Write your name here

Surname	Other names

Pearson Edexcel International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Biology

Unit: 4BI0
Paper: 2BR

Friday 5 June 2015 – Afternoon
Time: 1 hour

Paper Reference
4BI0/2BR

You must have:
Calculator
Ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Show all the steps in any calculations and state the units.

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

P44261A

1/1/1/1/1/1/

P 4 4 2 6 1 A 0 1 2 0

PEARSON

Answer ALL questions.

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

Conditioned Reflexes

Humans respond to stimuli such as sound, sight, smell and taste. Sometimes the response is a simple reflex. If we get a puff of air onto our eye, we blink. If we touch a hot object with our fingertips, we pull our hand away.

Another type of reflex is a conditioned reflex. These were first described around the beginning of the 20th century by the Russian physiologist Ivan Pavlov. Pavlov was studying digestive processes in dogs when he discovered that the dogs began to produce saliva before they received their food. In fact, after several occasions of the lab assistants bringing the food, the dogs started to produce saliva at the sight of the lab assistants. Pavlov called this 'psychic secretion'. He noted that dogs responded to a biological need (hunger) and also to a need developed by learning.

To experiment on conditioned reflexes, Pavlov used a tuning fork that produced a note of constant frequency. He hit the tuning fork and then gave the dog food. In the beginning the dog produced saliva only when given the food. After the combination of sound and then food were repeated, the dog produced saliva at the sound of the tuning fork. Even when Pavlov took away the food, the dog continued to produce saliva at the sound of the tuning fork alone. The dog had learned to associate one stimulus with another. The dog learned that the first stimulus is to be followed by the second stimulus. In Pavlov's experiments, the sound of the tuning fork informed the dogs that food was coming. The production of saliva was a conditioned reflex.

Pavlov then used a different tuning fork to produce a note of a different frequency. He measured the size of the dog's response to this note. He could then compare this response to the dog's response to the original tuning fork.

Many examples of conditioned reflexes exist in humans. Some psychologists believe that phobias, such as the fear of spiders, may develop by associating a neutral stimulus with a fearful one.

(a) Humans produce saliva when food is in their mouth.

Describe the function of saliva in humans.

(2)

.....

.....

.....

.....

(b) Complete the table by giving two sense organs that the dogs use to detect the arrival of food and the stimulus that each sense organ detects.

(2)

Sense organ	Stimulus

(c) Explain how reflex responses, such as blinking (line 2), differ from other nerve responses, such as picking up a pencil.

(2)

.....

.....

.....

.....

(d) Pavlov originally conditioned the dogs with a tuning fork of note B. The dogs would then produce saliva when the tuning fork was hit.

Different tuning forks produce notes of different frequencies as shown in the box.

E	G	**B**	D	F

highest frequency ⟶ lowest frequency

(i) Suggest why notes G and D produce a greater response in the dogs than notes E and F.

(1)

.....

.....

.....

(ii) Suggest how Pavlov might have measured the size of the conditioned response.

(2)

.....

.....

.....

.....

.....

.....

(e) Scientists make conclusions about humans from studying animal behaviour.
Suggest two reasons why these conclusions may **not** be valid.

(2)

1 .....

.....

.....

2 .....

.....

.....

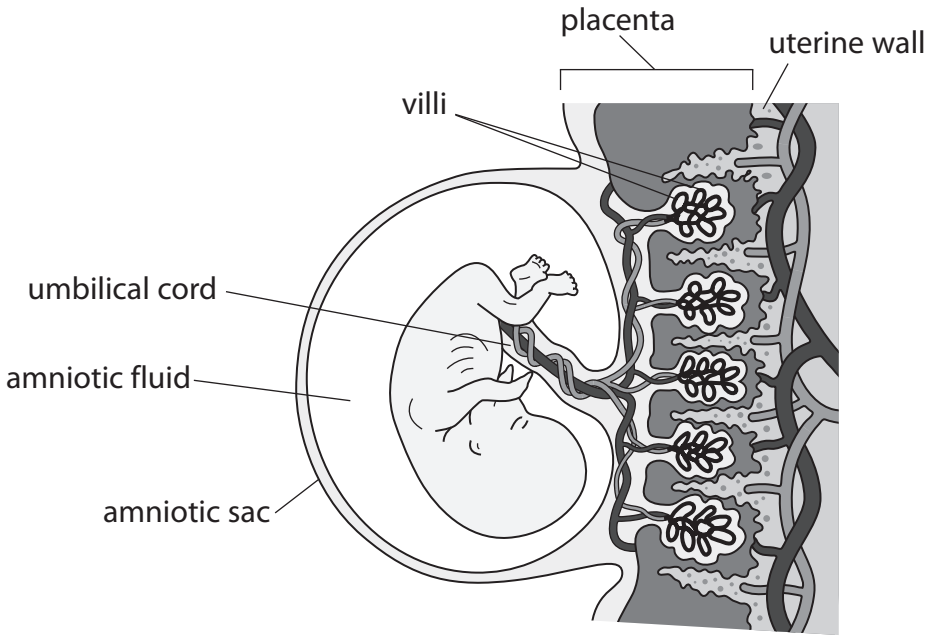
(f) Simple reflexes are responses to stimuli.

Explain the structure and functioning of a simple reflex arc, using the example of the withdrawal of a finger from a hot object.

(5)

(Total for Question 1 = 16 marks)

2 The diagram shows a human fetus developing in the uterus.



(a) Describe the function of the amniotic fluid surrounding the fetus.

(2)

.....

.....

.....

.....

(b) The placenta functions as an organ of exchange.

(i) Name two substances, required by the fetus, that move from the mother's blood into the blood of the fetus.

(2)

1 .....

2 .....

(ii) Name two waste substances that move from the blood of the fetus into the mother's blood.

(2)

1 .....

2 .....

(c) Use information from the diagram to help explain how the placenta is adapted for the efficient exchange of substances.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for Question 2 = 9 marks)

BLANK PAGE

3 Some food products are made using microorganisms.

The table gives information about the production of two of these food products.

(a) Complete the table by giving the missing information.

(5)

Food product	Name of organism used	Group organism belongs to	Substrate used	Type of respiration	Chemical product
	Saccharomyces (yeast)	fungus	glucose		ethanol
yoghurt		bacteria		aerobic	

(b) Explain one precaution that should be taken when making yoghurt so that it is safe for humans to eat.

(2)

.....

.....

.....

.....

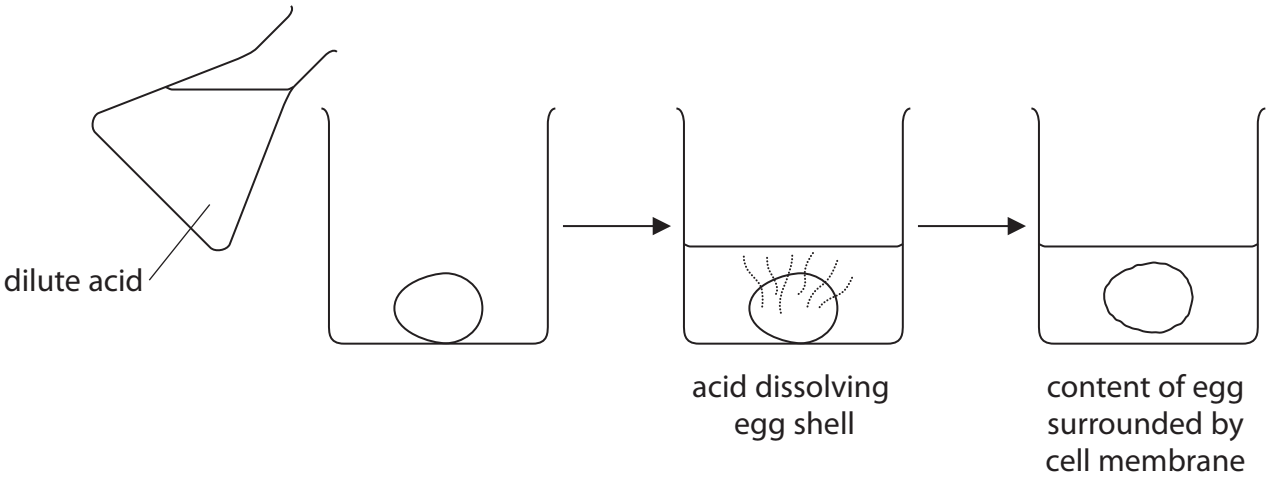
(Total for Question 3 = 7 marks)

4 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.

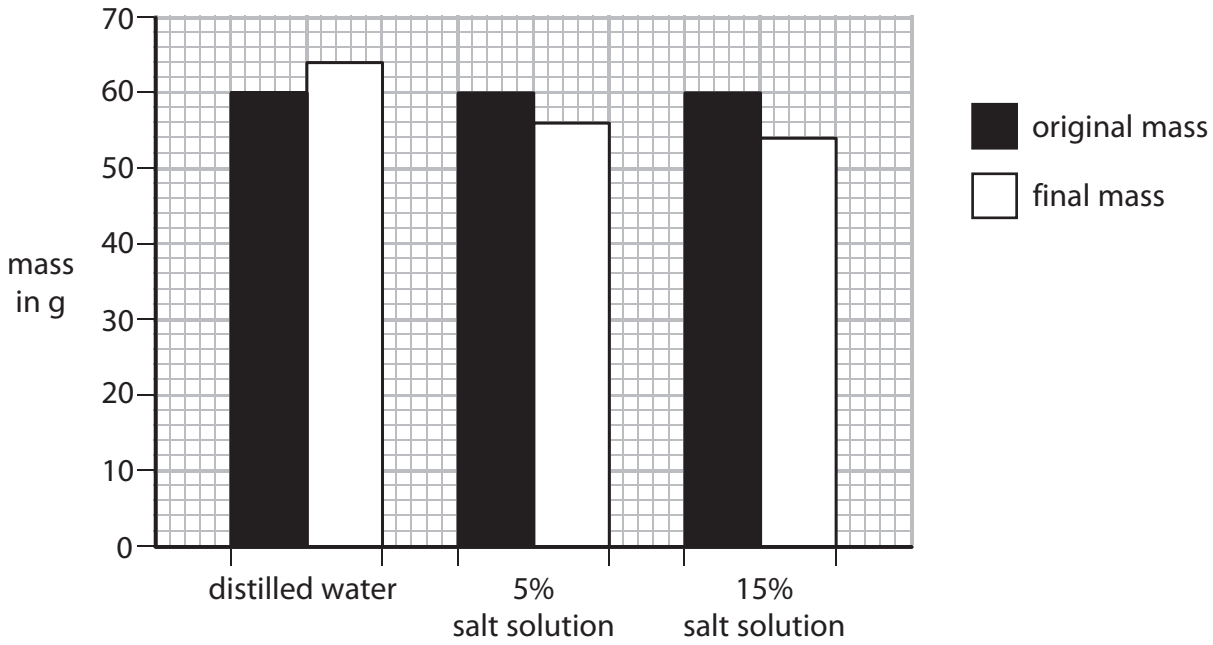


The student removes the eggs from the dilute acid and uses water to wash the surface acid away.

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)

.....

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

(2)

.....

.....

.....

.....

(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.

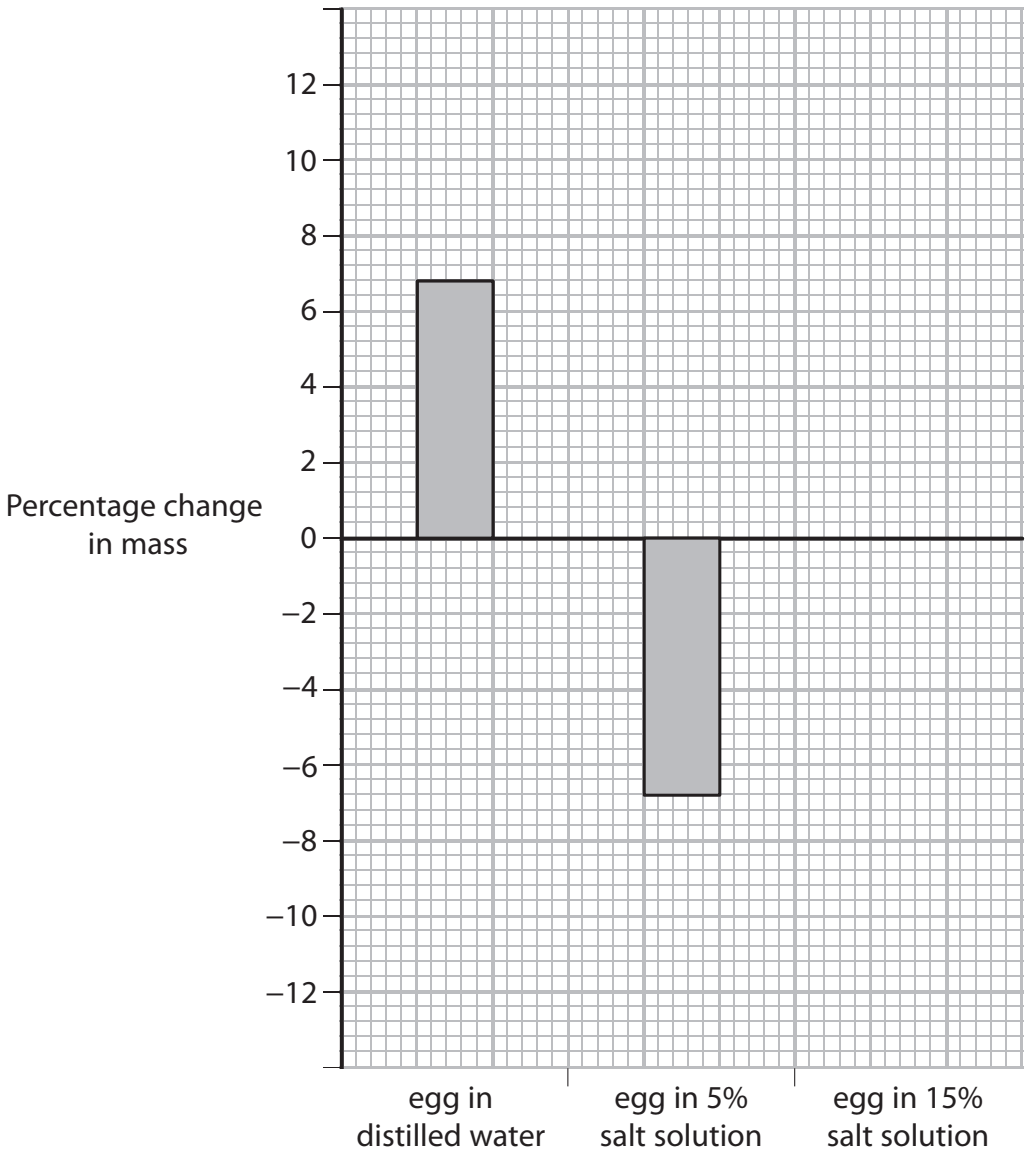
(2)

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)

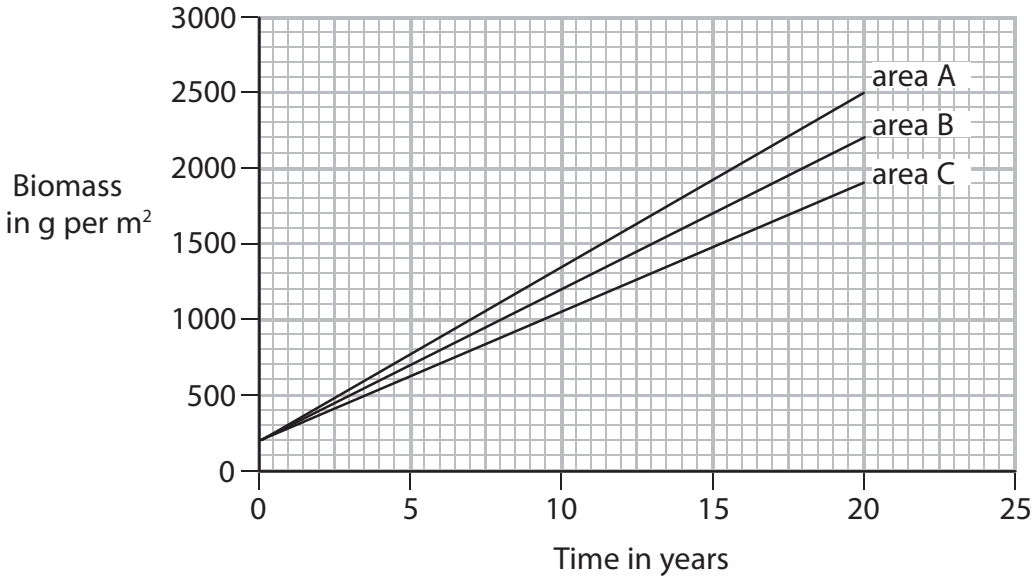
.....

.....

(Total for Question 4 = 7 marks)

5 Scientists want to compare the growth of the same species of plant in three different areas.

The graph shows the biomass of the plants in each area in g per m^2 each year for a period of 20 years.



(a) The table shows the increase in biomass in each area in g per m^2 per year for the 20-year period for areas A and B.

Area	Increase in biomass in g per m^2 per year
A	115
B	100
C	?

Calculate the increase in biomass in g per m^2 per year for area C

Show your working.

(2)

Increase in biomass = ... g per m^2 per year

(b) After 20 years, the plants in area A had a greater biomass than those in area B.

(i) Explain how abiotic (non-living) factors could cause this difference.

(4)

(ii) Explain how biotic (living) factors could cause this difference.

(2)

(c) The scientists wanted to find out how efficient plants in area A were at converting light energy and using it to make biomass.

The scientists knew the following information:

- the increase in biomass for the plant growth in area A is 115 g per m^2 per year
- one gram of the plants in area A contains 22 kJ of energy
- the amount of light energy available in area A is 3 200 000 kJ per m^2 per year

The formula for calculating the percentage energy transfer efficiency is

$$\% \text{ energy transfer efficiency} = \frac{\text{total energy in biomass}}{\text{energy avaliable}} \times 100$$

Use this information to calculate the percentage energy transfer efficiency of the plants in area A.

Show your working.

(2)

Energy transfer efficiency = ... %

(Total for Question 5 = 10 marks)

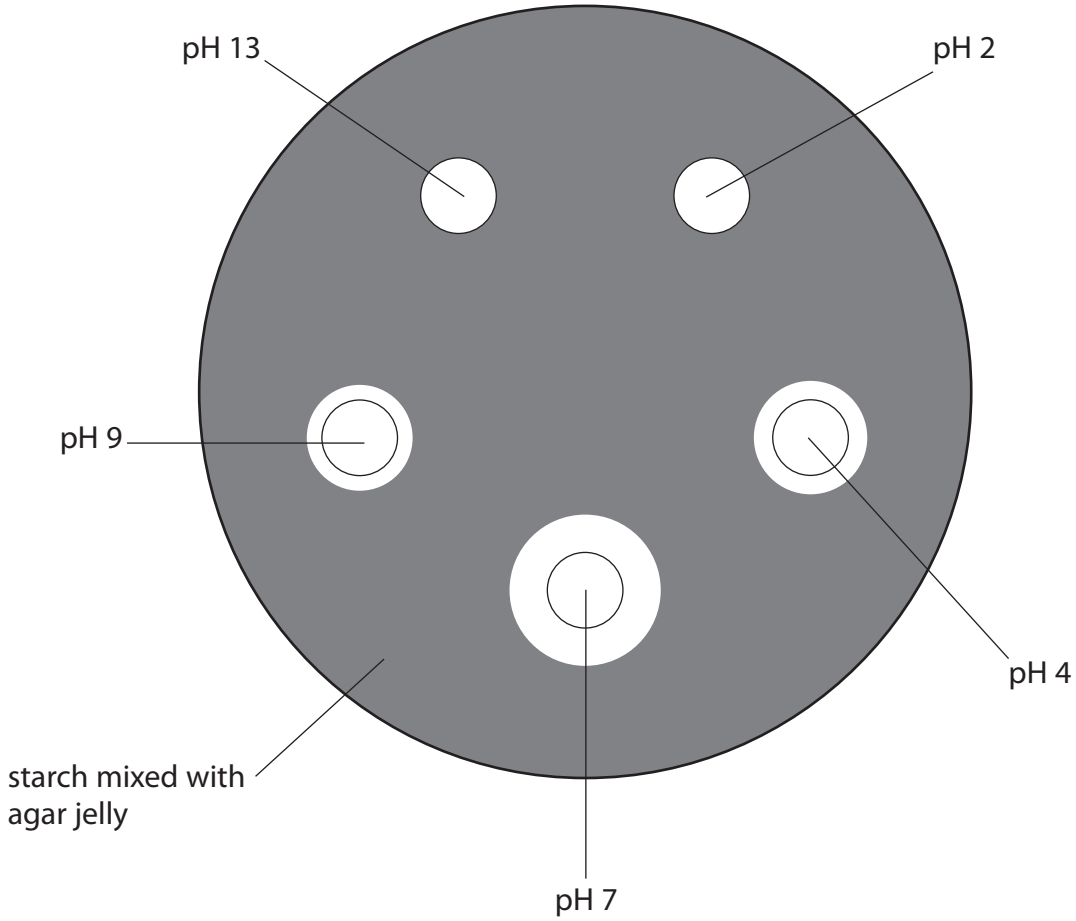
6 A student is given a Petri dish containing starch mixed with agar jelly.

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)

.....

.....

.....

.....

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

(2)

.....

.....

.....

.....

(c) Name the independent variable in this investigation.

(1)

.....

(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 .....

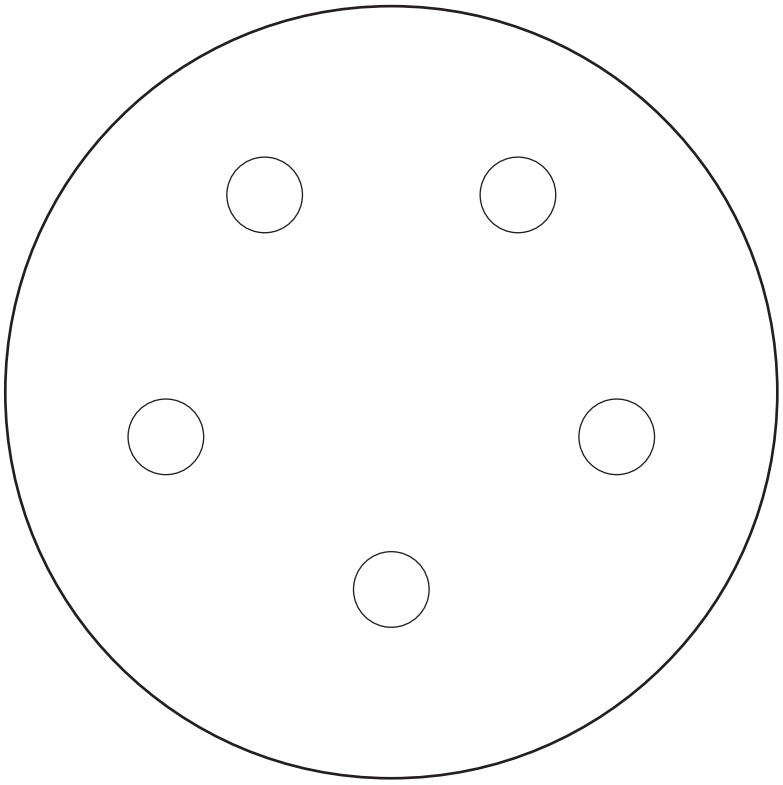
2 .....

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)



(Total for Question 6 = 11 marks)

TOTAL FOR PAPER = 60 MARKS

BLANK PAGE