Experiment worksheet answers

5.1 Using computer simulations

Pages 112–115 and 210

Challenge 5.1: Using computer simulations

Student answers will vary.

Experiment worksheet answers

5.2 Matter cycles through the Earth’s spheres

Pages 116–119 and 211

Experiment 5.2: Testing phosphorus

Discussion

1 What detergents contained phosphorus?

Detergent used for washing clothes.

2 Why do living organisms need phosphorus?

Phosphorus is found in DNA, and RNA, some proteins, and energy containing molecules (ATP).

3 Why are high levels of phosphorus in waterways a problem?

High levels of phosphorus lead to the increased growth of plankton and aquatic plants. This decreases the available oxygen in the water.

4 Check the labels on the detergents in your home. What phosphorus-containing detergents do you use regularly?

Most contain phosphates.

Experiment worksheet answers

5.3 The water cycle is a global cycle

Pages 120–123 and 211

Experiment 5.3: Make your own clouds

Expected results:

Condensate starts to form between the water and the base of the evaporating dish, and a constant water drip forms from the centre of the evaporating dish. As the water gets hotter (after a couple of minutes), condensate also builds on the side of the beaker and runs back down into the water. The air space in the beaker then becomes cloudy.

Discussion

1 What action produced water vapour?

Heating water produces water vapour (evaporation).

2 What happened to the water vapour?

The water vapour will change back into a liquid or rise.

3 In which of the Earths spheres would you find water vapour?

The hydrosphere

4 Why is the condensation of water important to the biosphere?

Condensation of water allows water to fall to the earth so that it can be used by living organisms.

Experiment worksheet answers

5.3 The water cycle is a global cycle

Pages 120–123 and 212

Challenge 5.3: Making a simple barometer

Discussion

1 What happened to the rubber balloon as the outside air pressure changed?

High atmospheric pressure pushes on the balloon, causing it to cave in. When atmospheric pressure is low, the balloon bulges out, raising the taped end of the straw.

2 What happened to the position of the straw against the scale? Why was this?

During high pressure, the plastic and the taped section of straw sink, causing the end of the straw to tilt up because the pressure is higher outside the jar. In low pressure, the pressure of the air inside the jar is higher and the edge of the straw falls until it comes to rest against the rim of the container.

3 Use the particle model of air to explain why the rubber balloon gets pushed in or out of the jar by the surrounding air.

When air pressure increases, it exerts more pressure on the balloon, pushing it down. When the air pressure decreases, the pressure lessens on the balloon and enables it to bulge outwards.

4 This ‘barometer’ will also respond to changes in temperature in addition to changes in air pressure. Explain why.

The barometer will also respond to temperature because warmer temperatures create more pressure. Warmer air that takes up the same amount of space as cold air will create more pressure. Warm molecules push away from one another instead of moving towards one another and try to take up more space than they have, creating a greater pressure.

Experiment worksheet answers

5.4 Human activity affects the carbon cycle

Pages 124–125 and 212

Challenge 5.4: Modelling a carbon sink

Discussion

1 What happened to the solid dry ice?

The solid carbon dioxide sublimates and forms a gas. As a result the dry ice appears to disappear. NOTE: The white gas that can be seen is condensed water that forms around the cold carbon dioxide gas.

2 Describe any changes you noticed in the water.

The indicator in the water will become pink as carbonic acid is formed.

3 What was the final pH of the water?

Students’ answers will vary.

4 Provide an explanation for the changes you noticed.

The carbon dioxide reacts with the water to form carbonic acid. The pink universal indicator shows this.

5 What is a carbon sink?

A carbon sink is a feature of the environment that absorbs or stores carbon.

6 How could you use this demonstration to explain the consequences of increased carbon dioxide levels in the atmosphere?

Increased carbon dioxide levels in the atmosphere will cause the oceans to absorb more carbon dioxide. This will result in the water becoming more acidic.

Experiment worksheet answers

5.5 Evidence supports enhanced global warming

Pages 126–129 and 213

Experiment 5.5A: What factors affect a greenhouse?

Expected results

The following is an example of collated results using thermometers in full sun for 20 minutes. Digital thermometers under a 150-watt lamp gave similar patterns in results.

|  |  |  |
| --- | --- | --- |
|  | Clear bottle Temperature increase (°C)  (no cloud cover) | Painted bottle Temperature increase (°C)  (cloud cover) |
| Soil | 16 | 10 |
| Water | 11.5 | 11 |
| Perlite | 15.5 | 12.5 |

It would be expected that the bottle with dark soil and no ‘cloud cover’ (bottle A) would be the hottest.

Discussion

1 Compare the graphs for the different bottles. Describe the differences. What do these graphs indicate?

The bottles with ‘cloud’ cover will have a lower temperature than their counterparts. The dark soil will be the warmest, and the white sand/perlite will be the coolest.

2 Which situation produced the lowest temperature? Which situation would lead to the least heating of the atmosphere?

The situation that produces the lowest temperature is the white sand/perlite with cloud cover (bottle F). This situation would subsequently lead to the least heating of the atmosphere.

3 Suggest some possible explanations for your results.

Answers will vary. However, students should understand that the absorption/reflective ‘value’ of a substance influences its response to sunlight.

4 Explain how this experiment demonstrates the effect of the oceans and dark and light surfaces on air temperature.

Dark and light surfaces absorb and reflect sunlight/heat, respectively. Oceans absorb energy but they don’t necessarily contribute to heating as much as do dark surfaces.

5 If the deserts are increasing and ice is melting, exposing dark soil, what effects would you expect these changes to have on atmospheric temperature?

If dark soils are being more exposed as ice sheets are melting, then the atmospheric temperature will increase due to an increase in absorption of heat energy.

Conclusion

Summarise your key findings from this experiment.

Answers will vary. However, students should understand that different surfaces absorb and radiate heat energy differently and therefore contribute to atmospheric temperature in various ways.

Experiment worksheet answers

5.5 Evidence supports enhanced global warming

Pages 126–129 and 214

Experiment 5.5B: Melting ice and its effect on sea levels

Discussion

1 How did the water level change as the sea ice melted?

The water level should not change as the sea ice melts. No extra water is added when floating ice melts because it is already displacing its mass of water and, when it melts, it only replaces the volume of water that it originally displaced.

2 How did the water level change as the sheet ice melted?

Water from land-based ice, such as ice sheets, enters the ocean when it melts, causing sea levels to rise.

3 Provide an explanation for any differences you observed.

Floating ice displaces water and, when it melts, replaces the volume of water displaced. Land-based ice, however, does not displace water and so will add to water levels when it melts.

Conclusion

Will melting sea ice or melting sheet ice have the greater effect on sea levels? Why?

Melting sheet ice will have the greatest effect on sea level as it does not displace water and so will cause an increase in sea level.

Experiment worksheet answers

5.6 Enhanced global warming has widespread effects

Pages 130–133 and 214

Challenge 5.6: Salt water density

Discussion

1 What is density?

The mass for each unit volume.

2 Which is denser, beaker 1 or beaker 4? Provide evidence from your results to support your answer.

Beaker 4 is the densest. This solution should sit on the bottom of the test tube.

3 Relate your results to the movement of water in ocean currents.

Cold salty water will flow under warm fresh water in the ocean.