2019 4E5NA Prelim Exam
Science Chemistry Solutions

MCQ

1.	C	5.	D	9.	A	13.	B	17.	C
2.	D	6.	C	10.	C	14.	D	18.	A
3.	C	7.	A	11.	A	15.	C	19.	C
4.	D	8.	D	12.	A	16.	A	20.	B

Paper 3
Section A

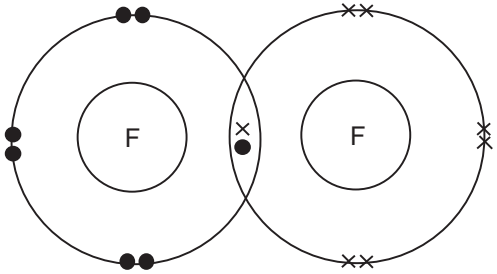
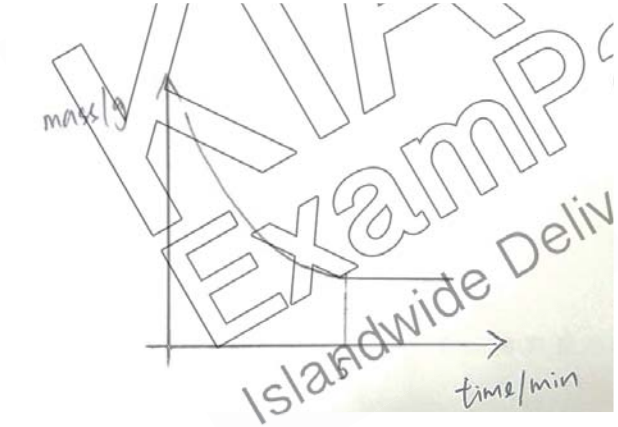
<table>
<tr><th>No.</th><th>Answers</th><th>Marks</th><th>Marker's Report</th></tr>
<tr><td>1(a)</td><td>addition</td><td>[1]</td><td>well answered</td></tr>
<tr><td>(b)</td><td>neutralisation</td><td>[1]</td><td>well answered</td></tr>
<tr><td>(c)</td><td>redox</td><td>[1]</td><td>Some students wrote substitution, could have confused with substitution of halogens</td></tr>
<tr><td>(d)</td><td>substitution</td><td>[1]</td><td>quite a number wrote as fermentation</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>2(a)</td><td>
<table>
<tr><th></th><th colspan="3">number of</th></tr>
<tr><th></th><th>protons</th><th>electrons</th><th>neutrons</th></tr>
<tr><td>$^{22}_{11}Na$</td><td>11</td><td>11</td><td>11</td></tr>
<tr><td>$^{23}_{11}Na$</td><td>11</td><td>11</td><td>12</td></tr>
</table>
</td><td>[1] all three must be correct

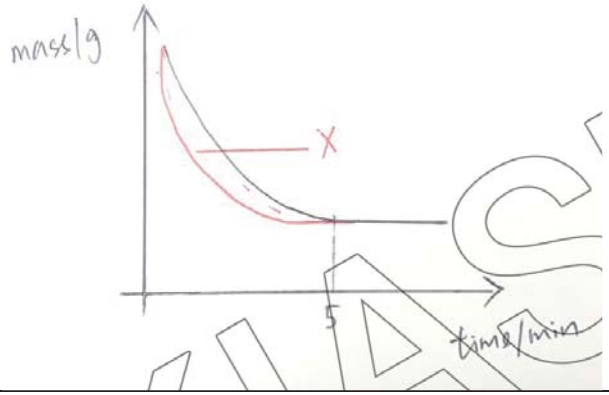
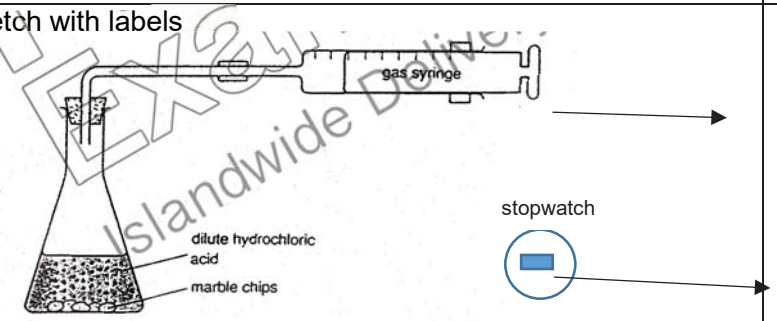
[1] all three must be correct</td><td>well answered</td></tr>
<tr><td>2(b)</td><td>soft metals or can be easily cut
low bp/mp
low density
explosive when in contact with water</td><td>any 2
[2]</td><td>many gave general physical properties shown by all metals such as good electrical conductors, high density, high melting and boiling points</td></tr>
</table>

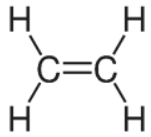
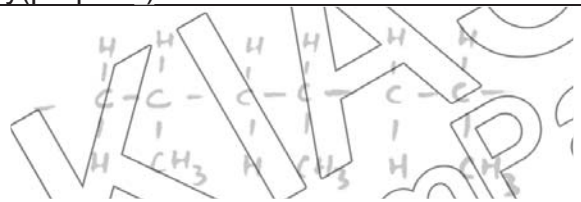
2(c)	electron	[1]	only less than 5 were able to give the correct answer, some possible answers given were hydrogen, hydroxide, hydrogen ions, water
3(a)	Sodium hydroxide and hydrochloric acid (accept any other possible and safe reactions)	1m for 2 correct answers [1]	some gave salt and acid
	Lead(II) nitrate and sodium chloride / hydrochloric acid (accept any other possible reactants)	[1]	some gave insoluble salt with soluble salt
3(b)	Until no more can dissolve To ensure that all the nitric acid has reacted Filter the mixture To separate the unreacted excess magnesium About one-third of its volume To obtain a saturated magnesium nitrate solution for crystallisation	[1] [1] [1]	many mentioned to dissolve all the magnesium oxide some were not specific and jus mentioned residue /filtrate some mentioned concentrated instead of saturation
3(c)(i)	0.5 x {24 + 2[14+3(16)]} = 74 g/dm^3	[1] [1]	many were unable to calculate Mr of magnesium nitrate accurately as the chemical formula is incorrect
3(c)(ii)	74g rep 1dm^3 7.4g rep $\frac{1}{74}$ X 7.4 = 0.1 dm^3 = 100 cm^3	 [1] [1]	most are not able to understand question
4(a)(i)	$N_2 + 3H_2 \rightarrow 2NH_3$	[1]	Balancing was poorly done
4(a)(ii)	At r.t.p. vol ratio = mol ratio NH_3 : H_2 Mol 2 : 3 Vol 900 : $\frac{900}{2} \times 3$ ∴ vol of H_2 gas required = 1350 dm^3	 [1] [1]	marks were given for ecf

4(b)(i)	Pipe **C or** Vessel 2 Sulfur trioxide is an **acidic gas** / acidic oxide which will **dissolve in rain / react with water in the air** to form acid rain - must mention both	[1] [1]	many wrote Pipe D which was not acceptable as sulfuric acid will not be able to react with rain. a number mentioned Pipe B as they were confused with meaning of decrease in pH value
4(b)(ii)	Acid rain decreases the pH of the soil which affects crops yield / crops cannot grow well. *Must mention what happens to the soil that will affect the crop yield* *OR* Acid rain can corrode (any one of) limestone structures / stonework / metal structures *Must mention what happens to the type of buildings – limestone or metals* *OR* Acid rain decreases the the pH of the water and kills the fish in the ponds / rivers *Must mention what happens to the water that will affect the marine life*	[1]	
5(a)	oxidation: rusting reason: gain in oxygen reduction: extraction reason: loss in oxygen	[1] [1]	some did not identify the change
5(b)(i)	oil prevents the metal inside to come into contact with water and oxygen	[1]	most only mention contact with water or oxygen only instaed of both
5(b)(ii)	Anti rust paint contains zinc which is a more reactive metal than iron so zinc corrodes in place of iron	[1] [1]	only a few were able to identify that zinc was more reactive than iron some mentioned about tannic acid reacting with zinc
6(a)	P: copper Q: copper(II) oxide R: hydrogen S: copper(II) nitrate -1 overall if chemical formulas are given	1m each only nmes are accepted	many still missed out on (II)

6(b)	$CuO + 2HNO_3 \rightarrow Cu(NO_3)_2 + H_2O$	[1]	
6(c)	dark blue	[1]	well answered
7(a)	-one member differ from the next by a CH_2 -same functional group, CHO -gradual change in their boiling point(physical property) -same general formula, $C_nH_{2n+1}CHO$	any 2 [2]	most were able to give at least 1
7(b)	Name: butanal formula: C_3H_7CHO / C_4H_8O boiling point: any reasonable value above 49	[1] [1] [1]	well answered
7(c)(i)	Stage 1: fermentation Stage 2: fractional distillation	[1] [1]	Stage 1 well answered Stage 2 some were confusd and mentioned distillation
7(c)(ii)	$C_6H_{12}O_6 \longrightarrow 2CO_2 + 2C_2H_5OH$	[1]	some were confused with glucose formula
7(c)(iii)	yeast, temperature of 37 ^{O}C , absence of oxygen	[1]	well answered
8(a)	Fluorine has displaced bromine from potassium bromide as it is more reactive and bromine which is brown is formed $2KBr + F_2 \longrightarrow 2KF + Br_2$	 [1] [1] [1]	equation badly written, missing out on the F_2, Br_2
8(b)(i)	Use Universal Indicator, initial colour will be green(neutral), when reaction is completed, colour is yellow/orange(weak acid)	[1]	very few mentioned bout colour change
8(b)(ii)	$2F_2$ (g) + $2H_2O$ (l) → O_2 (g) + 4HF (aq) F_2 : O_2 2 : 1 50 cm^3 : 25 cm^3 no of moles of O_2 = 25/24000 = 0.00104167 mass of O_2 = 0.00104167 X (16x2) = 0.0333g	 [1] [1]	poorly answered with many not understanding the question [1]

			[1]
8(c)(i)		1m correct bonding 1m correct valence ele for both atoms	most drew an atom of fluorine instead of molecule
8(c)(ii)	Consists of covalent bonds Little energy is needed to overcome the weak intermolecular forces of attraction between the molecules.	[1] [1]	
9(a)(i)	Graph sloping downwards flat towards the end with correct axes 	[1] graph going downwards [1] flat graph at labelled 5 mins	some gave the wrong curve some gave a line with constant slope -allow for ecf

9(a)(ii)	Initially, gradient is the steepest, rate of reaction fastest as there are highest concentration of reactants. As reaction progresses, rate of reaction decreases, gradient decreases as the concentration of the reactants decreases. Reaction stops when all zinc carbonate has been used up, gradient zero, at 5 mins onwards	[1] [1] [1]	most are unable to give an accurate description
9(b)(i)	Faster reaction. New curve below original 	[1]	
9(b)(ii)	when powdered, surface area of zinc carbonate increases so there is greater chance of effective collision leading to increase in speed of reaction	[1] [1]	some left out the term effective
9(c)	Rough sketch with labels 	[1] [1]	quite a number left out the stopwatch and the syringe

10(a)(i)	C_2H_4	[1]	some gave the wrong formula as they did not see the 2
(ii)-	Ethene 	[1] [1]	well answered
10(a)(iii)	-use aqueous bromine. -bubble butane and ethene into 2 separate test tubes containing - aqueous bromine. -test tube with butane remains reddish brown -test tube with ethene turn from reddish brown to colourless rapidly	 [1] [1]	colour changes were not specific some mentioned that butane and ethene changed colour instaed of the aqueous bromine
10(b)(i)	-one of the bonds in each double bond breaks -each monomer forms single bonds with 2 other monomers polymer is formed	[1] [1]	most were not able to give a complete answer
10(b)(ii)	poly(propene)	[1]	well answered
10(b)(iii)		1m for 3 sets shown 1m for connection between 3 sets	most left out the last CH_3