

Combined science - Physics - Key stage 4 - Energy

Specific heat capacity - worksheet

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In lesson questions



Independent practice

1. What does it mean if water has a higher specific heat capacity than oil?
– **It requires energy to**
2. What is the difference between thermal energy and temperature? (what is temperature a measure of?)
3. 4 kg of sand, and 4 kg of water are at 30 °C. Which has more energy in its thermal store? Explain your answer
4. 2 kg of oil and 2 kg of aluminium both have 3000 J of energy in their thermal store. Which will have the higher temperature? Explain your answer



Independent practice

Calculate the energy transferred for each of these:

- 1. $m = 0.5 \text{ kg}$ and $\Delta\theta = 20 \text{ }^{\circ}\text{C}$ (for copper)
- 2. $m = 2 \text{ kg}$ and $\Delta\theta = 60 \text{ }^{\circ}\text{C}$ (for oil)
- 3. $m = 40 \text{ kg}$ and $\Delta\theta = 7.5 \text{ }^{\circ}\text{C}$ (for water)
- 4. $m = 1.2 \text{ kg}$ and $\Delta\theta = 0.5 \text{ }^{\circ}\text{C}$ (for air)
- 5. $m = 2 \text{ kg}$ and $\Delta\theta = 8 \text{ }^{\circ}\text{C}$ (for aluminium)
- 6. **Challenge:** $m = 1\,500\,000 \text{ g}$ and $\Delta\theta = 0.2 \text{ }^{\circ}\text{C}$
(for iron)

Material	Specific heat capacity / J/kg $^{\circ}\text{C}$
Air	100
Aluminium	900
Copper	390
Iron	450
Oil	540
Water	4200



Independent practice

Calculate the mass for each of the following:

1. $\Delta E = 1\,000\text{ J}$ and $\Delta\theta = 2.5\text{ }^{\circ}\text{C}$ (for oil)
2. $\Delta E = 2\,500\text{ J}$ and $\Delta\theta = 0.2\text{ }^{\circ}\text{C}$ (for aluminium)
3. $\Delta E = 200\text{ J}$ and $\Delta\theta = 2.5\text{ }^{\circ}\text{C}$ (for copper)
4. $\Delta E = 5,000,000\text{ J}$ and $\Delta\theta = 15\text{ }^{\circ}\text{C}$ (for water)
5. **Challenge:** $\Delta E = 0.05\text{ kJ}$ and $\Delta\theta = 50\text{ }^{\circ}\text{C}$ (for oil)

Material	Specific heat capacity / J/kg $^{\circ}\text{C}$
Air	100
Aluminium	900
Copper	390
Iron	450
Oil	540
Water	4200



Answers



Review

1. What does it mean if water has a higher specific heat capacity than oil? **It requires more energy to raise its temperature by the same amount.**
2. What is the difference between thermal energy and temperature? **Temperature is a measure of the average kinetic energy of the molecules present. Thermal energy of an object depends upon the temperature and its mass.**
3. 4 kg of sand, and 4 kg of water are at 30 °C. Which has more energy in its thermal store? Explain your answer **Water. Because it has a higher specific heat capacity**
4. 2 kg of oil and 2 kg of aluminium both have 3000 J of energy in their thermal store. Which will have the higher temperature? Explain your answer. **Aluminium. It has a lower specific heat capacity**



Review

Calculate the energy transferred for each of these:

1. $m = 0.5 \text{ kg}$ and $\Delta\theta = 20 \text{ }^{\circ}\text{C}$ (for copper) **3900 J**
2. $m = 2 \text{ kg}$ and $\Delta\theta = 60 \text{ }^{\circ}\text{C}$ (for oil) **64 800 J**
3. $m = 40 \text{ kg}$ and $\Delta\theta = 7.5 \text{ }^{\circ}\text{C}$ (for water) **1 260 000 J**
4. $m = 1.2 \text{ kg}$ and $\Delta\theta = 0.5 \text{ }^{\circ}\text{C}$ (for air) **60 J**
5. $m = 2 \text{ kg}$ and $\Delta\theta = 8 \text{ }^{\circ}\text{C}$ (for aluminium) **14 400 J**
6. **Challenge:** $m = 1\,500\,000 \text{ g}$ and $\Delta\theta = 0.2 \text{ }^{\circ}\text{C}$ (for iron) **135 000 J**



Review

Calculate the mass for each of the following:

1. $\Delta E = 1\,000\text{ J}$ and $\Delta\theta = 2.5\text{ }^{\circ}\text{C}$ (for oil) **0.74 kg**
2. $\Delta E = 2\,500\text{ J}$ and $\Delta\theta = 0.2\text{ }^{\circ}\text{C}$ (for aluminium) **13.9 kg**
3. $\Delta E = 200\text{ J}$ and $\Delta\theta = 2.5\text{ }^{\circ}\text{C}$ (for copper) **0.21 kg**
4. $\Delta E = 5,000,000\text{ J}$ and $\Delta\theta = 15\text{ }^{\circ}\text{C}$ (for water) **79 kg**
5. **Challenge:** $\Delta E = 0.05\text{ kJ}$ and $\Delta\theta = 50\text{ }^{\circ}\text{C}$ (for oil) **0.002 kg**

