**MARKING SCHEME CHEMISTRY 2020 PAPER 233/2**

**1.(a)** CaO → Ca + ΔH = +635KJ molˉ¹ 🗸½mk

 CO2 → C + O2 ΔH = +394KJ molˉ¹ 🗸½mk

 ΔH = -1207KJ molˉ¹ 🗸½mk

 CaO(S) + CO2(S) → CaCO3(S) ΔH = +635 + 394 – 1207 🗸½mk

 = -178KJ molˉ¹ 🗸½mk

 OR



 +O2

 CaO + CO2

 ΔHr = -635 + -394 = -1207

 ΔHr = -1207 + 635 + 394 🗸1mk

 = -178KJ molˉ¹ 🗸½mk

 (b) - Heating value.

 - Availability

 - Cost

 - Ease of storage

 - Ease of combustion

 - Effect on environment

 - Ease of transport Any 1mk

 (c) (i) Mass of water 500 x 1 = 500g 🗸½mk

 ΔT = 44.5  25 = 19.5ºC 🗸½mk

 Heat evolved = 500 x 4.2 x 19.5 🗸½mk = 409.50 Joules 🗸½mk

 (ii) Mass of ethanol used = 121.5  120.0 = 1.5g 🗸½mk

 RMM of ethanol = 46 🗸½mk

 1.5g of ethanol produced 40950 Joules

 46g of ethanol produce 🗸½mk

 = 1255800 Joules

 = -1255.8KJ molˉ¹ 🗸½mk

 (d) C2H5OH + 3O2 → 3H2O + 2CO2 ΔH = -1255.8KJmolˉ¹ 🗸1mk

 (e)

C graphite

C (diamond)

Energy

Reaction path 🗸½

ΔH = +2.9KJ molˉ¹

🗸½

🗸(1mk)

 (e) ΔH = 435 + 243 + 2(-431) (1mk)

 = -862 + 678 ½mk

 = -184KJ ½mk

**2.(a)**A solution which contains as much solute as can dissolve at a particular temperature in the

 presence of undissolved solid. (1mk)

(b)(i) Scale (1mk)

 Plotting (1mk)

 Curve (1mk)

(ii).I.130g /100g of water ± 2 (1mk)

 (Read from candidate graph)

II Solubility at 85ºC = 53g/100g of H2O

 Mass dissolved = 53g (1mk)

 Mass undissolved = 90  53 🗸½ = 47g 🗸½

III Solubility of X at 30ºC = 44g/100g H2O 🗸½

 Mole of X = mol 🗸½

 0.3592mol contained in 100cm³

 Y mol contained in 1000cm³

 🗸½ = 3.592mol

(c)(i)

 

(ii).by adding brine to the column🗸 1

3.(i)

 OR Using asyringe🗸

(ii) I To displace air 🗸1 inside the aspirator.

 II To absorb/remove carbon (IV) oxide 🗸1 from air.

(iii) Zn (s) + O2(g) ZnO(s) 🗸 1

(b).(i)-dust, 🗸 1CO2 and 🗸 1moisture

(ii) iron 🗸 1

(iii) reduces wastage 🗸 1hence economical on the running cost

(iv) temperatures of 450o🗸 1

(c) manufacture of fertilizers🗸 ½

 -raw material in the solvay process🗸 ½

 -manufacture of nitric acid

(d).(i)platinum rhodium🗸 1

 (ii) 4NH3(g) + 502(g) 4NO(g) +6 H2O(l) 🗸 1

(iii) formation of acid rain which corrodes buildings 🗸 1

 4(i)C02(g)+ C(s) 2C0(g) 🗸 1

(ii)Potasiumhydroxide solution🗸 1

(iii)bubble🗸 ½ the gases separately in lime water🗸 ½,C02 forms awhite ppt🗸 ½ while C0 does not form appt🗸 ½

(iv) to absorb any unchanged🗸 1 CO2/unreacted CO2

(v) It is slightly🗸 ½ soluble in water/insoluble in water

(vi)- used as a reducing agent during extraction of metals🗸 1

 -used as a fuel

(b).(i)the reaction between brine and ammonia is highly exothermic🗸 1

(ii)2 NaHCO3(s) Na2C03(s)+ C02(g) +H20(l) 🗸 1

(iii)KHCO3🗸 ½ from which K2C03 is obtained, and ammoniumchloride are equally soluble🗸 ½,hence separation will not be easily possible

5.(a)(i) Zinc hydroxide🗸 1, Zn(OH)2🗸 1

(ii) Zincate ion, 🗸 1 [Zn(OH)4]2-🗸 1

 (b) it is amphoteric🗸 1mk

(c)Zn(OH)2(s) +2OH-aq [Zn(OH)4]2-🗸 1

(d). -React zinc hydroxide with nitric (v) acid to form zinc nitrate🗸 ½

 -Dissolve potassium carbonate in distilled water.

 -React Zinc nitrate solution with potassium carbonate solution🗸 ½

 -Filter🗸 ½ to obtain zinc carbonate as residue.

 -Wash🗸 ½ residue and dry it.🗸

(e) a weak acid is partially ionized while strong acid is strongly ionized 🗸 1

(f) water, it donates a proton🗸 1

**6.(a)** Q-🗸 1 This is because it has the highest number of energy levels. 🗸 1

 (b) U🗸 1  This is because U has the highest nuclear change due to its small atomic radius among the hon metals. 🗸 1

**(c)** P has bigger atomic radius than R. this is because P has higher nuclear charge than R🗸 1.

 **(d)(i)** S2-🗸 1

 **(ii).**R2+🗸 1

 **(e).**P = 18 N = 40  18 = 28

 P = 18

 N = 22🗸 1

 **(f)(i)**  RX2🗸 1

 (ii).-Compounds with the above structures are soluble in water but insoluble in organic conduct. 🗸 1

 - Compounds with the above structure conduct electricity in molten and aqueous state but they are non conductors in solid state.

-Compounds with the above structure exist in crystalline form

-Compounds with the above structure have very high melting and boiling point.

Any 1

7.(b)(i) water🗸 1

 (ii) H- C= C-H🗸 1

 (iii)polymerization🗸 1

(b) But-2-ene, 🗸 1

 🗸 1

(d)(i) L1- soapless detergent🗸

 L2-Soap🗸

(ii) L1- non biodegradable🗸

 L2-forms scum with hard water🗸 1

(d)(I)Esterification🗸 1

II.Alkanoic acid🗸 1

(e)