

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD
UNIVERSITY OF MALTA, MSIDA**SECONDARY EDUCATION CERTIFICATE LEVEL****SEPTEMBER 2013 SESSION**

SUBJECT:	Biology
PAPER NUMBER:	I
DATE:	5 th September 2013
TIME:	9:00 a.m. to 11:00 a.m.

ANSWER ALL QUESTIONS IN THIS PAPER IN THE SPACES PROVIDED.

1. a. Name the muscle/s that:

- i) does/do not suffer from fatigue; _____
 - ii) contracts when hairs on the skin stand upright; _____
 - iii) are present between the ribs; _____
 - iv) relaxes and becomes dome shaped during exhalation. _____
- (4 marks)

b. Peristalsis is the process of wave-like successive contractions and relaxation of muscles. Name the muscular tube along which the food is moved by peristalsis from the mouth to the stomach.

(1 mark)

c. Explain the function of peristalsis in **each** of the following:

i) the rectum; _____

(1 mark)

ii) oviduct; _____

(1 mark)

iii) ureter. _____

(2 marks)

(Total: 9 marks)

2. The following photo shows three biology students during fieldwork in a woodland area.



(<http://vims.blogs.wm.edu/files/2011/08/DSCN3651.jpg>)

a. Name the type of sampling equipment used by the students.

_____ (1 mark)

b. Explain why the sampling equipment shown in the diagram cannot be used for animals.

_____ (1 mark)

c. During the fieldwork the students investigated some abiotic factors affecting the organisms in the woodland ecosystem. List TWO abiotic factors affecting a woodland ecosystem.

_____ (2 marks)

d. During the field trip the students were surprised to see a weasel (ballotra). The weasel is the only carnivorous mammal living on land in the Maltese Islands. The weasel hunts mice and rabbits.

i) Describe the type of body surface cover of the weasel.

_____ (1 mark)

ii) Weasels and mice are both consumers however they are found at different trophic levels. Explain.

_____ (2 marks)

e. Explain why the weasel has a shorter intestine compared to that of a rabbit.

(2 marks)
(Total: 9 marks)

3. a. Describe **ONE** way how the environment benefits in **each** situation shown in the following drawings.

i) **Drawing 1**



(http://dc395.4shared.com/img/7i387lp9/s3/charge_-_Andy_Singer_-_Zero_em.gif)

ii) **Drawing 2**



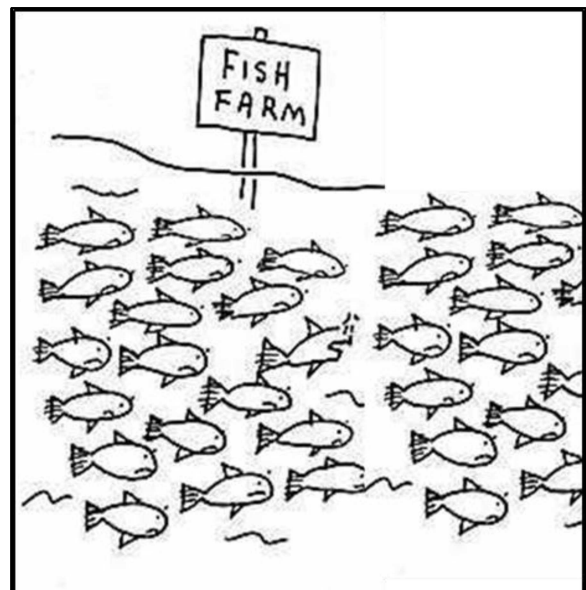
(<http://chefn.files.wordpress.com/2012/05/globeguycomposting.jpg>)

iii) **Drawing 3**



(http://4.bp.blogspot.com/-ANq99IB_9u8/TZkw4dA6Igl/AAAAAAAAAr8/ldTlcwWyxKo/s1600/plant%252520trees.gif)

iv) **Drawing 4**



(<http://letsthinkgreenthoughts.files.wordpress.com/2010/06/grin48911.jpg>)

DO NOT WRITE ABOVE THIS LINE

i) Drawing 1 _____

(1 mark)

ii) Drawing 2 _____

(1 mark)

ii) Drawing 3 _____

(1 mark)

iv) Drawing 4 _____

(1 mark)

b. Describe **ONE** way how each of the situations shown is beneficial for health.

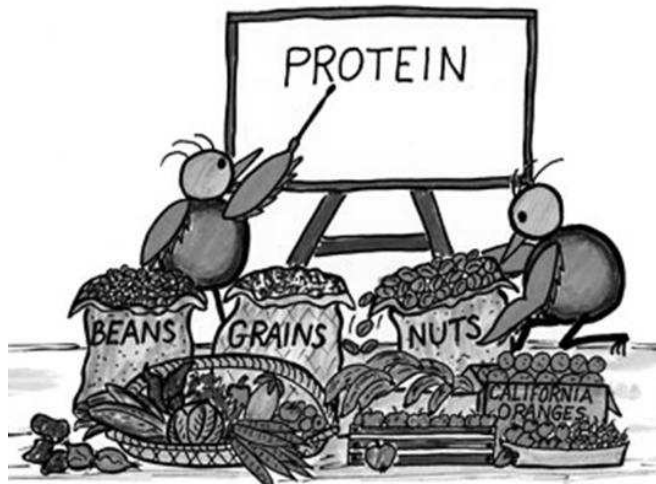
i)



(<http://www.nctba.org/wp-content/uploads/2012/06/Breastfeeding.jpg>)

(1 mark)

ii)



(<http://www.vegparadise.com/images/protein2.jpg>)

(1 mark)

iii) natural family planning.



(<http://t3.gstatic.com/images?q=tbn:ANd9GcS1v6hLvKRS7tVMsJ71O00cHVlyrGbnzfCyz64bComS-UFceF5qyg>)

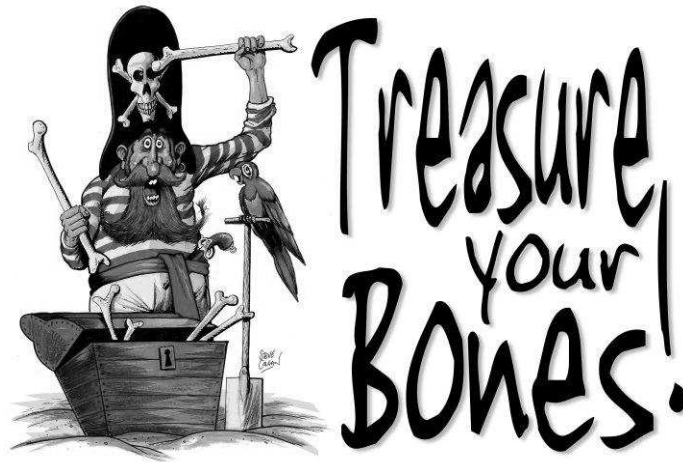
(1 mark)

iv)



(1 mark)

- c. The Maltese Health Authorities designed the following poster to celebrate National Osteoporosis Day.



Osteoporosis is a disease of the bones that become more fragile increasing the risk of bone fracture.

- i) Name **ONE** other deficiency disease affecting bones.

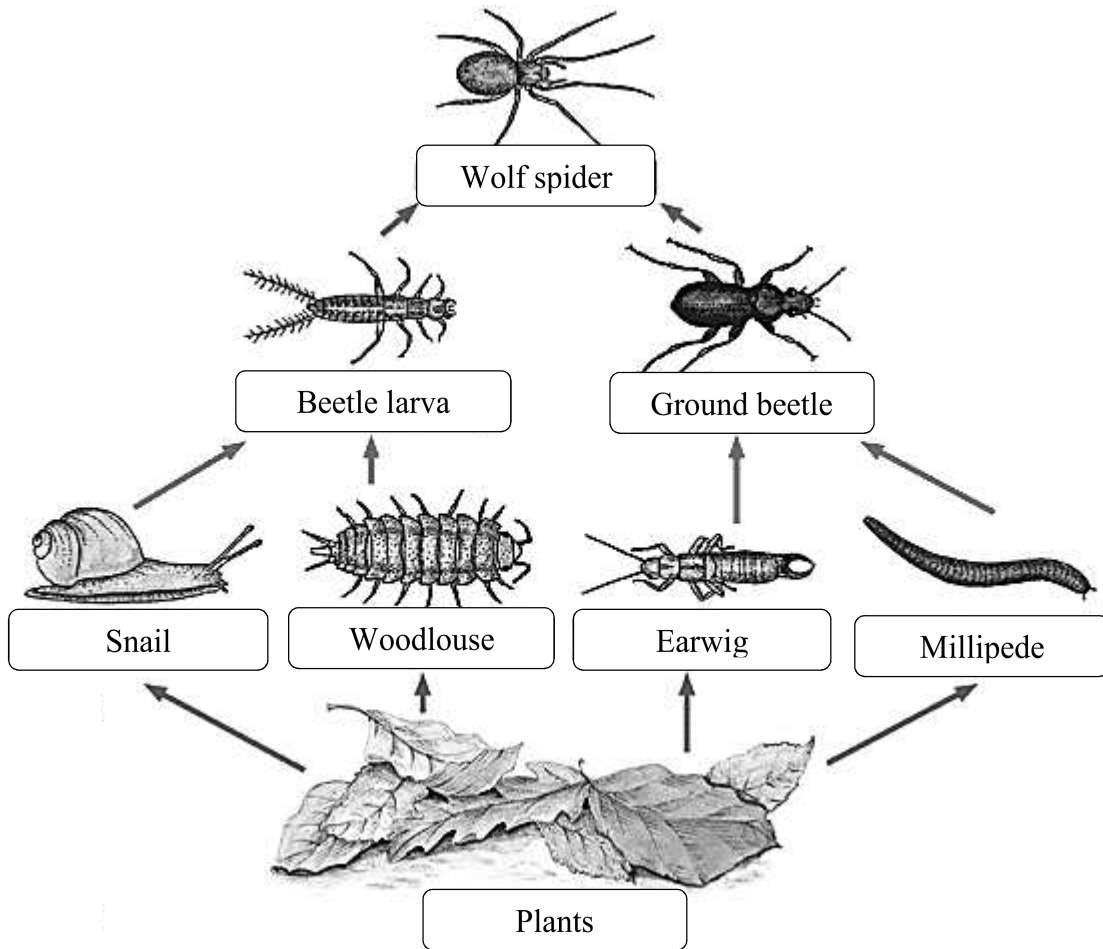
(1 mark)

- ii) Name the vitamin necessary for healthy bone formation.

(1 mark)

(Total: 10 marks)

4. The following diagram shows a woodland food web.



a. From the diagram name:

- i) ONE arachnid: _____
- ii) ONE mollusc: _____
- iii) ONE myriapod: _____
- iv) ONE crustacean: _____
- v) ONE arthropod. _____

(5 marks)

b. Buskett Gardens is one of the few woodland areas in Malta. Woodland areas in the island are characterized by the Holm Oak and Aleppo Pine trees. The Holm Oak is an angiosperm while the Aleppo Pine is a gymnosperm.

- i) State ONE way how a biology student can identify a gymnosperm.

(1 mark)

DO NOT WRITE ABOVE THIS LINE

ii) List ONE way how a biology student can identify an angiosperm.

_____ (1 mark)

c. Oak wilt is a disease caused by the fungus *Ceraticystis fagocearum*.

i) Explain why fungi are not green.

_____ (1 mark)

ii) A biology student remarked that most fungi are made up of a tangled mass of threads. Write the term that describes the thread-like structures in fungi.

_____ (1 mark)

d. Pine wilt is a disease of the Aleppo Pine trees caused by the pinewood nematode. Give TWO characteristics of nematodes.

_____ (2 marks)

e. In a woodland area one might come across vascular plants that lack flowers and seeds. Such plants are easy to recognize by their frond-like leaves. These plants reproduce by spores.

i) Name the group to which these plants belong.

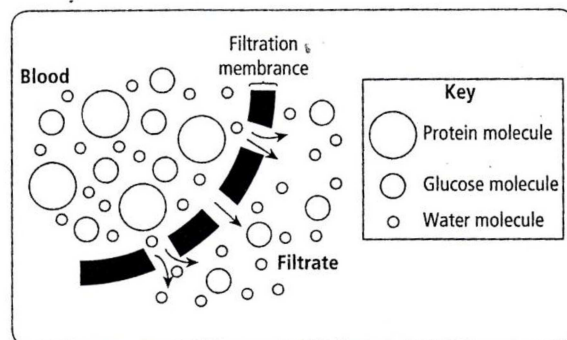
_____ (1 mark)

ii) Name the structure inside which the spores of these particular plants develop.

_____ (1 mark)

(Total: 13 marks)

5. The following diagram shows the filtration process taking place in the kidneys.



DO NOT WRITE ABOVE THIS LINE

a. Name the type of filtration taking place from the glomerular capillaries into the Bowman's capsule.

_____ (1 mark)

b. From the diagram name the type of molecule that does not pass through the filtration membrane. Give a reason for your answer.

(2 marks)

c. Apart from the molecules named in part (b) name ONE type of blood component that does not pass through the filtration membrane.

_____ (1 mark)

d. Name ONE part of the kidney nephron where water is reabsorbed.

_____ (1 mark)

e. The kidneys secrete a variety of hormones including erythropoietin (EPO). This hormone stimulates the production of red blood cells.

i) Describe the change in EPO production in a person living at a high altitude where there is a low level of oxygen.

_____ (1 mark)

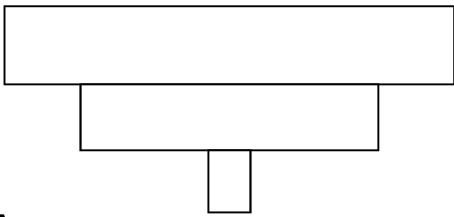
ii) The cyclist Lance Armstrong admitted that he used EPO during all seven of his Tour de France victories. Explain the benefit of using EPO before a cycling race.

(2 marks)

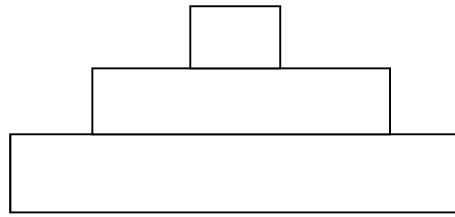
iii) Name ONE deficiency disease where a blood test would reveal low levels of EPO.

_____ (1 mark)
(Total: 9 marks)

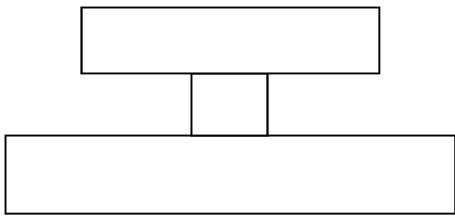
6. a. Below are four pyramids of numbers labelled A, B, C and D. Insert these labels in the correct spaces in the table below.



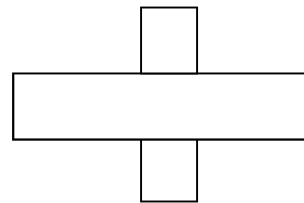
A



B



C



D

Description	Letter of pyramid of numbers
An oak tree is infested with many aphid insects. Parasitic protozoans feed on the aphids.	
An oak tree supports a variety of birds. Foxes hunt these birds.	
Zebras are herbivores which eat grass. The Tsetse flies suck the blood of the zebras.	
Field mice eat grass in a corn field. Snakes hunt the field mice.	

(1 mark each – 4 marks)

b. i) In the space provided draw a pyramid of biomass for the following food chain:



(2 marks)

DO NOT WRITE ABOVE THIS LINE

ii) Explain your reasoning in drawing such a pyramid of biomass.

(2 marks)

c. Fill in the following blank spaces with the appropriate term.

Plants obtain the energy they need for growth from the _____. When herbivores eat plants, they ingest energy rich compounds. The energy stored in these molecules is made available to the animal by the process of _____. Undigested plant parts are eventually lost as _____. The molecules used to build the cells, tissues and organs of the herbivores' body might be eaten by a _____.

(2 marks)

(Total: 10 marks)

7. In an investigation on the factors affecting photosynthesis, a piece of pond weed was put in a test tube containing water and a lamp was put at different distances from the test-tube. The rate of photosynthesis was measured by counting the number of gas bubbles coming out of the cut stem in a fixed amount of time. The temperature of the water was kept at 20°C.

a. i) Name the gas produced during the process of photosynthesis.

(1 mark)

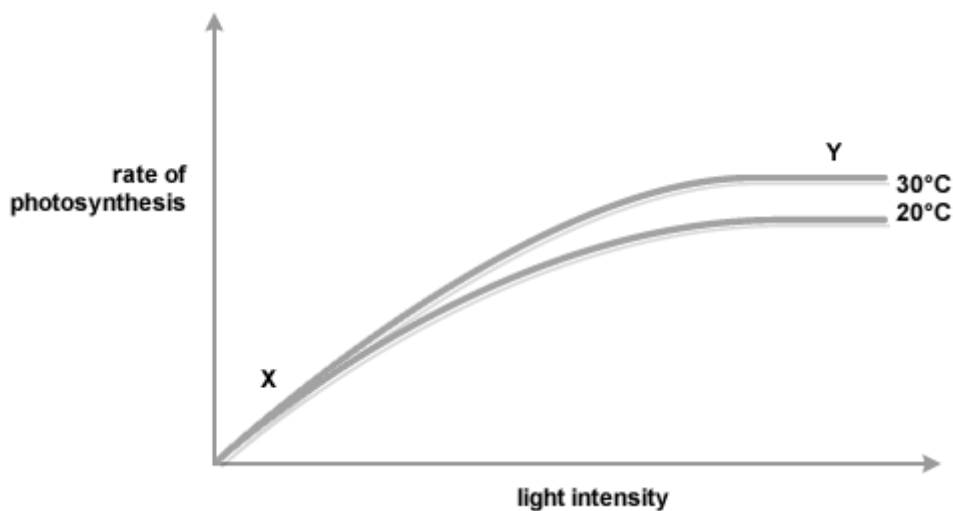
ii) Explain why the bubbles were counted in a fixed amount of time.

(2 marks)

iii) Explain how the apparatus is set up so that heat emitted from the lamp would not change the temperature of the water in which the pond weed had been placed.

(1 mark)

b. The experiment was repeated at 30°C. The graph below shows the results obtained for both temperatures.



http://www.bbc.co.uk/bitesize/higher/biology/cell_biology/photosynthesis/revision/5/

i) Explain the trend seen on the graph at point X.

(2 marks)

ii) Explain why the graphs level off at point Y.

(1 mark)

iii) When the light intensity is high, the graph at 30°C has a higher rate of photosynthesis than that at 20°C. Use your knowledge about enzymes to explain why.

(3 marks)
(Total: 10 marks)

8. a. Define the term *tissue*.

(2 marks)

b. Soil borne *Verticillium* fungi invade roots and infect the vascular tissue of the host plants, particularly xylem tissue.

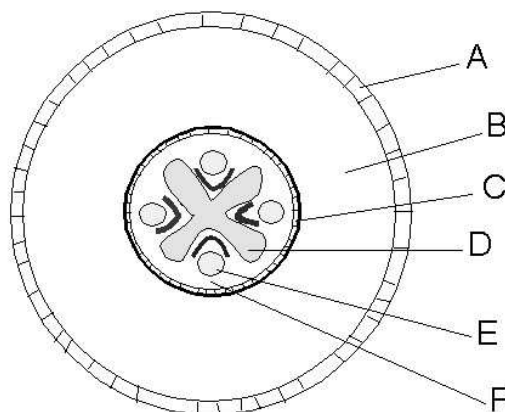
Name another type of vascular tissue found in plants and state its function.

Tissue: _____

Function: _____

(3 marks)

c. The diagram below shows a cross-section of a dicot root.



i) From the diagram above give the letter that refers to the xylem and explain the function of this tissue.

Letter: _____

Function: _____

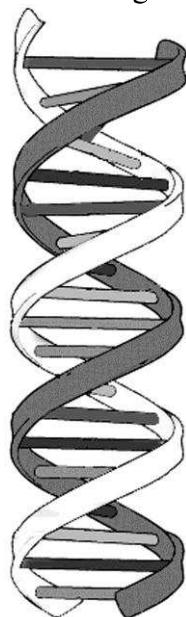
(3 marks)

- ii) When the *Ventricillium* fungus infects the xylem, it prevents this tissue from functioning normally. How does this affect the leaves?

(2 marks)

(Total: 10 marks)

- 9. a. The diagram shows part of an important biological molecule.



- i) Name the molecule shown in the diagram above.

(1 mark)

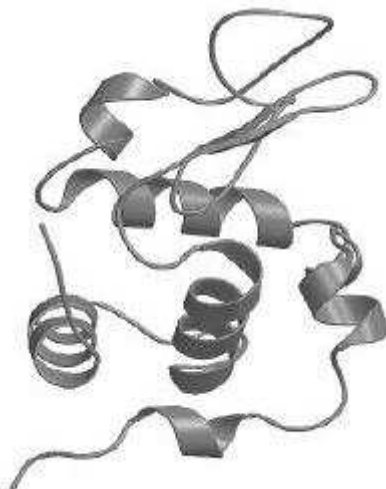
- ii) Name the exact location of this molecule within an animal cell.

(1 mark)

- iii) This molecule carries a code for the formation of another class of molecules. Name this class of molecules.

(1 mark)

b. The diagram shows a protein molecule called lysozyme. It is present in tears, saliva and in white blood cells.



i) List THREE elements found in a molecule of lysozyme.

(3 marks)

ii) Lysozyme breaks bonds between sugars found in the cell walls of bacteria. Explain how this may protect humans from disease.

(2 marks)

iii) Amylase is another enzyme present in saliva. What is the function of this enzyme?

(2 marks)

(Total: 10 marks)

Please turn the page.

10. a. Distinguish between:

i) *pollination* and *germination*;

(2 marks)

ii) a *carbohydrate* and a *lipid*;

(2 marks)

iii) *aerobic* and *anaerobic* respiration.

(2 marks)

b. Blood and tissue fluid are two important fluids found in the human body.

i) Distinguish between the two fluids.

(2 marks)

ii) List **TWO** substances present in both fluids.

(2 marks)
(Total: 10 marks)

END OF PAPER

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD
UNIVERSITY OF MALTA, MSIDA

SECONDARY EDUCATION CERTIFICATE LEVEL

SEPTEMBER 2013 SESSION

SUBJECT:	Biology
PAPER NUMBER:	IIB
DATE:	5 th September 2013
TIME:	4:00 p.m. to 6:00 p.m.

Write your answers on the booklet provided. Write down the number of the questions you answer on the front page of your answer booklet.

Please note that for question 1 of this paper you need the graph paper in the booklet.

Answer ANY FOUR (4) questions. Each question carries 25 marks.

1. The following table shows the occurrence of the number of reported cases of infectious diseases in the African region in 2010.

Infectious diseases	Number of reported cases (x10 ³)
Cholera	109
Leprosy	25
Measles	186
Meningitis	22
Rubella	43

(Adapted from WHO World Statistics 2012)

- a. On the graph paper provided draw a bar chart to show the number of reported cases for the five infectious diseases listed in the table. Label the bars clearly. (6 marks)
- b. Express the number of reported cases of measles in the African region in 2010 as a percentage of the total number of infectious diseases listed in the table. (2 marks)
- c. Another significant disease affecting several humans is cancer. Cancer cells are cells that grow and divide at an unregulated pace. Name:
 - i) the type of cell division necessary for production of gametes in animals; (1 mark)
 - ii) the fluid in the cell where chemical reactions take place; (1 mark)
 - iii) the site in the eukaryotic cell containing the chromosomes. (1 mark)
- d. Smoking is a major cause of lung diseases. Describe ONE initiative that the Health authorities may use to reduce the incidence of deaths caused by these diseases. (2 marks)
- e. Some viruses cause infectious diseases.
 - i) Draw and label a diagram of a virus. (3 marks)
 - ii) Explain why viruses are considered as parasites. (2 marks)
- f. Some stomach cancers are caused by an infection in the stomach by bacteria called *Helicobacter pylori*. Describe ONE function in **each** of the following parts of the bacterium cell:
 - i) slime capsule; (2 marks)
 - ii) flagellum. (2 marks)

g. Several microorganisms live in the human intestines. Studies reveal that these include about 300 species of bacteria. Unicellular fungi and protozoans are also present.

- i) Which of the organisms living in the human intestine are prokaryotic? Give ONE reason for your answer. (2 marks)
- ii) Explain why the micro-organisms living in the intestine are expected to be anaerobic organisms. (1 mark)

(Total 25 marks)

2. The Maltese Topshell, *Gibbula nivos*a, is an endemic marine mollusc. It is an extremely endangered species. It is active at night and hides during the day. It lives on Lesser Neptune grass, *Cymodocea nodosa* and feeds on organic matter on the ground.

- a. i) List the genus name of the Maltese Topshell. (1 mark)
- ii) Describe the benefit that this organism gains by being active at night. (2 marks)
- iii) Give TWO characteristics of molluscs. (4 marks)
- iv) Explain the meaning of “endangered species.” (2 marks)

b. The Lesser Neptune grass is a marine angiospermic monocot.

- i) Give TWO structural characteristics of monocots. (4 marks)
- ii) What is the role of the Lesser Neptune grass in the food chain that includes the Maltese Topshell? (2 marks)

c. The Lesser Neptune is found in Mediterranean seawaters at a depth of 10 m or less. It lives in well-lit areas. It can reproduce sexually or asexually using rhizomes.

- i) Explain why this marine plant is found in well-lit, shallow waters. (2 marks)
- ii) List TWO differences between sexual and asexual reproduction. (4 marks)

d. In the Mediterranean Sea there are several meadows of sea grass. Both the Lesser Neptune grass and Neptune grass (Mediterranean Tapeweed) *Posidonia oceanica*, form large sea meadows. Are these two species related? Give a reason for your answer. (2 marks)

e. Explain why these grass meadows may be defined as *ecosystems*. (2 marks)

(Total 25 marks)

3. a. Herbivores, carnivores, parasites and saprotrophs are all heterotrophs.

- i) Define the term *heterotrophic nutrition*. (1 mark)
- ii) Describe TWO structural differences between herbivores and carnivores. (4 marks)

b. Amoebic dysentery is a disease caused by a parasitic amoeba, *Entamoeba histolytica*. It feeds on the lining of the large intestine in humans and causes intestinal bleeding and diarrhoea.

- i) Describe, with the help of diagrams, the movement of an Amoeba to trap food particles. (3 marks)
- ii) Suggest an explanation why the action of this parasite causes diarrhoea. (2 marks)

c. i) Explain how decomposers (saprotrophs) obtain their food. (2 marks)

- ii) Explain why decomposers are very important in releasing nutrients into the soil. (2 marks)

- d. Insectivorous plants such as the Venus flytrap are green autotrophs that obtain some nutrients such as nitrogen by trapping and digesting invertebrates. These plants have leaves especially designed to act as traps.
- i) Why are these plants green? (2 marks)
 - ii) List ONE substrate needed for the process of photosynthesis by the plant. Give ONE source of the substrate you mentioned. (2 marks)
 - iii) State ONE function of the mineral nitrogen in plants. (2 marks)
 - iv) Explain why many insectivorous plants grow successfully in soils that are low in nutrients. (3 marks)
 - v) The Venus flytrap, traps mainly insects. Give TWO characteristics of the insect group. (2 marks)
- (Total: 25 marks)**

4. a. Give a biological explanation for **each** of the following statements.

- i) Most functions of the body are controlled by three prominent regions in the brain. (6 marks)
- ii) Both the nose and the skin have a protective function against disease. (3 marks)
- iii) After finishing a race an athlete carries on breathing deeply and quickly for a while. (3 marks)
- iv) Some plants have very large leaves, but others have needle-shaped leaves. (3 marks)

b. Explain why **each** of the following statements is incorrect.

- i) The heart and blood are two major organs in the body. (2 marks)
- ii) Blood plasma is red. (2 marks)
- iii) In both meiosis and mitosis two daughter cells are formed at the end. (2 marks)
- iv) Both identical twins and non-identical twins are genetically identical. (4 marks)

(Total 25 marks)

Please turn the page.

5. a. Describe the processes shown in **each** of the following pictures A to F. In your description include:
- the name of the process;
 - a description of the process;
 - and its biological importance.

A



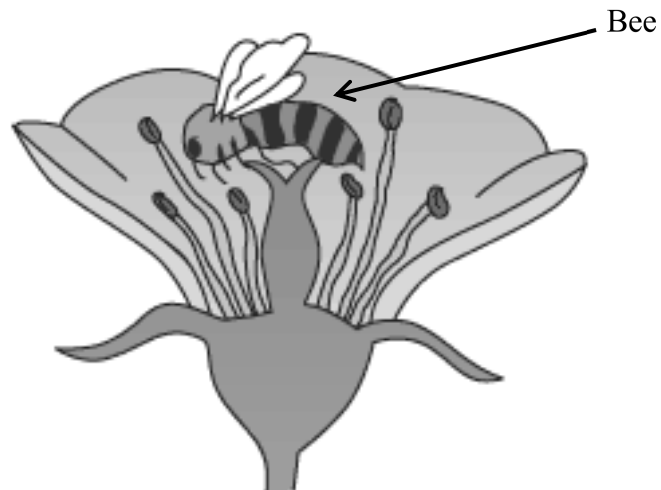
(4 marks)

B



(<http://www.yalemedicalgroup.org/stw/images/125505.jpg>)
(3 marks)

C



(Source: http://www.tekura.school.nz/departments/horticulture/images/ht102_16.gif)
(6 marks)

D



(Source: <http://sleepingresources.com/wp-content/uploads/2011/11/>)
(4 marks)

E



(4 marks)

F



(<http://www.visualphotos.com/photo/1x3744914/>)

(4 marks)

(Total: 25 marks)

6. Compare:

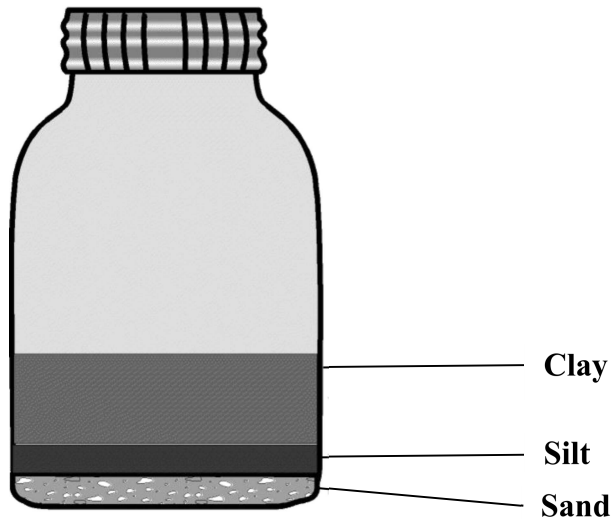
- a. the blood flowing in the right atrium with that flowing in the left atrium; (4 marks)
- b. the role of the semilunar valves and the atrio-ventricular valves (such as bicuspid / tricuspid valve) in a heartbeat; (4 marks)
- c. the wall of the left and right ventricle; (4 marks)
- d. the pumping of the heart at rest and during exercise; (3 marks)
- e. the blood flowing through the hepatic artery and the hepatic portal vein; (4 marks)
- f. the role of lymph vessels and blood vessels; (4 marks)
- g. the presence of haemoglobin in different blood cells. (2 marks)

(Total: 25 marks)

7. Different species of yeast and bacteria are used in the production of several useful food products such as bread, wine and vinegar.
- a. i) Give ONE difference that would be seen when a yeast cell and a bacterial cell are observed under a microscope. Give a reason for your answer. (3 marks)
ii) Explain why yeast cells and bacterial cells will never burst if placed in pure water. (2 marks)
- b. Yeast cells perform anaerobic respiration when oxygen is lacking. Name the TWO products formed when yeasts perform anaerobic respiration. (2 marks)
- c. The process of bread baking involves the addition of yeast to the mixture of ingredients. After mixing all the ingredients together, a very sticky dough results. The dough is then allowed to stand at a warm temperature. During this period the dough rises. The dough is then placed in an oven and baked.
i) List TWO ingredients, besides yeast, that would be used to produce the dough. (2 marks)
ii) What causes the dough to rise when it is allowed to stand in a warm temperature? (2 marks)
iii) Explain why it is important to produce a very sticky dough after mixing the ingredients together. (2 marks)
iv) What happens to the yeast when the dough is baked in the oven? Why? (2 marks)
- d. Write a short note to describe the production of wine. In your description include the following key words:
grapes, harvest, crushed, yeast, fermentation, barrel, filter, bottle. (4 marks)
- e. Wine vinegar is produced when Acetobacter are added to wine. In the process, wine is placed in large stainless steel tanks. Oxygen is bubbled through the tanks allowing the Acetobacter to act on a chemical in wine converting it into an acid. The whole mixture is kept at a temperature ranging between 26°C and 38°C.
i) Name the chemical that Acetobacter converts into an acid. (1 mark)
ii) Name the acid that is formed by the action of Acetobacter on the chemical. (1 mark)
iii) What evidence shows that the production of wine vinegar is an aerobic process. (2 marks)
iv) Give ONE reason why the process is performed at a temperature between 26°C and 38°C. (2 marks)
- (Total 25 marks)**

Please turn the page.

8. A student wants to determine the type of soil and soil conditions in a field where pea plants are grown.
- a. The student first determined the type of soil by filling a quarter of a jar with soil and adding water. After shaking the jar well, the soil contents were allowed to settle. The following diagram shows the different layers of soil particles after the contents were allowed to settle.



(<http://www.rain.org/global-garden/soil-types-and-testing.htm>)

- i) From the diagram above, name the type of soil and give TWO characteristic features of this type of soil. (5 marks)
- ii) This type of soil is rich in nutrients such as magnesium. Describe the importance of magnesium ions to plants. (2 marks)
- iii) List ONE visible effect on plant growth if magnesium ions are lacking in soil. (1 mark)
- b. The optimum pH of soil for the growth of peas is between pH 6 and pH 7. The student tested the soil and found it had a pH of 5.
- i) Name ONE method that may be used to increase the soil pH to pH 6. (2 marks)
- ii) Nitrogen-fixing bacteria form a mutualistic relationship with roots of pea plants. Explain how both organisms benefit from this association. (4 marks)
- iii) Nitrogen-fixing bacteria also need a pH between 6 and 7 for optimum rate of reaction. Describe how a pH level of 5 affects the rate of reaction. Give a reason for your answer. (3 marks)
- c. The student soaked the pea seeds in water and then planted them in soil.
- i) Give ONE reason why the student soaked the peas before planting them. (2 marks)
- ii) The student observed, that on germination, the shoot breaks through the surface of the soil, while the cotyledons remain underground. Name this type of germination. (2 marks)
- iii) List TWO factors, other than water, necessary for germination to occur and state their importance. (4 marks)

(Total: 25 marks)