

Simple Kinetic Molecular Model of Matter

Mark Scheme 3

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	Thermal Physics
Sub-Topic	Simple Kinetic Molecular Model of Matter
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 3

Time Allowed: 48 minutes

Score: /40

Percentage: /100

- 1 (a) (i) and (ii) marked together to maximum of 3 marks
- (i) molecules escape/leave the liquid/form gas or vapour B1
- (ii) evaporation OR heat/(thermal) energy needed for evaporation leaves sweat cooler B1
 fast(er) molecules/high(er) energy molecules escape B1
 OR slow(er) molecules left behind B1
 heat flows from body to warm the sweat (so body cools) B1
- (b) (Q =) $mc\Delta\theta$ OR mcT OR $60 \times 4000 \times 0.50$ C1
 1.2×10^5 J / 120 kJ A1
- (ii) $Q = mL$ in any form OR ($m =$) Q/L OR either with numbers C1
 $(m = 1.2 \times 10^5 / 2.4 \times 10^6 =)$ 0.05 kg e.c.f from (b)(i) A1

[Total 7]

- 2 (a) any two from:
- at surface / not within liquid (if other way round must be explicit) B1
 at any temperature / not at boiling point (if other way round must be explicit) B1 [2]
 (evaporation) causes cooling
 boiling requires a heat source
 bubbles rising
- (b) (i) viable heat source clearly described e.g. electrical/immersion heater B1
 appropriate readings e.g. V , I , t or P & t or joulemeter readings B1 [2]
 OR
 combustion heater but only with some mention of amount of fuel used B1
 correct measurement of amount of fuel used B1
- (ii) viable mass measuring device clearly described B1
 e.g. (top pan) balance/scale
 appropriate readings B1 [2]
 e.g. mass of water before and after / change of mass of water
 OR
 measuring cylinder B1
volume of water before and after / change of volume of water B1

[Total: 6]

- 3
- (a) any two of:
 boiling throughout liquid (evaporation at surface),
 boiling at one temperature (evaporation at any / all temperature / below boiling point),
 boiling not affected by draught/area (evaporation is),
 boiling produces bubbles (evaporation does not). B2
- (b) (thermal energy) does work against intermolecular forces / breaks bonds B1
 molecules separated/moved apart OR becomes PE B1
- (c) apparatus: e.g. kettle AND balance / scales OR steam condensing in water with
 measuring cylinder / scales AND thermometer B1
 two masses determined OR volume/mass condensed B1
 determine energy input: e.g. VIt or Pt or $mc\Delta T$ B1
 $(l_e =)Q/m$ B1 [8]
- 4
- (a) (i) any two of:
 (gas) molecules further apart
 greater PE
 move singly / in straight lines
 OR vice versa for. liquid molecules
 (allow faster)
- (ii) gases compressible OR liquids incompressible B1
 forces between gas molecules weaker OR vice versa for liquid molecules B1
- (b) $pV = \text{constant}$ OR $p_1V_1 = p_2V_2$ OR $2.6 \times 10^6 \times 0.035$ OR 91 000
 $2.6 \times 10^6 \times 0.035 / 1.0 \times 10^5$ OR $91\,000 / 1.0 \times 10^5$ C1
 0.91 m^3 A1
- (ii) slower / less KE B1 [8]

- 5 (a) irregular/random/haphazard movement B1
any mention of different directions or clearly described B1 [2]
- (b) smoke particles condense atoms, molecules etc. AND (invisible) air molecules B1
air and smoke/dots collide
ignore other collisions B1 [2]
- (c) dots move in or out of focus/disappear OR appear brighter/dimmer [1]
- [Total: 5]

- 6 (a) T-shirt in wind/on L dries quicker OR T-shirt out of wind/on R dries slower M1
wind removes more evaporated molecules accept quicker
NOT wind gives water molecules more KE A1 [2]
- (b) T-shirt folded double/on R dries slower OR T-shirt unfolded/on L dries quicker M1
correct reference to smaller/larger surface area for molecules to evaporate
OR water trapped (in fold) OR more humid in fold A1 [2]
- (c) water evaporates from her hair B1
heat required for evaporation OR heat flows (from body/hair) to warm up cold
water
OR faster molecules escape leaving water cooler/lowering KE
ignore: there is a cooling effect B1 [2]
- [Total: 6]