiration and photosynthesis contrasted for all 3 criteria.	3
• Respiration and photosynthesis contrasted for 1-2 criteria.	1-2

Answers may include:

	Reactants	Products	Roles in Ecosystems
Photosynthesis	Water + CO₂	Glucose + oxygen	Converts light energy into chemical energy – energy source for ecosystem
Respiration	Glucose + oxygen	Water + CO₂	Converts chemical energy into a form which is usable by the organisms.

Question 27(a)

Criteria	Marks
<ul style="list-style-type: none"> Valid hypothesis linking the two variables 	1

Answers may include: The greater the surface area of a leaf, the more photosynthesis it performs.

Question 27(b)

Criteria	Marks
<ul style="list-style-type: none"> Independent and dependent variables named Method of measuring variables Controlled variables identified Stepwise, feasible method Multiple tests 	5
<ul style="list-style-type: none"> 1-4 of the above 	1-4

Answers may include: Independent variable – surface area of the leaves – measured by tracing around leaves on grid paper and counting 1mm² squares.

Dependent variable – rate of photosynthesis – measured as time taken to make a certain volume of O₂, using stopwatch.

Controlled variables: temperature of water, CO₂ conc. in water, type of pondweed,

- Obtain a large pondweed and cut from it five sections, each with a different surface area of leaf.
- Measure the leaf surface area of each section, using the method described above.
- Place it in the apparatus as shown, take care to control the variables listed above.
- Mark a point on the inverted tube, and time how long it takes fill with oxygen.
- Repeat this 5 more times for each piece of weed and then average the time for that piece.
- Perform this procedure with all 5 pieces of weed.