2018 Bedok South Secondary School Secondary 4
Science(Chemistry) PRELIM Marking Scheme

Paper 1: 30 Marks

21	22	23	24	25	26	27	28	29	30
D	**B**	**C**	**D**	**A**	**C**	**D**	**B**	**A**	**C**
31	32	33	34	35	36	37	38	39	40
A	**B**	**A**	**D**	**A**	**B**	**C**	**C**	**B**	**C**

Answer

A1 **(a)** CO — 1
Prevents blood from absorbing oxygen which causes headaches, giddiness or may lead to death. — 1

(b) N_2 and CO_2 (both must be correct) — 1

(c) CO_2 and O_2 (both must be correct) — 1

(d) NO_2 and SO_2 (both must be correct) — 1

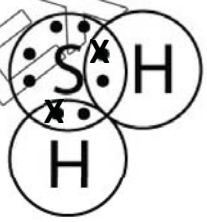
[Total: 5 marks]

A2 **(ai)**

Isotope	Number of		
	Proton	Neutron	Electron
Sulfur-32	16	32 - 16 = 16	16
Sulfur-34	16	34 – 16 = 18	16

1
1

(aii) Each sulfur isotope has different **relative abundance/ percentage/ amount**. — 1
When the **average** of the masses of the 2 sulfur isotope is taken, there is decimal. (any phrase to the effect) — 1

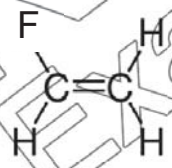
(bi) 

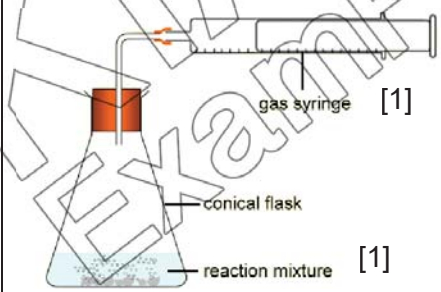
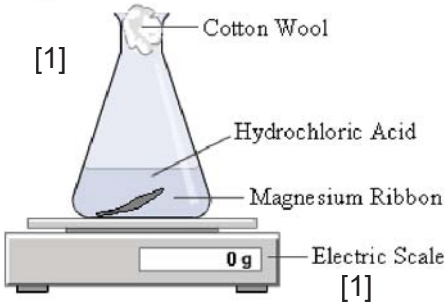
Correct valence electron for sulfur and hydrogen — 1
Correct number of shared electrons (2 single bond) — 1

(bii) [structure] hydrogen sulfide is a **simple covalent molecule/compound** — 1
[charge carrier] there are **no free moving electrons/charge carrier** to conduct electricity. [bonding] — 1

[Total: 8 marks]

<table>
<tr><td>A3 (salt pre)</td><td>(ai)</td><td>Salt: Silver chloride
Reason: It is an <u>insoluble</u> salt.</td><td>1
1</td></tr>
<tr><td></td><td>(aii)</td><td>Salt: Potassium nitrate (SPA – titration (neustralisation))
Reagent 1: <u>potassium hydroxide</u> Reagent 2: <u>nitric acid</u> (both correct)</td><td>1
1</td></tr>
<tr><td></td><td>(b)</td><td>
<table>
<tr><th rowspan="2">Substance</th><th colspan="4">Use</th></tr>
<tr><th>to make car battery</th><th>to make road surface</th><th>to reduce acidity in soil</th><th>to fill filament bulb</th></tr>
<tr><td>Calcium silicate (SLAG)</td><td></td><td>√</td><td></td><td></td></tr>
<tr><td>Calcium hydroxide(slaked lime)</td><td></td><td></td><td>√</td><td></td></tr>
<tr><td>Argon</td><td></td><td></td><td></td><td>√</td></tr>
<tr><td>Sulfuric acid</td><td>√</td><td></td><td></td><td></td></tr>
</table>
All correct – 2 marks 3/2 correct – 1 mark 1 correct – 0 marks</td><td>2</td></tr>
<tr><td></td><td></td><td>[Total: 6 marks]</td><td></td></tr>
<tr><td>A4</td><td>(a)</td><td>Difference in boiling point</td><td>1</td></tr>
<tr><td></td><td>(b)</td><td>Name: <u>Butene</u>
formula: <u>C_4H_8</u></td><td>1
1</td></tr>
<tr><td></td><td></td><td>[Total: 3 marks]</td><td></td></tr>
<tr><td>A5</td><td>(a)</td><td>2 Al (<u>s</u>) + Fe_2O_3 (<u>s</u>) → 2Fe (<u>l</u>) + Al_2O_3 (<u>s</u>) (all must be correct)</td><td>1</td></tr>
<tr><td></td><td>(bi)</td><td>
<table>
<tr><th>Element</th><th>Oxidation state at the start</th><th>Oxidation state at the end</th><th>Oxidised or reduced?</th></tr>
<tr><td>Oxygen</td><td>-2</td><td>-2</td><td>unchanged</td></tr>
<tr><td>Aluminium</td><td>0</td><td>+3</td><td>Oxidised</td></tr>
<tr><td>iron</td><td>+3</td><td>0</td><td>reduced</td></tr>
</table>
</td><td>1
1</td></tr>
<tr><td></td><td>(bii)</td><td>Aluminium is oxidised while iron is reduced, since oxidation and reduction occur <u>simultaneously</u>, Thermit reaction is a redox reaction.</td><td>1</td></tr>
<tr><td></td><td>(c)</td><td>Exothermic reaction. (heat given out , hot)
Temperature must be high for iron to be in liquid state. (any phrasing to the effect)</td><td>1
1</td></tr>
<tr><td></td><td>(d)</td><td>[P1] Aluminium oxide has a <u>high</u> melting point
[P2] Aluminium oxide is an <u>ionic</u> compound/ has <u>giant lattice</u> structure,
[P3] <u>large amount of heat</u> is needed to overcome the <u>strong electrostatic forces of attraction</u> between the oppositely-charged ions. (bonding)</td><td>3 pt – 2 M
2 pt – 1M</td></tr>
<tr><td></td><td></td><td>[Total: 8 marks]</td><td></td></tr>
<tr><td>A6</td><td>(ai)</td><td>carbon</td><td>1</td></tr>
</table>

	(aii)	[P1] Carbon will **disrupt the orderly** arrangement of iron, (ALLOY) [P2] making it more **difficult** for the iron atoms to slide past each other, [P3] thus **increasing the strength** of iron. (any phrasing to the effect)	3 pt – 2 M 2 pt – 1M
	(b)	[P1] zinc is **more reactive** than iron / zinc has higher tendency to lose its electrons, [P2] zinc will preferentially **corrode in place of iron**.	1 1
	(c)	$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$	1
	(d)	The earth's mineral ores are limited and are non-renewable. Recycling helps to conserve the limited resources in our earth and make them last longer. With a decrease of mining for ores, land will be free for other uses eg, agriculture. Recycling means saves the environment from pollution as unsightly scrap metals is removed from the environment. [any one, reject any answer about saving cost]	1
		[Total: 7 marks]	
A7	**(ai)**	Number of moles of propane: 44/44 = 1 mole	1
	(aii)	Number of moles of CO_2: 3 moles Volume of CO_2: 3 x 24 = 72 dm^3 (must include correct units, no ecf)	1 1
	(bi)	Propene is **unsaturated/ contains C=C double bond**, thus it is able to undergo **addition reaction**. OR Propane is saturated, contains all single covalent bond, thus unable to undergo addition reaction. (any phrasing with similar meaning)	1
	(bii)	[test] Add (aqueous) bromine solution to propane and propene. [result] reddish brown colour of bromine will become colourless in propene but remains unchanged in propane.	1 1
	(biii)	Polymer is non-biodegradable and thus will [effect] remain in the environment for a long time, thus causing land pollution/ constantly in need to find land to bury them. Polymer, when burnt, will release toxic gases to the environment thus, causing air pollution. [any one]	1
	(c)	 **monomer (alkene)**	1
		[Total: 8 marks]	
B8	**(a)**	[P1] An acid is a substance which produces **hydrogen ions** when it is dissolved in **water**. [P2] Example: Sulfuric acid reacts with reactive metal to produce salt and hydrogen gas/ sulfuric acid reacts with carbonates to produce salt,	1 Any

		water and carbon dioxide gas. Sulfuric acid react with base/alkali to produce salt and water. [P3] An alkali is a substance which <u>produces **hydroxide** ions when it is dissolved in **water**</u>. [P4] Example: sodium hydroxide reacts with ammonium salt to form salt, water and ammonia gas. (full credit if formulae/ chemical equation given)	one 1 1 1
	(b)	H^+ (aq) + OH^- (aq) → H_2O (l)	1
	(c)	Green solid **A**: **<u>copper(II) carbonate</u>** colourless gas **B**: **<u>carbon dioxide</u>** blue solution **C**: **<u>Copper(II) sulfate</u>** blue precipitate **D**: **<u>copper(II) hydroxide</u>**	1 1 1 1
	(d)	Sulfuric acid was added to the green solid, thus the sulfate ion might have come from sulfuric acid instead.	1
		[Total: 10 marks]	
B9	**(a)**	[Etemp] when temperature is increases, speed of chemical reaction **<u>increases</u>**. [Econc] when concentration decreases, speed of chemical reaction **<u>decreases</u>**. [Rtemp] when temperature increases, particles gains kinetic energy and **<u>move faster.</u>** Frequency of effective collision will increases. [Rconc] when concentration decreases, **<u>number of particles per unit volume decrease</u>**. Frequency of effective collision will decreases. [collision theory – 1 mark]	1 1 1 1 1
	(b)	Measurement of volume of hydrogen gas  [1] [1] Student will record the **<u>volume of hydrogen gas</u>** [1] produced **<u>at regular interval</u>**. [1] Measurement of decrease in mass  [1] [1] Student will record the decrease in **<u>mass of reaction mixture</u>** [1] at **<u>regular interval</u>** [1]. Speed of reaction will decrease with time.	Apparatus 1M Set up 1M 2 1

		[Total: 10 marks]	
B10	**(a)**	halogen	1
	(b)	[electronic configuration] E.C of Fluorine: 2.7, E.C of chlorine is 2.8.7 (state both to get 1 mark) Since they both have **7 valence electron**, thus they are placed in group VII.	1 1
	(ci)	Yellow	1
	(cii)	It is **lighter** in colour than chlorine, thus Fluorine is placed **above chlorine** in group VII.	1
	(ciii)	[observation] colourless solution turns reddish brown. [explanation] fluorine is **more reactive** than bromine, thus it will **displace** bromine from potassium bromide and **produce bromine**.	1 1
	(di)	[physical] cannot conduct electricity/ black colour/ solid at room temperature [any one] (do NOT write "high/low" melting point) [chemical] gain 1 electron to form anion/ least reactive in group VII/ reacts wth metal to form ionic compound/ reacts with non-metal to form covalent compounds. [any one]	1 1
	(dii)	$MgAt_2$	1
		[Total: 10 marks]	