Year 8 Heat Transfer Worksheet - Mark Scheme

Year 8 · KS3 Physics · Conduction, convection, radiation and insulation

Section A: Key ideas [8 marks]

1(a)	hot, cold (in that order) Guidance: 1 mark each.	**2**
1(b)	degrees Celsius; thermometer	**2**
1(c)	joules	**1**
1(d)	vibrate	**1**
2	Temperature tells you how hot or cold something is (1). Thermal energy is the total amount of energy stored in the vibrating particles of a substance (1).	**2**

Section B: Conduction, convection and radiation [17 marks]

3	Conduction: solids (especially metals); vibrating particles pass energy to neighbouring particles. Convection: liquids and gases; hot fluid rises and cooler fluid sinks, carrying energy. Radiation: any place including a vacuum; infrared waves carry the energy. Guidance: 1 mark for each correct box in the first two columns after Method (6 marks).	**6**
4	Radiation; conduction; convection; radiation. Guidance: 1 mark each.	**4**
5	Particles at the hot end gain energy and vibrate more (1). They collide with neighbouring particles and pass on the energy (1). Free electrons in metals also carry energy quickly through the metal, so metals are good conductors (1).	**3**
6	The water at the bottom is heated and expands, so becomes less dense (1). The warm water rises (1). Cooler, denser water sinks to take its place and the cycle repeats (1).	**3**
7	The particles are fixed in position and cannot flow.	**1**

Section C: Applications of heat transfer [10 marks]

8	The vacuum between the walls has no particles, so there is no conduction or convection across it (2). Shiny (silvered) surfaces reflect radiation back (1). The plastic stopper and lid are poor conductors / stop convection and evaporation (1).	**4**
9	Fibreglass traps pockets of air (1). Air is a poor conductor and cannot circulate to form convection currents (1).	**2**
10	White (shiny) surfaces reflect radiation (1) so less thermal energy is absorbed, and the building stays cooler (1).	**2**
11	The water at the bottom is heated first and rises (1), creating convection currents that heat all of the water (1).	**2**

Section D: Data and investigation [15 marks]

12(a)	Bare: 30 °C; foil: 15 °C; wool: 10 °C	**3**
12(b)	Wool, because the temperature fell the least.	**1**
12(c)	30 ÷ 10 (1) = 3 °C per minute (1)	**2**
12(d)	Any two: starting temperature; volume of water; type and size of beaker; room temperature; thickness of wrapping. Guidance: 1 mark each.	**2**
12(e)	To reduce heat loss by evaporation and convection.	**1**
13	Axes correct: time on the x-axis and temperature on the y-axis with units (1). Points plotted correctly (1). A smooth line or line of best fit drawn (1).	**3**
14	Metal is a better conductor than wood (1). Thermal energy moves from your hand into the metal faster (1). Your hand loses energy faster so the metal feels colder (1).	**3**

Total: 50 marks. Accept any scientifically correct alternative wording.