

Name of the Student: _____

Max. Marks : 25 Marks

Time : 25 Minutes

Mark Schemes

Q1.

- (a) pressure decreased

1

because molecules have less (kinetic) energy

allow less speed/velocity

1

so fewer collisions (with the wall/container each second)

*allow collide with less force**allow less force on the walls*

1

- (b)
- $0.70 = m \times 330$

1

or

$$700 = m \times 330\,000$$

$$m = \frac{0.70}{330}$$

or

$$m = \frac{700}{330\,000}$$

allow correct rearrangement using converted value(s) of E to J and/or L to J/kg

1

$$m = 0.0021 \text{ (kg)}$$

*allow 0.0021(212121...)**allow correct calculation using converted value(s) of E and/or L*

1

*an answer of 0.0021(212121...) scores 3 marks**3 marks can only be awarded for $m = 0.0021(212121...) \text{ (kg)}$*

- (c)

Substance	Solid	Liquid	Gas
Oxygen		✓	
Nitrogen			✓
Carbon dioxide	✓		

2 correct answers scores 1 mark.

if more than one tick in a row, neither can score a mark

2

- (d) **Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.

5–6

Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.

3–4

Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

1–2

No relevant content

0

Indicative content

cooling

- as the argon cools the particles slow down
- particles in a liquid move slower than particles in a gas
- particles in a solid move slower than particles in a liquid
- as the liquid/solid cools the particles get closer together
- as the liquid/solid cools the density increases

gas to liquid

- particles change from being spread apart to touching each other
- particles will (collide with other particles more often and) change direction more often

liquid to solid

- particles change from a random arrangement to a regular pattern
- particles change from moving freely to fixed positions
- particles change from moving freely/randomly to vibrating

explanation

- (internal) energy (of the argon) decreases
- (kinetic) energy (of the particles) decreases with temperature
- (potential) energy (of the particles) changes with change of state (of the argon)
- forces between particles in a gas are negligible/zero
- attractive forces act between atoms when they are close to each other
- attractive forces between particles are stronger in a solid than in a liquid

to access level 3 there must be an explanation of changes to arrangement and movement of particles during either cooling or a change of state

[14]

Q2.

- (a) the store of chemical energy (in the battery) decreases

1

the internal energy of the surrounding air increases.

accept description of energy becoming less usefully stored for 2 marks

(b) kinetic energy = $\frac{1}{2} \text{ mass} \times \text{velocity}^2$

1

(c) $E_k = \frac{1}{2} \times 0.8 \times 12^2$

1

$E_k = 57.6 \text{ (J)}$

1

allow 57.6 (J) without working shown for 2 marks

- (d) lower proportion of wasted energy
accept less energy is wasted

1

higher proportion of energy is converted into kinetic energy
accept more kinetic energy

1

(e) **Level 2 (3–4 marks):**

A relevant and coherent argument which demonstrates processing and numerical analysis of the information presented and draw a conclusion which is logically consistent with the reasoning and refers to payback time for the vehicles.

Level 1 (1–2 marks):

Simple comparisons are made which demonstrate a basic ability to numerically analyse the information presented. The conclusion, if present, may not be consistent with the calculations.

0 marks:

No relevant content

Indicative content

- The electric car costs £12 000 more to buy
- Running cost of electric car = £3 000
- Running cost of petrol engine car = £24 000
- Total cost of electric car = £30 000
- Total cost of petrol engine car = £39 000
- The electric car cost £1 750 less to run each year
- The electric car will save £9 000
- Additional cost is covered in 6.9 years
- So the electric car will be cheaper over the 12 year lifetime

or

Electric

$27000 / 12 = 2250$

Annual cost = $2250 + 250 = 2500$

Petrol

$15000 / 12 = 1250$

Annual cost = $1250 + 2000 = 3250$

So electric is £750 cheaper per year

4

[11]

