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Mark Scheme (Results)
Summer 2010

GCE O

GCE O Chemistry (7081) Paper 01

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Summer 2010

7081/01 O-LEVEL CHEMISTRY MARK SCHEME – SUMMER 2010

Question Number		Acceptable Answers	Reject	Mark
row	1	$PbCO_3$		(1)
		CO_3^{2-}		(1)
row	2	iron(III) hydroxide / ferric hydroxide		(1)
		OH^-		(1)
row	4	Cr^{3+}		(1)
		O^{2-}		(1)

Total 6 marks

Question 2			
(a)		sulphur/S/S_8	(1)
(b)		iodine/I_2	(1)
(c)		xenon/Xe	(1)
(d)		iron(III) chloride/$FeCl_3$ / ferric chloride	(1)
(e)		beryllium/Be	(1)

Total 5 marks

Question 3			
(a)		red-brown/brown	(1)
(b)		brown /red-brown/ orange-brown / yellow-brown	(1)
(c)		blue / from white to blue	(1)
(d)		white	(1)
(e)		blue, red (*both required in that order)*	(1)

Total 5 marks

Question 4

Particle	Number of protons	Number of neutrons	Number of electrons
$^{19}_{9}F$	9 (1 mark)	10 (1 mark)	
$^{80}_{35}Br^{-}$		45 (1 mark)	36 (1 mark)
$^{39}_{19}K^{+}$ 39,19 (1mark) K (1mark) + sign in correct position (1mark)			

Total 7 marks

Question 5

(a)		5	(1)
(b)		17	(1)
(c)		4	(1)
(d)		2	(1)
(e)		0.125	(1)

Total 5 marks

Question 6			
(a)		$2Mg + O_2 \rightarrow 2MgO$ formulae	(1)
		balance	(1)
(b)		`$2KOH + CO_2 \rightarrow K_2CO_3 + H_2O$ formulae	(1)
		balance	(1)
(c)		$Al_2(SO_4)_3 + 6NaOH \rightarrow 2Al(OH)_3 + 3Na_2SO_4$ formulae	(1)
		balance	(1)
(d)		$2C_2H_5OH + 2Na \rightarrow 2C_2H_5ONa + H_2$ formulae	(1)
		balance	(1)

Total 8 marks

Question 7			
(a)		red-brown (coating on the zinc)	(1)
		copper is deposited / zinc displaces copper	(1)
		blue colour fades / solution turns colourless	(1)
		Cu^{2+} ions deposited as copper / Cu^{2+} ions replaced by Zn^{2+} ions / Cu^{2+} ions are removed	(1)
		$CuSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Cu(s)$ (or ionic) balanced equation	(1)
		state symbols *(only award if all the formulae are correct)*	(1)
(b)		colourless solution turns yellow (from the bromine) (accept 'no reaction')	(1)
		(red-)brown solution formed / black (or dark grey) solid(or precipitate)formed	(1)
		$Br_2 + 2NaI \rightarrow 2NaBr + I_2$ (or ionic) formulae	(1)
		balance	(1)

Total 10 marks

Question 8			
(a)	(i)	25-40 ^{0}C / warm conditions	(1)
		air excluded / leave for a few days	(1)
		yeast/ named enzyme	(1)
		distil	(1)
		$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$	(1)
	(ii)	40-100 atm pressure	(1)
		250-500 ^{0}C	(1)
		(phosphoric) acid catalyst	(1)
		$C_2H_4 + H_2O \rightarrow C_2H_5OH$	(1)
(b)	(i)	sugar is a renewable resource *N.B. Reject any statement about not causing harm to the environment or cost of the process or energy required*	(1)
	(ii)	faster process	
		product does not need further purification / concentration / distillation	(1)
		continuous process (*any 2 out of 4 marks*)	(1)
		high yield	
		No CO_2 produced	

Total 12 marks

Question 9			
(a)	(i)	iron in the beaker is exposed to air/oxygen + water so rusts	(1)
		iron in the test tube is not in contact with air/oxygen <u>because the air was boiled out of the water</u> (so does not rust)	(1)
	(ii)	add (aq) sodium hydroxide (or ammonia) If 'alkali' or 'OH^-' allow 2nd and 3rd marks only	(1)
		brown precipitate if Fe^{3+} present	(1)
		$Fe^{3+} + 3OH^- \rightarrow Fe(OH)_3$	(1)
(b)	(i)	Mg is more reactive than iron / higher in reactivity series	(1)
		so corrodes (*not 'rusts'*) first / Mg acts as a sacrificial metal	(1)
	(ii)	Any two of	(1)
		painting galvanising /coating with zinc coating with chromium, silver, tin (etc) or electroplating or coating with plastic greasing / oiling	(1)
		alloying	

Total 9 marks

Question 10			
(a)	(i)	2e, Zn	(1)
	(ii)	$2H_2O$	(1)
(b)	(i)	recognition of 1:2 ratio	(1)
		10 (mol)	(1)
	(ii)	10 (mol) = 650 g Allow t.e. from (i)	(1)
	(iii)	5 (mol) Allow t.e. from (i)	(1)
	(iv)	use of molar volume in correct expression i.e. moles x 24 (or moles x 24000)	(1)
		5 x 24 = 120 dm^3 / 5 x 24000=120000cm^3	(1)
		Allow t.e. from (iii)	

Total 8 marks

Question 11			
(a)	(i)	small pieces have greater surface area	(1)
		so more (frequent) collisions	(1)
	(ii)	raise the temperature	(1)
		particles move faster / have more energy	(1)
		more (frequent) collisions / more particles achieve the activation energy	(1)
		Or	
		increase the concentration of acid	(1)
		more particles in a given volume / greater concentration of particles	(1)
		more (frequent) collisions / greater chance of collision	(1)
(b)	(i)	equilibrium moves to left / less product formed / reaction shifts towards the reactants	(1)
		reaction is exothermic / ΔH is negative (or reverse reaction is endothermic)	(1)
		N.B. If position of equilibrium is stated to move to the right, no marks are awarded for (b)(i).	
	(ii)	change in pressure has no effect	(1)
		because no change in moles/volume during the reaction	(1)
		N.B. In (ii), the second mark is awarded only if the first mark has been given i.e. the effect on the position of equilibrium has to be correct in order to score any marks.	
	(iii)	reaction rate increases	(1)
		molecules are closer together	(1)
		so more (frequent) collisions *N.B. In (iii), the second and third marks are awarded only if the first mark has been given.*	(1)

Total 12 marks

Question 12			
(a)	(i)	propane: 2 C-C = 2 x 350 = 700 kJ	(1)
		8 C-H = 8 x 410 = 3280 kJ	(1)
		oxygen: 5 O=O = 5 x 495 = 2475 kJ	(1)
		total = 6455 kJ	(1)
		A t.e. can be given here for the total if there is an arithmetical error. It is not given if the number of bonds broken is incorrect in any part of the above.	
	(ii)	carbon dioxide: 6 C=O = 6 x 745 = 4470 kJ	(1)
		steam: 8 O-H = 8 x 465 = 3720 kJ	(1)
		total = 8190 kJ	(1)
		A t.e. can be given here for the total if there is an arithmetical error. It is not given if the number of bonds broken is incorrect in any part of the above.	
	(iii)	ΔH = 6455 – 8190 (*must be 'bonds broken – bonds formed' or equivalent*)	(1)
		= -1735 kJ mol^{-1}	(1)
		Allow t.e. from (i) and (ii) even if error in number of bonds broken.	
(b)		Si-Si bond is weaker than C-C (or converse)	(1)
		so silicon chains less stable (or weaker) / less likely to form / carbon chains are stronger	(1)
(c)		Si-O bond is stronger than Si-H	(1)
		so more stable molecule / compound containing silicon and oxygen is more likely to form / compound with Si-O bonds is more stable.	(1)

Total 13 marks

PAPER TOTAL: 100 MARKS

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