***1. (a) Zn(s) + 2HCl(aq) ZnCl2(aq) + H2(g) 1***

 ***(b) Concentrated sulphuric (IV) acid or anhydrous calcium chloride. 1***

 ***(c) Copper cannot displace hydrogen from its solution. 1***

 ***(d) (i) 2H2(g) + O2(g) 2H2O(l) 1***

 ***(ii) Before: Pass hydrogen / through the tube before lighting 1 to drive off air.***

***End: There should be a continuous flow of hydrogen after / putting off the flame***

 ***to avoid an explosion. 1***

 ***(e) – Filling balloons 1***

 ***- Manufacture of margarine.***

 ***- Manufacture of ammonia.***

 ***- Conversion of coal to synthetic petrol.***

 ***(f) Zn (s) + H2O(g) ZnO(s) + H2(g) 1***

 ***(g) S,½ P, ½ Q, ½ R, ½***

 ***(h) It adds to unsaturated oils and hardens them. 1***

***2. I (i) C***

🗸 1

 ***(ii) D or E***

🗸 1

 ***(iii) F***

 ***(iv) D or E***

🗸 1

 ***(v) A***

 ***(vi) D***

🗸 ½

🗸 1

***I(a) (i) Atomic radius of M is smaller than that of X. The effective nuclear charger in M is greater***

🗸 ½

 ***than in X hence outer electrons strongly pulled to the centre reducing the radius.***

 ***(ii) Radius of Q is greater than that of U because Q has more energy levels than U***

***(b) J because it loses energy more easily due to the bigger atomic radius of J***

***(c) (i)***

 ***(ii)Period – 3 Group – VI***

***(d) (i) On the grid (period 2 Group 7)***

 ***(ii) Halogen***

🗸 1

🗸 1

 ***(iii) – Used in hospitals with patients with breathing difficulties***

 ***- Used by mountain climbers and deep sea divers***

🗸 1

***(iv) Basic oxide***

***3. (a) (i) Carbon (II) Oxide or CO – (reject Carbon monoxide)***

 ***(ii) Combines with haemoglobin to form carboxyhaemoglobin which prevents carrying of***

 ***oxygen***

 ***(b) (i) CO(g) + C(s) 2CO(g)***

 ***(ii) ZnO(s) + CO(g) Zn(s) + CO2(g)***

***(iii) KOH(aq) + CO2(g) K2CO3(aq) + H2O(l)***

***(c) Orange/yellow Lead (II) Oxides turns grey***

***(d) CaCO3(s) + 2HCl(aq) CaCl2(aq) + CO2(g) + H2O(l)***

***(e) Methanoic acid and concentrated sulphuric acid***

Gas X

Water

***4. a)i) Fractional distillation of liquid air***

 ***ii) Argon***

 ***b) A Sulphur***

 ***B Ammonia gas***

 ***C Oleum***

 ***D Amonium sulphate***

 ***c) i) Finely divided iron***

 ***ii) Vanadium (v) Oxide***

 ***d) Speeds up the rate of reaction by lowering the activation energy***

 ***e) 2NH3(g) + H2SO4(aq) (NH4)2SO4(aq)***

 ***f) R.M.M of (NH4) = 132***

 ***Mass of N = 28***

 ***% N = 28/132 x 100 = 21.212%***

 ***g) Used as a fertilizer***

***5. (a) (i) MnO2 (s) + 4HCl(l) MnCl2(aq) + 2H2O + Cl2(g)***

 *Penalize ½mk if state symbols are not correct*

🗸 1

 ***(ii) KMnO4 or PbO2***

🗸 1

 ***(iii) The Chloride gas can be dried by passing it through a wash-bottle of concentrated sulphuric acid and is then collected by downward delivery.***

🗸 1

🗸 1

***(b)(i) A- Aluminium (III) Chloride***

🗸 1

 ***(ii) 2Al(s) + 3Cl2(g) 2AlCl3(s)***

 ***Penalize ½mk for wrong state symbols***

 ***(iii)***

***6. a) i) They are different physical/ structural forms of an element in the same physical state.***

 ***ii) Trausition temperature***

 ***b) i) X - Diluter***

 ***Y- Heat exchanger***

 ***Z- Roaster/ Burner***

 ***ii) Catalyst- Vanadium (v) Oxide, V2O5***

 ***Temperature – 450C***

 ***Pressure – 1 atmosphere***

 ***iii) I - They are purified not to poison the catalyst***

 ***II - The reaction in the convertor/ production of sulphur (vi) Oxide is exothermic/***

 ***heat is produced. Chamber Y is used to ensure temperature does not rise above 450oC***

 ***iv) Step 2: 2502(g) +O2(g) \_\_\_\_\_\_\_\_\_\_\_\_2503(g) √ 1 mark***

 ***Step 3: 503(g) + H2SO4(L) \_\_\_\_\_\_\_\_\_\_ H252O7(l √ 1 mark***

 ***Step 4: H2S2O7(L) + H2O(L) \_\_\_\_\_\_\_\_\_ 2H2SO4(L) √ 1 mark***

 ***7. (a) B – ammonia gas 1***

 ***C - nitrogen (II) oxide (NO) 1***

 ***E – water 1***

 ***F – unreacted gases 1***

 ***(b) The mixture of ammonia and air is passed through heated/ catalyst where ammonia (II) is***

 ***oxidized to nitrogen (IV) oxide. 1***

***(c) Gases are cooled and air passed through heated/ catalyst where ammonia is further***

 ***oxidized to nitrogen(IV) oxide. 1***

***(d) Fractional distillation,***

 ***Water with a lower boiling point than nitric (V) acid, distills left leaving the***

 ***concentrates acid.***

***(e) HNO3 decomposes when exposed to light***

***(f) HNO3 is an oxidizing agent hence able to oxidizes copper to Cu2+***

***HCl on the other hand doesn’t react with copper because copper is less reactive and can not displace hydrogen from its acid.***