

Fuels, nuclear power, renewables and the climate

Grade 8 science (Year 9 · Class 8) · Test answers (mark scheme)

Use these model answers and the marking notes to score your test. Award marks only for ideas that are written clearly, and use the notes to find the topics you should revise.

Level: Grade 8 science (Year 9 · Class 8) · **Curriculum:** MS-ESS3-3

Question 1 Renewable resources (2 marks)

- a. A resource that is replaced naturally in a short time, so it does not run out.
- b. For example wind, solar or tidal energy.

Marking: (a) 1 mark; (b) 1 mark for a correct example.

Question 2 Power station Sankey diagram (3 marks)

- a. $200 - 70 = 130$ MJ.
- b. Efficiency = $70 \div 200 \times 100 = 35 \%$.

Marking: (a) 1 mark; (b) 1 mark for the substitution, 1 mark for 35 %.

Question 3 Burning coal and the climate (3 marks)

Burning coal releases carbon dioxide into the atmosphere. Carbon dioxide is a greenhouse gas and absorbs infrared radiation from the ground, sending some of it back down. More CO₂ therefore traps more energy, and the average temperature of the Earth rises.

Marking: 1 mark for releases CO₂; 1 mark for greenhouse gas traps infrared; 1 mark for temperature rises.

Question 4 Nuclear power (2 marks)

- a. It releases no CO₂ while generating electricity (or a small mass of fuel gives a lot of energy).
- b. It produces radioactive waste that must be stored safely (or a nuclear accident would be serious).

Marking: 1 mark each.

Question 5 Solar farm energy (3 marks)

- a. $E = P \times t = 4.0 \times 6.0 = 24 \text{ MWh}$.
b. $24 \text{ MWh} = 24 \times 1000 = 24\,000 \text{ kWh}$.

Marking: (a) 1 mark for the equation or substitution, 1 mark for 24 MWh; (b) 1 mark for 24 000 kWh.

Question 6 Reliability of wind power (2 marks)

Wind turbines only produce electricity when the wind blows, so output varies and can fall to nothing on calm days. Energy storage such as batteries, or backup power stations, can supply the missing power.

Marking: 1 mark for output depends on the wind; 1 mark for a valid solution.

Question 7 Hydroelectric energy (3 marks)

$$E = m g h = 2.0 \times 10^4 \times 9.8 \times 50 = 9.8 \times 10^6 \text{ J}.$$

Marking: 1 mark for the formula, 1 mark for the substitution, 1 mark for $9.8 \times 10^6 \text{ J}$ with unit.

Question 8 Reducing emissions (2 marks)

For example: install solar panels or buy renewable electricity, and use less energy by switching off unused appliances or by improving insulation.

Marking: 1 mark for each valid suggestion.