



**SINGAPORE SPORTS SCHOOL
PRELIMINARY EXAMINATION 2019
SECONDARY 4 EXPRESS
SECONDARY 5 NORMAL (ACADEMIC)**

CANDIDATE
NAME

Mark Scheme

CLASS

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NUMBER

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SCIENCE (PHYSICS, CHEMISTRY)

5076/03

SCIENCE (CHEMISTRY, BIOLOGY)

5078/03

Paper 3 Chemistry

6 AUGUST 2019

1 hour 15 minutes

Paper 1

| | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1/21 | 2/22 | 3/23 | 4/24 | 5/25 | 6/26 | 7/27 | 8/28 | 9/29 | 10/30 |
| B | B | C | D | B | C | A | D | D | D |
| 11/31 | 12/32 | 13/33 | 14/34 | 15/35 | 16/36 | 17/37 | 18/38 | 19/39 | 20/40 |
| B | A | C | C | B | A | B | D | A | C |

Section A

Answer **all** questions in the spaces provided.

1 (a)^K molecule Made up of two or more atoms chemically combined

element Substance made up of atoms of same number of protons /
A pure substance that cannot be broken down into simpler
substances by chemical processes [2]

- (b)^A
- (i) 24
- (ii) F, G
- (iii) E and F
- (iv) H
- (v) H [5]

[Total: 7]

2 (a)^A E [1]

(b)^U C and F [1]

(c)^A C₈H₁₈ [1]

(d)^A A [1]

[Total: 4]

- 3 (a)^A
- | | | |
|---|---|-------------------------------|
| A | <i>copper (II) hydroxide / Cu(OH)₂</i> | |
| B | <i>copper (II) sulfate / CuSO₄</i> | |
| C | <i>copper (II) oxide / CuO</i> | |
| D | <i>calcium sulfate / CaSO₄</i> | <i>R: lead (II) sulfate</i> |
| E | <i>calcium oxide / CaO</i> | <i>R: lead (II) oxide</i> |
| F | <i>calcium hydroxide / Ca(OH)₂</i> | <i>R: lead (II) hydroxide</i> |
| G | <i>water / H₂O</i> | |
- [7]

(b)^A *Correction balanced eqn [1]; correct state symbols [1]* [2]

[Total: 9]

4 (a)^A *Volcanic eruption / volcanoes;* [1]

(b)^A *pH 1 – 2 [1];*
sulfur dioxide is an acidic gas; OR SO₂ dissolves in water to form an acid [1] [2]

(c)^U *Surface temperature of Venus is 462°C; [½]*
water's boiling point is 100°C; [½]
Before water has a chance to reach the surface, it would have turned into a gas / evaporated [1]; [2]

(d)(i)^K *In internal combustion engines of cars [1];*
High temperature of car engines cause nitrogen and oxygen to react; [1]
Producing nitrogen oxides; lightning activity / forest fires; high T causes N₂ and O₂ from air to react [2]

(ii)^K *These acidic gases [½] dissolve in rain water to form acid rain [½];*
Cause respiratory problems for humans; [1]
Damage buildings / dissolve limestone / concrete structures; [1] [3]

[Total: 10]

5 (a)^A *No. of mole of FeSO₄ used = 12.16 g / 152 = 0.08 mol [1]*
Mole ratio of FeSO₄: Fe₂O₃ = 2:1
No. of mole of Fe₂O₃ formed = 0.04 mol [1]
Mass of Fe₂O₃ formed = 0.04 mol x 160 = 6.4 g [1] [3]

(b)^A *Total no. of mole of gases produced = no. of mol of FeSO₄
 = 0.08 mol; [1]
 Total volume of gases produced = 0.08 mol x 24 dm³
 = 1.92 dm³ OR 1,920 cm³ [1]* [2]

(c)^U *Sulfur dioxide is a reducing agent [1]*

*Acidified potassium manganate (VII) is a strong oxidising agent; /
 O.S. of Mn changed from +7 in KMnO₄ to +2 in Mn²⁺; [1]* [2]

[Total: 7]

6 (a)^U

Table 6.1

| solution | approximate pH |
|---|----------------|
| (i) 0.2 mol/dm ³ hydrochloric acid | 1 |
| (ii) 0.1 mol/dm ³ sodium hydroxide | 14 |
| (iii) a mixture of 20 cm ³ of (i) and 40 cm ³ of (ii) | 7 |

[3]

(b) (i)^A calcium sulfate: 1. *calcium chloride*

 2. *sodium sulfate*

 lead (II) carbonate: 1. *lead (II) nitrate*

 2. *sodium carbonate*

 [2]

(ii)^U *Mix Pb(NO₃)₂ with CaCl₂ or NH₄Cl; [1]*

Filter to obtain residue of calcium sulfate; [1]

Rinse with distilled water and dry; [1] [3]

[Total: 8]

Section B

Answer **two** questions in the spaces provided.

7 (a)^K *haematite* [1]

(b)^U *Two reasons:*
burning of coke exothermic, helps to heat furnace to high T [1];
To produce carbon monoxide, reducing agent for the reaction [1];
 $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$; [1]
Limestone; decomposes to calcium oxide; reacts with acidic impurities or SiO₂; [1]
Combines to form calcium silicate / slag; [1] [5]

(c)^A *Carbon atom different size from iron;*
Disrupts regular arrangement of iron atoms;
Cannot slide over each other; [2]

(d)^A *Hydrogen peroxide is an oxidising agent; [1]*
Iron (II) ions oxidised by hydrogen peroxide into iron (III) ions. [1] [2]

[Total: 10]

8 (a)^A $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$ [1]

(b)(i)^A $44 \text{ cm}^3 / 30 \text{ s} = 1.47 \text{ cm}^3/\text{s}$
 rate of reaction = $1.47 \text{ cm}^3/\text{s}$ [1]

(ii)^A $(32 + 28) \text{ cm}^3 = 60 \text{ cm}^3$
 Total volume of hydrogen = 60 cm^3 [1]

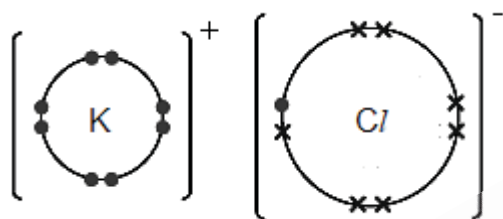
(c)^A *Number of mole of zinc used = $0.15\text{g} / 65 = 0.0023 \text{ mol}$ [1]*
Mole ratio of Zn:HCl = 1:2; [$\frac{1}{2}$]
No. of mol of HCl used = 0.00468 mol [$\frac{1}{2}$]
Concentration of HCl = $0.00468 \text{ mol} / 0.050 \text{ dm}^3$
= 0.0936 mol/dm^3 [1] [3]

(d) (i)^U *Steeper gradient/faster initial rate [1],
same height where the curve levels off; [1]* [2]

(ii)^U *Zinc limiting reactant, final volume of gas produced depends on Zn; [1]
Higher acid conc, more reactants for greater effective collisions [1]
Faster initial rate;* [2]

[Total: 10]

9 (a)(i)^A *Correct ion + correct charge – 1m each*



[2]

(ii)^U *Covalent bonding from sharing electrons / 2 chlorine atoms covalently
bonded ;* [1]

(b) (i)^U *Chlorine > Bromine > Iodine ; ORA [1]
Chlorine can displace both bromide and iodide, most reactive; /
Iodine cannot displace any halide; least reactive; /
Bromine can only displace iodide but not chloride; more reactive than
iodine but less reactive than chlorine; [any 2 points for 2m]* [3]

(ii)^A *Write a balanced chemical equation for **any** of the reactions.
 $\text{Cl}_2 + 2\text{KI} \rightarrow 2\text{KCl} + \text{I}_2$* [1]

(c)^A *$\text{Mr}(\text{AgBr}) = 188$, $\text{Mr}(\text{AgNO}_3) = 170$ [1]
No. of mol of AgBr to produce = $47/188 = 0.25$ [1]
Mole ratio of AgBr:AgNO₃ = 1:1 [$\frac{1}{2}$]
No. of mol of AgNO₃ needed = 0.25mol [$\frac{1}{2}$]
Mass of AgNO₃ needed = $0.25 \times 170 = 42.5 \text{ g}$ [1]
Max 3m* [3]

[Total: 10]

----- End of Paper -----

