Cathkin High School

National 4 Biology

Unit 2: Multicellular Organisms Homework Booklet

S3 Biology – Unit 2

Sexual and asexual reproduction

Homework Exercise 1

Reproduction and Fertilisation

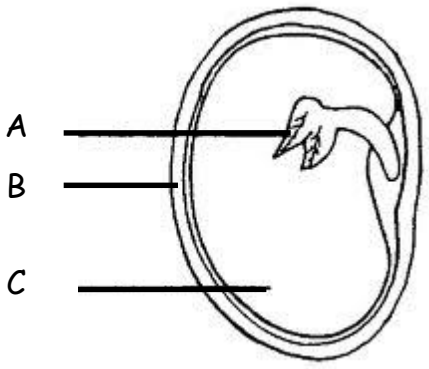
20

1. Copy and complete the table below. If the word underlined is correct then put a tick in the True column, if it is wrong put a tick in the False column and put the correct word in the **Correction** column..

Statement	True	False	Correction
Reproduction **decreases** the number of organisms in a population			
Only one parent is required for **asexual** reproduction			
Budding is the method by which **daffodils** reproduce asexually			

(3)

2. The diagram below shows a section through a French bean seed.



Copy and complete the table below by filling in the **letter** from the diagram above and the **name** of each part to match the functions given

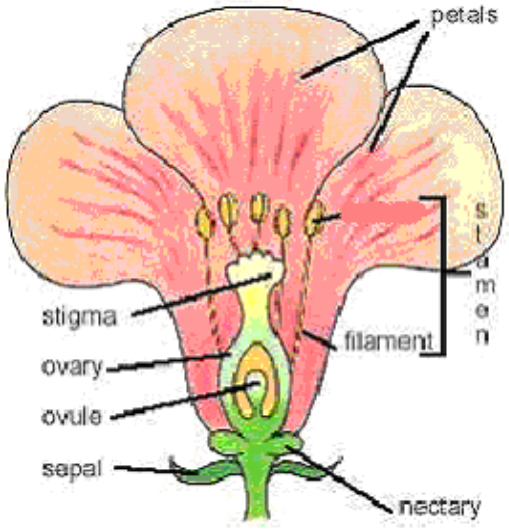
Letter	Name of Part	Function
		Provides material and energy for growth of new plant
		Grows into a new plant
		Protects the seed

(3)

3. The diagram below shows the structure of a flowering plant.

Answer the following question using structures labelled in the diagram

i. The male part of the flower
ii. Produces female sex cells
iii. Sticky to catch pollen grains (3)



4. Here are several statements about sperm.
   1. Sperm contain the male nucleus
   2. Sperm are attracted to egg cells
   3. Sperm are larger than egg cells
   4. Sperm have a tail for swimming

a. Which of the above statements are correct? **Write** down the correct **letter** from the choices given below.

   A. All are correct
   B. 1,2 and 3 only are correct
   C. 1 and 2 only are correct
   D. 1,2 and 4 only are correct (1)

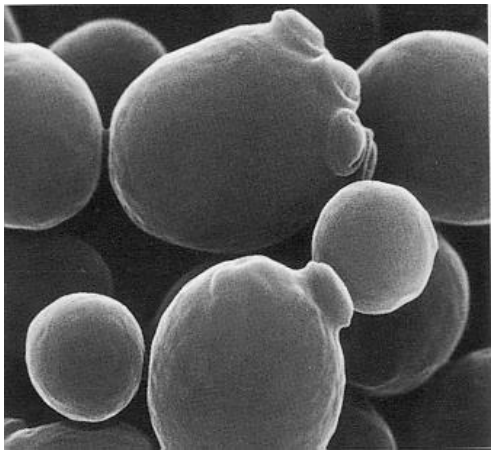
b. **State** where the male and female sex cells are produced in a human. (2)

c. **Copy** and **complete** the sentence below:

   Fertilisation occurs when the …….. of the male and female sex cell …….. together. (1)

d. Describe the different methods of fertilisation and for each state an organism that uses that method. (2)

5. The diagram below shows budding of yeast cells as they reproduce.

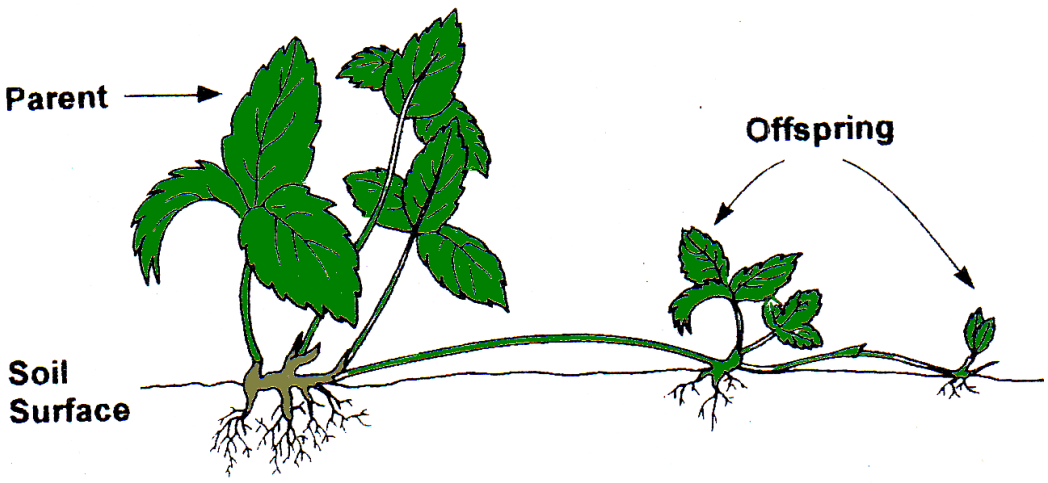


i. Copy and complete the sentence by inserting the correct word.

Yeast cells reproduce by **asexual/sexual** reproduction (1)

ii. Why are the offspring produced by asexual reproduction called clones? (1)

6. The diagram below represents asexual reproduction by a strawberry plant.



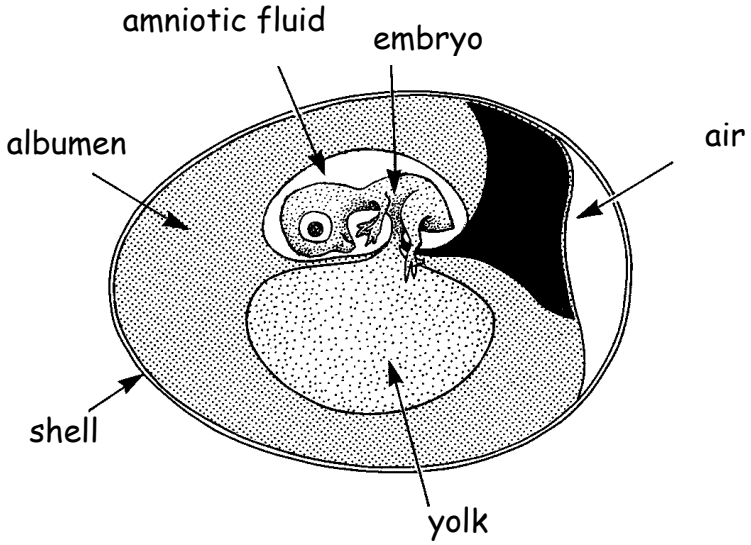
a) Name the method of asexual reproduction shown in the diagram above. (1)

b) Name another method of asexual reproduction and give an example of a plant which uses this method (2)

S3 Biology – Unit 2
Sexual and asexual reproduction
Homework Exercise 2
Development

15

1. The diagram below shows inside a bird's egg with the developing embryo.



a. Which part of the egg is a source of food for the embryo

(1)

b. Give **one** way in which the parents can increase the chances of the survival of the developing bird embryo

(1)

2. The following table shows aspects of reproduction in two animals.

	Number of eggs or young produced at a time	*Type of fertilisation*	*Where development takes place*
Cod	3-7 million	External	Water
Wild cat	4	Internal	In uterus

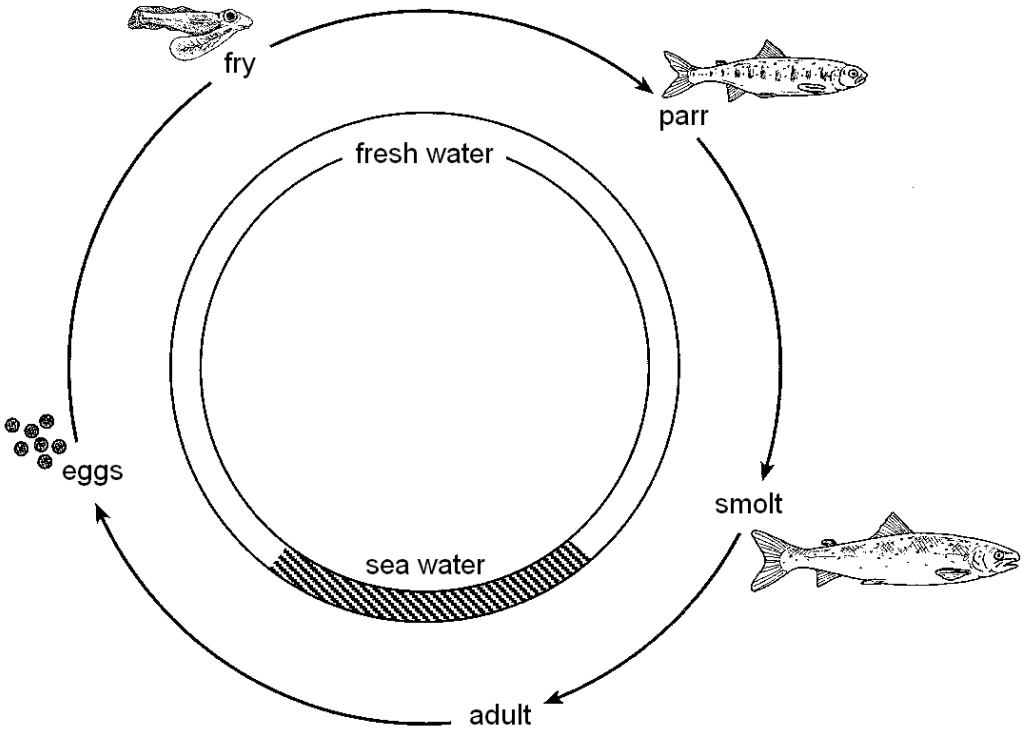
a. Give **one** reason why the cod must produce large numbers of eggs in order for this kind of fish to survive

(1)

b. Give **one** reason why the offspring of the wild cat have a high survival rate after birth

(1)

3. The diagram below shows the life cycle of the Atlantic Salmon. The salmon are able to swim between their breeding grounds in Scottish rivers and their feeding grounds in the Atlantic Ocean.



(a) From where do the young fry obtain their food? (1)

(b) Sea lice are a pest of adult salmon. Suggest, from the information given, why they never attack fry or parr. (1)

(c) A female salmon lays 8000 eggs but only 5% of them hatch.

How many fry will be produced? (1)

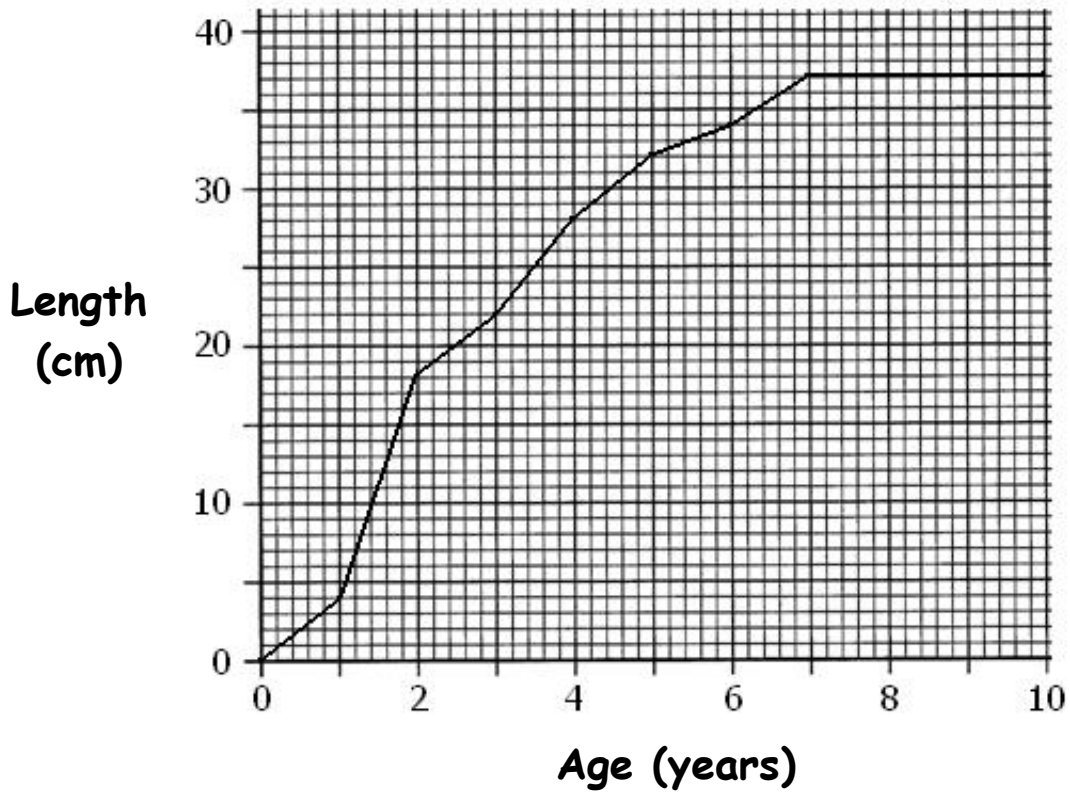
(d) Give **two** ways in which birds increase the survival chances of their young compared to the trout. (2)

4. A female rabbit had 5 litters during one year; giving a total of 30 young. Of the young rabbits, 3 were still-born, 9 were eaten by predators and 6 died from disease.

i. How many of the young **survived**? (1)

ii. What **percentage** of the young survived to the end of the first year? (1)

5. The following line graph shows the growth of a trout during its first 10 years.



Answer the following questions using the information given in the graph.

(i) What length was the trout at 2.5 years of age? (1)

(ii) During which year did the trout grow fastest? (1)

(iii) At what age was the trout fully grown? (1)

(iv) Express as a simple whole number ratio, the length of the trout at 4 years of age compared to that at 1 year. (1)

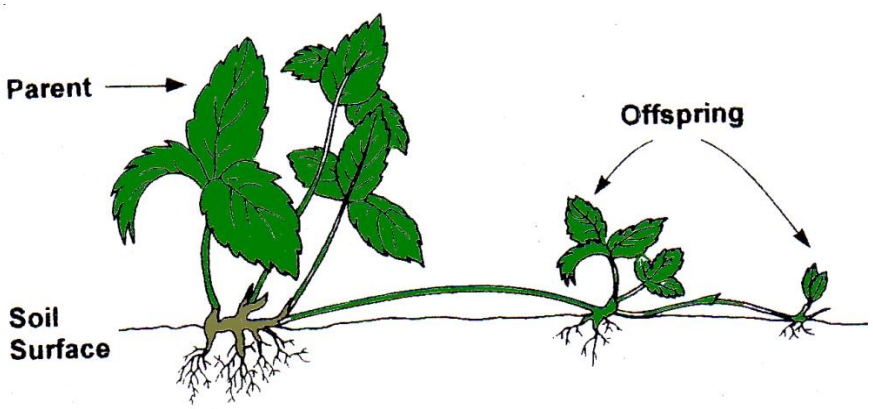
S3 Biology – Unit 2
Propagating and growing plants
Homework Exercise 1

12

1. Describe the meaning of the term propagation. (1)

2. Give three examples of natural vegetative plant propagation structures. (3)

3. The diagram below represents asexual reproduction by a strawberry plant.



   a. Name the method of asexual reproduction shown in the diagram. (1)

   b. Name another method of asexual reproduction and give an example of a plant which uses this method. (2)

   c. State one advantage and one disadvantage of asexual reproduction in plants. (2)

4. a. What is a node? (1)

   b. Describe how cuttings are taken at a node. (2)

S3 Biology – Unit 2

Commercial uses of plants

Homework Exercise 1

10

1. Give two examples of plants used commercially and explain how they are used differently. (2)

2. Match the following pictures of crop uses with the correct crop. (3)

1

2

3

A Cinchona tree

B Cotton plant

C Sunflower

3. Explain why there is a growing demand for crops to be used for the production of food stuffs. (1)

4. a. The table below contains the annual crop harvest from a farm.

Crop	Number of tonnes harvested
Wheat	50
Barley	20
Corn	5
Rice	15
Cress	10

On graph paper, present these results as a bar graph. (2)

b. What could the farmer add to the soil to improve the growth of these crops? (1)

c. What is the percentage of wheat harvested (of the total)? (1)

S3 Biology – Unit 2
Genetic Information
Homework Exercise 1

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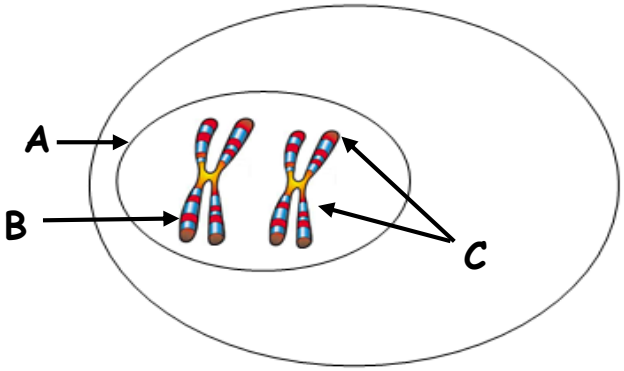
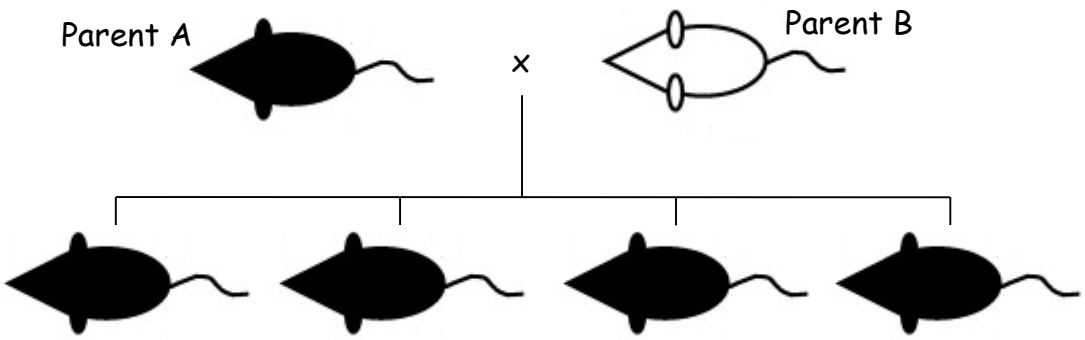
Q1. The diagram below shows a typical human cell. Name the structures labelled A, B and C on the diagram. (3)



Q.2. A genetic cross was carried out to investigate coat colour in mice.
Parent A is a true breeding black mouse and parent B is a true breeding white mouse.
Their offspring are also shown below.



a. Which coat colour can be described as dominant? (1)
b. What term is used to describe the other coat colour? (1)
c. What is the genotype of i) Parent A and ii) Parent B? (2)
d. Draw a punnet square to show the genotypes of the offspring of this cross. (2)

Q.3. Excluding coat colour and ear lobe type, give two examples of an inherited characteristic in a) animals b) humans and c) plants. (3)

Q.4. Explain the meaning of the term 'genotype'. (1)

Q.5. Explain the meaning of the term 'phenotype'. (1)

Q.6. The type of ear lobe a person has is an inherited characteristic, ear lobes can be free or attached. The diagram below shows two parents and their resulting offspring; both parents are true-breeding.

Parents

Free ear lobes

X

Attached ear lobes

Offspring

Free ear lobes

(2)

a. Which type of ear lobe is dominant? Explain your answer.

b. i. Two of the offspring were interbred to produce another generation of offspring. Copy and complete the punnet square below to show the possible genotypes of the second generation.

		Offspring 1	
		F	f
Offspring 2	F		
	f		

(1)

ii. From the second generation, write down the genotypes of the offspring which could be described as true-breeding. (1)

iii. What is the ratio of free ear lobes to attached ear lobes in the second generation? (1)

S3 Biology – Unit 2
Genetic Information
Homework Exercise 2

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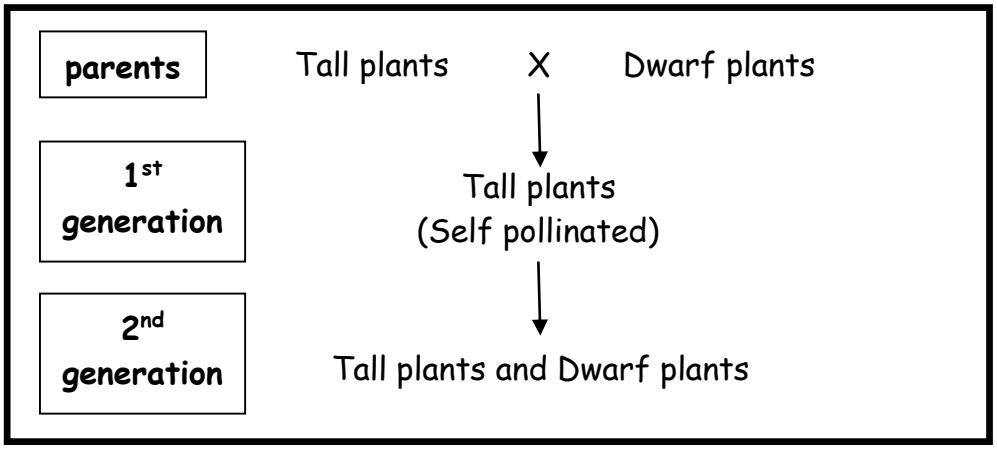
Q.1. In pea plants, tallness is dominant to dwarfness. The following crosses were carried out.



Using the symbol 'T' to represent tallness and 't' for dwarfness, answer the following questions.

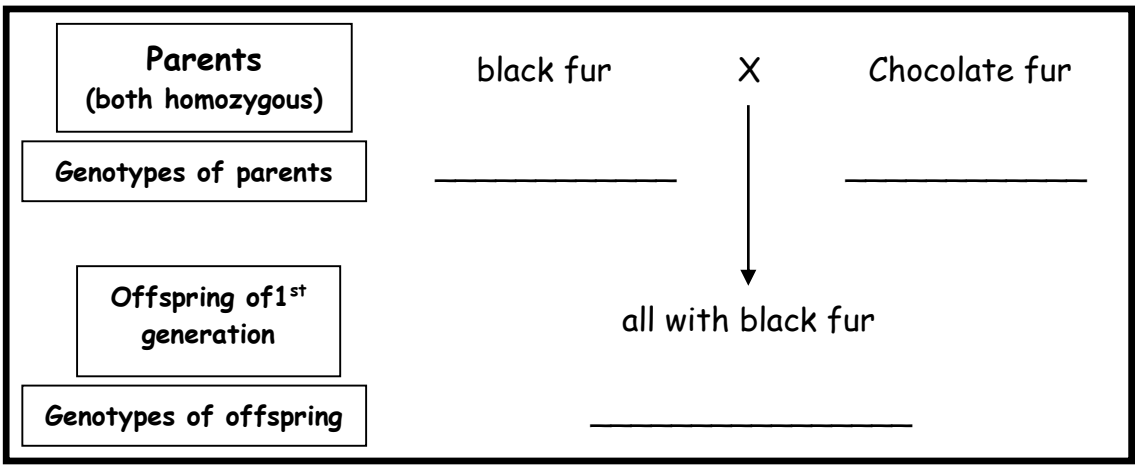
a. What is the genotype of the tall parent? (1)

b. What is the genotype of the tall plants in the first generation? (1)

c. 1200 plants were produced in the 2nd generation.
In theory, how many would be i) dwarf and ii) tall? (2)

Q.2. In mice a single gene is responsible for the presence of black or chocolate-coloured fur.

a. Using the symbol 'B' to represent black fur and 'b' to represent chocolate fur, copy and complete the cross to below.



(3)

b. Which phenotype is dominant? Give a reason for your answer (1)

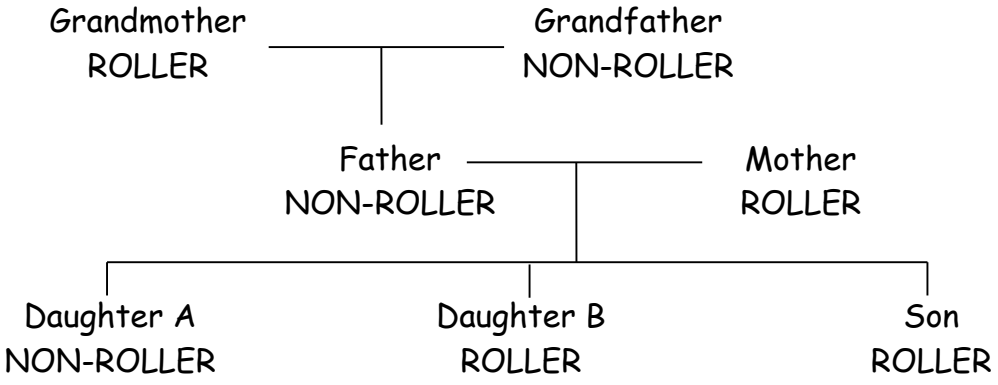
c. What would be the ratio of black fur to chocolate fur offspring produced in the second generation? (1)

d. If a mouse from the F1 generation had been crossed with a mouse with chocolate fur, what would the expected ratio of phenotypes be in this second generation?
Copy and complete the punnet square below to show how you arrived at your answer.

		Mouse with chocolate fur	
Mouse with black fur from 1st generation			

(2)

Q.3. The ability to tongue roll is an inherited characteristic controlled by a dominant gene '**R**'. The recessive gene is represented by '**r**'.
The diagram below represents part of a family tree. Some members of the family can roll their tongue (Rollers) and some cannot (Non-rollers).



a. What are the genotypes of (i) daughter A, (ii) mother and (iii) grandmother? (3)
b. Daughter B marries a man who is a true breeding tongue-roller. Copy and complete the table below to work out the possible phenotypes of their children (F1 generation).

Parents Daughter B X Husband
Genotypes …… ……
F1 phenotypes ……
F1 genotypes ……

(3)

Unit 2 – Multicellular Organisms
2.5 Growth and development of different organisms
Homework Exercise 1 Healthy Diet

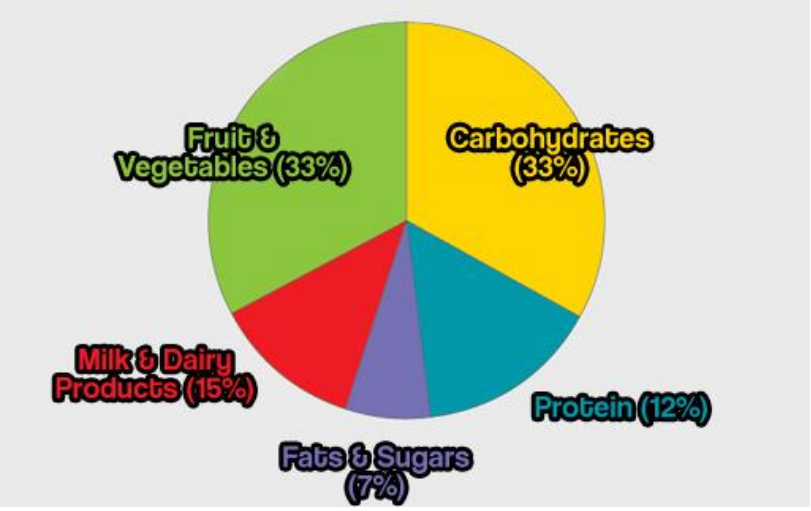
12

Q.1. In order for humans to grow and develop properly they must follow a healthy lifestyle. Copy and complete the table below and state whether the lifestyle shown is healthy (H) or unhealthy (U) by using the appropriate letter.

Lifestyle	Healthy (H) or Unhealthy (U)
Eat an appropriate range of foods	
Exercise regularly	
Take part in enjoyable activities	
Drinking alcohol with friends	
Taking drugs occasionally	

(2)

Q.2. The pie chart below shows the proportion of foods that should be eaten as part of a balanced diet.



Using graph paper provided, convert this information into a bar graph. (2)

Q.3.a. Copy and complete the following sentence by choosing the correct word:

Carbohydrates and **fats/proteins** supply the body with energy. Examples of such foods are **bread/meat** and pasta. (2)

b. The energy content of four different foods is shown below.

Food	**Energy Content (kJ per 100g)**
Cornflakes	1500
Milk	280
Bread	1000
Butter	3100

ii) What is the total energy content in a snack of 200g bread, 10g butter and 100g of milk? (1)

iii) What is the ratio of the energy content present in cornflakes to bread? Write you answer in the following format: **cornflakes:bread** (1)

Q.4. The table below shows the percentage of 11-15 year olds who ate fresh fruit daily.

	11-15 yr olds who ate fresh fruit daily (%)	
Year	Boys	Girls
1990	49.4	60.4
1994	60.9	69.0
1998	62.4	68.4

(a) What change occurred between 1990 and 1998 in the percentage of girls eating fresh fruit daily? (1)

(b) Fresh fruit is a source of vitamins in a healthy diet. Why are vitamins important in a healthy diet? (1)

(c) In addition to vitamins, name the three other food types contained in a balanced diet. (2)

Unit 2 – Multicellular Organisms
2.5 Growth and development of different organisms
Homework Exercise 2 Unhealthy Lifestyles

10

1. If a person does not follow a healthy diet they increase their chances of developing health problems. Below is a list of health problems associated with poor diet.

   Draw a table with appropriate headings to show which are associated with being overweight and which ones are associated with being underweight.

   Health problems: diabetes, arthritis, anorexia, cancer, heart disease, kidney failure (2)

2. If a person eats a diet lacking in nutrients this will have an effect on the growth and development of that person.
   Give the possible effects on a person who eats a diet lacking in iron. (1)

3. During pregnancy, many of the substances a mother consumes passes across to the baby.
   State the effect smoking cigarettes has on a developing baby. (1)

4. The table below shows the percentage of men in different age groups who are light, medium and heavy smokers.

	Percentage of men (%)					
	16-24 years	**25-34 years**	**35-44 years**	**45-54 years**	**55-64 years**	**65-74 years**
Light smokers	13	7	6	3	2	4
Medium smokers	19	17	11	13	13	8
Heavy smokers	6	15	18	17	17	8

   a) What percentage of the men aged 45-54 are heavy smokers? (1)
   b) Calculate the percentage of men aged 16-24 years who do not smoke. (1)
   c) Draw one conclusion from the results in the table. (1)

5. The following results were obtained during a research project on the effects of smoking on breathing rate in two female patients.

	Breathing rate (breaths per minute)	
	Patient 1	*Patient 2*
At rest	14	17
During exercise	21	30

a) Calculate the percentage increase in breathing rate during exercise in Patient 1. (1)

b) One of the patients was a smoker while the other was a non smoker.
Which patient do you think is the smoker and why? (1)

c) Compare the breathing rate during exercise of both patients and write it as a ratio in the following format: (1)

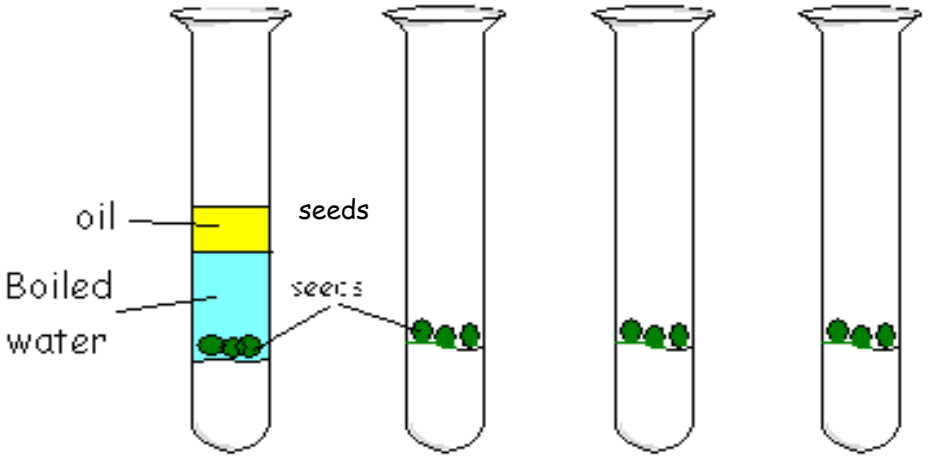
Non smoker : smoker

Unit 2 – Multicellular Organisms
2.5 Growth and development of different organisms
Homework Exercise 3 Growth and development of plants

15

1. a. Explain what is meant by the term *germination*? (1)

   b. The test tubes A, B, C and D below were set up to investigate the conditions necessary for germination.



Room Temp. | **Refrigerated** Moist cotton wool | **Room temp.** Moist cotton wool | **Room temp.** Dry cotton wool

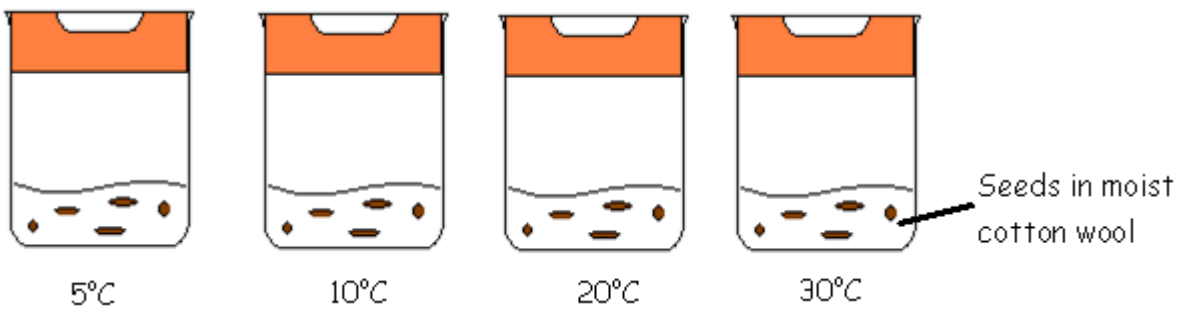
Note: The layer of oil and the boiled water prevent the seeds from getting oxygen.

Copy and complete the table below to show whether the seeds would germinate or not. Put a tick (✓) if they would and a cross (x) if they would not.

Tube	Germinate (✓) or not (x)
A	
B	
C	
D	

(2)

2. An experiment was set up to investigate the effect of temperature on germination.



a) Name the three factors which would have to be kept the same during this experiment to make it a fair test. (1)

b) The tubes were examined after a few days to find the percentage of seeds which had germinated in each tube.

Copy and complete the table below by calculating the percentage of the seeds that have germinated and which temperature the test tubes were placed at to get those results.

Number of seeds in tube	*Number of seeds germinated*	*Percentage germination*	*Temperature of the tube (°C)*
25	23		
25	0		
25	14		
25	0		

(5)

3. Which of the following indicates that a plant needs potting on?

A The plant is infected with greenfly.

B Roots are growing out of the drainage holes in the bottom of the pot.

C The leaves are limp and drooping.

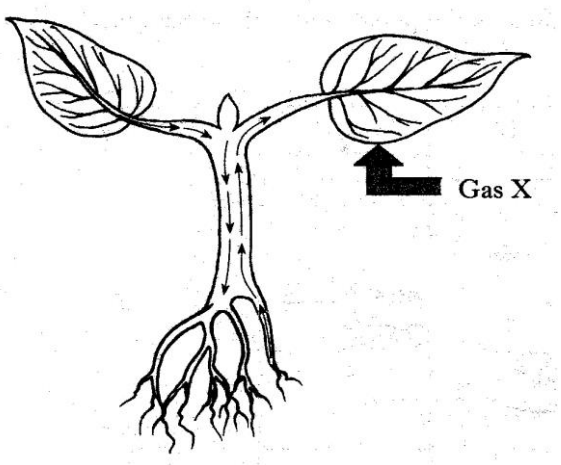
D The flowers fall off soon after opening. (1)

4. Fertilisers are chemicals used on plants promote healthy growth. Copy and complete the table of the chemicals and their importance.

Chemical	**Importance**
Nitrogen (N)	
	required for **root growth**.
Potassium (K)	

(3)

5. The diagram represents a plant carrying out photosynthesis.



a. Name gas (1) ch is required for photosyn

b. Name th (1) roduced during photosynthesis (1)

Unit 2 – Multicellular Organisms
2.5 Growth and development of different organisms
H/w 4 Growth and development of Micro-organisms

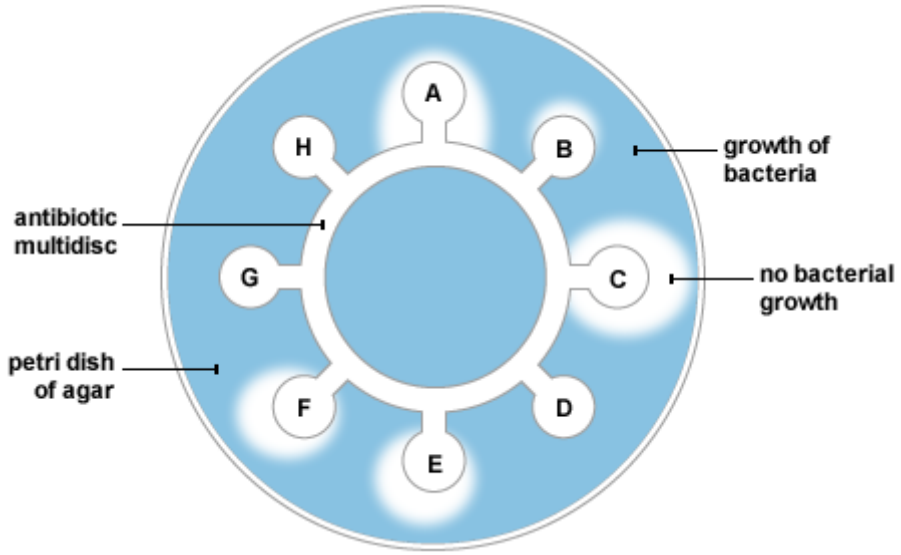
10

1. a. Copy and complete the following sentence by choosng the correct word:

   Micro-organisms are **single-celled/multi-celled** living things. They **can /cannot** be used in the production of new products such as cheese and yoghurt. (1)

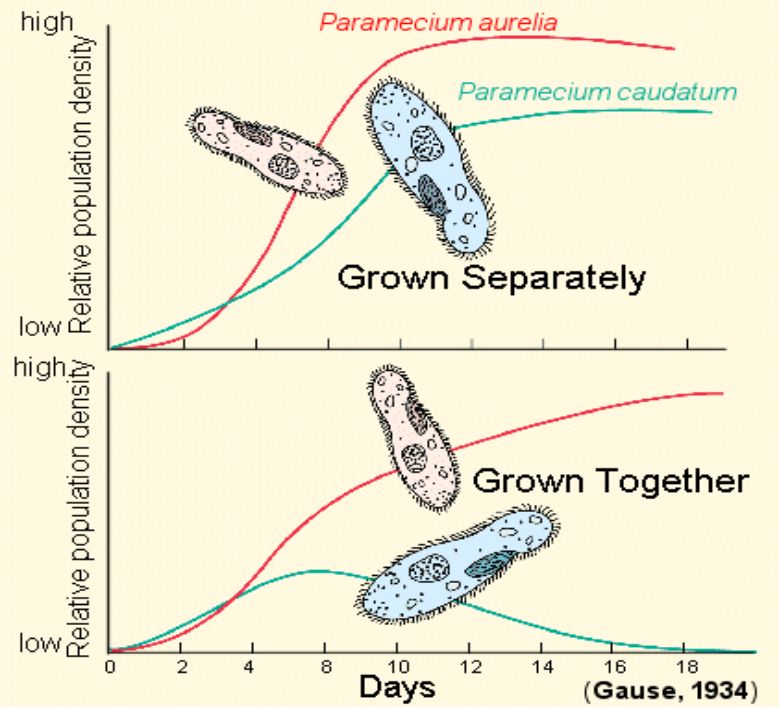
   b. Micro-organisms need certain factors to be available in order for them to grow. State 2 factors needed by micro-organisms for growth. (2)

2. The following diagram shows an antibiotic multidisc used to show which antibiotics are best at preventing the growth of a micro-organism.



The letters A-H represent a different type of antibiotic. The cleared area around each of the antibiotics shows how effective the antibiotic has been at preventing the growth of the micro-organisms.
From the diagram, identify the antibiotic which is most effective at preventing the growth of the micro-organism and which one is least effective. (2)

3. The diagram shows the growth of two types of micro-organisms grown both separately and together.



a. When grown separately, which micro-organism is higher in number? (1)

b. Which micro-organism is disadvantaged when grown together? (1)

c. When organisms are grown together they begin to compete for resources. State 2 possible resources these micro-organisms will be competing for. (1)

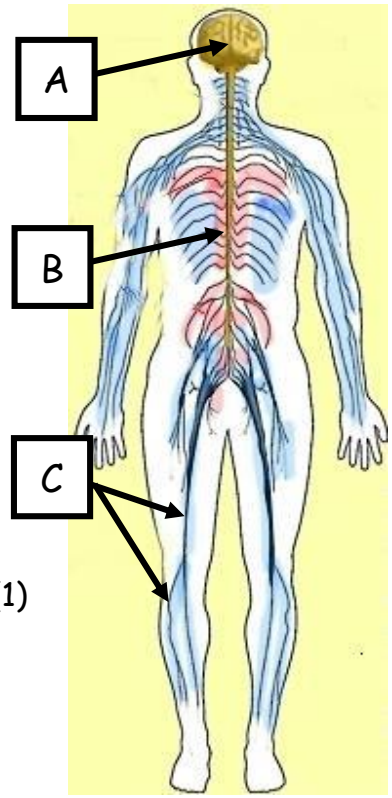
d. If groups of organisms continually compete with one another for resources, What do think could eventually happen to one of the groups and explain your answer. (2)

S3 Biology – Unit 2 – Multicellular Organisms

Biological actions

Homework Exercise 1

20



Q1. The diagram shows the human nervous system.

a. Name the parts labelled A, B and C on the diagram. (3)

b. Name the parts which make up the Central Nervous System. (1)

c. What is the function of the nerves? (1)

Q.2. a. Describe the function of receptor cells. (1)

b. Describe how receptor cells will cause a response to a stimulus. (1)

Q.3. Body temperature is an example of a condition which must be maintained at a particular level.

a. What is the core body temperature of a human? (1)

b. What condition would a person be said to have if they had a:

i. low body temperature?

ii. high body temperature? (2)

c. Describe the response of the body when a person moves into a very cold area. (2)

Q.4. Insulin is a hormone which controls blood glucose levels.

a. Name the organ which produces insulin. (1)

b. Use the words **'high'** and **'low'** to complete the table below to correctly describe the levels of insulin in the blood at different glucose concentrations.

Blood glucose concentration	Insulin levels
High	
Low	

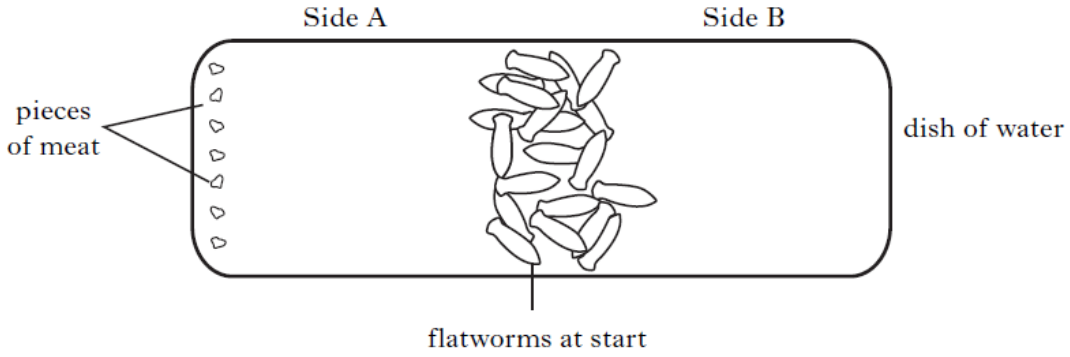
(1)

c. Some people do not have the ability to maintain their blood glucose at a steady level. Which condition are these people said to have? (1)

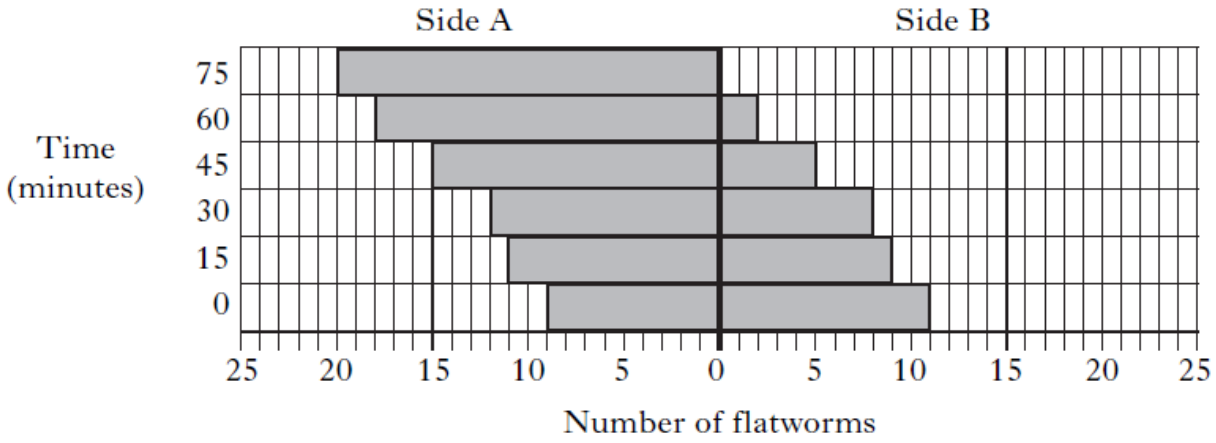
Q.5. When woodlice are exposed to different humidity levels they respond by altering their behaviour; they will move more slowly in an area of high humidity to prevent their bodies drying out and so maintaining body water levels.

Give another example of an organism which alters its behaviour, name the environmental stimulus, describe its response and explain why this response is important. (2)

Q.6. The diagram below shows an experiment to investigate the response of flatworms to food. Twenty flatworms were placed in the centre of a dish of water with pieces of meat at one end. The number of flatworms present in each side was recorded every 15 minutes.



The results are shown below:



a. Calculate the simple whole number ratio of flatworms in Side A and Side B after 30 minutes. (1)

b. Calculate the percentage of flatworms on Side A at 60 minutes. (1)

c. The hypothesis is that the flatworms responded only to the smell of the food. How could the design of the investigation be improved to test this? (1)

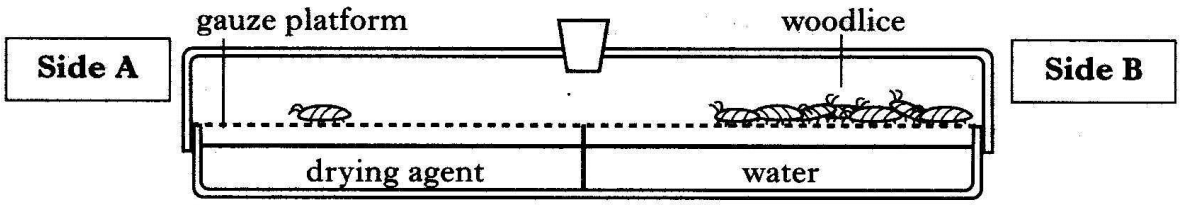
S3 Biology – Unit 2 – Multicellular Organisms
Biological actions
Homework Exercise 2

12

Q1. Woodlice move more slowly or settle when in damp conditions. Explain how this response contributes to the survival of the woodlice. (1)

Q.2. Swallows migrate to Africa from Britain in the autumn. Explain how this behaviour contributes to the survival of the swallow. (1)

Q.3. The apparatus shown below was set up to investigate the behaviour of woodlice.



At the start of the investigation 20 woodlice were placed in the centre of the chamber. After 10 minutes 2 woodlice were found on side A and 18 on side B.

a. Name the environmental stimulus being investigated. (1)

b. Explain the response of the woodlice in the investigation. (1)

c. Why were the woodlice left for 10 minutes before the results were taken? (1)

d. Why were twenty woodlice used rather than once? (1)

e. Name one other environmental stimulus which would have to be kept constant during the investigation. (1)

f. Suggest two changes which would have to be made to the apparatus in order to investigate the behavioural response of woodlice to light. (1)

Q.4. A pupil set out to investigate some aspects of the behaviour of birds in his garden. He put out a tray in the middle of the lawn and each day he put out a cupful of bird food and observed how many birds visited the food in a given time. Each day he recorded the outside temperature at the same time as the food was put out.
The results are shown in the table below:

Time birds observed	Mon. 9.45-10.00	Tues. 9.15-9.25	Wed. 11.00-11.15	Thurs. 10.30-10.40	Fri. 9.30-9.45
Number of visits	10	14	26	32	38
Temperature (°C)	9	8	5	4	4

Note: he ran out of bird food on Thursday and used breadcrumbs for the Friday experiment. He concluded that the birds had learned to expect the food to be put out and that explained why more visits were being made to the garden.

a. Write down another conclusion which could be drawn based on the bird's response to an environmental stimulus. (1)

b. Describe two ways in which the pupil's experimental technique could be improved. (1)

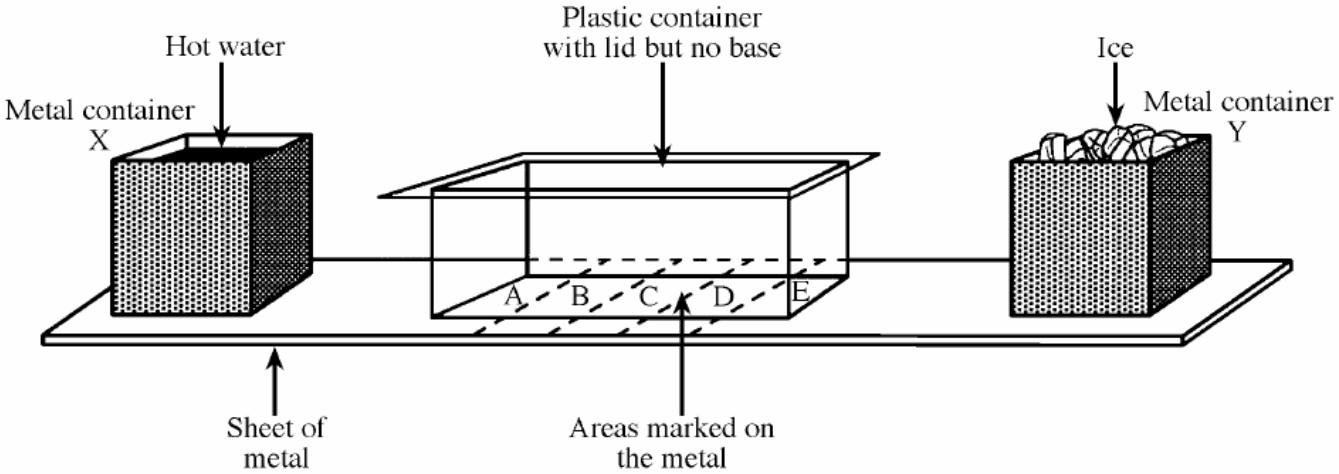
c. Another pupil in the class suggested that the results showed that the birds preferred breadcrumbs to bird food. Why could this not be regarded as being a valid conclusion? (1)

d. Calculate the percentage increase in the number of visits made between Monday and Friday. (1)

S3 Biology – Unit 2 – Multicellular Organisms
Biological actions
Homework Exercise 3

13

Q1. The apparatus shown below was used in an investigation into the response of housefly larvae to changes in an environmental factor.

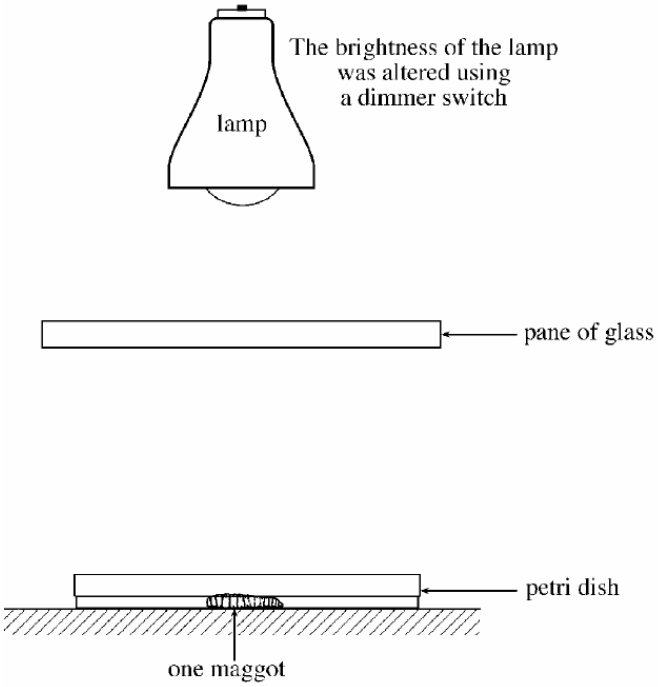


20 larvae were placed in the plastic container, 4 in each area, and the number in each area counted after 20 minutes. The plastic container was covered with a black box during the investigation.
The results are shown in the table below.

Area	Number of larvae	
	At start	*After 20 minutes*
A	4	0
B	4	13
C	4	6
D	4	1
E	4	0

a. Name the environmental stimulus which is causing the response. (1)
b. i. Why is the plastic container covered with a black box during the investigation? (1)
ii. How could the reliability of the results be improved? (1)
c. i. Calculate the percentage of the total number of larvae which gather in area B after 20 minutes. (1)
d. What conclusion can be drawn from the results? (1)
e. The water in container X was replaced with boiling water. Predict the direction of movement of the larvae which gathered in area B. (1)
f. Express as a simple whole number ratio, the number of larvae in area C to the total in all other areas, after 20 minutes. (1)

Q.2. An experiment was set up to investigate the response of maggots to different intensities of light. The diagram shows the apparatus used to test the response of one maggot to the light.



The results of the experiment are shown in the table:

Light intensity (units)	Rate of movement (mm/min)
10	51
20	64
30	66
40	71
50	76
60	86

a. i. Explain why a pane of glass was placed between the lamp and the Petri dish. (1)

ii. What could be done to improve the reliability of the results obtained? (1)

b. Use the results in the table to plot a line graph (on a piece of graph paper) showing the rate of movement of the maggot at different intensities of light. (2)

c. Describe the relationship between light intensity and the rate of movement of the maggot. (1)

d. Predict the rate of movement of maggots in darkness. (1)