01 **Acids can react with bases or alkalis to produce salt and water**

(a) Name this type of reaction.

(b) Write a balanced chemical equation for the following reactions.

(i) Magnesium oxide powder and sulfuric acid solution

(ii) Iron(II) oxide powder and nitric acid solution

(iii) Aluminium oxide powder and hydrochloric acid solution

(iv) Ammonium hydroxide solution and hydrochloric acid solution

(v) Sodium hydroxide solution and ethanoic acid solution (CH_3COOH)

(vi) Potassium hydroxide and nitric acid solution

(a) Neutralisation reaction.

(b) (i) $MgO(s) + H_2SO_4(aq) \rightarrow MgSO_4(aq) + H_2O(l)$

(ii) $FeO(s) + 2HNO_3(aq) \rightarrow Fe(NO_3)_2(aq) + H_2O(l)$

(iii) $Al_2O_3(s) + 6HCl(aq) \rightarrow 2AlCl_3(aq) + 3H_2O(l)$

(iv) $NH_4OH(aq) + HCl(aq) \rightarrow NH_4Cl(aq) + H_2O(l)$

(v) $NaOH(aq) + CH_3COOH(aq) \rightarrow CH_3COONa(aq) + H_2O(l)$

(vi) $KOH(aq) + HNO_3(aq) \rightarrow KNO_3(aq) + H_2O(l)$

02 **The table given below shows the colours of two indicators, methyl orange and methyl red, commonly used in the laboratory at different pH values.**

pH	2	3	4	5	6
Methyl orange	Red		Yellow		
Methyl red	Red				Yellow

Four solutions of different pH values are given below.

Solutions	P	Q	R	S
pH	2	3	5	6

(a) In which solution(s) will both the indicators be red ?

(b) In which solution(s) will both the indicators be yellow ?

(a) Solutions P and Q only.

(b) For solution R at pH 5 methyl orange has changed to yellow.

For solution S, both the indicators are yellow at pH 6.

03 **pH scale is used to measure the strength of an acid or a base. Its value ranges from 0 – 14. pH of acids lies between 0 – 6, that of bases between 8 – 14 and pH of neutral salt is 7.**

(a) What is the pH of sodium chloride ?

(b) What is the pH range of HC*l* ?

(c) Which base has a maximum pH value ?

(d) What is the pH of drinking water ?

(a) Sodium chloride is a neutral salt. It has pH of 7.

(b) HC*l* being a strong acid has pH range between 0 – 2.

(c) Sodium hydroxide is a strong base. It has a very high pH value of 14.

(d) pH of drinking water is between 6.5 to 8.5.

04 **When chlorine gas is bubbled into water for killing the harmful germs, the following reaction takes place.**

$$Cl_2(g) + H_2O(l) \rightarrow HCl(aq) + HOCl\ (aq)$$

(a) Is the resulting solution acidic, basic or neutral ? Explain your answer.

(b) When a piece of blue litmus paper is put into the solution, it turned red in colour. Why ?

(c) Write the formula of the salt formed if aqueous sodium hydroxide is added to HCl solution.

(a) Acidic

HCl and HOCl are acids and they dissociate in water to produce hydrogen ions.

$HCl \rightarrow H^+ + Cl^-$

$HOCl \rightarrow H^+ + OCl^-$

The presence of hydrogen ions causes the solution to be acidic.

(b) Blue litmus paper turns red due to the presence of acids HCl and HOCl produce hydrogen ions in water.

(c) NaCl. $HCl + NaOH \rightarrow NaCl + H_2O$

05 **When calcium hydroxide is added to the acidic soils, It neutralises acids very fast. The soil will not be acidic anymore and plants can grow healthily.**

(a) Why neutralization reaction is very slow and less effective when limestone or lime are added to acidic soils ?

(b) Why calcium hydroxide should not be mixed with fertilizers containing ammonium salts to reduce the acidity of soil ?

(a) Presence of impurities in some limestones and lime lower the neutralizing value of acidic soils thereby increasing aluminium and manganese toxicities.

(b) Calcium hydroxide should not be mixed with fertilisers containing ammonium ions because displacement of ammonia from the fertilisers will take place.