

Chemistry Paper 1 2023 June
Mark scheme

MCQs

1. D
2. C
3. D
4. B
5. B
6. C
7. C
8. B
9. D
10. B
11. C
12. C
13. A
14. B
15. C
16. D
17. B
18. C
19. A
20. D
21. A
22. A
23. B
24. C
25. B

Extended Theory Mark Scheme:

1ai) Dust in air / clay in water / toothpaste in water.

Aii) Image should show random irregular movement.

- Irregular and zig zag [1]
- Needs an arrow to show directional movement. [1]

Aiii)

- MP1 Visible particles [1]
- MP2 Collided / bombarded by smaller non-visible particles [1]

Bi) 1 mark per factor + description of how it affects diffusion. Only needs one correct effect / description not both.

Temperature

- High temperature increased rate of diffusion
- Low Temperature slower rate of diffusion

Molecular mass

- Bigger Mr slower rate of diffusion
- Smaller Mr faster rate of diffusion

Concentration:

- Higher concentration higher rate of diffusion
- Lower concentration lower rate of diffusion

Surface area:

- Larger surface area faster the rate of diffusion
- Lower surface area slower rate of diffusion.

AVP:

Presence of membrane:

- Slower with membrane
- Faster without

State of matter:

- Faster in gases
- Slower in liquid

Bii)

Physical reaction: Evaporation / vaporization

Chemical reaction: Precipitation / Neutralization / Redox reaction

Both needed for 1 mark

Biii) 1 mark both reactants, 1-mark products and 1 mark for start of matter.



c) MP1 - They have the same / no difference in rate of diffusion

MP2 – As they have the same Molecular Mass / Mr.

2a) In order / increasing of proton number.

b) Transition metals

c) 1 marking point for each

- Form coloured compounds

- Form complex ions

- Good Catalysts

- Less reactive than other groups of metals.

- Have more than one oxidation state / can form different ions / Accept example ions (chemical formula)

- Accept Max 1 mark for a suitable example of any named chemical property / example

d) MP1 – Positive ions

MP2 – floating in a sea of delocalized/ mobile electrons.

MP3 – Electrostatic forces of attraction between positive ions and electrons.

e.)

MP1 – elements become less metallic across the period.

MP2 – elements change from basic to acidic across the period.

MP3 – Melting point/boiling point decreases across the period

MP4 – Electrical conductivity decreases across the period.

MP5 – Chemical reactivity decreases across the period.

MP6: - Density increases across the period.

AVP: Metallic bonding changes to covalent

3a) Correct calculations showing

MP1 : Mass / Ar

C = 0.04 F = 0.08 and Cl = 0.08

MP2: Showing ratio 1 : 2 : 2

MP3 = CF_2Cl_2

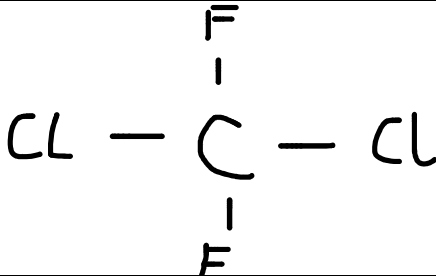
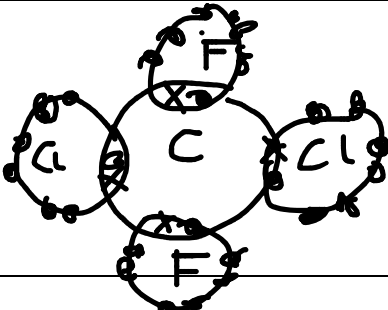
Allow 3 marks for correct answer without working.

Max: 1 mark for ecf if Ar for Carbon was used instead of Chlorine resulting in CFCI or CF₂Cl

ii) 1 mark for display formula

Dot and cross diagram MP1 = showing single covalent bond with a X and O a total of 4 of them.

MP2 the correct number of lone pairs on the F and Cl atoms to complete full outershell.

Display formula [1 mark]	Dot and cross diagram [2 marks]
	

b)

C₄F₈Cl₈

Allow error carried forward if any to aii) is multiplied by 4.

4a)

MP1 : calculation used mass / Mr

MP2: 0.075 moles

ii)

MP1: Evidence of calculation used moles * Conc

MP2: 0.051 moles

iii)

MP1 Ensure all the acid is reacted / no acid left

iv) correctly sketched image of filtration with funnel, filter paper

Accept without or with beaker present.

v) 2 marks awarded if answer is 1.73g without calculation evidenced.

MP1 - Correct calculation of 3.672g reacted.

MP2: Difference 5.4g – 3.672g

1.73g (3sfg)

Accept MP2 if mass calculated – original

Max 1 mark if full answer 1.782g

Part 3: Practical Theory:

Q1)

a) Complete the table below relating to variables. [3 marks]

Independent variable	Dependent variable	State 1: Control variable
Volume of acid	pH Change	Temperature / drops of indicator

b) Measuring cylinder

c) Changes from pink to colourless

Must include the start colour and final colour, reject final colour only.

d) Difficulty seeing end point / point of neutralization / Accept valid descriptions of colour

e)

Burette reading in cm ³ before adding the acid	0.2
Burette reading in cm ³ after adding the acid	22.2
Volume of acid added in cm ³	22.0

1 mark for readings

1 mark for volume of acid to 1 decimal place.

Fi)

All 4 values correct 2 mark

2 values correct 1 mark

Burette reading in cm ³ before adding the acid	0.5	21.5	0.1	21.4
Burette reading in cm ³ after adding the acid	21.5	41.7	19.6	40.3
Volume of acid added in cm ³	21.0	20.2	19.5	18.9

fii) 20.0 cm³, 20.2 cm³, 19.5 cm³

fiii) 19.9cm³ [1 mark]

fiv) Increases precision.

fv) Increases reliability.

g.)

MP1 = Calculating number of moles in NaOH = 0.08×0.025

Evidence of moles = vol * conc

= 0.02 moles of NaOH

MP2 = application of molar ratio 0.02/2 therefore 0.01 moles of H₂SO₄

MP3 = concentration of H₂SO₄ determined by $0.01/0.0199$

= 0.5 mol/dm³

MP4 = Yes, it is the same concentration / likely to be the bottle

Accept max 2 marks for ECF if forgotten to use dm³ conversion but showed appropriate method of deduction.

Q2)

- a) Thermal decomposition / Reduction
- b) Reaction is completed / finished / achieve a constant mass / all reactant reacted.
- c) Stop / prevent solid spitting / ejecting from crucible / avoid loss of reactant.
- d) Getting burned / burnt / burns skin. Ignore idea of its hot / Bunsen / referenced to hazard.

Ei) 3.55g

Eii) M1 3.55 / 68 (RFM)

MP2 0.05 moles / 0.0522 moles of LiHCO_3

MP3 0.025 moles / 0.0266 of Li_2CO_3

MP4 Deduced maximum mass of 0.025 mols * 74 = 1.85g – 1.97g

e) MP1 (Calculation obtained mass / maximum mass) * 100\
(4.94g / 5.20) * 100

MP2: 95%

- f) Spillages / Impurities. (Reject human error)