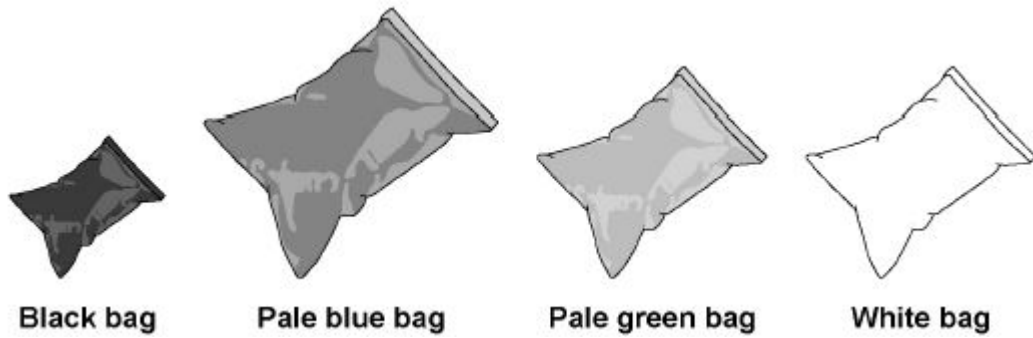


Q1.

A solar water bag can be used to heat water for an outdoor swimming pool.

A student wanted to find out if the colour of the solar water bag affects the temperature increase of the water inside the bag.

The diagram below shows some of the equipment used.



This is the method used.

1. Fill each bag with water.
2. Place the four bags on the ground outside.
3. After three hours, measure the temperature of the water inside each bag.
4. Repeat steps 1–3 on the next two days.

(a) Suggest three changes the student should make to this method to get valid results.

1. _____

2. _____

3. _____

(3)

The student repeated the investigation using an improved method.

The results obtained were valid.

The table below shows the results.

Colour of bag	Temperature increase in °C			
	Day 1	Day 2	Day 3	Mean
Black	44.0	31.4	43.4	39.6
Pale blue	38.5	23.6	38.1	33.4

Pale green	37.9	23.7	37.7	33.1
White	25.3	23.4	24.2	X

- (b) The student used a thermometer to measure the temperature of the water inside each bag.

What was the resolution of the thermometer?

Resolution = _____ °C

(1)

- (c) Suggest **one** reason why the temperatures increased less on Day 2 than on Day 1 and Day 3.

(1)

- (d) Calculate the mean temperature increase for the white bag.

Mean temperature increase = _____ °C

(1)

- (e) Which colour of bag would be best to use to heat water?

Give a reason for your answer.

Colour _____

Reason _____

(2)

(Total 8 marks)

Mark schemes

Q1.

(a) any **three** from:

- same surface area of bag (exposed to sun)
allow same sized bag
- same volume / mass of water
allow same amount of water
- use same starting temperature of water
allow measure temperature at the start
- place all bags out at the same time
- place all bags out in same area / conditions
- same thickness of material / bag
- same type of material (for each bag)
- use IR lamp in a lab

3

(b) 0.1 (°C)

1

(c) any **one** from:

- more cloudy
- less sunny
ignore less Sun
- less sunlight
- cooler day

1

(d) 24.3 (°C)

1

(e) black

1

(it has the) greatest (temperature) rise

allow it is the best absorber of IR (radiation)
ignore best emitter of IR (radiation)

1

reason only scores if black is given

[8]