BIOLOGY – FORM 4  
TIME: 2 HOURS

NAME: _____________________________  CLASS: _____________________________

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TOTAL MARK

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<th>85% Theory Paper</th>
<th>15% Practical</th>
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Track 3
Section A

Answer ALL questions in this section.

1. Vegans exclude eggs and dairy products such as animal milk, cheese, butter and yoghurt from their diet. Plant milk such as soy milk or almond milk is used in vegan diets. Soy milk is complete in protein, containing all the essential amino acids. Most vegan diets contain little or no vitamin D however they contain as much iron as animal-based diets.

a. From the passage above write the food substance that is:
   i. needed for growth and repair of worn-out or damaged tissues  
   ii. necessary to prevent rickets
   iii. lacking in anaemic patients.

   ________________  
   ________________  
   ________________  

   (1, 1, 1 mark)

b. Write the term that describes a diet that contains all the food substances in the right proportions.

   ________________________________________________________________________  

   (1 mark)

c. A school launched the following “Cut the junk” poster in a Healthy Eating campaign among teenagers.

   Discuss the biological message in the poster.

   ________________________________________________________________________
   ________________________________________________________________________
   ________________________________________________________________________

   (2 marks)

d. Mediterranean diets are rich in unrefined cereals, legumes, fruits and vegetables. Explain the benefits of this type of diet.

   ________________________________________________________________________

   (2 marks)

Total: 8 marks
2. The following diagram shows the breathing rate of a young person participating in a 400 metre race.

[Graph showing breathing rate]

a. Explain the increase in breathing rate in part A of the graph.

____________________________________________________________________________

____________________________________________________________________________ (2 marks)

b. From the graph write the letter that represents the time when:

i. lactic acid is produced ________

ii. the oxygen debt is paid off. ________ (1, 1 mark)

c. Compare the action of the intercostal muscles during breathing in and breathing out.

____________________________________________________________________________

____________________________________________________________________________ (1 mark)

d. Name the gas whose concentration in the blood increases during breathing in.

____________________________________________________________________________ (1 mark)

e. During exercise the heart pumps more blood each minute. Explain TWO ways how this is achieved.

____________________________________________________________________________

____________________________________________________________________________ (2 marks)

Total: 8 marks
3. In patients that suffer from Transposition of the Great Arteries, the pulmonary artery and the aorta are reversed. This implies that the pulmonary artery leaves the left ventricle and the aorta leaves the right ventricle.

a. Describe the flow of oxygen-poor blood and oxygen-rich blood in patients suffering from Transposition of the Great Arteries:

i. oxygen-poor blood

ii. oxygen-rich blood

(1, 1 mark)

b. Aortic valve stenosis (AS) is a heart disease in which the opening of the aortic valve is narrowed. The aortic valve is the semilunar valve between the left ventricle of the heart and the aorta.

i. Name the valve between the left atrium and the left ventricle.

ii. Explain how the AS disease affects the heart beat and the left ventricle muscle wall.

(1, 2 marks)

c. A newborn baby was suffering from the heart condition tricuspid atresia — where there is complete absence of the tricuspid valve.

i. Explain why a newborn with this condition is often short of breath.

ii. Explain the exact location of the tricuspid valve.

(1, 1 mark)

d. The heart muscle has a large number of mitochondria and a good supply of blood. Explain.

(3 marks)

Total: 10 marks

4a. Distinguish between:

i. where urea is produced and where it is excreted
ii. where bile is produced and where it is stored

_________________________________________________________________________
_________________________________________________________________________

iii. where urine is stored in the body and where it is carried to the outside.

_________________________________________________________________________

(2, 2, 2 marks)

b. Name TWO substances that are NOT present in urine of healthy individuals.

_________________________________________________________________________

(2 marks)

c. Jerboas are desert rats. Describe the urine and faeces of jerboas.

_________________________________________________________________________

(2 marks)

Total: 10 marks

5. Lactose is a disaccharide present in dairy products. To be absorbed, the lactose needs to be broken down into its two component sugars. This digestion is brought about by specific enzymes that lie in the microvilli of the lining of the small intestine. A deficiency of this enzyme leads to an inability to break down lactose. As a consequence, patients suffering from lactose intolerance suffer from diarrhoea due to fluid entering the small intestine.

a. Name the disaccharide present in fruit.

______________________________________________________________________

(1 mark)

b. Name the component sugars (monosaccharides) present in lactose.

______________________________________________________________________

(2 marks)

c. The hormone secretin secretes the alkali bicarbonate into the small intestine. Explain the biological importance of the secretion of bicarbonate in the small intestine.

______________________________________________________________________

(1 mark)

d. Enzymes are not altered by the reaction in which they take part. Explain the biological importance of this.

______________________________________________________________________

(1 mark)

e. From the passage above choose and write the phrase that indicates that each enzyme controls one type of reaction.

______________________________________________________________________

(1 mark)

f. Digestion starts in the mouth. Describe ONE mechanical digestion process and ONE chemical digestion process taking place in the mouth.

Mechanical digestion:

Chemical Digestion:

(1, 1 mark)
g. Explain the role of microvilli in the lining of the small intestine.  

____________________________________________________________________

(2 marks)

Total: 10 marks

6. The following apparatus was set up in the lab. The experiment was exposed to light for about six hours. Concentrated NaOH solution was placed in Jar A. Sodium hydroxide (NaOH) absorbs carbon dioxide present in air.

![Diagram of the apparatus]

a. After six hours a leaf from the plant in each jar was tested for starch. Describe the result you would expect.

Leaf from Jar A: ________________________________________________________________

Leaf from Jar B: ________________________________________________________________  (2 marks)

b. List ONE variable that needs to be kept the same during the experiment.

______________________________________________________________________  (1 mark)

c. A biology teacher conducted an experiment to investigate the products of photosynthesis. First a lighted candle was placed in a sealed chamber. After a short while the candle goes out. A sprig of mint is then introduced into the chamber without any air being let in. The apparatus is left in the light. After ten days the candle, on being lit, burns again. The following diagram shows the experiment set up.
Name the gas released by photosynthesis that allows the candle to burn again.

__________________________________________________________ (1 mark)

d. A biology student placed a white carnation in a beaker with methylene blue stain dissolved in water. After six hours the carnation turned into a light blue. Explain the result obtained.

__________________________________________________________ (2 marks)

e. The photosynthetic cells are mainly on the upper side of the leaf. Explain.

__________________________________________________________ (3 marks)

Section B

Answer Question 1 and any TWO other questions.

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

Obstructive lung diseases are respiratory diseases characterised by airway obstruction. Asthma is an obstructive lung disease where the bronchial airways are extra sensitive. The airways become inflamed and produce excess mucus. The muscles around the airways tighten, thus making the airways narrower. Restrictive lung diseases are respiratory diseases that restrict lung expansion resulting in a decreased lung volume.

a. Describe the position of the lungs in the human body. (1 mark)
b. Describe TWO consequences of narrower airways. (2 marks)
c. Low air quality from factors such as traffic pollution has been associated with asthma.
   i. Compare the risk of suffering from asthma for children living in Floriana with those living in Wardija.
   ii. Describe ONE way how car manufacturers are reducing air pollutants in car emissions. (1, 1 mark)
d. Explain the role of mucus in the human respiratory system. (1 mark)
e. Compare the lung volume during breathing in and breathing out. (2 marks)
f. Describe ONE symptom of a reduced lung volume in individuals suffering from restrictive lung disease. (1 mark)
g. A smoker is 20 times more likely to develop bronchitis than a non-smoker. Explain. (3 marks)
h. Contrast the damage caused by tar, nicotine and carbon monoxide in cigarette smoke. (3 marks)

Total: 15 marks
2. Describe why each of the following statements is incorrect:

   a. The pancreatic juice flowing down the pancreatic duct contains only proteases. (3 marks)
   b. As the temperature increases, the rate of photosynthesis keeps increasing. (2 marks)
   c. Carnivorous animals have a gap between the front and back teeth. (2 marks)
   d. The liver receives blood only from the hepatic artery. (3 marks)
   e. All food ingested via the mouth is absorbed and assimilated. (2 marks)
   f. All animals require specialised gas exchange organs. (3 marks)

   **Total: 15 marks**

3. A biologist described some of the interactions between organisms in a temperate forest.

   *The Gray squirrel and the White-tailed deer feed on rice grass and goosegrass, while the toad feeds on carpet moss. The toad in turn is preyed upon by the Great horned owl, the bald eagle and the duckbilled platypus. Bald eagles and Great horned owls hunt and feed on the Gray squirrel. The cougar and wolves hunt and feed on the White-tailed deer and the Gray squirrel.*

   a. Draw a food web to illustrate the interactions described in the passage above. (5 marks)
   b. Describe how food chains can be represented quantitatively. (1 mark)
   c. Describe the change in energy flow along a food chain. Give a reason for your answer. (2 marks)
   d. The Gray squirrel population was drastically affected by a viral disease. Discuss how this affects the population of White tailed deer. (2 marks)
   e. White tailed deer are ruminants. Describe the difference between a ruminant and a non-ruminant. (1 mark)
   f. Name the TWO types of teeth present in herbivores that grow throughout the life span of the animal. (2 marks)
   g. The canines in carnivores are long and pointed. Explain. (2 marks)

   **Total: 15 marks**

4. Distinguish between each of the following:

   a. tracheae and spiracles in insects (3 marks)
   b. pharynx and larynx (4 marks)
   c. phloem vessels and xylem vessels (4 marks)
   d. wall of the left and right ventricle. (4 marks)

   **Total: 15 marks**
5. Give a biological explanation for each of the following posters.

a.

![Image of Biogas poster]

(3 marks)

b.

![Image of Bob and Bob with Bob having emphysema]

(3 marks)

c.

![Image of No longer green poster]

(3 marks)
d. I cannot see well in dim light.

(2 marks)

e. I switched to biological detergents!

(4 marks)

Total: 15 marks