BIOLOGY – FORM 3
TIME: 2 HOURS

NAME: _________________________________       CLASS: _____________________________

<table>
<thead>
<tr>
<th>Question No.</th>
<th>Section A</th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th>Section B</th>
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TOTAL MARK

<table>
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<tr>
<th>85% Theory Paper</th>
<th>15% Practical</th>
<th>100% Final Score</th>
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Section A

Answer ALL questions in this section.

1. Flamingos are a type of wading bird in the genus *Phoenicopterus*. Flamingos filter-feed on brine-shrimp and blue-green algae. Their beaks are especially adapted to separate mud from the food they eat. The pink colour of flamingos comes from proteins in their diet of animal and plant plankton. These proteins are broken down into pigments by liver enzymes.

   a. From the passage above write the name of:
      
      i. a crustacean ______________________________
      
      ii. an organ. _______________________________  (1, 1 mark)

   b. Flamingos live in groups called colonies whose populations can number in thousands. Explain ONE advantage of large colonies.

      ____________________________________________  (1 mark)

   c. The following table gives the scientific classification for the flamingo. Fill in the blanks in the table below with the correct taxonomic group name.

      (2 marks)

      | Kingdom | Animalia |
      |---------|----------|
      | __________ | Chordata |
      | __________ | Birds |
      | __________ | *Phoenicopteriformes* |
      | __________ | *Phoenicopteridae* |
      | Genus | *Phoenicopterus* |

   d. Python snakes attack flamingos. The python snakes are often referred to as ambush predators or sit-and-wait predators. They remain motionless and wait for their prey to come within striking distance. Give ONE reason why this mode of predation is advantageous to predators such as the python snake.

      ____________________________________________  (1 mark)

   Total: 6 marks
2. The following poster was placed at the entrance of the school garden.

a. Name the annelid referred to in the poster adjacent and describe ONE visible structural feature typical of annelids.

Name: ________________________________________

Structural feature: ________________________________________

(2 marks)

b. In many soils, annelids such as the one in the poster play a major role in the conversion of large pieces of organic matter into humus, thus improving soil fertility. Describe ONE way how annelids change organic matter into humus.

_____________________________________________________________________

(1 mark)

c. Name the type of soil with poor water drainage.

______________________________________

(1 mark)

d. Explain the disadvantage of waterlogged soils.

_____________________________________________________________________

_____________________________________________________________________

(2 marks)

e. The Maidenhair fern is found in the shady area of the school garden. The lower side of the leaves of this fern plant contains a number of brown patches called sori. What is found inside these sori?

_____________________________________________________________________

(1 mark)

f. The school gardener ploughs the soil before sowing seeds. Describe ONE advantage of this practice.

_____________________________________________________________________

(1 mark)

g. Saprophytic fungi live in soil.

i. Explain the saprophytic mode of nutrition in fungi.

_____________________________________________________________________

_____________________________________________________________________

(2, 1 mark)

Total: 11 marks
3. The following diagram shows a phototropism experiment and the result obtained.

![Diagram of phototropism experiment and result]

a. Write the conclusion derived from this experiment.

_____________________________________________________________________

(1 mark)

b. In another phototropism experiment two shoot tips were cut off. One tip was replaced on agar block while the other on a metal disc and put in front of a lamp as shown in the diagram below. Compare the result of the growth of the two shoot tips in this experiment.

![Diagram of shoots with different treatments]

_____________________________________________________________________

_____________________________________________________________________

(2 marks)
c. The *Euglena* is a unicellular protist that contains chloroplasts. The whole *Euglena* organism moves in response to the stimulus of light – indeed the *Euglena* moves towards the light stimulus. Explain the advantage of *Euglena* moving towards the light stimulus.  

_____________________________________________________ (1 mark)

d. The *Euglena* reproduces by binary fission. Name the type of reproduction involved in binary fission.  

_____________________________________________________ (1 mark)

e. In *Euglena* water enters by osmosis.

i. Define the term osmosis.  

_____________________________________________________  

ii. Name the organelle present in protists such as the *Euglena* that pumps excess water out of the cell.  

_____________________________________________________  

iii. The *Euglena* does not have a cell wall. Explain what happens to the *Euglena* cell if excess water is not pumped out of the cell.  

_____________________________________________________  

(2, 1, 1 mark)

**Total: 9 marks**

4. The following diagram shows a halved broad bean seed.

![Diagram of a halved broad bean seed]
a. Label the parts A and D.

A: _________________________  D: _________________________  (2 marks)

b. Write the letter of the part showing the region of the young shoot that will produce the first leaves.

__________________________  (1 mark)

c. Seeds vary in size. The difference in size reflects differences in the amount of food reserves stored in the seed. The larger the seed the more food reserves it contains. Explain the advantage of more food reserves present in the seed.

____________________________________________________________________________
____________________________________________________________________________

(2 marks)

d. Write the type of seed dispersal in each (X and Y) of the following fruits. Give a reason for your answer.

**X**

Type of seed dispersal: ________________

Reason: __________________________________
_________________________________________
_________________________________________

**Y**

Type of seed dispersal: ________________

Reason: __________________________________
_________________________________________
_________________________________________

(2, 2 marks)

**Total: 9 marks**
5. The following diagram shows a small herbivorous mammal called hyrax. About 25 species of lice live on the hyrax.

a. Define the term herbivore.

_____________________________________________________________________

(1 mark)

b. The body of lice is flattened dorsoventrally (flattened from top to bottom). Explain the benefit of this.

_____________________________________________________________________

(1 mark)

c. The bacterium Bacillus anthracis is another parasite of hyrax. In the box below draw the outer shape of the bacterium Bacillus anthracis.

(1 mark)

d. Describe ONE similarity between bacteria and plant cells.

_____________________________________________________________________

(1 mark)

e. A biology student remarked that both bacteria and viruses can be observed using a light microscope. Explain whether this observation is correct.

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

(3 marks)

f. Hyraxes have symbiotic bacteria present in their stomachs. Explain the biological importance of the presence of symbiotic bacteria in the stomach of hyraxes.

_____________________________________________________________________

(1 mark)

Total: 8 marks
6. The following graphs (X and Y) each show the water loss from a plant over a period of time.

![Graph X and Y](image)

a. Write the letter of the graph that represents water loss
   i. with increasing humidity
   ii. with increasing temperature
   iii. with increasing light
   iv. with decreasing wind speed.

   (1, 1, 1, 1 mark)

b. The following table shows the density of stomata on the leaf surfaces of three different species of plants (A, B and C).

<table>
<thead>
<tr>
<th>Plant</th>
<th>Stomatal density (number of stomata/mm²)</th>
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<tbody>
<tr>
<td></td>
<td>In upper leaf surface</td>
</tr>
<tr>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>460</td>
</tr>
<tr>
<td>C</td>
<td>0</td>
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i. Write the letter of the plant representing the aquatic water lily
ii. Write the letter of the underwater plant *Anacharis* in which the leaves float on the water surface.

(1, 1 mark)

Total: 6 marks
7. Name and describe the vital function represented in each of the following pictures (A, B and C).

A  
_________________________________________________  
_________________________________________________  
_________________________________________________

B  
_________________________________________________  
_________________________________________________  
_________________________________________________

C  
_________________________________________________  
_________________________________________________  
_________________________________________________

(2, 2, 2 marks)  
Total: 6 marks
Section B

Answer any THREE questions from this section. Answer the questions of Section B on a foolscap.

1. Read the following passage and answer the questions that follow.

   Mosquito fish were introduced in Australia in 1925 as a biological control agent for mosquitoes that cause malaria. Unlike many fish they give birth to live young. Mosquito fish are extremely aggressive predators. They pose a threat to the population of native frogs.

   a. From the passage above name the amphibian. (1 mark)
   b. Name the class of chordates that usually give birth to live young. (1 mark)
   c. List ONE disadvantage of biological control methods. (2 marks)
   d. The Australian authorities are considering the use of pesticides to control the population of mosquito fish. Explain ONE disadvantage of this decision. (2 marks)
   e. List TWO structural adaptations of fish to survive in an aquatic environment. (2 marks)
   f. A biology student remarked that fish depend on environmental conditions for body temperature regulation. Explain. (1 mark)
   g. A population is a group of individuals of the same species living in a particular habitat. List TWO factors (besides the presence of predators) that affects the size of a population. (4 marks)
   h. Camouflage is a typical defence mechanism of frogs. Describe ONE other defence mechanism typical of prey organisms. (2 marks)

Total: 15 marks

2. Most penguins in Antarctica feed on squid, a soft bodied organism with an internal shell. Penguins are flightless birds that dive in the deep water to catch fish.

   a. Write the name of the phylum to which the squid belongs. (1 mark)
   b. Penguins spread natural oil on their feathers.
      i. Explain the benefit of this adaptation.
      ii. Compare the size of penguins living in a cold region like Antarctica with penguins living in a tropical warm region like the Galapagos Islands. (2, 2 marks)

Total: 15 marks
c. The following diagram shows penguins spreading their wings (flippers) away from their body on a hot day. Explain the benefit of this adaptation. (2 marks)

![Penguin spreading wings](image)

- The following diagram shows penguins spreading their wings (flippers) away from their body on a hot day. Explain the benefit of this adaptation. (2 marks)

- While swimming in the sea to catch fish, the water pressure bends the penguin feathers thus breaking the insulating layer of air. Explain how this affects penguins. (2 marks)

- *The Alaskozetes antarcticus* is a mite typically found in Alaska. The mite is an arachnid. Describe TWO structural features of arachnids. (2 marks)

- The Antarctic hair grass is one plant species typically found in Antarctica. This plant is self-pollinating. Explain ONE advantage and ONE disadvantage of self-pollination. (4 marks)

**Total: 15 marks**

3. Explain why each of the following statements is incorrect:

- All plants have vascular bundles. (2 marks)
- All animal cells have a nucleus. (2 marks)
- All types of reproduction form genetically identical organisms. (2 marks)
- All flowering plants have long, narrow leaves with parallel veins running through them. (2 marks)
- The human skin is only responsible for protection of the body. (2 marks)
- The heart and blood are the main organs in the circulatory system. (2 marks)
- Chlorophyll is present in all parts of the plant. (3 marks)

**Total: 15 marks**
4. A farmer planted a monoculture of soybean plants in a number of fields. The soybean plant is a leguminous plant.

a. Name the type of bacteria involved in the mutualistic relationship present in leguminous plants. (2 marks)

b. Soybean plants exhibit epigeal germination.
   i. Describe the position of the cotyledons as the seedling emerges during epigeal germination.
   ii. A farmer planted some soybean seeds in the open fields, however they did not germinate. Suggest TWO possible reasons for this. (1, 2 marks)

c. Soybean plants may be infected by the soybean mosaic virus. The leaves of infected soybean plants are dwarfed (grow smaller) and narrower than normal. Explain the effect of this. (1 mark)

d. Thrips are tiny insects that pierce and suck sugary fluid from soybean plants. Name the plant vessel from where thrips suck fluids. (1 mark)

e. Some species of thrips feed on pollen.
   i. Name the site where pollen is produced.
   ii. Draw a labelled diagram to show how the nucleus in pollen meets the nucleus in the egg cell.
   iii. A biology student remarked that the pollen from a wind pollinated flower is structurally different from that in an insect pollinated flower. Explain.
   iv. A biology student remarked that not all flowers produce nectar. Explain. (1, 3, 2, 2 marks)

Total: 15 marks

5. The Sandarac Gum Tree (Għargħar) is the Maltese national tree. The Sandarac Tree is a conifer tree and is wind pollinated.

a. Name the site in the Sandarac Tree where pollen is located. (1 mark)

b. Describe the seeds typical of conifer trees. (1 mark)

c. Many conifer trees have pointed or scale like leaves. Explain the benefit of this adaptation. (2 marks)

d. *Cynomorium coccineum* is a parasitic plant that gives the Fungus Rock (il-Ġebla tal-Ġeneral) its name. The plant was often been mistaken for a fungus.
   i. Name the process that is NOT carried out by both *Cynomorium coccineum* and fungi.
   ii. Name the threads of a fungus that make up a mycelium.
   iii. Draw a diagram to show the process of sporulation (reproduction by spores) in fungi.
   iv. Parasitic plants have attachment organs. Explain the benefit of these attachment organs in parasitic plants. (1, 1, 4, 1 mark)

e. Yeasts are structurally different from other fungi.
   i. Give ONE reason for this statement.
   ii. Name the process of asexual reproduction taking place in yeast.
   iii. Describe ONE advantage of asexual reproduction. (1, 1, 2 marks)

Total: 15 marks