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

Time allowed

56 Minutes

Score /49

Percentage %

CHEMISTRY

OCR AS & A LEVEL

Mark Scheme

Module 2: Foundatons in chemistry

1. (i) The H^+ ion in an (nitric) acid has been replaced by a metal ion
OR by a Ca^{2+} ion ✓

DO NOT ALLOW *it has been produced by the reaction of an acid and a base as this is stated in the question.*

IGNORE *references to replacement by* NH_4^+ *ions or positive ions.*
ALLOW *H* ***OR*** *Hydrogen for* H^+*;*
DO NOT ALLOW *Hydrogen atoms*
ALLOW *Ca* ***OR*** *Calcium for* Ca^{2+}*.*
DO NOT ALLOW *Calcium atoms*
ALLOW *'metal' for 'metal ion*

1

(ii) $2HNO_3(aq) + Ca(OH)_2(aq) \rightarrow Ca(NO_3)_2(aq) + 2H_2O(l)$
Formulae ✓
Balance **AND** states ✓

ALLOW *multiples*
ALLOW *(aq)* ***OR*** *(s) for* $Ca(OH)_2$

2

(iii) Accepts a **proton OR** accepts H^+ ✓

ALLOW $H^+ + OH^- \rightarrow H_2O$
ALLOW OH^- *reacts with* H^+ ***OR*** OH^- *takes* H^+
ALLOW OH^- *'attracts'* H^+ *if 'to form water' is seen*

DO NOT ALLOW OH^- *neutralises* H^+ *('neutralises' is in the question)*

1

[4]

2. (a) (i) Calculate correctly $\frac{0.0880 \times 25.0}{1000} = 2.20 \times 10^{-3}$ mol

OR 0.00220 mol ✓

ALLOW *0.0022* ***OR*** 2.2×10^{-3} *mol*

1

(ii) Calculates correctly $\frac{0.00220}{2} = 1.10 \times 10^{-3}$ mol

OR 0.00110 mol ✓

ALLOW *0.0011* ***OR*** 1.1×10^{-3} *mol*
ALLOW *ECF for answer* ***(i)****/2 as calculator value or correct rounding to 2 significant figures or more but ignore trailing zeroes*

1

(iii) $\frac{0.00110 \times 1000}{17.60} = 0.0625 \text{ mol dm}^{-3}$

OR 6.25×10^{-2} mol dm^{-3} ✓

ALLOW *0.063* ***OR*** *6.3×10^{-2} mol dm^{-3}*

ALLOW *ECF for answer* ***(ii)*** *× 1000/17.60*

OR

ECF from ***(i)*** *for answer* ***(i)****/2 × 1000/17.60 as calculator value or correct rounding to 2 significant figures or more but ignore trailing zeroes*

1

(b) (i) (The number of) Water(s) of crystallisation ✓

IGNORE *hydrated* ***OR*** *hydrous*

1

(ii) 142.1 ✓

ALLOW *142*

ALLOW *M_r expressed as a sum*

ALLOW *ECF from incorrect M_r and x is* ***calculated correctly***

$x = \frac{(322.1 - 142.1)}{18.0} = 10$ ✓

ALLOW *ECF values of x from nearest whole number to calculator value*

ALLOW *2 marks if final answer is 10* ***without any working***

2

[6]

3. (i) $2NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$ ✓

ALLOW *$2NH_4OH + H_2SO_4 \rightarrow (NH_4)_2SO_4 + 2H_2O$*

ALLOW *$NH_3 + H^+ \rightarrow NH_4^+$*

ALLOW *any correct multiple*

IGNORE *state symbols*

1

(ii) when the H^+ in an acid is replaced by a metal ion **OR** an ammonium ion **OR** a + ion ✓

ALLOW *H for H^+;*

ALLOW *'metal' for 'metal ion'*

i.e.: *H in an acid can be replaced by a metal*

1

(iii) accepts a proton **OR** accepts H^+ ✓

ALLOW *donates a lone pair*

ALLOW *removes* H^+

ALLOW *forms* OH^- *ions*

1

(iv) 132.1 ✓

IGNORE *units*

NO OTHER ACCEPTABLE ANSWER

1

[4]

4. (i) $M(MgSO_4) = 120.4$ OR 120 (g mol^{-1}) ✓

mol $MgSO_4 = \frac{1.51}{120.4} = 0.0125$ *mol* ✓

ALLOW *0.013 up to calculator value of 0.012541528 correctly rounded (from* $M = 120.4$ g mol^{-1}*)*

ALLOW *0.013 up to calculator value of 0.012583333 correctly rounded (from* $M = 120$ g mol^{-1}*)*

ALLOW *ecf from incorrect M i.e. 1.51 ÷ M*

2

(ii) $\frac{1.57}{18.0} = 0.0872(2)$ (mol) ✓

ALLOW *0.09 up to calculator value of 0.08722222*

1

(iii) × = 7 ✓

ALLOW *ecf i.e. answer to (ii) ÷ answer to (i)*

ALLOW *correctly calculated answer from 1 significant figure up to calculator value, ie, × does not have to be a whole number. Likely response = 6.95* ✓

1

[4]

5. (i) $Ca(OH)_2$ ✓

IGNORE *charges, even if wrong*

1

(ii) $Ca(NO_3)_2$ ✓

IGNORE *charges, even if wrong*

1

[2]

6. (i) Molar mass of $CaCO_3$ = 100.1 g mol^{-1} **(1)**
2.68/100.1 = 0.0268/0.027 **(1)** 2

(ii) 0.0268 mol × 24,000 = 643 cm^3 **(1)** 1

(iii) moles HNO_3 = 2 × 0.0268
= 0.0536 /0.054 mol **(1)**
(i.e. answer to (i) × 2)

volume of HNO_3 = 0.0536 × 1000/2.50 = 21.4 cm^3 **(1)** 2

[5]

7. (i) MgO has reacted with CO_2✓ 1

(ii) Solid dissolves / disappears✓
Fizzing / bubbles✓ 2
$MgO + 2HCl \rightarrow MgCl_2 + H_2O$✓
$MgCO_3 + 2HCl \rightarrow MgCl_2 + CO_2 + H_2O$✓
both reactions form magnesium chloride/$MgCl_2$✓ 3

[6]

8. (i) $CaCO_3$ (s) + 2HCl(aq) → $CaCl_2$(aq) + CO_2(g) + H_2O (l)

$CaO(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O$ (l)

each balanced equation 1 mark (2)

all state symbols (1) 3

(ii) $CaCO_3$ fizzes/ gas given off/ gas evolved / carbon dioxide evolved (1) 1

[4]

9. (i) a proton donor ✓ 1

(ii) $MgO + 2HCl \rightarrow MgCl_2 + H_2O$ ✓ 1

[2]

10. $CaCO_3$ reacts with (or neutralises) HC*l* ✓
(or $CaCO_3$ + HC*l* in an equation)

$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$ ✓
(correct equation would score both marks)

[2]

11. (i) as a base (1) ……. accepts a proton/H+/ **neutralises** an acid/ reacts with acid to form salt/ has a **lone** pair of electrons (1) 2

(ii) fertiliser (1) 1

(iii) manufacture of explosives/ dyes/ nitric acid/ fibres/ ammonium nitrate/ urea/ refrigeration/ cleaning agents/ fertiliser
(if not allowed in (ii) (1) 1

[4]

12. (i) fizzing/gas/hydrogen evolved *or* Mg dissolves/disappears ✓ 1
[an incorrect observation negates this mark]

(ii) $2HCl + Mg \rightarrow MgCl_2 + H_2$

[correct formula for $MgCl_2$. Allow equation with HI/MgI_2 instead of HC*l*] ✓

[balancing: e.g. $2HCl + 2Mg \rightarrow 2MgCl + H_2$ will get this mark but not the 1st] ✓ 2

[3]

13. No mark scheme available

14. No mark scheme available