

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: _____

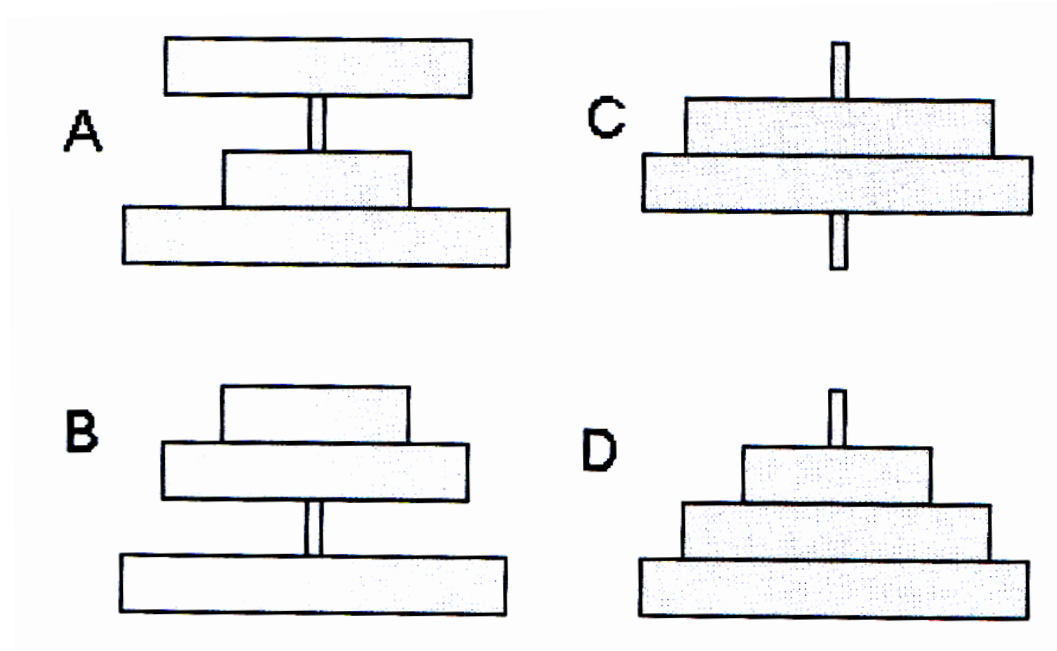
Question No.	Section A							Section B					
	1	2	3	4	5	6	7	1	2	3	4	5	
Max mark	5	10	10	7	9	6	8	15	15	15	15	15	
Actual mark													TOTAL MARK

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.

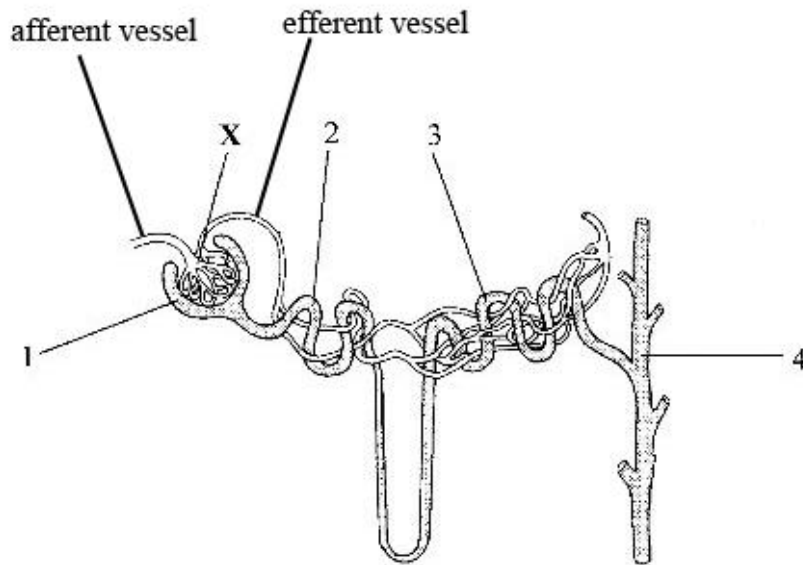
(2 marks)

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)

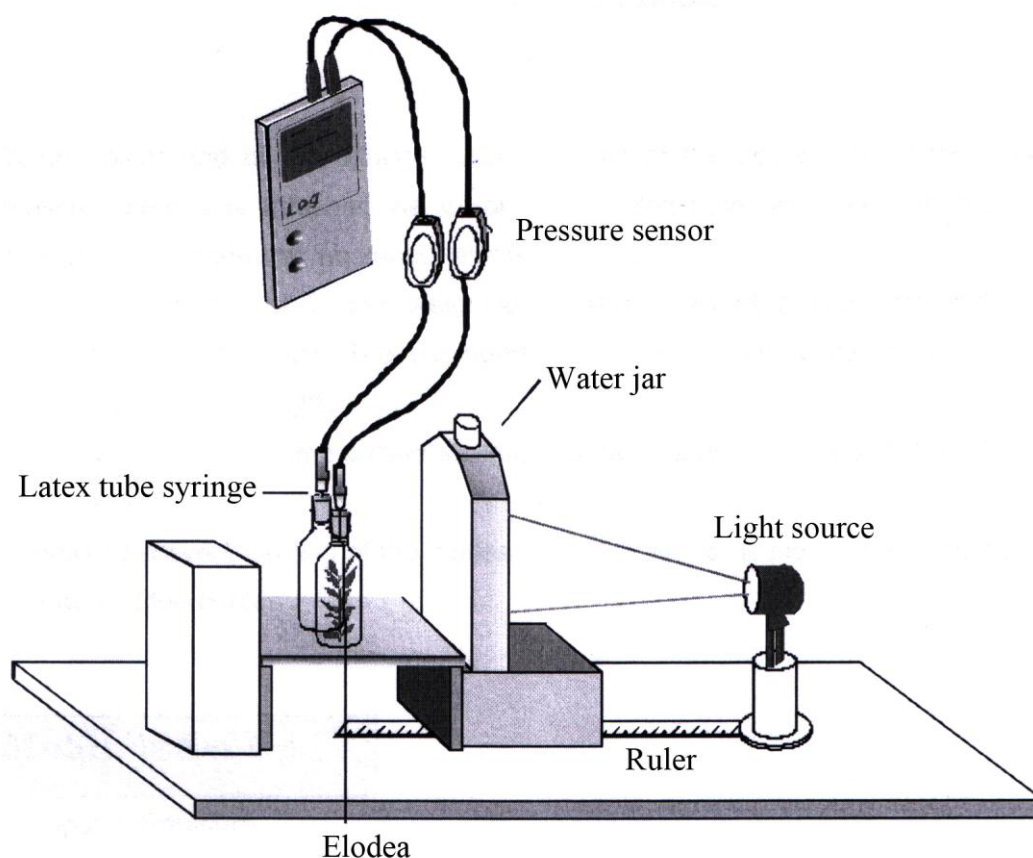
f. Compare the urea concentration in the renal artery with that in the renal vein.

(1 mark)

g. Name TWO organs that excrete urea.

(2 marks)

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.

- 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)

- b. Mountaineers at high altitudes take in less oxygen with each breath than they would at sea level. Explain how this will affect the rate at which oxygen is absorbed in their 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 question 1 and choose TWO other questions. Answer the questions of Section B on a foolscap.

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

Egg yolk consumption almost as bad as smoking!

Newly published research shows that eating egg yolks accelerates atherosclerosis in a manner similar to smoking cigarettes. The research team reported that consumption of egg yolks is about two-thirds as bad as smoking when it comes to increased build-up of carotid plaque, a risk factor for stroke and heart attack. Atherosclerosis, also called coronary artery disease is a disorder of the arteries where plaque, aggravated by cholesterol, form on the inner arterial wall. (Adapted from www.sciencedaily.com/releases/2012/08/120813155640.htm)

- a. List THREE structural features of the type of blood vessel mentioned in the passage. (3 marks)

- b. The carotid artery carries oxygenated blood to the head particularly to the brain.
the change brought about in the structure of the carotid artery in a person where plaques
are forming on the inner arterial wall. (1 mark)

- c. A rapid (fast) pulse is often one of the symptoms of a person suffering a heart attack.
- What is the biological significance of a rapid pulse?
 - The pulse may be felt in any place that allows an artery to be compressed against bone. Name ONE place where the pulse can be felt. (1, 1 mark)
- d. The following table shows the normal pulse rates (at rest) in children of different ages.

Age	Newborn (0-3 months)	Infants (3-6 months)	Infants (6-12 months)	Children (1-10 years)	Children over 10 years
Pulse rate Range	100-150	90-120	80-120	70-130	60-100

- Describe the general pattern of the pulse rate in children with increasing age.
 - Compare the pulse rate of an athletic teenager with that of a non-athletic teenager. (1, 1 mark)
- e. Describe TWO ways how smoking would affect the body's ability to respond to exercise. (2 marks)
- f. The Kitchen Garden at San Anton Gardens is a smoke-free recreational park in the Maltese Islands. Explain the benefit of smoke-free gardens for the children playing in the park. (1 mark)
- g. Cigarette smoking is the leading cause of bronchitis. Bronchitis is inflammation of the mucous membranes of the bronchi. What is the function of the bronchi? (2 marks)
- h. Eggs are high in cholesterol but they are still important in the diet of a body builder. Explain. (2 marks)

Total: 15 marks

2. Explain why **each** of the following statements is incorrect.
- Anaerobic respiration produces as much energy as aerobic respiration. (3 marks)
 - Both carnivores and herbivores have a very long small intestine. (3 marks)
 - The enzyme bile is important in lipid digestion. (3 marks)
 - The palisade mesophyll and the spongy mesophyll have a similar structure and function. (4 marks)
 - Tissue fluid is formed from plasma and is similar to it. (2 marks)

Total: 15 marks

3. The population of krill – a small crustacean that is the preferred food of penguins, crab-eater seals and fish – has dropped by 80% on the Antarctic Continent. Krill feeds on phytoplankton. Small toothed whales feed on penguins, crab-eater seals, leopard seals and fish. Leopard seals feed on fish and penguins, while penguins feed on fish too.
- Draw a food web to show the feeding relationships between the organisms mentioned above. (5 marks)
 - Explain why the drop in the number of krill is highly worrying the biologists studying the ecosystem in the Antarctic. (2 marks)
 - Define the term *population*. (1 mark)
 - The kidneys of sea mammals such as seals are able to maintain a constant salt concentration in their bodies, even though sea mammals drink seawater. Describe the type of urine excreted by sea mammals such that they can maintain a constant salt concentration in their bodies. (1 mark)

- e. Phytoplankton are microscopic organisms that inhabit the upper sun-lit layer of all oceans. Explain why phytoplankton live in the well-lit surface layer of oceans. (2 marks)
- f. Explain why the gills of fish consist of thin filaments of tissue branches that have a highly folded surface. (2 marks)
- g. Once fish are out of water the gills stick together. Explain how this affects the gas exchange process in fish. (2 marks)

Total: 15 marks

- 4a. A patient was diagnosed with Esophageal Stricture. This involves narrowing or tightening of the oesophagus. The disorder can be caused by inflammation of the oesophagus. List TWO possible symptoms that this patient can suffer. (2 marks)
- b. Describe the structure of the oesophagus. (1 mark)
- c. Explain the role of the epiglottis for efficient feeding. (2 marks)
- d. Gastric dumping syndrome is a condition where ingested foods bypass the stomach too rapidly (fast) and enter the small intestine largely undigested.
 - (i) Compare the pH in the stomach and the small intestine.
 - (ii) Name the first part of the small intestine and the longest part of the small intestine.
 - (iii) List TWO enzymes that normally digest food in the small intestine.
 (1, 2, 2 marks)
- e. Patients suffering from gastric dumping syndrome need to eat several small meals a day that are low in carbohydrates. Name the site where carbohydrate digestion begins and explain the change brought about. (3 marks)
- f. Explain what happens to the small soluble digested food particles present in the small intestine when digestion is complete. (2 marks)

Total: 15 marks

- 5. Pierce's Disease in grapevine is caused by the growth of the bacterium *Xylella fastidiosa* in the xylem vessels of stems, petioles and leaf blades.
 - a. Distinguish between the *midrib* and the *petiole*. (2 marks)
 - b. Compare the arrangement of the xylem and phloem tissue in a plant stem and root. (You may use diagrams to compare the arrangement of xylem and phloem tissue.) (4 marks)
 - c. 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 will lead to leaf death. (2 marks)
 - d. Elm Yellows is a plant disease affecting Elm trees. It is caused by bacteria that are obligate parasites of the plant phloem tissue. These bacteria destroy the plant's phloem tissue. Explain why when an Elm tree is infected with Elm Yellows the first parts to die are the root hairs. (2 marks)
- e. A biology student remarked that the plant cuticle also functions in plant defence. Explain. (2 marks)
- f. A biology student observed a slide of the cross section of a leaf under the light microscope. The student observed many pores on the lower epidermis but only few on the upper epidermis. Name the pores observed and explain why more pores are present on the lower epidermis than on the upper epidermis. (3 marks)

Total: 15 marks