Topica Past Papers IGCSE Edexcel

BIOLOGY

PAPER 2B, 2BR 2015 - winter 2019

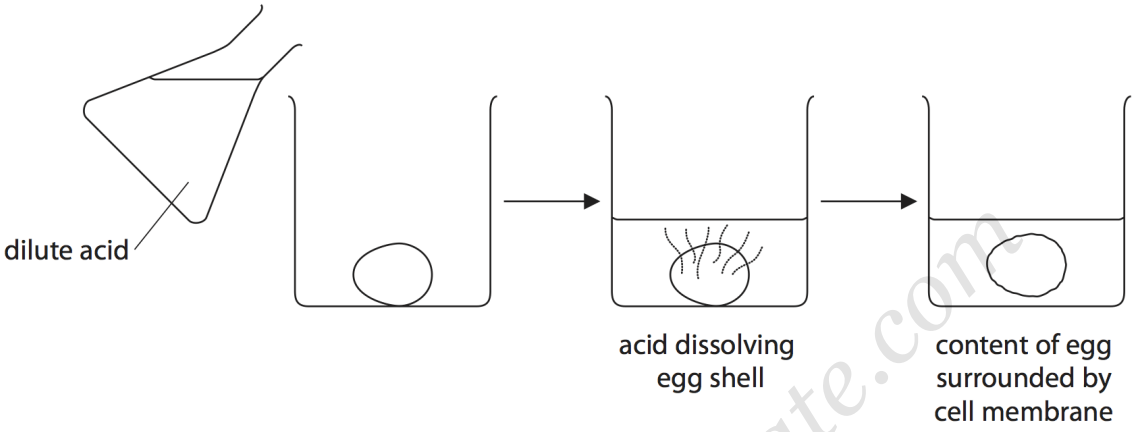
1 - (4BI0-S 2015-Paper 2BR-Q4) - *LIFE PROCESSES*

A chicken egg is a single cell protected by a shell on the outside.

A student puts three chicken eggs into dilute acid and leaves them for three days.

The acid dissolves the egg shells, leaving the contents of the eggs surrounded by the cell membrane.

The diagram shows the student's method.

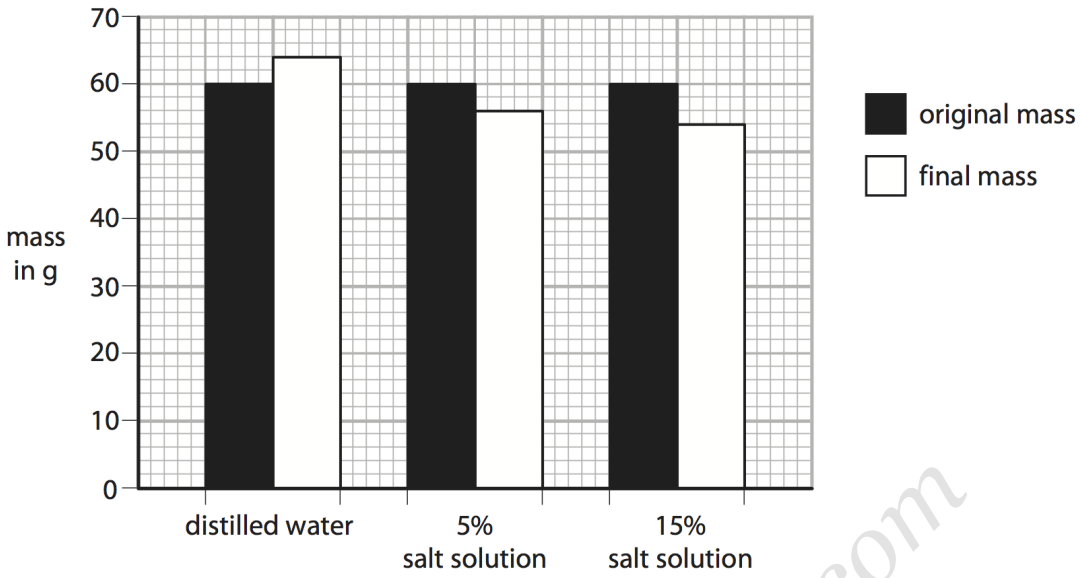


The student removes the eggs from the dilute acid and uses water to wash the surface acid away.

The student then uses the eggs for this osmosis experiment.

- he measures the mass of each egg
- he then puts one egg into a beaker containing distilled water
- he puts another egg into a beaker containing 5% salt solution
- he puts a third egg into a beaker containing 15% salt solution
- after 15 minutes he removes each egg from its beaker and measures its mass again

(a) The bar graph shows the results obtained by the student from the osmosis experiment.



Bar graph 1

(i) Name the dependent variable in this experiment.

(1)

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(ii) Explain the result for the egg placed in distilled water.

(2)

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(b) The student calculates the percentage change in mass for the eggs placed in distilled water and in 5% salt solution.

(i) Use the data from graph 1 to calculate the percentage change in mass for the egg placed in 15% salt solution. Show your working.

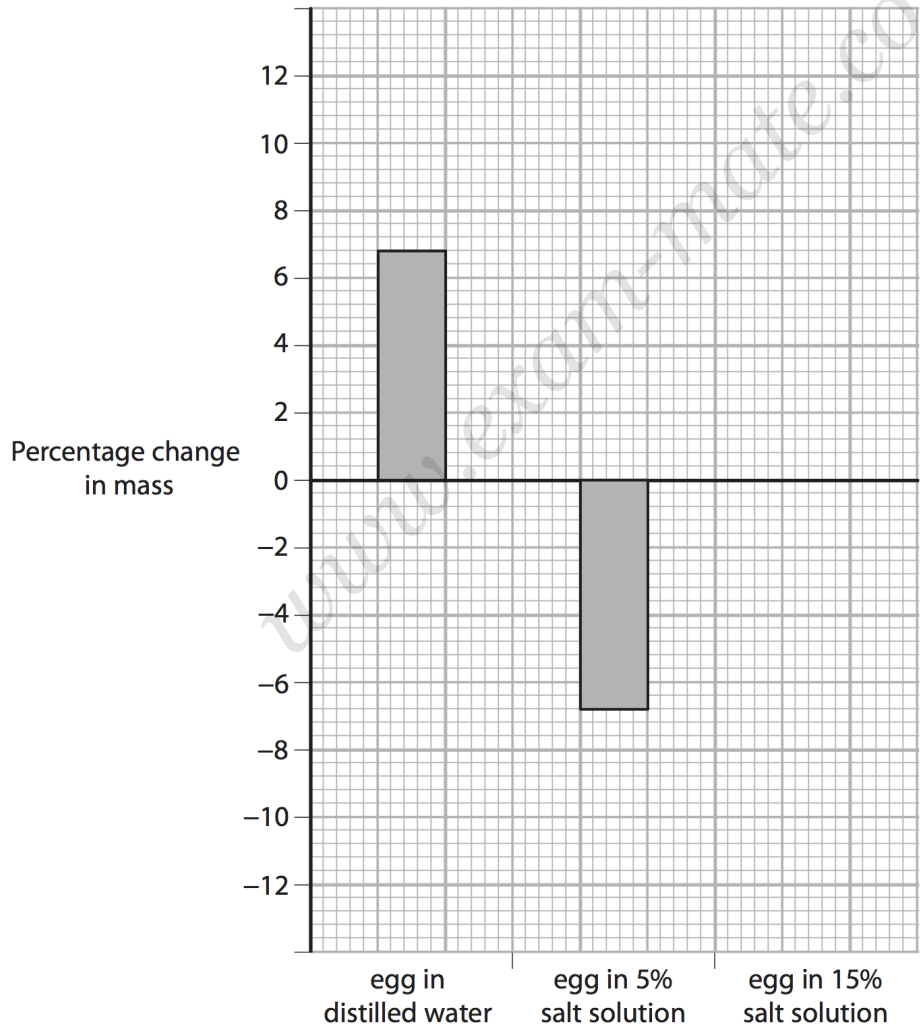
(2)

Percentage change in mass = ... %

(ii) The student plots the percentage change in mass on graph 2.

Complete the bar graph to show the percentage change in mass for the egg placed in 15% salt solution.

(1)



Bar graph 2

(c) Give one way in which osmosis differs from diffusion.

(1)

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2 - (4BI0-S 2015-Paper 2BR-Q6) - *LIFE PROCESSES*

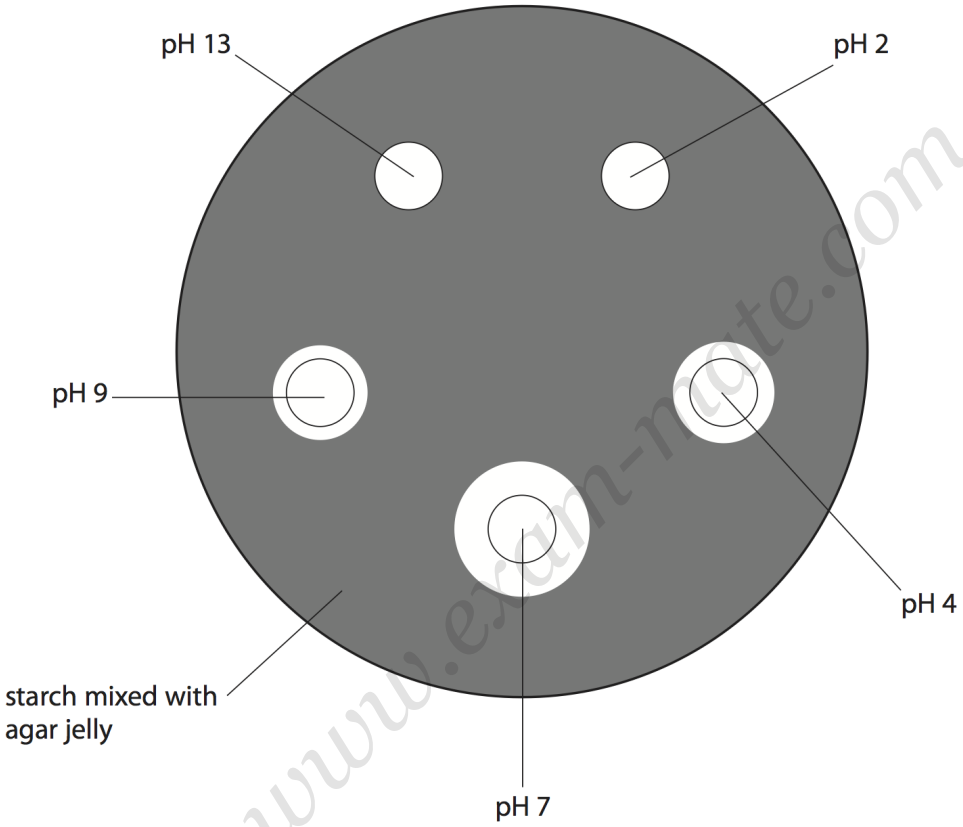
A student is given a Petri dish containing starch mixed with agar jelly.

The student makes five wells each of diameter 10 mm in the agar. She fills the wells with solutions of amylase, each with a different pH.

After 24 hours she pours iodine solution on to the agar jelly.

The iodine solution turns the starch in the agar jelly a dark blue colour.

The diagram shows the appearance of the Petri dish.



(a) The student measures the clear area around each well using a ruler.

Two have been done for you. Complete the remainder of the table.

(1)

pH of amylase solution	Diameter in mm
2	
4	15
7	
9	
13	10

(b) (i) Explain why there is a clear zone around some of the wells containing amylase.

(2)

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(ii) Explain why the clear zones have a range of different diameters. The diameters of the wells do not change during the experiment.

(2)

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(c) Name the independent variable in this investigation.

(1)

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(d) (i) The student keeps the Petri dish at 20 °C to control the temperature in order to make a valid comparison between each pH.

Name three other variables that the student needs to control.

(3)

1 .....

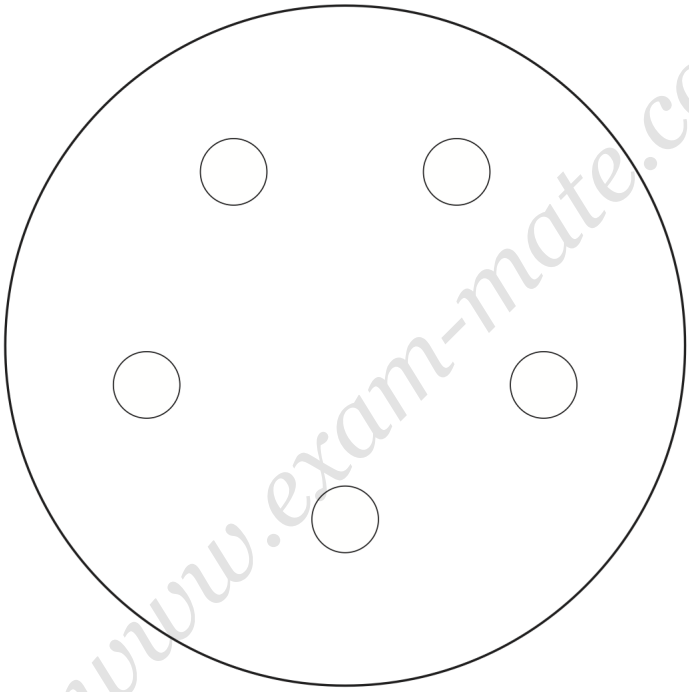
2 .....

3 .....

(ii) The student repeats the experiment, keeping the Petri dish at 37 °C on this occasion.

On the diagram, draw the results you would expect to see.

(2)



3 - (4BI0-S 2016-Paper 2B-Q1) - *LIFE PROCESSES, PLANTS AND FOOD , ECOSYSTEMS*

Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

Meat-eating plants

Venus flytraps carry out the process of photosynthesis. The glucose produced is used as a source of energy. In addition to synthesising glucose, plants also need to make amino acids, vitamins and other components to survive. To do this, plants need to absorb minerals.

In the bogs where Venus flytraps live the mineral content of the soil is low so minerals are scarce. Most plants cannot survive in this environment because they cannot make enough of the building blocks necessary for growth. The Venus flytrap has evolved the ability to grow well in this habitat by finding alternate means of getting minerals. Insects provide a good source of the minerals missing from the soil, and they contain additional carbohydrates.

Carnivorous plants attract and capture insects, discriminate between food and non-food, and digest the insects. They do this using mechanical and chemical processes. Plants lack the muscles and tendons to eat, chew and swallow food. The Venus flytrap completes the entire process using specialised leaves that carry out the role of the mouth and the intestines.

Most plants have some mechanism to attract insects. The Venus flytrap does this by secreting sweet nectar from the leaves of the trap. When an insect lands or crawls on the trap, it is likely to touch one of six, short, stiff hairs on the trap's surface. These are trigger hairs, and they serve as a motion detector for the plant. If two of these hairs are brushed in quick succession, or one hair is touched twice, the leaves close on the insect.

The mechanism of trap closure is not clearly understood but it involves changes in the concentration of solution in the cells. The cells expand as water enters causing the trap to close. Once the trap fully closes, the leaves form a seal so that digestive fluid and insects are kept inside the trap and bacteria and fungi cannot get in.

To make sure that the insects are kept in the trap, the edges of the leaves have projections that fit together when the leaves shut. These projections look like teeth but they are only used to keep the trap shut.

The leaf trap now serves as a digestive organ to dissolve the soft tissues and cell membranes of the food. It produces acid and enzymes. The insect body is broken down over a period of 5 to 10 days and the products of digestion are absorbed.

(a) Name the process that the plant uses to release energy from glucose (lines 1 and 2).

(1)

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(b) Carnivorous plants attract insects for food.

Give a reason why other plants need to attract insects (line 11).

(1)

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(c) The Venus flytrap can be placed at two different trophic levels.

Name these levels.

(2)

1 .....

2 .....

(d) The trap only closes 'If two of these hairs are brushed in quick succession, or one hair is touched twice' (lines 20 and 21).

Suggest why this is an advantage to the plant.

(2)

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(e) Explain how changes in the concentration of solution in the cells can lead to water entering the cells (lines 23 and 24).

(2)

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(f) Suggest two reasons why the traps need to prevent the entry of bacteria or fungi (line 26).

(2)

1 .....

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2 .....

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(g) (i) The trap lacks teeth that function as they do in animals.

Explain how this may affect the rate at which the insect is digested.

(2)

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(ii) Name one enzyme that may be present in the digestive fluid produced within the trap (line 25).

(1)

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(h) Explain two factors that could affect the length of time taken to digest an insect once it has been caught in a trap.

(4)

1 .....

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2 .....

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ANSWERS

1 - (4BI0-S 2015-Paper 2BR-Q4) - *LIFE PROCESSES*

(a) (i)	mass;		1
(ii)	1. water in; 2. high conc. (of water) to low conc. (of water) / from dilute solution to concentrated solution / eq;	Mp 2 allow correct reference to water potential Ignore osmosis	2
(b) (i)	minus 10;;	One mark for 10 alone	2
(ii)	bar drawn to minus 10 / answer in (i);		1
(c)	1. water (only); 2. membrane;	Ignore reference concentration gradient	1 max

2 - (4BI0-S 2015-Paper 2BR-Q6) - *LIFE PROCESSES*

(a)	**pH of amylase solution** / **diameter in mm** 2 / 10 ± 1 4 / (15) 7 / 20 ± 1 9 / 14 ± 1; 13 / (10)		1
(b) (i)	1. digestion / break down; 2. no starch;	Breaks down all the starch = 2 Breaks down starch = 1	2 max
(ii)	1. (amylase/enzyme) denatured at pH 2 or 13 / low or high pH; 2. optimum / works best at pH 7; 3. enzymes work less well at pH 9 or pH 4;		2 max
(c)	pH;		1

(d) (i)	1. volume of amylase; 2. concentration of amylase; 3. same amylase / source of amylase; 4. depth of agar; 5. time;	Mp 1 ignore amount Ignore concentration of starch / agar / iodine	3 max
(ii)	1. 0 for pH 2 and pH 13; 2. wider for pH 7 than at 20 ^{o}C;	Check position of wells	2

3 - (4BI0-S 2016-Paper 2B-Q1) **-** *LIFE PROCESSES, PLANTS AND FOOD , ECOSYSTEMS*

(a)	respiration / aerobic respiration / anaerobic respiration;		1
(b)	pollination / transfer pollen / eq;	Ignore reproduction / collect nectar	1
(c)	1. producer; 2. secondary consumer 3. tertiary consumer;	 Reject primary consumer Ignore carnivore	2
(d)	1. avoids closing unnecessarily / by accident / due to wind / debris / when no insect is present / only closes with an insect / must be a big insect / eq; 2. avoids wasting energy / enzymes / digestive fluid;		2
(e)	1. solution (more) concentrated / reduced water potential / less water in cell / more ions / minerals / solutes / high salt concentration / eq; 2. water enters by osmosis;	Allow converse for Mp1 Ignore water concentration	2

(f)	1. prevent infection / disease / may be pathogenic; 2. prevent competition (for food) / prevent loss of energy from insect / prey;	Ignore harm / illness / produce toxins Eg. prevent decomposition of insect / feeding on insect / taking nutrients from insect / digesting insect Ignore digesting / decomposing / feeding on plant	2
(g) (i)	(slower rate) 1. no/less mechanical digestion / mechanical breakdown / not broken into pieces / eq; 2. less surface area / small SA:VOL; 3. (for) enzymes;	Allow converse Ignore crush / chew	Max 2
(ii)	protease / carbohydrase / lipase / eq;	Allow any named digestive enzyme	1

(h)	1. temperature; 2. (kinetic) energy / collisions / <u>movement</u> of molecules / enzymes / substrates / more enzyme substrate complexes; OR 3. size / shape / mass of insect; 4. (surface area for) enzyme contact / eq; OR 5. composition of insect / type of insect; 6. exoskeleton / indigestible; OR 7. amount of enzyme / enzyme concentration; 8. collisions / more enzyme substrate complexes / eq;	Pairs of Mps are linked Ignore enzymes work faster / denature Ignore pH Ignore shell	Max 4