Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2012

Chemistry

Assessment Unit AS 2

assessing

Module 2: Organic, Physical and Inorganic Chemistry

[AC122]

TUESDAY 19 JUNE, AFTERNOON

MARK SCHEME

Section A

	AVAILABLE MARKS
1 D	
2 D	
3 B	
4 B	
5 D	
6 D	
7 B	
8 C	
9 D	
10 A	
[2] for each correct answer [20]	20
Section A	**20**

Section B

AVAILABLE MARKS

11 (a) (i) Moles of salicylic acid = 3/138 = 0.0217 [1]

(ii) Mass of ethanoic anhydride = 1.08 × 6 = 6.48 (g) [1]

(iii) Moles of ethanoic anhydride = 6.48/102 = 0.0635 [1]

(iv) 0.0217 mole [1]

(v) 0.0217 × 180 = 3.91(g) [1]

(vi) (3.08/3.91) × 100 = 78.8% [1]

(b) (i) $\frac{\text{Mass of desired product}}{\text{Total mass of reactants}} \times 100$ [1]

(ii) 180/240 × 100 = 75% [2]

9

12 (a) (i) Maxwell-Boltzmann distribution [1]

(ii) Same shape: peak to the right [1]
peak lower [1] [2]

(iii) More of the molecules will have energy greater than the activation energy [1]
More of the collisions will be successful [1] [2]

(iv) (The reaction is exothermic so) the equilibrium will move to the left (to reduce the temperature) [1]
The yield of NO will decrease [1] [2]

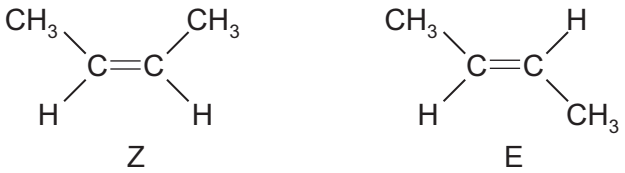
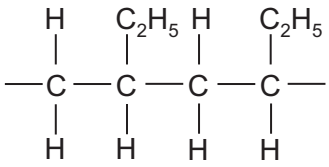
(b) (i) Increasing the pressure reduces the volume/the molecules are closer together/conc. increases [1]
More collisions will increase the rate of the reaction [1] [2]

(ii) There are more molecules/greater volume of gas on the right hand side so equilibrium moves to the left to reduce the volume [1]
Yield of NO decreases [1] [2]

(c) (i) (The catalyst) provides (an alternative pathway of) lower activation energy [1]
More of the collisions will be successful (and the rate of the reaction increases) [1] [2]

(ii) (The catalyst) speeds up the forward and reverse reactions equally [1]
(There is no effect on the equilibrium so there is) no change in the yield of NO [1] [2]

15

					AVAILABLE MARKS
13	**(a)**	**(i)**	C=C contains sigma and pi bond [1] C—C contains only a sigma bond [1] C=C is stronger and shorter than C—C [1]	[3]	
		(ii)	C=C is a centre of high electron density [1] can undergo addition reactions/attracted by electrophiles [1]	[2]	
		(iii)	Add bromine water [1] * essential changes colour from orange/brown/yellow [1] to colourless [1]	[3]	
	(b)	**(i)**	 Z E [1] for diagram [1] for labels	[2]	
		(ii)	No free rotation about the C=C [1] Both C in C=C have two different atoms/gps attached [1]	[2]	
	(c)	**(i)**	Addition	[1]	
		(ii)	 ([–1] for each mistake)	[2]	15
14	**(a)**		$BaS + Na_2CO_3 \rightarrow BaCO_3 + Na_2S$	[1]	
	(b)	**(i)**	$BaCO_3 \rightarrow BaO + CO_2$	[1]	
		(ii)	The coke burns to produce heat	[1]	
		(iii)	$BaCO_3$ is more stable [1] Ba^{2+} is larger [1] Less polarising/lower charge density [1] **(or converse)**	[3]	
		(iv)	Dip (nichrome) wire in conc. HCl [1] Dip in solid [1] and hold in blue (Bunsen) flame [1] Barium gives a green flame [1] Calcium gives a brick red flame [1]	[5]	
			Quality of written communication	[2]	
	(c)		Dissolve in water [1] add Mg^{2+} ions(aq) [1] CO_3^{2-} forms white ppt [1] **or** add Mg^{2+} ions(aq) [1] HCO_3^- no ppt formed [1]	[3]	16

					AVAILABLE MARKS
15	**(a)**	**(i)**	Warmth/heat [1] Absence of air/oxygen [1]/anaerobic	[2]	
		(ii)	(Fractional) distillation	[1]	
	(b)	**(i)**	**A**: (2-) methylpropan-1-ol [1] **B**: (2-) methylpropan-2-ol [1]	[2]	
		(ii)	Add iodine (solution) (I_2 dissolved in KI solution) [1] and NaOH solution [1] warm [1] butan-2-ol will form yellow crystals [1] antiseptic smell [1] any 4 from 5	[4]	
		(iii)	Add acidified potassium dichromate [1] A will turn the solution (from orange to) green [1] B no change [1]	[3]	
	(c)	**(i)**	Renewable/clean fuel/instead of a fossil fuel	[1]	
		(ii)	$\Delta H + (-327) = 4(-394) + 5(-286)$ $\Delta H = -1576 - 1430 + 327$ $\Delta H = -2679$ (kJ mol^{-1}) ([–1] for each mistake)	[3]	
		(iii)	1 atmosphere pressure [1] 298 K [1]	[2]	
		(iv)	Oxygen is an element	[1]	
	(d)	**(i)**	Energy required to break [1] one mole of a (covalent) bond [1]	[2]	
		(ii)	Bonds broken – Bonds formed (347 + 358 + 5(413) + 464 + 3(498)) – (4(805) + 6(464)) 4728 – 6004 = –1276 kJ ([–1] for each mistake)	[3]	
		(iii)	Bond enthalpies are average values (and so this value is only an estimate)	[1]	25
				Section B	**80**
				Total	**100**