BIOLOGY – FORM 3  
TIME: 1H 30MIN

NAME: ___________________________         CLASS: ______________

<table>
<thead>
<tr>
<th>Question No.</th>
<th>Section A</th>
<th>Section B</th>
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<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6 7 8</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Max mark</td>
<td>5 6 6 6 10 7 7 8</td>
<td>15 15 15 15 15</td>
</tr>
<tr>
<td>Actual mark</td>
<td></td>
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</tbody>
</table>

85% Theory Paper | 15% Practical | 100% Final Score

TOTAL MARK

85% Theory Paper | 15% Practical | 100% Final Score

Biology – Secondary Schools – Track 3 – Form 3 – 2011
Section A

Answer ALL questions in this section.

1. Name the cell structure described in each of the following statements:

<table>
<thead>
<tr>
<th>Structure Description</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>the part of the cell that contains chromosomes</td>
<td></td>
</tr>
<tr>
<td>the part that absorbs light energy used for photosynthesis</td>
<td></td>
</tr>
<tr>
<td>large permanent spaces filled with cell sap (a solution of sugar and salts)</td>
<td></td>
</tr>
<tr>
<td>the organelle that produces energy for the cell</td>
<td></td>
</tr>
<tr>
<td>the outermost layer of plant cells</td>
<td></td>
</tr>
</tbody>
</table>

(1, 1, 1, 1, 1 mark)

Total 5 marks

2. The upside-down jellyfish, *Cassiopea andromeda*, is a cnidarian (coelenterate) that has been sighted at Marsamxett harbour in the recent months.

a. State whether jellyfish are invertebrates or vertebrates. Give a reason for your answer

__________________________________________________________________________________

__________________________________________________________________________________

(2 marks)

b. Jellyfish have photosynthetic algae attached to them. These provide food to the jellyfish. These algae live in the tissue on the top side of the jellyfish.

(i) Define the term tissue.

__________________________________________________________________________________

__________________________________________________________________________________

(2, 2 marks)

Total 6 marks
3. The table below shows the classification of three wild plants of the family *Crucifaceae*.

<table>
<thead>
<tr>
<th>Family</th>
<th><em>Crucifaceae</em></th>
<th><em>Crucifaceae</em></th>
<th><em>Crucifaceae</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Genus</td>
<td>Brassica</td>
<td>Cabile</td>
<td>Brassica</td>
</tr>
<tr>
<td>Species</td>
<td>nigra</td>
<td>maritima</td>
<td>rapa</td>
</tr>
<tr>
<td>Common name</td>
<td>Black mustard</td>
<td>Sea rocket</td>
<td>Wild turnip</td>
</tr>
</tbody>
</table>

a. Which **TWO** plants are more closely related? Give a reason for your answer.

__________________________________________________

__________________________________________________

__________________________________________________

(3 marks)

b. The three plants listed in the table are dicotyledonous. Give **THREE** characteristics of dicotyledonous plants.

__________________________________________________

__________________________________________________

__________________________________________________

(3 marks)

Total 6 marks

4. The following diagram shows plant cells that were left in a strong salt solution for six hours.

a. i) Describe what has happened to these cells.

__________________________________________________

__________________________________________________

ii) Name the process that brought about the effect shown in the diagram above.

__________________________________________________

(2, 1 mark)

b. Predict what happens to the plant cells if they were placed in distilled water instead in the strong salt solution.

__________________________________________________

(1 mark)
c. Mineral salts are absorbed by root hair cells by **diffusion** or **active transport**. State TWO differences between these two processes.

__________________________________________________ __________________________

__________________________________________________ __________________________

__________________________________________________ __________________________

(2 marks)

Total 6 marks

5. The fruit of the ‘rough cocklebur’ that grows at Chadwick Lakes, has hooks that stick to grazing animals. It is also woody enabling it to float. Its seeds are toxic to herbivores.

a. Name the **TWO** methods of fruit dispersal used by the rough cocklebur.

__________________________________________________ __________________________

__________________________________________________ __________________________

(2 marks)

b. Explain why it is important that fruits are dispersed away from the mother plant.

__________________________________________________ __________________________

__________________________________________________ __________________________

(2 marks)

c. The seeds of the ‘rough cocklebur’ are toxic to herbivores and this increases the chances of seeds to germinate. Explain.

__________________________________________________ __________________________

(1 mark)

d. This plant has its sex organs on separate flowers which can be found on the same stem. Explain why the male flower is always found above the female flower.

__________________________________________________ __________________________

(2 marks)
e. The wild radish plant also grows at Chadwick Lakes. It produces white flowers with bluish veins that attract insects. It has six stamens and a central carpel.

i) Name **ONE** function of the stamen and **ONE** function of the carpel.
   Stamen: ________________________________
   Carpel: ________________________________

ii) Explain why it is beneficial for wild radish plants to attract insects.
   ________________________________________________________________
   (2, 1 mark)

Total 10 marks

6. Some broad bean seeds were soaked overnight and set up as in diagram A below. After 2 days the radicles grew as shown in diagram B below.

![Diagram A](image1)

![Diagram B](image2)

a. i) Describe what happened to the radicles in diagram ‘B’.
   ________________________________________________________________

ii) Give **ONE** benefit of the growth pattern of the radicles.
   ________________________________________________________________

iii) Explain why seeds were soaked overnight before the experiment.
   ________________________________________________________________
   (1, 1, 1 mark)

b. Plants display a positive phototropic response. Explain.
   ________________________________________________________________
   (1 mark)
c. A plant was placed on a clinostat as shown in the diagram below and was left to rotate for two days.

Write the letter of the diagram that represents the plant after two days rotating as shown above. Give a reason for your answer.

Diagram: ___________
Reason: _________________________________________

(1, 2 marks)
Total 7 marks
7a. From the list in the box below choose and write the term that fits each description. (Each term can be used once, more than once or not at all)

<table>
<thead>
<tr>
<th></th>
<th>parasitism</th>
<th>mutualism</th>
<th>predator-prey relationship</th>
</tr>
</thead>
</table>

| Description                                                                 | Term                                                                 |
|-----|-------------------------------------------------|------------------------------------------------------------------------|
| a fungus damaging an oak tree by absorbing nutrients from its phloem        | parasitism                                                            |
| an alga and a fungus living together as a lichen on a rock.               | mutualism                                                             |
| a chameleon eating a locust                                               | predator-prey relationship                                           |
| an orb web spider feeding on a fly it has just captured                   |                                                                        |
| hairs of a dodder plant extracting sap from wild thyme                    |                                                                        |

(1, 1, 1, 1 mark)

b. A biology student took different soil samples from Buskett. These samples were tested and results showed that soil taken from an area full of the leguminous plant clover had a high content of nitrates. Explain.

__________________________________________________ __________________________
__________________________________________________ __________________________
__________________________________________________ __________________________

(2 marks)

Total: 7 marks

8a. From the list in the box below choose and write the name of the correct type of soil to match each description. (Each term can be used once, more than once or not at all).

<table>
<thead>
<tr>
<th></th>
<th>loam</th>
<th>clay soil</th>
<th>sandy soil</th>
</tr>
</thead>
</table>

| Description                                                                 | Type of soil |
|-----|-------------------------------------------------|--------------|
| minerals are easily washed out                                             | loam         |
| soil generally contains more nutrients                                      | clay soil    |
| can become waterlogged easily                                              | sandy soil   |
| soil more prone to erosion                                                 |              |

(1, 1, 1 mark)

b. Some farmers add humus to soil. Give TWO benefits of adding humus to soil.

__________________________________________________ __________________________
__________________________________________________ ____________________

(2 marks)
c. Earthworms help to fertilise the soil by pulling leaves into it. Explain.

__________________________________________________________________________
__________________________________________________________________________

Total 8 marks

Section B

Answer question ONE and choose any other TWO. This section carries 45 marks. Write the answers for section B on a foolscap.

1. Read the following paragraph and answer the questions below.

_The Scarab Beetle Species_

Some days ago I found several beetles along the water’s edge at Mellieha Bay. The insects belonged to a common species of the scarab family. Like many members of this family it does not have a common English name. In Maltese most beetles are known as ‘hanfus’. The unique scientific name of this beetle is _Phyllognathus excavatus_.

The male of this species has a structure on its head that resembles the horns of a rhinoceros. Around September it is the most common beetle in the Mediterranean. The scarab beetle family consists of over 30,000 species. Many of these have bright metallic colours ranging in size from 1.5mm to 160mm. The larvae have no exoskeleton. They are soft-bodied pale yellow or white grubs. Most live underground or under leaves away from sunlight. The majority are scavengers and many species live on dung, dead animals or decaying vegetation. Some beetles lay eggs in dung.

_(Text adapted from The Scarab Beetle Species by Paul Portelli, The Times, 30th September 2010)_

a. Why are scientific names unique? (1 mark)

b. Write the phylum and the genus of the scarab beetle species mentioned in the passage. (2 marks)

c. Apart from the segmented body, name TWO other characteristics shared with all animals of the same phylum. (2 marks)

d. Name the other TWO main body segments of the beetle besides the head. (2 marks)

e. (i) Name the process that changes the larva into an adult beetle. (1 mark)
   (ii) Name the stage between the larva and the adult. (1, 1 mark)

f. Suggest ONE reason why
   (i) larvae prefer to stay away from sunlight (1 mark)
   (ii) some beetles lay eggs in dung. (1 mark)
g. There are around 400,000 different species of beetles. Use the identification key below to distinguish between the following four beetles:

1. Body is striped ........................................ go to 2
   Body is spotted ........................................ Hercules beetle
2. Long, pointed appendage attached to head ........ Red palm weevil
   No pointed appendage attached to head .......... go to 3
3. Roundish abdomen ..................................... Colorado potato beetle
   Elongated abdomen ................................. Sawtooth beetle

A       B                                               C                                   D

(4 marks)
Total 15 marks

2. A biology student owns an aquarium. The student gives extra fish food since some females are bearing offspring. After two days the aquarium became infested with Hydra - a simple freshwater animal that reproduces asexually by budding. Soon enough the newly-hatched fish started falling prey to the Hydra’s stinging tentacles around its mouth.

(i) Name the phylum to which the Hydra belong.
(ii) Explain why asexual reproduction is advantageous to the Hydra.
(iii) List TWO factors that helped the Hydra population to grow so fast.
(iv) Fish lay hundreds of eggs. Give ONE advantage and ONE disadvantage of this.

(1, 1, 2, 2 marks)

b. In this aquarium Hydra can be regarded as a pest. The student introduces a species of fish called Gouramis, that feed on Hydra.
   Name this method of controlling the growth of the pest population. Give ONE advantage of it.

(2 marks)

c. Distinguish between the terms predator and prey.

(2 marks)

d. One other method of getting rid of the Hydra population is to remove the fish from the tank temporarily and treat the water with an appropriate concentration of salt. How does salt kill the fresh-water Hydra?

(2 marks)

e. Most aquarium plants reproduce by vegetative propagation.
   (i) List ONE disadvantage of vegetative propagation.
   (ii) Explain why reproduction of the aquarium plants by vegetative propagation could be a disadvantage in the event of a viral infection.

(1, 2 marks)

Total 15 marks
3a. A student used a UV (ultra-violet) monitor to measure how the strength of ultraviolet rays changes across a period of 12 hours. These are the results obtained.

<table>
<thead>
<tr>
<th>Time</th>
<th>8am</th>
<th>9am</th>
<th>10am</th>
<th>11am</th>
<th>12pm</th>
<th>1pm</th>
<th>2pm</th>
<th>3pm</th>
<th>4pm</th>
<th>5pm</th>
<th>6pm</th>
<th>7pm</th>
</tr>
</thead>
<tbody>
<tr>
<td>UV</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>9</td>
<td>12</td>
<td>11</td>
<td>10</td>
<td>8</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

(i) How do the student’s results confirm that it is not recommended to sunbathe between 11am and 3pm?
(ii) Explain how the skin acts as a protective layer against UV rays.

(2, 2 marks)

b. During another investigation the body temperature of a human being and that of the surrounding environment were measured every hour over a period of 24 hours. The data was plotted on the chart below.

(i) Explain why the body temperature changed very little in spite of the changes in the temperature of the surrounding environment.
(ii) List TWO body processes by which humans lose heat.
(iii) Explain why we need to eat more on winter days in order to keep a constant body temperature.
(iv) Explain the importance of the adipose tissue under the skin.

(2, 2, 1, 1 mark)

c. The Maltese wall lizard is a reptile often seen basking in the sun. Explain.

(2 marks)

d. Malta’s hot and dry summer season is harsh on many plants living on the island. List THREE adaptations that help plants survive this hot and dry season.

(3 marks)

Total 15 marks
4. A student was conducting an investigation about transpiration. The student set up the apparatus as in the diagram below making sure to cut and insert the plant under water. The experiment was performed twice, first under strong light conditions and then in low light conditions. The results showed that the transpiration rate decreased in low light conditions.

![Diagram of transpiration setup]

a. (i) Name of the apparatus used for this investigation.
(ii) Explain the importance of cutting and inserting the shoot under water.
(iii) Give two reasons why the rate of transpiration decreases under low light conditions.
(iv) List TWO environmental factors besides light intensity that affect the rate of transpiration.
(v) The student compared the transpiration rate of several leaves. Which leaf feature should be measured to obtain a fair comparison? (1, 2, 2, 2, 2 marks)

b. In dry desert conditions, seeds of palm trees can remain dormant for well over a year until it rains before they germinate by hypogeal germination.

(i) Why is water important for germination to take place?
(ii) Explain why palm tree seeds have a relatively hard seed coat.
(iii) Distinguish between hypogeal and epigeal germination.
(iv) Explain why it is difficult to germinate a palm tree seed in a cold northern European country. (1, 1, 2, 2 marks)

Total 15 marks

5. Give a biological explanation for each of the following statements:
   (i) Viruses need a living cell to reproduce. (3 marks)
   (ii) Mosses are simple plants living in humid conditions. (4 marks)
   (iii) Whales and dolphins are marine mammals. (2 marks)
   (iv) The Arctic vegetation consists of small plants that grow only during summer months. (4 marks)
   (v) Amphibians live on land but lay eggs in water. (2 marks)

Total 15 marks