

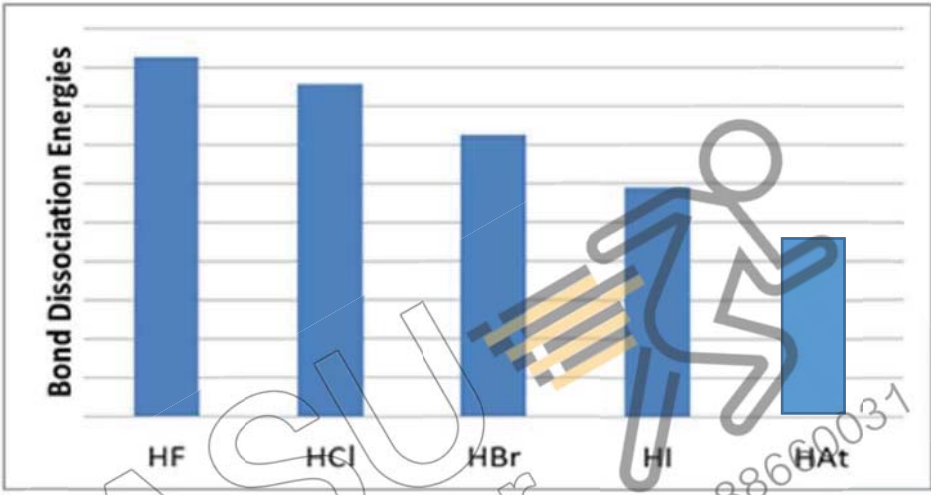
Zhonghua Secondary School

2020 Preliminary Examination- Chemistry

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

Chemistry (Zhonghua Sec school)
 Paper 2
 Prelim 2020

A1	(a)	Calcium carbonate	[1]
	(b)	Lead (II) hydroxide / sodium	[1]
	(c)	Sulfur dioxide / Chlorine	[1]
	(d)	chlorine	[1]
	(e)	graphite	[1]
A2	(a) (i)	purple	[1]
	(ii)	0.5 , 1.25	[1]
	(b)(i)	NaOH / KOH Alkali with pH 14 is a strong alkali	[1] [1]
	(ii)	Blue Pink	[1] [1]
A3	(a)	ammonia	[1]
		Turn damp red litmus paper blue	[1]
	(b)	Aluminium Chloride $\text{Al(OH)}_3 (\text{s}) + 3\text{HCl} (\text{aq}) \rightarrow \text{AlCl}_3 (\text{aq}) + 3 \text{H}_2\text{O} (\text{l})$	[1] [1]
	(c)	Silver nitrate is added to test for chloride as silver chloride is insoluble and forms a precipitate. <u>Nitric acid is added to ensure that no carbonate is present as silver carbonate will also form a white precipitate if present.</u> <u>No visible change when silver nitrate was added confirms the absence of carbonate and chloride.</u>	[1] [1]
A4	(a)	$\text{H}_3\text{PO}_4 \rightarrow 3 \text{H}^+ + \text{PO}_4^{3-}$ Phosphoric acid <u>dissociates partially</u> to form ions as shown in the equation above. Phosphoric acid is a tribasic acid as <u>1 mole of phosphoric acid dissociates to form 3 moles of H⁺ ions.</u>	[1] [1]
	(b)	Steel which contains iron that will rust after a while when exposed to oxygen and water.	[1]
	(c)	$\text{Fe}_2\text{O}_3 + 2\text{H}_3\text{PO}_4 \rightarrow 2\text{FePO}_4 + 3\text{H}_2\text{O}$	[1]

	(d)	Phosphoric acid present in Totalshine will continue to attack the surfaces of objects when left on it and not washed away.	[1]
	(e)	TOTALSHINE contains phosphoric acid that will react with marble which is made of a form of <u>calcium carbonate</u> .	[1]
A5	(a)	As the reactivity of the halogen decreases, the bond dissociation energy of hydrogen halides also decreases.	[1]
	(b)	 <p>The bar chart displays the bond dissociation energies for five hydrogen halides: HF, HCl, HBr, HI, and HAt. The y-axis is labeled 'Bond Dissociation Energies'. The bars show a clear downward trend from HF to HAt. A cartoon character is sitting on the HI bar, and another character is sitting on the HAt bar, illustrating that HAt has the lowest bond dissociation energy.</p>	[1]
	(c)(i)	HAt	[1]
	(ii)	HAt has the lowest bond dissociation energy which means that it can dissociate into ions most easily to form the strongest acid.	[1]
	(d)	$\text{Enthalpy change} = 432 + 193 - 2(363)$ $= -101\text{kJ}$ <p>Since negative, it is an exothermic reaction.</p>	[1] [1]
A6	(a)(i)	Steep gradient at the beginning shows that the rate is the fastest because lots of reactants are present.	[1]
	(ii)	Curve is a horizontal line shows that the reaction has stopped as <u>all the calcium</u> has been used up.	[1]
	(b)(i)	<p>Experiment 2 can be carried out with</p> <ol style="list-style-type: none"> 1 water of a higher temperature. 2 powdered calcium <p>Reject : Pressure / catalyst</p>	[1]

	(ii)	At a higher temperature, <u>reacting particles possess energy equal to or greater than their activation energy</u> . They collide harder and <u>more frequently</u> and this <u>increasing the frequency of effective collision</u> . So rate of reaction increases. Or In the powdered form, <u>more surface area are exposed / more area of contact between particles</u> for reaction to take place. This <u>increasing the frequency of effective collision</u> . So rate of reaction increases.	[1] [1]
	(c)	60 cm ³ of gas was produced for experiment 1 and 120cm ³ of gas was produced for experiment 3. As calcium is the limiting reagent, twice the mass of calcium is used in experiment 3 as compared to experiment 1.	[1] [1]
A7	(a)(i)	(i) $\text{TiO}_2 + 2\text{Cl}_2 \rightarrow \text{TiCl}_4 + \text{O}_2$	[1]
	(ii)	oxidising agent is chlorine Cl_2 has been reduced. The oxidation state of chlorine in Cl_2 has decrease from 0 to -1 to form TiCl_2 .	[1] [1]
	(b)(i)	(i) Displacement reaction. Magnesium being more reactive can displace titanium from titanium (IV) chloride.	[1] [1]
	(ii)	<u>Aluminium</u> reactivity is near that of magnesium as it is place just below magnesium. Being <u>more reactive than titanium</u> , it should be able to displace titanium for its compound. Accept : Calcium	[1] [1]
	(iii)	Reactor is filled with an <u>inert argon</u> gas to create an inert atmosphere to ensure that when pure titanium cools down, it will <u>not be oxidized by the oxygen in the air</u> to form the oxide back again.	[1]
A8	(a)	Cell A is a simple cell. Electrons flow from the more reactive metal, Mg, to the less reactive metal, Pb.	[1] [1]
	(b)	electrode 3	[1]
	(c)	electrode 1: $2\text{H}^+(\text{aq}) + 2\text{e}^- \rightarrow \text{H}_2(\text{g})$	[1]
		electrode 2: $\text{Mg}(\text{s}) \rightarrow \text{Mg}^{2+}(\text{aq}) + 2\text{e}^-$	[1]
	(d)	At electrode 3, Cu^{2+} ions are preferentially discharge. $\text{Cu}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Cu}(\text{s})$ At electrode 4, copper anode dissolves. $\text{Cu}(\text{s}) \rightarrow \text{Cu}^{2+}(\text{aq}) + 2\text{e}^-$	[1] [1]

		Results in no change in the concentration of Cu ²⁺ in solution. So no change in the blueness of solution.	
B9	(a)	In 1990, solid fuel like coal was the most common type of fuel used , 67% as compared to 32% in 2002) In 2002, usage of gaseous fuel increased by 39% (1% in 1990 and 40% in 2002) Burning of coal produces more carbon dioxide and methane than gas fuels. These are greenhouse gases which can contribute to global warming.	[1] [1] [1]
	(b)	<ul style="list-style-type: none"> • High concentration of carbon monoxide at air : fuel ratio of 12:1 due to low level of oxygen present, leading to higher tendency of <u>incomplete combustion</u>. • Concentration of carbon monoxide decreased sharply from air : fuel ratio of 12:1 to 14:1 and <u>decreased gradually</u> after air fuel ratio of 14.1. • As air content increased to 24:1, <u>greater amount of oxygen is available for complete combustion</u>, thus decreasing the concentration of carbon monoxide. 	[1] [1] [1]
	(c)	15:1 (accept range between 14: 1 to 16: 1)	[1]
	(d)(i)	Oxides of nitrogen / nitrogen dioxide / nitrogen monoxide	[1]
	(ii)	Use a catalytic converter $2\text{NO} + 2\text{CO} \rightarrow \text{N}_2 + 2\text{CO}_2$	[1] [1]
B10	(a)(i)	As the current increases, the mass of copper formed also increases.	[1]
	(ii)	As more electron passes through more copper (II) ions will gain electrons and be deposited.	
	(iii)	Since current are the variable in this experiment. Time is fixed as a constant.	
	(b)	In 10 mins, 1.2 g of copper is produced. In 5 mins, 1.2/2 =0.6 g of copper is produced. With half the amount of time, half the number of electrons passes through, results in half the amount of copper deposited. Accept: 0.58g / 0.63g / 0.605g	[1] [1]
	(c)	A blue precipitate is formed which dissolves in excess aqueous ammonia to form a dark blue solution. There is copper(II) ions present in the solution.	[1] [1]

		<p>High pressure results in more gas particles per unit volume. Gas particles collide harder and more frequently. This increases the frequency of effective collision, So rate of reaction increase.</p> <p>Or</p> <p>Presence of iron catalyst provides an alternative pathway with a lower activation energy. More reacting particle have the minimum activation energy required for reaction to take place. So rate of reaction increases.</p>	
	(d)	<p>VX₃ is a covalent compound with a simple molecular structure. It is neutral with no mobile electrons or ions. It cannot conduct electricity in any state.</p> <p>W₂T is an ionic compound with a giant crystal lattice structure. It cannot conduct electricity in the solid state when the ions are held in fixed position. It can conduct electricity in the molten and aqueous state when the ions are mobile.</p>	<p>[1]</p> <p>[1]</p>

