



EXAM PAPERS PRACTICE

Boost your performance and confidence
with these topic-based exam questions

Practice questions created by actual
examiners and assessment experts

Detailed mark scheme

Suitable for all boards

Designed to test your ability and
thoroughly prepare you

2002

XVIII

1583

Time allowed
44 Minutes

Score

/37

Percentage

%

CHEMISTRY

**AQA
AS & A LEVEL**

Mark Scheme

3.1 Physical chemistry

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1

- (a) (i) Uses sensible scales.

*Lose this mark if the **plotted points** do not cover half of the paper.*

Lose this mark if the graph plot goes off the squared paper

Lose this mark if volume is plotted on the x-axis

1

All points plotted correctly

Allow \pm one small square.

1

Smooth curve from 0 seconds to at least 135 seconds – the line must pass through or close to all points (\pm one small square).

Make some allowance for the difficulties of drawing a curve but do not allow very thick or doubled lines.

1

- (ii) Any value in the range 91 to 105 s

Allow a range of times within this but not if 90 quoted.

1

- (b) (i) Using $pV = nRT$

This mark can be gained in a correctly substituted equation.

1

$$100\,000 \times 570 \times 10^{-6} = n \times 8.31 \times 293$$

Correct answer with no working scores one mark only.

1

$$n = 0.0234 \text{ mol}$$

Do not penalise precision of answer but must have a minimum of 2 significant figures.

1

- (ii) Mol of $\text{ZnCO}_3 = 0.0234$

Mark consequentially on Q6

M1

1

Mass of $\text{ZnCO}_3 = M1 \times 125.4 = 2.9(3)$ or $2.9(4)$ g
If 0.0225 used then mass = 2.8(2) g

M2

1

(iii) Difference = $(15.00 / 5) - \text{Ans to b}$
If 2.87 g used then percentage is 4.3

M1

1

Percentage = $(M1 / 3.00) \times 100$
Ignore precision beyond 2 significant figures in the final answer
If 2.82 g used from (ii) then percentage = 6.0

M2

1

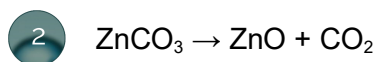
(c) A reaction vessel which is clearly airtight round the bung

1

Gas collection over water or in a syringe
Collection vessel must be graduated by label or markings
Ignore any numbered volume markings.

1

[13]



Ignore state symbols.

If equation incorrect, allow one mark only for correct atom economy method.

1

Percentage atom economy =

Mark consequentially for incorrect formula mass(es)

1

$$\frac{81.4}{125.4} \times 100 = 64.9$$

Accept answer to at least 2 significant figures

1

[3]

3 (a) M1 $550 \times \frac{100}{95} = 579 \text{ g would be 100\% mass}$
Allow alternative methods.
There are 4 process marks:

1

M2 So $\frac{579}{65} = 8.91 \text{ moles NaN}_3$

or

M1 $\frac{550}{65} = 8.46 \text{ moles NaN}_3 \text{ (this is 95\%)}$

M2 So 100% would be $8.46 \times \frac{100}{95} = 8.91 \text{ moles NaN}_3$

1: $\text{mass} \div 65$

2: $\text{mass or moles} \times 100 / 95 \text{ or } \times 1.05$

3: $\text{moles NaN}_3 \times 2$

4: $\text{moles NaNH}_2 \times 39$

1

Then M3 Moles $\text{NaNH}_2 = 8.91 \times 2 = (17.8(2) \text{ moles})$

1

M4 $\text{mass NaNH}_2 = 17.8(2) \times 39$

1

M5 $\underline{693}$ or $\underline{694}$ or $\underline{695} \text{ (g)}$

If 693, 694 or 695 seen to 3 sig figs award 5 marks

1

(b) M1 308 K and 150 000 Pa

1

$$M2 \quad n = \frac{PV}{RT} \quad \text{or} \quad \frac{150\,000 \times 7.5 \times 10^{-2}}{8.31 \times 308}$$

1

M3 = 4.4(0) or 4.395 moles N₂

Allow only this answer but allow to more than 3 sig figs

1

$$M4 \quad \text{Moles NaN}_3 = 4.395 \times \frac{2}{3} \quad (= 2.93)$$

M4 is for M3 × $\frac{2}{3}$

1

$$M5 \quad \text{Mass NaN}_3 = (2.93) \times 65$$

M5 is for moles M4 × 65

1

$$M6 = 191 \text{ g}$$

Allow 190 to 191 g allow answers to 2 sig figs or more

1

(c) (i) 150 / 65 = 2.31 moles NaN₃ or 2.31 moles nitrous acid

1

$$\text{Conc} = 2.31 \times \frac{1000}{500}$$

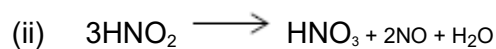
M2 is for M1 × 1000 / 500

1

$$4.6(1) \text{ or } 4.6(2) \text{ (mol dm}^{-3}\text{)}$$

Only this answer

1



Can allow multiples

1

(d) Ionic

If not ionic then CE = 0 / 3

1

Oppositely charged ions / Na^+ and N_3^- ions

Penalise incorrect ions here but can allow M3

1

Strong attraction between (oppositely charged) ions / lots of energy needed to overcome (strong) attractions (between ions)

M3 dependent on M2

1

(e) (i) $\text{N} \equiv \text{N} \rightarrow \text{N}^-$

Only

1

(ii) CO_2 / N_2O / BeF_2 / HN_3

Allow other correct molecules

1

(iii) MgN_6

Only

1

[21]