

5.5 UNIT

Practical activities

Water rockets



**SAFETY WARNING:** The launch of this rocket must be done outside. Everyone must stand clear of the launch area.

**Aim** To observe action/reaction forces in action

**Equipment**

- 1.25 L plastic softdrink bottle, champagne cork (other corks or rubber stoppers may do, but the fit must be tight), sandpaper, Vaseline, safety glasses, access to bike pump or electric pump, access to power drill with fine drill bit, access to hacksaw, retort stand, clamp and ring

**Method**

- 1 Cut the champagne cork with the hacksaw, shortening it so that it is a little shorter than the valve of the bike pump.
- 2 Sand the sides of the cork so that it fits neatly into the neck of the plastic bottle.
- 3 Drill a hole through the centre of the cork. Lightly smear the sides of the cork with Vaseline.
- 4 Fill the bottle to about one-third with water.
- 5 Push the valve of the pump through the cork and then secure the cork in the neck of the bottle.
- 6 Quickly place the bottle upside down in the ring.
- 7 Start pumping, standing well clear of the rocket.
- 8 Repeat, trying different amounts of water.
- 9 Repeat, trying different-sized plastic softdrink bottles.



**Aim** To construct a two-stage rocket using balloons

**Equipment**

- Plastic cup, scissors, 2 balloons (1 long, 1 round), tape

**Method**

- 1 Cut the bottom out of one of the paper cups.
- 2 Partly inflate the long balloon and pull it through the bottomless cup, taping the opening to the side of the cup as shown in Figure 5.5.10.
- 3 Place the round balloon inside the cup and blow it up so it wedges inside the cup. Hold the opening shut.
- 4 Remove the tape holding the long balloon on the side of the cup and release the end of the round balloon to launch your 'rocket'.

Questions

- 1 Identify the action/reaction force pair in this situation.
- 2 Identify the 'fuel' for this rocket.
- 3 List the forces that slowed its ascent.
- 4 Recommend how these forces could be reduced.
- 5 More water did not necessarily produce increased height. Discuss why.
- 7 Evaluate the effect of different-sized plastic bottles on height.
- 6 Trigonometry can be used to find the height reached by the rocket. Describe how this can be done.

Fig 5.5.9

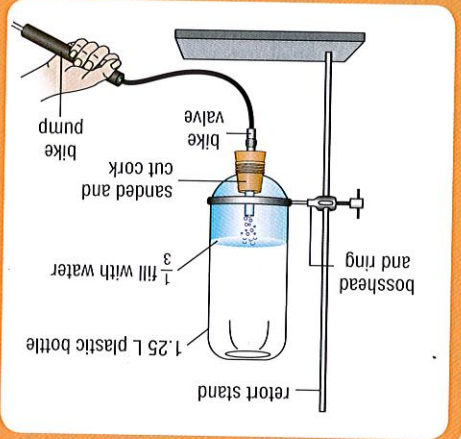


Fig 5.5.10

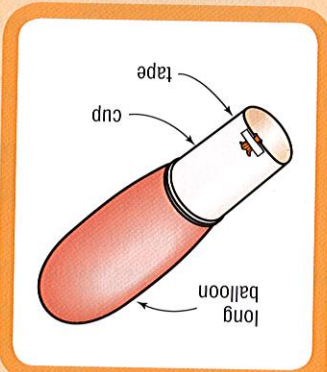
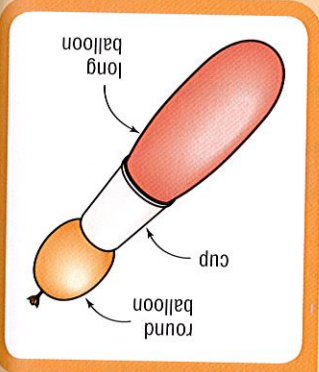


Fig 5.5.11



Questions

- 1 Account for the propulsion of the rocket.
- 2 a Explain how the rocket could be enlarged to include a third stage.  
b Assess whether there would be a limit to how many stages you could attach.