

DIRECTORATE FOR QUALITY AND STANDARDS IN EDUCATION
 Department for Curriculum Management and eLearning
 Educational Assessment Unit
Annual Examinations for Secondary Schools 2013

BIOLOGY – FORM 4
 TIME: 2 HOURS

NAME: _____ CLASS: _____

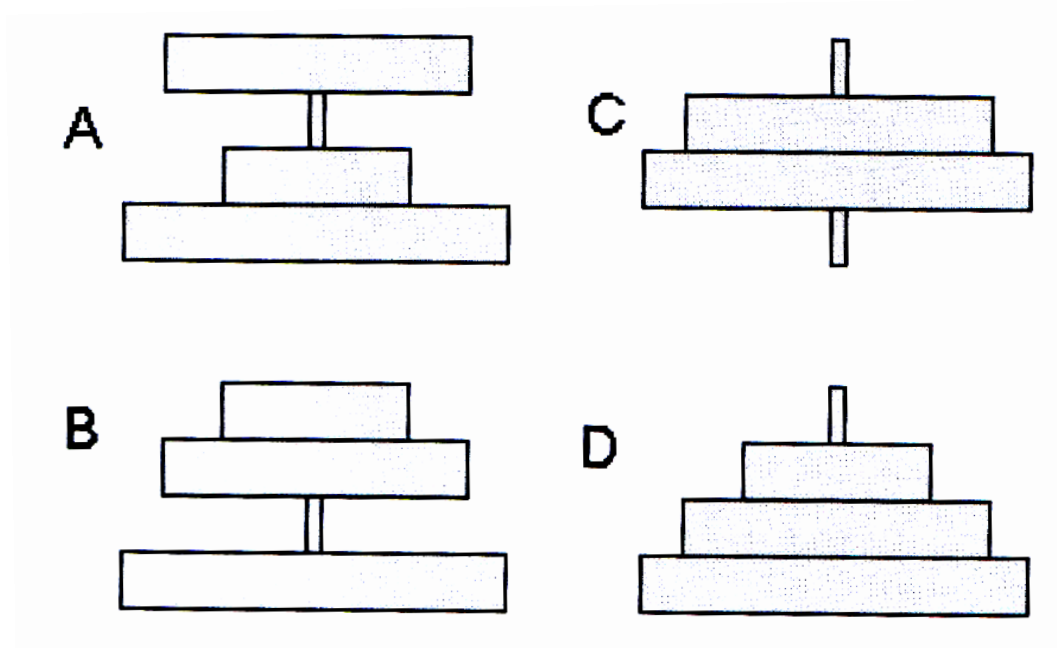
Question No.	Section A							Section B					
	1	2	3	4	5	6	7	1	2	3	4	5	
Max mark	5	10	10	7	9	6	8	15	15	15	15	15	
Actual mark													TOTAL MARK

85% Theory Paper	15% Practical	100% Final Score

Section A

Answer ALL questions in this section.

1. The following diagrams show four pyramids of numbers (A, B, C and D).



- a. For **each** of the following food chain descriptions, write the letter of the pyramid that best represents it.

i. Arthropods feed on tiny algae. Sardines feed on tiny arthropods. Dolphins feed on sardines.	
ii. Antelope feed on grass; lions feed on antelope. Fleas live on lions sucking their blood.	
iii. Greenflies feed on a rose bush. Ladybirds feed on greenflies. Swallows feed on ladybirds.	
iv. Zebras feed on long grass. Ticks suck the blood of zebras. Birds sit on the zebras' backs and feed on ticks.	

(1, 1, 1, 1 mark)

- b. An ecologist worked out the pyramids of biomass for a specific food chain in winter and again in summer. Explain why the two pyramids of biomass were not identical.

(1 mark)

Total: 5 marks

2. Aneurysm is a localized blood-filled balloon-like bulge in the wall of a blood vessel. Aneurysms commonly occur in arteries at the base of the brain and an aortic aneurysm occurs in the main artery. When the size of an aneurysm increases there is a high risk of a rupture resulting in internal bleeding.

a. Name the:

(i) main artery _____

(ii) main vein. _____

(1, 1 mark)

b. List TWO differences of the blood flow in arteries and veins.

(2 marks)

c. Describe the type of blood received in the left ventricle.

(1 mark)

d. The left ventricle pumps blood at higher pressure than the right ventricle. Explain how the structure of the wall of the left ventricle is different from the wall of the right ventricle.

(1 mark)

e. The heart keeps the blood flowing in one direction. Name the TWO types of valves that prevent the backflow of blood.

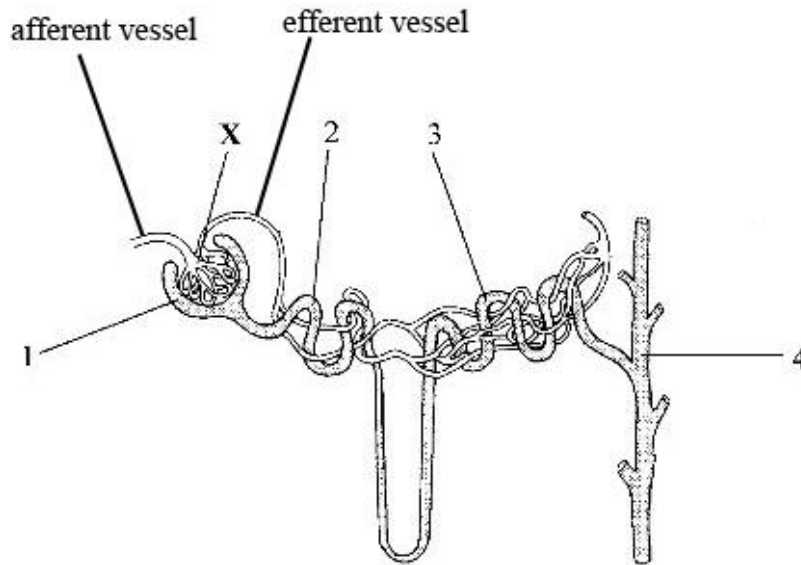
(2 marks)

f. Capillary beds are adapted for their function of exchange of substances. List TWO adaptations of capillaries that facilitate exchange of substances.

(2 marks)

Total: 10 marks

3. The following diagram shows the nephron.



a. From the diagram above write the number that represents the:

(i) collecting duct _____ (ii) Bowman's Capsule. _____ (1, 1 mark)

b. On the diagram above label the loop of Henle. (1 mark)

c. Name structure X.

_____ (1 mark)

d. Compare the blood pressure in the afferent and efferent arterioles and explain the cause of this difference.

 _____ (2 marks)

e. Proteins are not present in the glomerular filtrate but amino acids are. Explain.

 _____ (1 mark)

f. Compare the urea concentration in the renal artery with that in the renal vein.

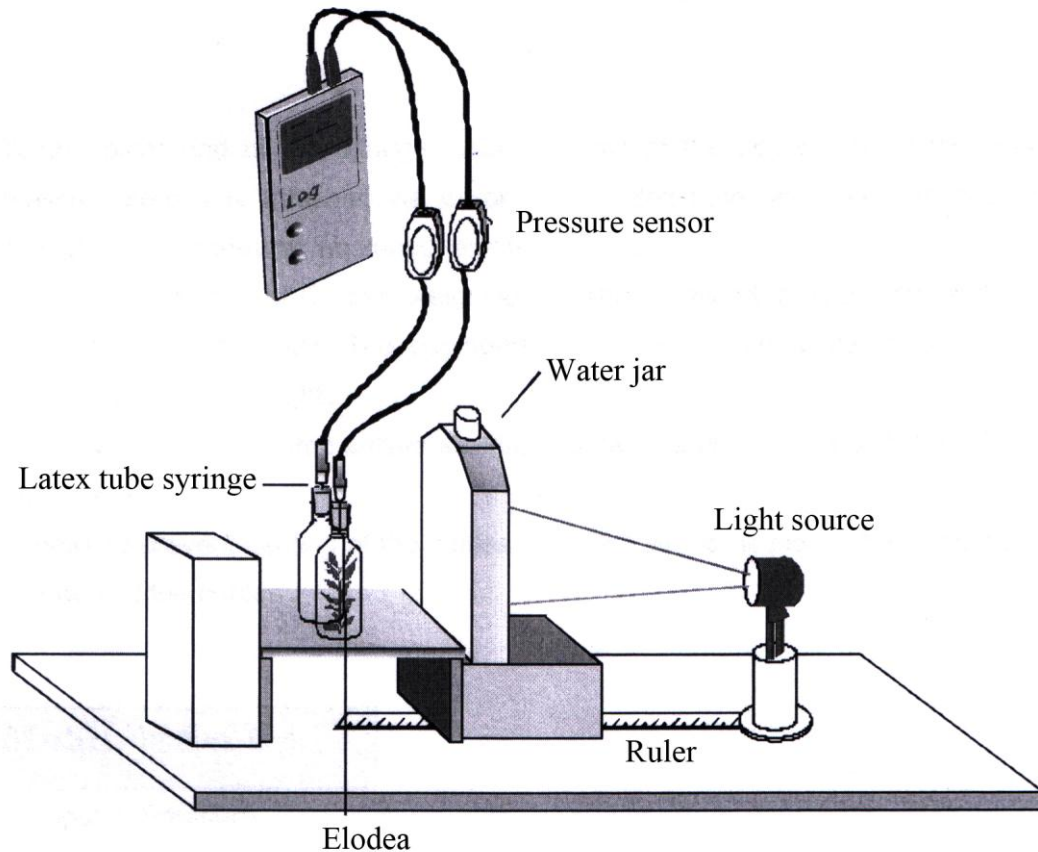
_____ (1 mark)

g. Name TWO organs that excrete urea.

_____ (2 marks)

Total: 10 marks

4. A biology teacher used the following experimental set up to measure the rate of photosynthesis. The experimental set-up consists of two 50ml transparent glass bottles tightly closed with rubber corks. Each bottle is filled with 0.5% bicarbonate solution. A pressure sensor is attached to each glass bottle. A fresh branch of Elodea is added in one of the bottles. A 1 litre water jar is placed between the light source and the bottles.



- Explain the importance of placing the water jar between the light source and the glass bottles.

(1 mark)
- List ONE advantage of using dataloggers when carrying out investigations about photosynthesis.

(1 mark)
- The teacher asked students to repeat the experiment in such a way that there is a higher rate of photosynthesis. Describe ONE way how this can be achieved.

(1 mark)
- Write the word equation for the process of photosynthesis.

(2 marks)

- e. List TWO reasons why a farmer prefers to control the conditions in a greenhouse artificially.

(2 marks)

Total: 7 marks

- 5a. Identify the deficiency disease in **each** of the following situations:

<i>Description</i>	<i>Name of deficiency disease</i>
(i) Ann is looking pale and feeling tired, lacking energy and slightly dizzy. The doctor prescribed iron tablets.	
(ii) Thomas is having difficulty to drive at night.	
(iii) Marisa and Jacob are both suffering from bleeding gums. Their nutritionist suggested adding citrus fruits in their diet.	

(1, 1, 1 mark)

- b. Reports of an increase in Vitamin D deficiency and the resulting bone-weakening disease emerged in a research study of children and adolescents taken across European countries. The report mentions that the reduced time that children are spending outdoors, is contributing to an increase in the incidence of the bone-weakening disease. Explain.

(2 marks)

- c. The Health Department designed the following two posters aimed to improve diets for children. Explain the biological significance of **each** poster.

EAT YOUR GREENS!



AVOID YOUR CHILD THE JUNK FROM THE START!



(2, 2 marks)

Total: 9 marks

6a. List TWO environmental advantages/benefits of using enzymes in detergents.

(2 marks)

b. Describe TWO ways how a car owner can reduce air pollution whenever driving the car.

(2 marks)

c. A journalist reported that there are no filters on Marsa power station chimneys.

(Times of Malta Tuesday 24th November 2009)

List TWO disadvantages of this situation.

(2 marks)

Total: 6 marks

7a. Name the:

(i) muscles present between the ribs that pull the rib cage upwards and outwards during breathing in

(ii) the sheet of muscle that separates the chest cavity from the abdomen.

(1, 1 mark)

- b. Mountaineers at high altitudes take in less oxygen with each breath than they do at sea level. Explain how this will affect the rate at which oxygen is absorbed in the lungs.
- _____
- _____
- (2 marks)
- c. The tidal volume is the volume of air breathed in and out during a normal resting breath. Describe how the tidal volume changes during exercise.
- _____
- (1 mark)
- d. Women have smaller lungs than men. Compare the maximum tidal volume in women with that in men.
- _____
- (1 mark)
- e. A reporter wrote that children are particularly prone to the effects of air pollution because they breathe through their mouth. Explain why this statement is correct.
- _____
- _____
- (2 marks)
- Total: 8 marks**

Section B

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

1. Newly published research shows that eating egg yolks accelerates atherosclerosis in a manner similar to smoking cigarettes. Atherosclerosis, also called coronary artery disease, is a disorder of the arteries.
- a. List TWO structural features of arteries. (2 marks)
- b. Describe the direction of blood flow in all arteries. (2 marks)
- c. Coronary arteries supply blood to the heart muscle. Compare the blood supply of the renal and hepatic arteries. (2 marks)
- d. Name the artery which has a high carbon dioxide concentration. (1 mark)
- e. Describe ONE way how smoking affects the human body's ability to respond to exercise. (2 marks)
- f. Arteries have a pulse but veins do not have a pulse. Explain. (2 marks)
- g. Eggs are high in cholesterol but they are still important in the diet of a body builder. Explain. (2 marks)

- h. Mater Dei Hospital is a smoke free zone. List ONE health benefit of this measure. (2 marks)

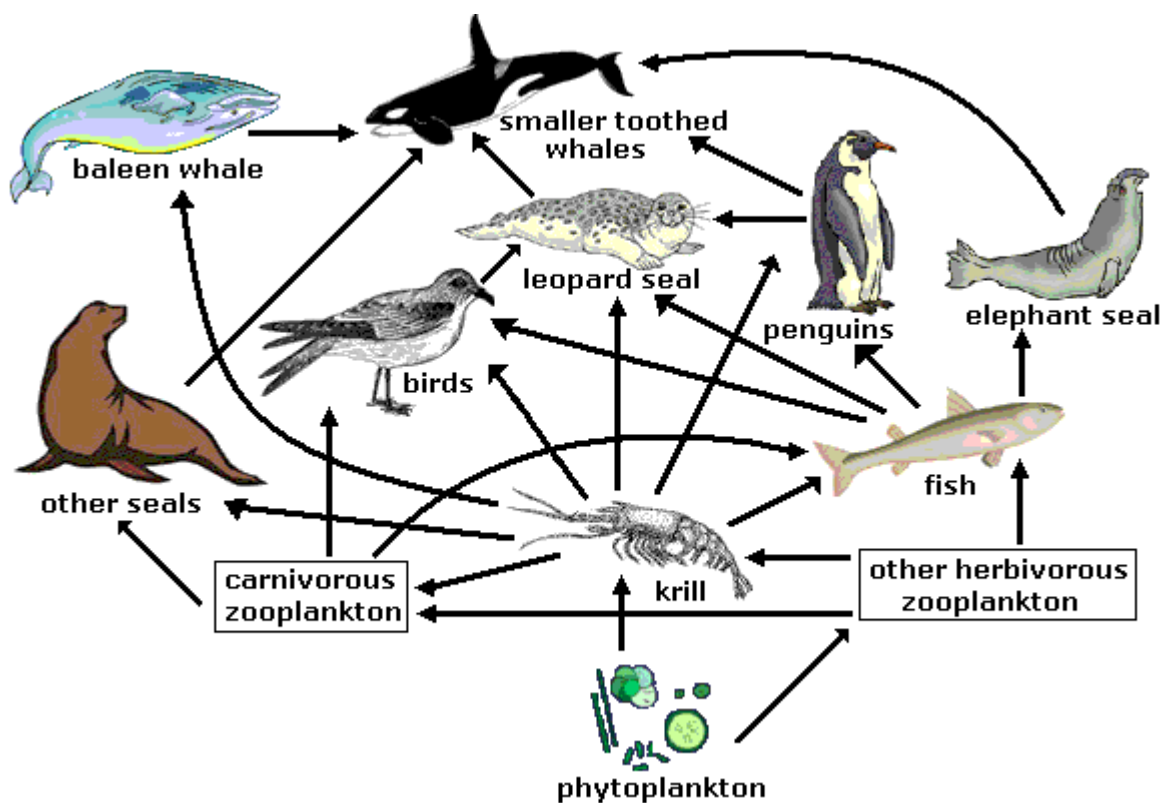
Total: 15 marks

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

- Enzymes can be used in more than one type of reaction. (2 marks)
- The enzyme bile is important in lipid digestion. (3 marks)
- Water enters a protist such as *Amoeba* and as a result the organism bursts. (3 marks)
- Tissue fluid is formed from plasma and is similar to it. (2 marks)
- Both carnivores and herbivores have a symbiotic relationship with cellulose-digesting bacteria. (3 marks)
- All types of blood cells have a red pigment. (2 marks)

Total: 15 marks

- 3a. The population of krill (a small crustacean) has dropped by 80% on the Antarctic Continent. Define the term *population*. (2 marks)
- b. The following diagram shows the feeding relationships between the organisms living in the Antarctic.



- Write the term that describes the feeding relationships between the organisms shown in the diagram.
- From the diagram write a food chain that includes the crustacean krill and has five trophic levels. (2, 5 marks)

- c. Explain how a drop in the krill population affects the population of penguins. (2 marks)
- d. Phytoplankton are microscopic organisms that inhabit the upper sun-lit layer of oceans. Explain why phytoplankton live in the well-lit surface layer of oceans. (2 marks)
- e. Explain how the amount of energy changes along a food chain. (2 marks)

Total: 15 marks

- 4. A patient was diagnosed with Esophageal Stricture. This involves narrowing or tightening of the oesophagus.
 - a. List TWO possible symptoms that this patient may suffer. (4 marks)
 - b. Name the process that pushes food along the oesophagus. (1 mark)
 - c. Describe the structure of the oesophagus. (1 mark)
 - d. Name the flap that prevents food passing through the trachea during feeding. (1 mark)
 - e. Gastric dumping syndrome is a condition where ingested foods bypass the stomach too fast and enter the small intestine largely undigested.
 - (i) List TWO secretions of the stomach.
 - (ii) Explain why the digestion of carbohydrates stops in the stomach.
 - (iii) Name the first part of the small intestine. (2, 2, 1 mark)
 - f. Maltase and lactase are two enzymes found in intestinal juice secreted by the ileum.
 - (i) Name the substrate of the enzyme lactase.
 - (ii) Describe the enzymatic change brought about by the enzyme maltase. (1, 2 marks)

Total: 15 marks

- 5. Pierce's Disease in grapevines is caused by the growth of the bacterium *Xylella fastidiosa* in the xylem vessels of stems, petioles and leaf blades.
 - a. Draw a diagram to show the arrangement of the xylem and phloem in a plant stem. (3 marks)
 - b. When a grapevine becomes infected with the Pierce's Disease, the bacterium causes a gel to form in the xylem tissue of the vine. Explain why this gel formation leads to leaf death. (2 marks)
 - c. Describe the role of the petiole. (2 marks)
 - d. Name and describe the process that changes grape juice into wine. (3 marks)
 - e. Grapes accumulate sugars as they grow on the grapevine through the translocation of sucrose. During ripening, the sucrose molecules are changed by the enzyme sucrase into glucose and fructose. Compare the types of sugars sucrose and glucose. (2 marks)
 - f. A biology student found out that sucrase works best at an optimum pH of 4.5. The student concluded that probably pH 4.5 is the optimum pH for all enzymes. Discuss whether the student's conclusion is correct. (3 marks)

Total: 15 marks