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

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

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]

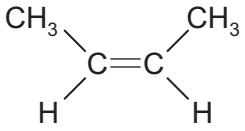
(ii) (The catalyst) speeds up the forward and reverse reactions equally [1]
(There is no effect on the equilibrium so there is) no change in the yield of NO [1] [2] 15

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)**



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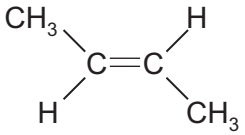

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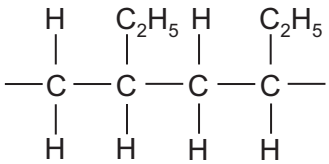
[1] for diagram [1] for labels [2]

(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

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**