Chemistry - 2004

Trial HSC Exam

Suggested Answers

	A	B	C	D
1			X	
2		X		
3				X
4			X	
5		X		
6			X	
7				
8			X	
9		X		
10		X		
11			X	
12		X		
13				X
14	X			
15			X	

SECTION 1 - Part B

Q. 16:

HCO_3^-	+	H_2O	$\Leftrightarrow$	H_3O^+	+	CO_3^{2-}
Acid I		Base II		Acid II		Base I

HCO_3^-	+	H_3O^+	$\Leftrightarrow$	H_2O	+	H_2CO_3
Base I		Acid II		Base II		Acid I

Q.17:

(a) (i) ethylbutanate

(ii) $CH_3CH_2 - O - CO - CH_2 - CH_3$

(iii) Conc H_2SO_4

(iv) Heating under reflux because reactions occur near boiling points of the reactants. Reflux collects and returns vapours driven off by heating.

Q.18:

(a) Pressure released, gas released out of solution as it stays in only because of high pressure in container.

(b) Dissolving as is exothermic - dissolving produces heat - we remove it by refrigeration - more goes in to produce heat.

Q.19:

(a) Iodine 131

(b) Used in therapy for thyroid cancer.

(c) Has short half life, must be produced close to point of usage otherwise has decayed beyond point of usage if has to travel too far.

Q.20:

(a) Moles H_2SO_4 left

2.447L NH_3 = .1 moles

$$H_2SO_4 = \frac{.5x200}{1000} = .1 \text{ moles}$$

From equation 2 moles nH_3 needs 1 mole H_2SO_4

1 mole NH_3 = 0.5 moles H_2SO_4

0.1 mole NH_3 = 0.05 moles H_2SO_4

0.1 - 0.05 - 0.05

Therefore 0.05 moles H_2SO_4 remains

(b) $$\frac{.05x700}{1000} = \frac{.107xV}{1000}$$

$$V = \frac{.05x200}{1000} \times \frac{1000}{.107}$$

= 93 mls NaOH

Q.21:

(a) acid HB

(b) (i) $2HCl + Ba(OH)_2 \rightarrow H_2O + BaCL_2$

(ii) $$\text{Moles acid} = \frac{0.03x15}{1000} = .00045$$

$$\text{Moles alkali} = \frac{0.01x20}{1000} = .0002$$

As 2 lots acid use one lot alkali

$\frac{.00045}{2}$ .00025 moles alkali

- .0002

.00005 moles alkali left

= [POH] = 5×10^{-5}

$$PH = \frac{10^{-5}}{5x10^{-5}} = 2 \times 10^{-10}$$

PH = 9.69

Q.22:

(a) copper sulfate solution

(b) $cu^{2+} + 2e^- \rightarrow cu_{(s)}$

(c) $cu \rightarrow cu^{2+} + 2e^-$

Q.23:

(a) Lowry - Bronstead

Anything that can donate a proton (H^+) .... releases H^+ in solution

(b) NH_4NO_3

When in water

$$NH_4^+ + H_2O \Leftrightarrow H_3O^+ + NH_3$$

As H^+ ions produced solutions are acidic

(c) H_2O is acting as a base as it accepts a H^+ to become H_3O^+

(d)

H_2O $\rightarrow$	H_3O^+	OR	Hcl	$\rightarrow$	Cl^-
Base	Acid		Acid		Base

Q.24:

(a) $Cu\,S + O_2 \rightarrow Cu + SO_2$

(b) 10^6g Cu S $\rightarrow$? SO_2

1 mole Cus $\rightarrow$ 1 mole SO_2

63.6 + 32 32 + 16 + 16

95.6g Cu S $\rightarrow$ 64g SO_2

$$10^6\text{g Cu s} \rightarrow \frac{64}{95.6} \times 10^6\text{g } SO_2$$

$$= \frac{669456g}{64} SO_2$$

= 10460.25 Moles SO_2

x 24.5 =

256276 L SO_2

Q.25:

(a) $VO_2^+ + 2H^+ + e^- \rightarrow VO^{2+} + H_2O$

(b) $V^{3+} + VO_2^+ + 2H^+ + 2e^- \rightarrow V^{2+} + VO^{2+}$

E° = to^v 74V

(c) $E^\circ = 0.74$ V

(d)

Q.26:

(a) $N_2 + 3H_2 \Leftrightarrow 2NH_3$

(b) (i) Compressing → increased pressure - reaction goes to right as this reduces pressure

4 molecules to 2

(ii) Higher temperatures would accelerate reaction but also send equilibrium to left (less product).

(c) Entering gas stream is closely monitored to keep N_2 : H_2 about 1 to 3 as gases left after reaction are recycled as well as new gas added.

(d) Fertilisers - explosives

Q.27:

(a) (i) Chlorine

(ii) Spray can propellants

(iii)

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       F
       |
Cl  —  C  — F
       |
       d
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(b) Melting Point

O_3 higher MPt than O_2 as molecules are bigger, therefore need more energy to turn liquid into a gas.