

**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												<b>TOTAL MARK</b>

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]

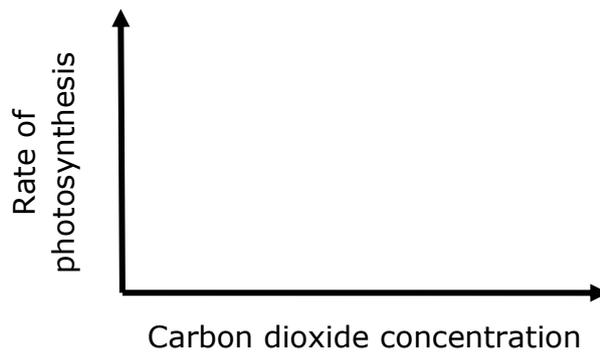
\_\_\_\_\_

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]

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

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- ---

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

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

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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]

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**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]

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

- 
- ii. the secondary consumer. [1/2]

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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.

<b>Change in mass of individual seedlings / g</b>					
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
<b>Average:</b>	<b>Average:</b>	<b>Average:</b>	<b>Average:</b>	<b>Average:</b>	<b>Average:</b>
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]

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

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

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

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

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d. Minerals are also essential to animals.

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

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

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**Total: 10 marks**

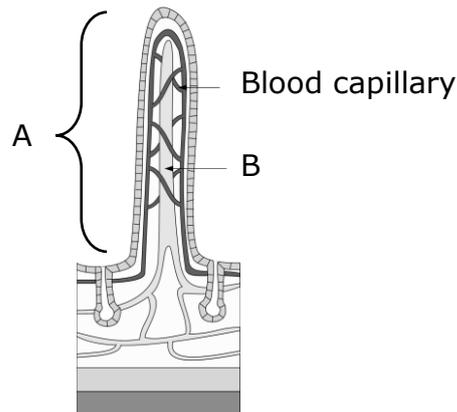
6. a. Complete table 3 below by inserting the correct terms from the following list:

**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]

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

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**Total: 9 marks**

### **Section B**

**Answer Question 1 and any other two questions on separate sheets of paper. This section carries 45 marks.**

1. When it comes to finding an athletic edge, athletes will try just about anything from using the latest training and recovery techniques, modifying diets and hydration, training at altitude and using sports psychology techniques in hopes of finding the ideal performance formula. Some strategies to enhance performance are controversial, and many sporting organizations have banned specific practices among competitive and professional athletes.

One such method of gaining a performance edge is altering the body's ability to use, produce and carry oxygen to the working muscles. This practice is most commonly associated with endurance athletes, and cyclists have been those most in the spotlight for a technique called 'blood doping'.

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, where an athlete stored and re-infused his or her own RBCs or the RBCs of someone with the same blood type. Another means involves 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. Describe the changes in the heart rate and breathing rate of an athlete during a race. [2]
- ii. Account for the changes described in a i. [3]
- iii. Explain why the breathing rate does not immediately return to the resting rate at the end of the race. [2]
- b. List **two** features of a red blood cell and explain how each feature helps the red blood cell to carry out its function. [2]

- c. White blood cells are also found in blood plasma. At times, their number increases sharply for a few days. Account for this observation. [1]
- d. Once oxygenated in the lungs, the blood returns to the heart before entering the general circulation again.
  - i. Identify the side of the heart that receives the oxygenated blood and account for the importance of this. [1]
  - ii. Explain how the heart is structurally adapted to its function. [4]

**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. A group of students carried out this investigation using **mashed** boiled egg white. 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.
  - i. Pepsin is a protease enzyme. Explain this statement. [1]
  - ii. Describe the pattern of results obtained. [2]
- b.
  - i. From the table, determine the value for the optimum temperature of pepsin. [1]
  - ii. At a temperature of 5°C the mixture **does not** turn colourless. Specify the term that best describes the enzyme at this temperature. [1]
  - iii. Describe and explain what results would be expected as the temperature increases **above** 45°C. [3]
  - iv. This investigation shows that enzymes are temperature sensitive. Mention **one** other property of enzymes. [1]
- c. The students repeated the investigation using a **lump** of boiled egg white.
  - i. List **two** variables that were kept constant. [2]
  - ii. Describe the difference, if any, you think they noticed when the second set of results was compared to the one shown above. [2]
  - iii. Explain your answer to c ii. [2]

**Total: 15 marks**

- 3. a. Write short paragraphs to compare and contrast the following terms:
  - i. Capillaries, veins and arteries [7]
  - ii. Lymph and tissue fluid [3]
- b. Explain how smoking can lead to emphysema. [5]

**Total: 15 marks**

4. 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	NO DATA	NO DATA
Urea	53	28	CALCULATE
Potassium	28	24	4
Uric acid	8.5	7.7	0.8
Creatinine	1.4	0	1.4

[https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcSxArxWFyu\\_mdvN576pD3ks9uxoS7FyVrEHWmhzWCOGSC4pYrY81A](https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcSxArxWFyu_mdvN576pD3ks9uxoS7FyVrEHWmhzWCOGSC4pYrY81A)

**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. Some of the test results for glucose are not recorded (marked as NO DATA) in the table.  
 i. Predict a value for the amount of glucose that is:  
     • reabsorbed [1]  
     • excreted [1]  
 ii. Explain your reasoning in c i. [2]  
 iii. Describe how the results of a **diabetic** patient would differ. [1]
- d. The kidney plays an important role in homeostasis as a result of its osmoregulatory function.  
 i. Define the terms 'homeostasis' and 'osmoregulation'. [2]  
 ii. An *Amoeba* is a unicellular protist, whereas a human being is a multicellular organism. However, osmoregulation takes place in both. Explain. [2]

**Total: 15 marks**

5. 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.
- a. Identify **two** structural adaptations of the leaf and describe their importance for efficient photosynthesis. [4]
  - b. Before being used in experiments related to photosynthesis, a plant needs to be **destarched**.  
Define the term 'destarched' and explain what it involves. [2]
  - c. Stomata are openings which allow gases to diffuse in and out of the leaf.
    - i. Name the process, other than photosynthesis, which also takes place in the leaf and requires exchange of gases with the surrounding atmosphere. [1]
    - ii. The type and amount of gas being exchanged with the surrounding atmosphere depends on the time of day. Explain. [3]
  - d. Insects, being animals, possess a different kind of organ 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 gas exchange in insects cannot take place all over their body surface. [2]

**Total: 15 marks**