

Why some changes heat up and others cool

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

Marks are in each model answer. Accept equivalent wording, and give error-carried-forward credit where a later part uses a wrong earlier value correctly.

Level: Grade 8 science (Year 9 · Class 8) · **Curriculum:** MS-PS1-6

Question 1 Definitions (2 marks)

- a. A reaction or process that **absorbs energy from the surroundings**, so the temperature falls.
- b. An instant cold pack (or melting ice, or photosynthesis).

Marking: 1 mark each.

Question 2 Classify (2 marks)

- a. **Exothermic.**
- b. **Endothermic.**

Marking: 1 mark each.

Question 3 Temperature change (3 marks)

- a. $27.0 - 18.5 = +8.5\text{ }^{\circ}\text{C}$.
- b. It is **exothermic**, because the temperature rose, so energy was released to the surroundings.

Marking: 1 mark for ΔT ; 1 for exothermic; 1 for reason.

Question 4 Energy calculation (3 marks)

- a. $Q = 80 \times 4.2 \times 7.5 = \mathbf{2520\text{ J}}$.
- b. $\Delta T = 2520 \div (160 \times 4.2) = \mathbf{3.75\text{ }^{\circ}\text{C}}$.

Marking: 1 mark for substitution, 1 for 2520 J; 1 for 3.75 $^{\circ}\text{C}$.

Question 5 Cold pack graph (3 marks)

- a. **5 $^{\circ}\text{C}$.**
- b. $22 - 5 = \mathbf{17\text{ }^{\circ}\text{C}}$.

- c. The warmer room transfers energy to the pack, so it warms back up.

Marking: 1 mark each.

Question 6 How a hand warmer works (3 marks)

- a. Iron reacts with oxygen from the air in an **exothermic reaction**, which releases energy as heat. The pack stays warm while iron remains. It stops when the iron is **used up**, and then it cools.

Marking: 1 mark exothermic reaction with oxygen; 1 mark energy released as heat; 1 mark stops when iron used up.

Question 7 Energy diagram (2 marks)

- a. **Exothermic**, since products are lower.
b. $150 - 110 = \mathbf{40\text{ kJ}}$ released.

Marking: 1 mark each.

Question 8 Correct the idea (2 marks)

- a. The pack absorbs energy as its solid dissolves. **Energy flows from the warm knee into the colder pack**, so the knee cools.

Marking: 1 mark for energy absorbed by the pack; 1 mark for direction from knee to pack.