

# GCSE Double Award Science Biology

## Sample Results and Observations

---



## Double Award Science Biology Sample Results and Observations

Content/Specification Section	Page
B1a Investigate the need for light in photosynthesis by testing a leaf for starch	2
B1b Investigate the need for chlorophyll in photosynthesis by testing a leaf for starch	2
B2 Investigate the energy content of food by burning food samples	3
B3 Investigate the effect of temperature on the action of an enzyme	4
B4 Use quadrats to investigate the abundance of plants and/or animals in a habitat	5
B5a Investigate the process of osmosis by measuring the change in length or mass of plant tissue	6
B5b Investigate the process of osmosis in a model cell using Visking tubing	7
B6a Use the washing line method to investigate the factors affecting the rate of water loss from leaves	8
B6b Use a bubble potometer to investigate the factors affecting the rate of water uptake by a plant	9
B6c Use a weight potometer to investigate the factors affecting the rate of water uptake by a plant	10

## **B1a & 1b Investigate the need for light and chlorophyll in photosynthesis by testing plant leaves for starch**

### **Investigation 1a**

#### **Answers to Questions**

1a: Drawing of leaf with position of card marked.

b: Part of leaf where card had been – colour yellow – brown.

Part of leaf not covered in card – colour blue-black.

c: • kills the leaf/stop reactions in the leaf

- softens the leaf
- to test for starch

d: Light.

e: Leaf gets no light (in the part covered); Therefore no photosynthesis occurred. No starch was produced.

### **Investigation 1b**

#### **Answers to Questions**

1. Yellow – brown.

2. No chlorophyll in the white area of the leaf.

Therefore no photosynthesis occurred.

No starch was produced.

## B2 Investigate the energy content of food by burning food samples

### Sample results

Mass of cracker /g	Initial temperature of water /°C	Final temperature of water /°C	Rise in temperature of water /°C
1.52	19	62	43

$$\text{Energy in food /J per gram} = \frac{\text{Rise in water temperature /}^\circ\text{C} \times \text{Volume of water /cm}^3 \times 4.2}{\text{Mass of food burned in grams}}$$

$$\text{Energy in 1 gram of the mini cheddar} = \frac{43 \times 20 \times 4.2}{1.52} = \frac{3612}{1.52} = 2376.3 \text{ Joules}$$

### Answers to questions

1. Stirring the water distributes the heat evenly throughout the water. This gives a more accurate measure of the water temperature.
2. Repeating an experiment means that an average can be calculated which gives more reliable results.
3. Glassware : Carefully remove broken glass to a glass bin.  
Carefully mop up water spill.  
Hot apparatus: Student has burnt their hand.
- 4.

Change in the investigation	Effect on rise of temperature of the water		
	Increase	Decrease	No effect
Increasing the volume of water in the boiling tube		✓	
Holding the cracker closer to the boiling tube	✓		
Incomplete burning of the cracker		✓	
Lower initial temperature of the water			✓
Increasing the mass of the cracker	✓		

$$5. \frac{2940}{12800} \times 100 = 22.969 \\ = 23\%$$

## B3 Investigate the effect of temperature on the action of an enzyme

### Sample results

Temperature /°C	Height of froth /mm
20	4
30	11

### Answers to questions

1. Height of froth produced /mm.
2. 5cm<sup>3</sup> of water.
3. The molecules have more kinetic energy at 30 °C than at 20°C.  
They move faster at 30°C and there are more collisions at 30°C between the catalase (enzyme) molecules and the hydrogen peroxide (substrate) molecules which results in more oxygen and more froth being produced at 30°C.

## B4 Use quadrats to investigate the abundance of plants and or animals in a habitat

### Sample results

Distance from edge of woodland into grassland area /m	Number of daisies	Light intensity /lux	Soil moisture content /arbitrary units	Soil pH
0	0	low	10	6.7
5	1	low	15	6.7
10	3	medium	22	6.7
15	7	medium	36	6.8
20	11	high	40	6.7
25	11	high	46	6.7

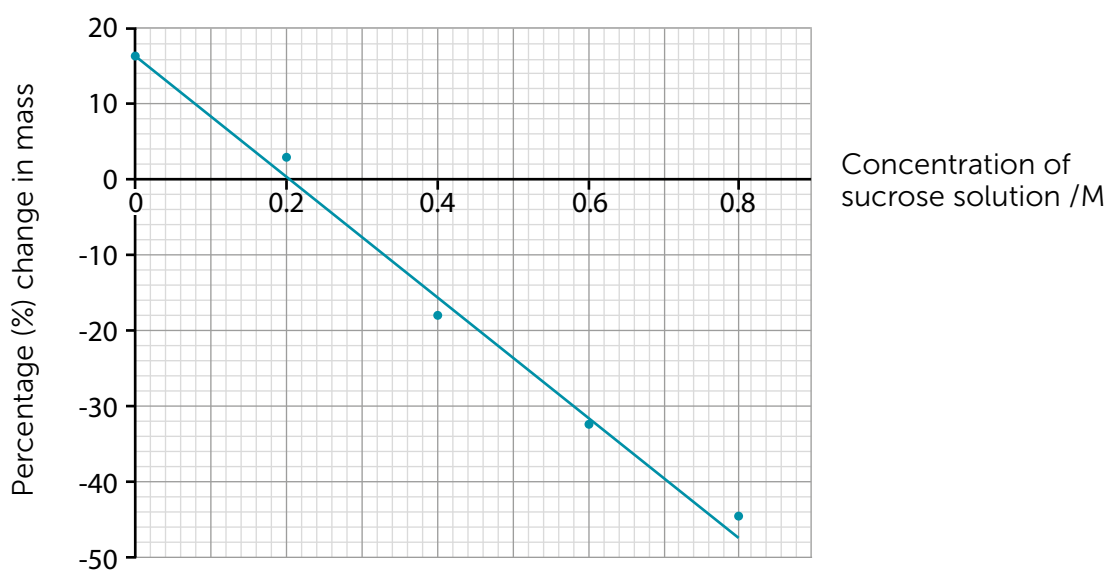
### Answers to questions

1. As the distance from the edge of the woodland increases there are more daisies.
2. There are more daisies when the light is greater, and the soil moisture content is high.
3. Abiotic.

## B5a Investigate the process of osmosis by measuring the change in length or mass of plant tissue

### Results

Beaker	Concentration of sucrose solution /M	Initial mass of potato cylinder /g	Final mass of potato cylinder /g	Change in mass of potato cylinder /g	Percentage (%) change in mass of potato cylinder /g
1	0.0	2.38	2.77	0.39	+16.39
2	0.2	2.30	2.37	0.70	+3.04
3	0.4	2.11	1.73	0.38	-18.01
4	0.6	2.43	1.64	0.79	-32.51
5	0.8	2.05	1.13	0.92	-44.88



### Answers to Questions

1. Percentage (%) mass of potato cylinder increased.
2. Turgid.
3. 0.2M.
4. Percentage (%) mass of potato cylinder decreased.
5. Water moved out of the potato cylinder through the selectively permeable membrane. The water moved from the dilute solution of the cytoplasm of the potato cells to the concentrated external sucrose solution surrounding the potato cells. The potato cells and therefore the potato cylinder decreased in mass.



## B5b Investigate the process of osmosis in a model cell using Visking tubing

Boiling tube	Percentage (%) concentration of sucrose solution inside the Visking tubing in each boiling tube	Initial mass of Visking tubing bag /g	Final mass of Visking tubing bag /g	Change in mass of Visking tubing bag /g
1	0	18.08	17.35	-0.73
2	5	18.31	18.31	0.00
3	20	19.88	19.94	+0.06

### Answers to Questions

1. Cell membrane.
2. It was wider than at the start.
3. The mass decreased. The water moved out from the dilute sucrose solution (water) into the more concentrated surrounding external solution (5% sucrose solution).
4. No change in the mass of the Visking tubing bag. There was no difference in concentration of the sucrose solution between the inside the Visking tubing bag and the surrounding external sucrose solution.

## B6a Use the washing line method to investigate the factors affecting the rate of water loss from leaves

### Results

Leaf surface area	Loss in mass of leaf /g
Small	0.4
Medium	0.6
Large	1.6

### Answers to Questions

1. Time /hours.
2. Surface area (size) (independent variable).  
Loss in mass of leaf /g (dependent variable).
3. The loss of mass increases with the increase in surface area (size) of the leaf.
4. The larger the surface area (size) of the leaf the more stomata present on the leaf.
5. Therefore there will be most water lost by transpiration from the stomata of the leaf with the largest surface area (size).

## B6b Use a bubble potometer to investigate the factors affecting the rate of water uptake by a plant

### Results

Conditions	Initial position of air bubble /cm	Final position of air bubble /cm	Distance air bubble moved /cm in 10 minutes	Rate of water uptake (transpiration) cm /hour
No wind	0.0	0.5	0.5	3
Wind	0.0	1.0	1.0	6

### Answers to Questions

1. The rate of water uptake was greater with wind than with no wind. The greater the water uptake the greater water loss from the leaves.

In conditions with wind, the water from the leaf will be carried away from outside the stomata quicker.

2. Other factors that affect the rate of water loss (transpiration) are:
  - temperature
  - surface area of leaves
  - light intensity
  - humidity

## B6c Use a weight potometer to investigate the factors affecting the rate of water uptake by a plant

### Results

Conditions	Initial mass of conical flask and contents /g	Final mass of conical flask and contents /g	Change in mass of conical flask and contents /g	Rate of water loss g /hour
Warm conditions	420.99	416.91	4.08	0.17
Cool conditions	419.89	417.76	2.13	0.09

### Answers to Questions

1. Time/size of plant shoot/type of plant shoot.
2. To prevent any water loss from the conical flask so that all the water is lost from the leaves of the plant shoot.
3. Plant shoot in the warmer conditions had a faster rate of water loss than the plant shoot in cooler conditions.

The increased temperature in warmer conditions will result in the water molecules evaporating quicker and this will maintain the gradient for water loss.

