

2. Thermal physics

Starter Quiz · 课前小测

IGCSE Physics

Name: _____ Score: _____

1. In which state are the particles far apart, fast, and moving in random directions?

- ☐ gas
- ☐ solid
- ☐ liquid
- ☐ they are the same in all states

2. For the same rise in temperature, which expands the most?

- ☐ a gas
- ☐ a liquid
- ☐ a solid
- ☐ they all expand by the same amount

3. While ice is melting into water, what happens to the temperature?

- ☐ it stays the same until all the ice has melted
- ☐ it rises steadily
- ☐ it falls steadily
- ☐ it rises then falls

4. Why are metals such good conductors of thermal energy?

- ☐ they have free electrons that carry energy quickly
- ☐ they are shiny
- ☐ they are heavy
- ☐ they contain trapped air

5. Temperature is a measure of:

- ☐ the average kinetic energy of the particles
- ☐ the total number of particles
- ☐ the mass of the object
- ☐ the colour of the object

6. Convert 27 °C to kelvin.

_____ K

7. How much energy is needed to heat 2.0 kg of water by 10 °C? (Use $c = 4200$ J per kg per °C.)

_____ J

8. Evaporation can happen below the boiling point.

- ☐ True ☐ False

9. Convection can happen in a solid.

- ☐ True ☐ False

10. A gas has a volume of 200 cm³ at 100 kPa. It is squeezed to 100 cm³ at constant temperature. What is the new pressure, in kPa?

_____ kPa

1. **gas**

Gas particles are far apart and move quickly in random directions, filling the container. Solids only vibrate; liquids slide past each other.

2. **a gas**

Gases expand the most, then liquids, then solids (whose particles are held most tightly).

3. **it stays the same until all the ice has melted**

During a change of state the energy goes into breaking the forces between particles, so the temperature stays constant until the change is complete.

4. **they have free electrons that carry energy quickly**

Metals have free (delocalised) electrons that move through the metal and carry energy rapidly from the hot end to the cold end.

5. **the average kinetic energy of the particles**

Hotter means the particles move faster, so temperature measures their average kinetic energy.

6. **300 K**

$$T = \theta + 273 = 27 + 273 = 300 \text{ K.}$$

7. **84000 J**

$$\Delta E = mc\Delta\theta = 2.0 \times 4200 \times 10 = 84\,000 \text{ J.}$$

8. **True**

Evaporation happens at the surface at any temperature — the fastest surface particles escape. Boiling happens throughout the liquid at the boiling point.

9. **False**

Convection needs particles to move from place to place, so it only happens in liquids and gases — not solids.

10. **200 kPa**

pV is constant: $100 \times 200 = p \times 100$, so $p = 200 \text{ kPa}$. Halving the volume doubles the pressure.