

Annual Examinations for Secondary Schools 2019

YEAR 10

BIOLOGY

TIME: 2 hours

Name: _____

Class: _____

Question No.	Section A						Section B					
	1	2	3	4	5	6	1	2	3	4	5	
Max mark	9	8	9	10	10	9	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. This section carries 55 marks.

1. Plants carry out photosynthesis in order to build up their own 'complex' food from simpler molecules.

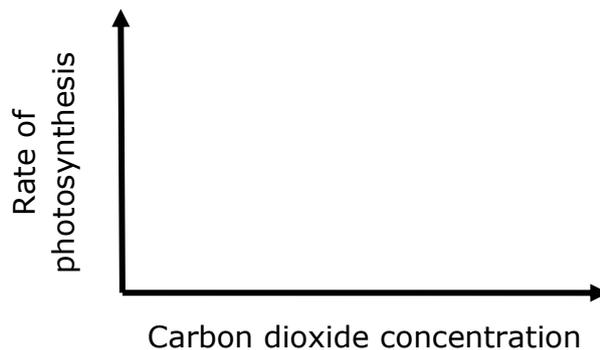
a. Identify the term that best describes this mode of nutrition. [1]

b. i. Name the organelle where photosynthesis takes place. [1]

ii. Write a **word equation** to summarise the process of photosynthesis. [2]

c. Carbon dioxide concentration is one of the factors that affects the rate of photosynthesis.

i. Sketch a graph on the axes provided to illustrate this statement. [2]



ii. Explain the pattern shown in c i. [2]

iii. Name **one** other factor that affects the rate of photosynthesis in the same way. [1]

Total: 9 marks

2. Complete the following statements by writing a suitable word in the space provided.
- a. _____ is the storage form of extra glucose in animal [1] cells.
 - b. Protein molecules are made up of carbon, hydrogen, [2] _____ and oxygen. They may also contain _____.
 - c. One can conclude that _____ is absent when a food [1] sample solution, to which iodine is added, remains reddish brown.
 - d. _____ involves the removal of waste products of [1] metabolism from the body.
 - e. Complete digestion of carbohydrates yields the individual [2] _____. This is an example of a _____ reaction.
 - f. The incomplete breakdown of glucose during _____ [1] respiration yields a variety of products depending upon the organism in which it takes place.

Total: 8 marks

3. The Plant Health Directorate is performing numerous inspections on a wide range of woody plants such as olive and citrus trees. The aim is to detect and control the spread of the bacterium *Xylella fastidiosa*. This bacterium blocks the xylem of the infected plants.

a. i. Mention **one** function of the xylem vessels. [1]

ii. List **two** adaptations of the xylem vessels to their function. Describe the importance of each. [2]

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- ---

iii. Explain why the infected plants eventually die as a result of the blockage. [1]

b. Name the other vascular tissue found in plants. [1]

c. i. In the space provided draw a neatly labelled diagram that shows a cross section of a dicot root. [2]

ii. Compare the direction of transport in the xylem and the vascular tissue named in b. [2]

Total: 9 marks

4. Wild rabbits are still relatively common in the Maltese countryside. However, they are rarely seen because being very timid, they usually emerge to feed on grass at dawn or dusk. While in the open, it is not unusual to see some of them scratching because of the fleas that make them itch while feeding on their blood.



- a. Place the following terms next to their meaning in table 1. The first one [2]
has been done as an example.

trophic level, population, habitat, ecosystem, community

Meaning	Term
An interacting group of various species in a common location.	community
Where an organism lives.	
A group of organisms of the same species living in the same area.	
Position in a pyramid of numbers.	
Organisms and their environment.	

Table 1

- b. i. In the space provided draw a labelled pyramid of numbers for the food chain described in the introduction to the question. [2]

- ii. Account for the shape of this pyramid of numbers. [1]

- c. From this food chain identify:
i. the producer [1/2]

- ii. the secondary consumer [1/2]

d. State **two** ways in which energy is lost between trophic levels. [2]

- _____

- _____

e. During a particular year, the summer months were very hot and huge fires ravaged the countryside. The wild rabbit population decreased drastically. [2]

Suggest **two** likely causes for this.

- _____

- _____

Total: 10 marks

5. A group of students investigated the effect of mineral deficiencies on the growth of wheat seedlings.

The wheat seedlings were allowed to grow in the different nutrient solutions for 14 days. The students weighed and recorded the change in mass of the individual seedlings in each of the solutions. The results are shown in table 2 below.

Change in mass of individual seedlings / g					
Complete solution	Solution without nitrate*	Solution without phosphate**	Solution without magnesium	Solution without potassium	Distilled water (no nutrients)
2.50	0.30	0.50	1.40	1.30	0.10
2.10	0.20	0.40	1.00	1.20	0.05
1.90	0.20	0.40	1.30	0.90	0.20
2.80	0.40	0.20	1.20	1.10	0.05
Average:	Average:	Average:	Average:	Average:	Average:
2.33	_____	0.38	1.23	1.13	0.10

* Solution lacks a source of nitrogen

** Solution lacks a source of phosphorus

Table 2

a. Calculate and tabulate the missing average value in table 2. Use the space provided for the working. Give your answers to **2 decimal places**. [2]

b. i. Identify the element that appears to be the most important for seedling growth. Give a reason for your choice. [3]

ii. Describe its use inside a plant. [1]

c. As a precaution the students used wheat seeds from the same wheat plant.

i. Suggest a valid reason for this precaution. [1]

ii. Mention **one** other factor the students should keep constant in their experiment. [1]

d. Minerals are also essential to animals.

i. Name **one** mineral not mentioned in table 2 and its source. [1]

ii. Describe the symptoms of its deficiency. [1]

Total: 10 marks

6. a. Complete table 3 below by inserting the correct terms from the following list:

Bile, Molars, Stomach, Diastema, Lipase, Peristalsis

	An organ for the mixing of food.
	Wavelike contractions in the gut that move food along.
	Grind food into smaller pieces.
	An enzyme that digests fats into fatty acids and glycerol.
	A secretion that emulsifies fats.
	A gap between the incisors and premolars of a herbivore.

Table 3

b. Figure 1 represents a structure that forms part of the digestive system. [3]

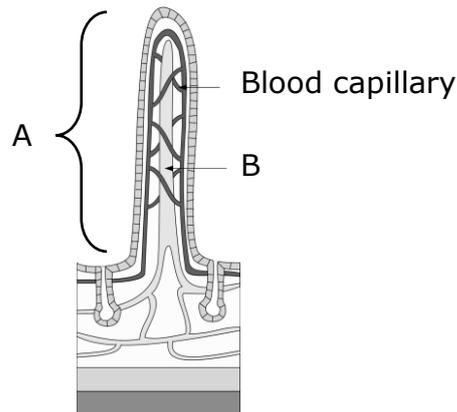


Figure 1

i. Name structure **A**. [1]

ii. State **two** ways in which **A** is adapted for the absorption of soluble foods. [1]

- _____
- _____

c. Name the type of food which is mainly absorbed into **B**. [1]

- d. The blood vessels shown empty the blood full of absorbed nutrients into the hepatic portal vein.
- i. Name the organ that receives the blood via the hepatic portal vein. [1]

- ii. Explain why the blood needs to be taken to the organ named in d i. [2]
before being distributed round the body.

Total: 9 marks

Section B

Answer ANY THREE questions on separate sheets of paper. This section carries 45 marks.

1. When it comes to improving their performance, athletes will try just about anything. One such method of gaining a performance edge is altering the body's ability to use, produce and carry oxygen to the working muscles.

Blood doping is a method of increasing athletic performance by artificially increasing an athlete's red blood cell count (RBC). Initially athletes turned to blood transfusions. Another method involves the injection of the drug erythropoietin (EPO). This is a naturally occurring hormone, produced by the kidneys, that stimulates the production of red blood cells.

Adapted from:

<https://www.verywellfit.com/epo-and-blood-doping-in-sports-3120522>

- a. i. Name the process that utilises oxygen for the production of energy. [1]
ii. Write the **word equation** that summarises the process named in a i. [1]
- b. i. Describe the changes in the heart rate and breathing rate of an athlete during the race. [2]
ii. Explain why the breathing rate does not immediately return to the resting rate at the end of the race. [2]

- c. Figure 2 below shows two types of blood cells. These are typical examples of specialised cells.

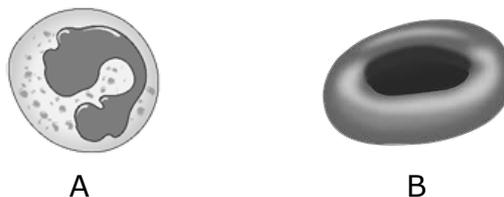


Figure 2

- i. Name the two types of blood cells shown, giving a reason for your choice by referring to features visible in Figure 2. [4]
- ii. Define the term 'specialised cells' using the cells shown in Figure 2 as a reference. [3]
- iii. At times cell A increases sharply in number for a few days. Suggest why this takes place. [2]

Total: 15 marks

2. Pepsin is an enzyme that breaks down cooked egg white. When the egg white is digested, the mixture turns from white to colourless. Table 4 shows the time taken for this mixture to turn colourless at different temperatures.

Temperature (°C)	Time for mixture of mashed boiled egg white to go colourless (seconds)
20	840
25	540
30	360
35	180
40	150
45	360

Table 4

- a. Pepsin is a protease enzyme. Explain this statement. [1]
- b. The Lock and Key hypothesis explains how enzymes work. [6]
Draw a neat labelled diagram that represents the reaction being investigated.
Make sure you label the following: substrate, enzyme, enzyme-substrate complex, product and active site.
- c. By referring to table 4, determine an **approximate** value of the temperatures at which the enzyme is:
 - i. at its optimum temperature [3]
 - ii, denatured [3]
 Give a reason for **each** answer.
- d. This investigation shows that enzymes are temperature sensitive. Mention **one** other property of enzymes. [1]
- e. Specify **one** use of enzymes in everyday life. [1]

Total: 15 marks

3. The function of the kidney is to filter blood as it passes through the glomerulus. Some of the substances in the filtrate are reabsorbed back into the bloodstream. The rest move on to the collecting duct and are stored in the bladder to be removed from the body as urine.

Table 5 below provides information about the amounts filtered, reabsorbed and excreted by the kidney of a healthy person.

Substances Filtered and Reabsorbed by the Kidney per 24 Hours			
Substance	Amount filtered (grams)	Amount reabsorbed (grams)	Amount in urine (grams)
Water	180 L	179 L	1 L
Proteins	10-20	10-20	0
Chlorine	630	625	5
Sodium	540	537	3
Bicarbonate	300	299.7	0.3
Glucose	180	180	0
Urea	53	28	CALCULATE

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Table 5

- a. i. Calculate the mass of urea that is excreted. [1]
 ii. Calculate the percentage of sodium that is reabsorbed. Show your working and give your answer to **one** decimal place. [2]
- b. Urea is produced when deamination of proteins takes place.
 i. Name the organ where deamination takes place. [1]
 ii. Explain why proteins are deaminated. [2]
- c. In a healthy person, none of the glucose is excreted even though it is filtered into the Bowman's capsule.
 i. Explain the importance of this. [1]
 ii. Unlike glucose, no plasma proteins are filtered into the Bowman's capsule. Explain. [1]
- d. i. Compare the colour and amount of urine produced on a hot and cold day. [1]
 ii. Name the hormone that triggers this change. [1]
 iii. Name the part of the nephron that is affected by this hormone and describe this effect. [2]
 iv. Name the structure which is responsible for the monitoring of blood concentration. [1]
- e. i. Name **another** excretory organ in the body, other than the kidney. [1]
 ii. Mention **one** excretory product of the organ you named in e i. [1]

Total: 15 marks

4. a. Write short paragraphs to compare and contrast the following terms:
- i. Capillaries and veins [5]
 - ii. Mechanical and chemical digestion [3]
 - iii. Fats and oils [3]
- b. Explain how smoking can lead to emphysema. [4]

Total: 15 marks

5. Figure 3 below shows a cross section through a leaf.

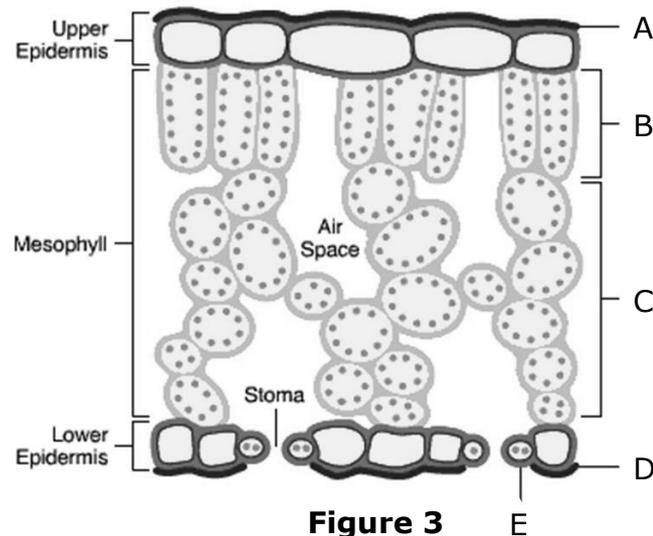


Figure 3

- a. i. Name layer **A**. [1]
 ii. Describe its function. [1]
- b. The leaf is the organ responsible for production of food in a plant. Its structure makes it highly adaptable to carry out photosynthesis at an efficient rate.
- i. The mesophyll layer is divided into two layers **B** and **C**. All the cells that make up the mesophyll layer carry out photosynthesis. Suggest why the cells at **C** contain fewer chloroplasts than the cells at **B**. [2]
- ii. Describe **two** adaptations of the leaf for efficient photosynthesis other than the one described in b i. [2]
- c. Stomata are openings which allow gases to diffuse in and out of the leaf. The size of the stomata is controlled by the cells labelled E.
- i. Name these cells. [1]
 ii. Name the process, other than photosynthesis, which takes place in the leaf and requires exchange of gases with the surrounding atmosphere. [1]
 iii. Name the **two** gases involved in the gas exchange taking place. [2]
- d. Complex organisms such as insects possess specialised organs where gas exchange can efficiently take place.
- i. Using diagrams or otherwise, name and describe the gas exchange surface of an insect. [1,2]
 ii. Explain why insects need a gas exchange surface such as that described in d i., instead of taking place all over their body surface as in an *Amoeba*. [2]

Total: 15 marks