



Annual Examinations for Secondary Schools 2022

YEAR 11

BIOLOGY

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	6	9	11	9	7	8	15	15	15	15	15	
Actual mark													TOTAL MARK

85% Theory Paper	15% Practical	Final Score

Section A: Answer all questions in this section.

1. Name the phylum indicated by these descriptions:

Description of phylum	Phylum
Plants have roots, stems and leaves with vascular tissue. However, a damp environment is needed for reproduction to occur.	
Plants whose seeds are formed within the ovaries of flowers.	
Animals that have a sac-like body with a single opening surrounded by tentacles armed with stinging cells.	
Animals that have a soft unsegmented body with an external or an internal shell. They live in aquatic or moist environments.	
Animals that have a vertebral column extending to form a tail. The internal skeleton is usually made up of bone.	

(5)

Total: 5 marks

2. A group of students investigated the rate of transpiration by measuring the decrease in mass due to water loss. Leaves from the same plant of a similar surface area were cut and one or both surfaces were coated with grease to prevent transpiration.

Below are the results obtained:

	Leaf 1	Leaf 2	Leaf 3	Leaf 4
Epidermal surface coated with grease	None	Upper only	Lower only	Both
% decrease in mass	38	35	4	1

- a. Name the pores found on leaves that allow water evaporation from the leaf. (1)

- b. Give the vascular tissue through which water passes from the roots to the leaves. (1)

- c. State a conclusion that can be reached from these results. (2)

d. Why are the following precautions important for the reliability of the results?

i) The leaves are cut from the same plant. (1)

ii) The leaves have a similar surface area. (1)

Total: 6 marks

3. Water and mineral ions are absorbed by the roots in soil by processes of passive and active transport.

a. Define 'active transport'. (3)

b. Name the type of passive transport that allows water to enter plants. (1)

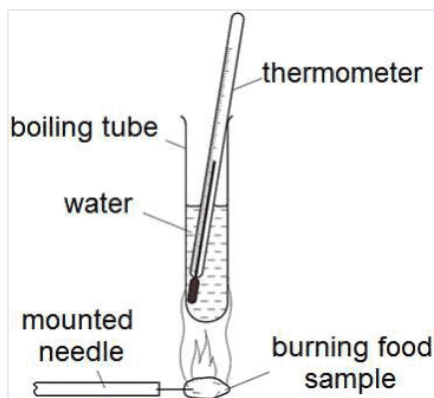
c. A student was invited to a research lab to observe passive diffusion in plant and animal cells.

i) Plant cells were placed on a microscope slide and covered with a sugar solution. This solution had a higher sugar concentration than the cytoplasm of the plant cells. Describe the changes that would happen to the cell structures of cell wall and cell membrane, cytoplasm and permanent vacuole. (3)

ii) In research on live (in vitro) animal tissues, some muscle tissue was bathed in a solution which had a concentration like the concentration of solutes in blood or tissue fluid. Explain why this is necessary for the research to proceed well. (2)

Total: 9 marks

4. In an investigation on the energy content of food, the following apparatus was set up.



Source: <https://schoolworkhelper.net/energy-content-food-lab-report-answers/>

Figure 1

The energy content of two different foodstuffs, a peanut and dried broad bean, was found. In this investigation, the student used a constant volume of water for each experiment. A thermometer was used to stir the water before the temperature change was read. The burning foodstuffs, of the same mass, were both kept at the same distance from the bottom of the boiling tube.

- a. From the text above, give **two** constant variables of this investigation. (2)

- b. Explain why the water in the boiling tube was stirred, before a reading of temperature was taken. (2)

- c. On taking temperature readings, the student noted that temperature increase of the water when the peanut was burnt was higher than temperature increase when the broad bean was burnt. What does this mean? (2)

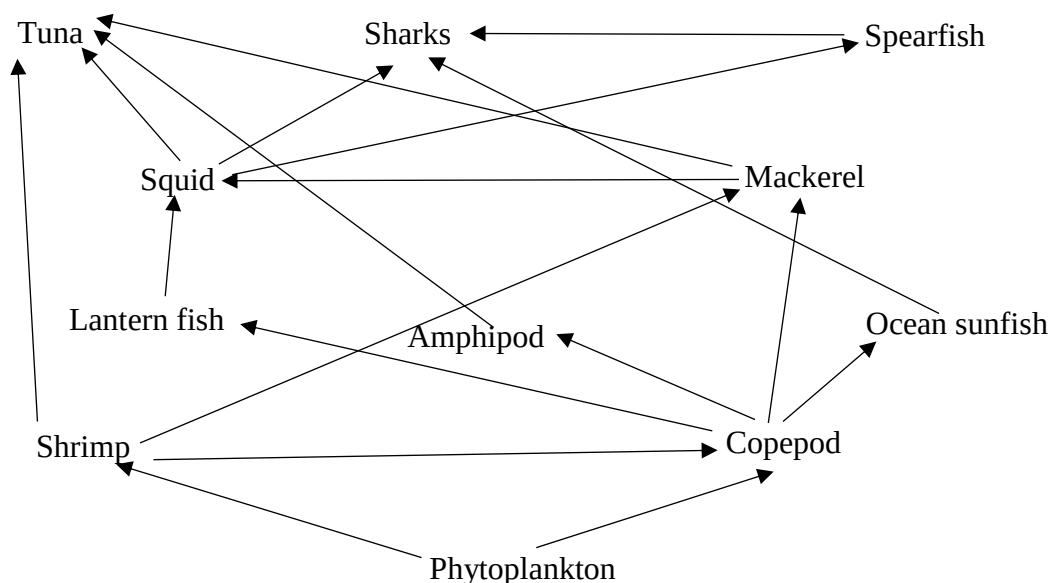
- d. The student decides to repeat each experiment to get two readings of each foodstuff. Give the importance of taking repeated readings. (2)

- e. The energy values obtained for the two peanut experiments were both lower than the official energy content value of a peanut.
- i) Describe a flaw in the experimental set-up that might cause this discrepancy. (2)

- ii) How may the apparatus be modified to make results more accurate? (1)

Total: 11 marks

5. The food web below shows the feeding relationships between some organisms in the Mediterranean Sea. Phytoplankton are microscopic photosynthetic organisms while copepods and amphipods are crustaceans.



Adapted from: Thematic Assessment - Marine and Coastal environment

Figure 2

- a. From the food web above, write down a food chain with **four** trophic levels. (2)

- b. Name a quaternary consumer found in the food web. (1)

- c. i) Give **one** characteristic of crustaceans. (1)

- ii) Explain why copepods and amphipods, both crustaceans, are found at different trophic levels. (2)

- d. i) Name **one** environmental factor that affects the growth and reproduction of phytoplankton. (1)

- ii) How will an abundance of shrimp affect the food web? (2)

Total: 9 marks

6. Biogas is produced by the microbial decomposition of organic matter by anaerobic respiration.

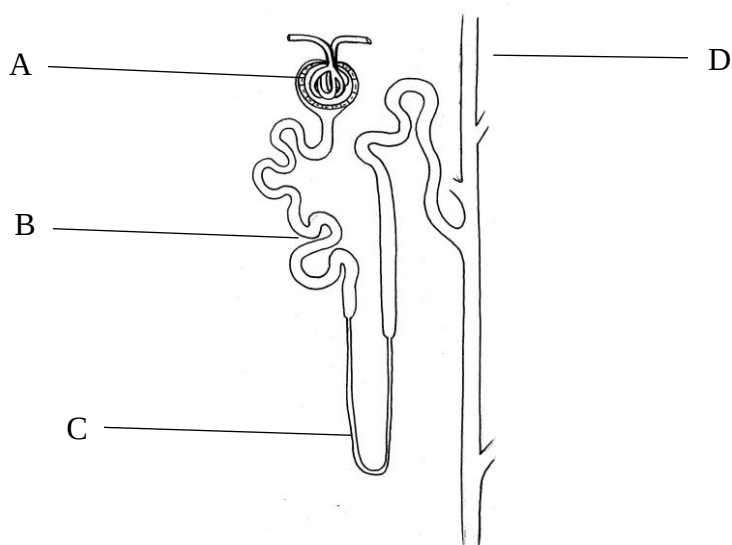
- a. Define 'anaerobic respiration'. (2)

- b. Biogas is produced in large structures called fermenters or anaerobic digestors. Both the temperature and pH are kept constant in these fermenters. Explain the importance of this feature. (3)

- c. List **two** economic uses of biogas. (2)

Total: 7 marks

7. Figure 3 shows a cross-section of a structure found in the cortex and medulla of a kidney.



Source: <http://www.aic.cuhk.edu.hk/web8/Kidney.htm>

Figure 3

- a. Fill in the table below, by giving the letter of the part of the nephron where the process takes place. (2)

Process	Part of nephron
Ultrafiltration	
Selective reabsorption of glucose	

- b. The kidney has an excretory function. Name the nitrogenous waste product that is excreted by the kidney. (1)

- c. Dandelion tea contains a natural diuretic. A diuretic stimulates the kidney to reduce the reabsorption of water back into the blood.

- i) From figure 3, name **two** structures where reabsorption of water takes place. (2)

- ii) Describe how a diuretic works on the pituitary and how this affects one of the labelled structures in figure 3. (3)

Total: 8 marks

Section B: Answer question 1 and two other questions on a separate A4 sheet of paper. A graph paper is needed for question 4.

1. Read the following text and answer the questions on it.

Deceptive flowers

Plants use numerous mechanisms for their pollination. Now botanists have discovered a particularly sophisticated system among pipevines that is based purely on deception.

The flowers of the Greek plant *Aristolochia microstoma* emit a foul, musty scent that seems to mimic the smell of decaying insects. *A. microstoma* has inconspicuous brownish flowers that lie horizontally close to the ground or partly buried, among leaf litter or between rocks. *A. microstoma* flowers emit a simple but highly unusual mix of scents including a molecule that does not occur in vertebrate carcasses or faeces, but in dead beetles.

The fly pollinators from the genus *Megaselia* likely get attracted to this odour while searching for arthropod corpses to potentially mate over and lay their eggs. Then, when entering the tube of an *Aristolochia* flower, the flies are guided by downward-pointing hairs into a small chamber, which holds the female and male floral organs. Trapped inside, they deposit pollen they carry onto the stigma, before the stamens ripen and release pollen on the body of the flies. When the hairs that block the entrance to the chamber wither, the pollinators can escape, and a new cycle can begin.

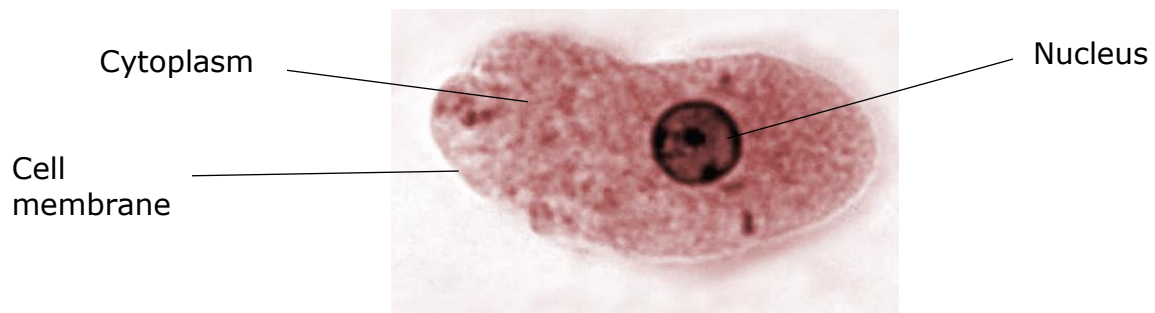
Between 4-6% of flowering plants are deceptive: they use odour, colour, and / or tactile signals to advertise a reward to pollinators, such as nectar, pollen, or mating and breeding sites, but do not actually give this reward. The deception works because pollinators are poor at distinguishing between the reward and the mimic.

Adapted from <https://www.sciencedaily.com/releases/2021/06/210610135603.htm>

- a. From the text identify:
- i) A male gamete;
 - ii) A group with characteristics of an exoskeleton, segmented body and jointed limbs;
 - iii) A sugar rich fluid produced by plants by glands in flowers. (1, 1, 1)
- b. Name the female floral organ. (1)
- c. It is unusual that such flowers as explained in the text to be inconspicuous and brown. Explain why. (3)
- d. Explain why the female and male floral organs do not mature at the same time. (2)
- e. Name **one** other importance of mimicry. (1)
- f. Describe the process in the flower from pollination to fertilisation. (5)

Total: 15 marks

2. Amoebiasis is an infection caused by any of the amoeba of the *Entamoeba* genus. Below is a photomicrograph of an *Entamoeba*.



Source: <https://eol.org/pages/491174>

Figure 4

- a. A student thinks that this microscopic organism is a prokaryote.
- i) Is the student correct or incorrect? (1)
 - ii) Give **one** reason for your answer. (1)
 - iii) In a homework task, the student writes the species of the amoeba that causes amoebiasis as: *Entamoeba Histolytica*. State **one** error made by the student. (1)
- b. Amoeba organisms may be attacked by viruses. Pandoravirus infects amoebae by phagocytosis. The amoebae act as hosts for the reproduction of the virus.
- i) Describe the process of phagocytosis. (3)
 - ii) Describe how the virus reproduces inside a cell. (4)
- c. The *Entamoeba* parasite enters the human body through drinking infected water. The parasite inflames the colon of the alimentary canal and hinders the function of this structure.
- i) Define the term 'parasite'. (2)
 - ii) State the function of the colon. (1)
 - iii) Using your biological knowledge from cii, give an effect/symptom of this disease. (1)
- d. *Entamoeba* divides by binary fission. Give **one** characteristic of this type of reproduction. (1)

Total: 15 marks

3. The following statements are incorrect. Explain giving details, why each statement is incorrect.

- a. The atrial chambers of the heart are thick walled and receive blood at high pressure from the arteries. (5)
- b. The phloem in plant vascular bundles carries sucrose from the roots to the flower. (5)
- c. A reflex is a consciously controlled nervous reaction as the sensory impulse travels to the brain. (5)

Total: 15 marks

4. In an investigation on the effect of salt solution on the germination of seeds, the following results were obtained. The same number of seeds were sowed in two containers with one container watered with distilled water and the other with 30mM salt solution.

No. of days	16	20	24	28	32	36	40	44
Accumulated no. of germinating seeds – distilled water	2	20	38	40	42	42	42	42
Accumulated no. of germinating seeds – 30mM salt solution	18	42	60	80	95	105	107	107

- Using a 2mm square graph paper, draw a graph of accumulated no of germinating seeds – distilled water (y-axis) against the no. of days (x-axis). Using the same axes, plot a graph of accumulated no of seeds – 30mM salt solution against no. of days. (6)
- Describe the trends observed in the results of this study. (3)
- Some of the seedlings were then sowed in two pots. One pot, A, was placed in a box with a slit to allow unilateral (from one side only) light to enter. The second pot, B, was left on a bench exposed to light from all directions.
 - Distinguish between the growth of the seedlings in pot A and pot B. (2)
 - What brings about growth in plants? (1)
 - Explain the growth of seedlings in pot A. (3)

Total: 15 marks

5. The Oriental Hornet (Žunžan bagħal) is a special insect having pigments in its exoskeleton that helps it store and convert the sun's energy. The exoskeleton has yellow and brown strips. The yellow strips absorb the sun's energy while the brown strips convert this energy to another type of energy. The insect is most active when the sun is most intense.
- Explain why the insect is most active during the sun intensive parts of the day. (2)
 - The absorption of sun's energy in the Oriental Hornet is similar to the absorption of this energy by plants.
 - Explain the importance of the absorption of sun's energy for plants. (2)
 - Explain how this absorption affects the ecosystems where the plants grow. (2)
 - Explain the importance of the exoskeleton in land arthropods. (2)

- d. The brown tissues in the exoskeleton contain the pigment melanin. This same pigment is found in human skin. In humans, melanin absorbs UV radiation reducing skin damage.
- i) Name the skin layer where melanin is stored in skin. (1)
 - ii) State **one** other function of the skin layer stated in part d i). (1)
 - iii) Melanin is made up from an amino acid. List the elements that make up amino acids. (1)
 - iv) Explain the statement – The dermis plays an important role in thermoregulation. (4)

Total: 15 marks