

## Starter Activity: What physics can you see from the window?

**Introduction:** This activity is intended as a warm-up 'ice-breaker' exercise, to stimulate thinking about how pupils might relate the physics they are taught to the world outside the window.

**Key Stage:** Physics KS3

**National Curriculum Ref:** Sc4.2a, b, c, d, e, f: .3a-e, g: .4a-d: .5a-c, e.

**Time:** 10 minutes

**Pupil learning outcomes:** Pupils may well be astonished at just how much "physics" is going on around them, when they probably thought that the subject is confined to the laboratory. As a result of the discussion, they may treat their environment with more respect and understanding.

**Context:** Physical processes are going on all around us, both indoors and outside. Real examples of physics in nature, or employed by human activity may be observed through almost any window.

**Activity:** Participants simply look through a nearby window and attempt to answer the questions. This is best done in pairs to encourage discussion.

**Resource list:** Participant card per group

**Follow-up:** Pupils can be asked to look out for other examples of "physics in action" at work on their way home, or in the home itself.

The questions are asked on a 'participant card' - some examples to guide discussion are given below, together with some possible answers.



The view from the window (*Starter Activity*)

Physics I can see	Some examples, to guide discussion
<ul style="list-style-type: none"> <li>Where is gravity clearly having an effect?</li> </ul>	Leaves falling/objects falling; things thrown up come down.
<ul style="list-style-type: none"> <li>Where can a force resisting gravity be seen in action?</li> </ul>	Branches being held up; things not sinking into the ground
<ul style="list-style-type: none"> <li>Is there an example of air rising because it has a lower density than the surrounding air?</li> </ul>	Rising 'bubbly' clouds (Cumulus); shimmering rising air above hot roads/pavements/ hot roofs in summer; rising water vapour after rain on a hot day; any steam from vents (= air + steam); exhaust fumes (= air + fumes)
<ul style="list-style-type: none"> <li>Where has a high friction surface been laid down?</li> </ul>	Road; pavement
<ul style="list-style-type: none"> <li>Where is a lower friction surface visible?</li> </ul>	Glass; ice; wet grass; wet roads; mud
<ul style="list-style-type: none"> <li>Can an example of acceleration be seen? If so, where?</li> </ul>	All movement involves acceleration to begin with - so cars and people moving off, branches waving (stop at outside of arc, accelerate to middle, then decelerate), the start of any movement of limbs, etc.
<ul style="list-style-type: none"> <li>Can an example of deceleration be seen? If so, where?</li> </ul>	The opposite of the above - ie. slowing down
<ul style="list-style-type: none"> <li>Can an example of torque (turning forces) be seen? If so, where?</li> </ul>	Any movement in an arc or circle - so waving branches, turning wheels, limbs moving in an arc
<ul style="list-style-type: none"> <li>Where is an example of light reflection?</li> </ul>	From windows, puddles, shiny metal surfaces (polished cars)
<ul style="list-style-type: none"> <li>Where might an example of light refraction in the air be seen?</li> </ul>	A mirage on a hot day; rising/setting sun; rainbow
<ul style="list-style-type: none"> <li>All of what you see from the window is dependent on light. What can your other senses detect about things going on outside. How do these work?</li> </ul>	Sound - ears, detecting shock waves through the air; Vibration - touch, touch and other detectors in the skin; Smell - nose, molecules in the air; Taste - unlikely
<ul style="list-style-type: none"> <li>Can any objects in the solar system, apart from the Earth, be seen?</li> </ul>	The Sun: moon; the evening star (Venus)

<ul style="list-style-type: none"> <li>• What evidence can you see of the human use of different forms of energy, e.g. electrical, chemical.</li> </ul>	<p>Electrical – car, street lights, other lights;                      Electrical – nervous system in the body                      Chemical – battery starting car, battery driving walkman/mobile phone;                      Chemical – driving the body producing heat and motion;                      Chemical/thermal - burning objects, smoke from chimneys.                      Chemical – car moving (fuel) producing heat and motion. Chemical - lighting a match producing thermal energy                      People climbing up hill - from chemical to gravitational potential or position energy.                      This section is a wonderful introduction to forms of energy - the list is endless.</p>
<ul style="list-style-type: none"> <li>• What invisible forces are operating outside the window, but you can't see them?</li> </ul>	<p><i>Many – this will be followed up in the 'What physics can't you see from the window?' starter activity for the KS4 Physics 'Teaching Science in an Earth Context' workshop. This is an extension activity here for the faster workshop participants</i></p>

*All photographs can be found in colour on the Earth Science Education Unit website.*