PART 01: REVISION EXERCISES Compiled from SBs

HW Multiple Choice Questions

i. Spring water decomposes on boiling to produce white solid particles. The solid particles are:
   A. Calcium sulphate
   B. Calcium hydrogencarbonate
   C. Magnesium carbonate
   D. Magnesium hydrogencarbonate

ii. Which one of the following pairs of compounds can cause temporary hardness of water?
   A. Sodium hydrogen carbonate and calcium hydrogen carbonate
   B. Sodium hydrogen carbonate and magnesium hydrogen carbonate
   C. Potassium hydrogen carbonate and magnesium hydrogen carbonate
   D. Magnesium hydrogen carbonate and calcium hydrogen carbonate

iii. Which of the following reagents is used for softening hard water?
   A. Na_2CO_3
   B. Na_2SO_4
   C. $CaCO_3$
   D. $CaSO_4$

iv. Which one of the following compounds does not cause hardness of water?
   A. Calcium sulphate
   B. Sodium hydrogen carbonate
   C. Magnesium sulphate
   D. Calcium hydrogen carbonate

v. Which one of the following processes is not used to remove hardness in water?
   A. Treatment with sodium carbonate
   B. Addition of calcium hydroxide
   C. Distillation of water
   D. Addition of sodium structure

vi. Which one of the following is most common in hard water?
   A. SO_4^{2-}
   B. CO_3^{2-}
   C. Na^+
   D. Mg^{2+}

vii. Which one of the following compounds does not cause hardness of water?
   A. Calcium sulphate
   B. Sodium carbonate
   C. Magnesium sulphate
   D. Calcium hydrogen carbonate

viii. How is permanent hardness of water removed?
A. By boiling
B. By adding slaked lime
C. By adding washing soda
D. By adding ammonia

ix. One advantage of hard water is that:
A. It does not contain bacteria
B. It forms lather more easily with soap
C. It contains calcium compounds which help to form healthy bones
D. It forms scales in boilers which prevent the boilers from leaking

x. Which one of the following types of water would take the greatest amount of soap solution to form lather using the same volume of each type?
A. Rain water
B. Distilled water
C. Sea water
D. River water

xi. Potassium aluminium sulphate (potash alum) is used during the purification of water for:
A. Removing colouring matter
B. Killing harmful bacteria
C. Removing suspended matter
D. Making water soft

xii. Permanent hard water can be softened by:
A. Boiling the water
B. Adding calcium hydroxide
C. Adding aqueous ammonia
D. Adding sodium carbonate

Short Answer Questions

2. (a) Name one compound that causes:
(i) Permanent hardness of water
(ii) Temporary hardness of water
(b) State one disadvantage of using hard water
(c) (i) Write equation to show how ion exchangers removes permanent hardness in water
(ii) State the principle on which it works.

3. Table below shows results obtained when soap solution was added to 10 cm^3 of water samples P, Q, and R in separate containers.

	Before boiling			After boiling		
Sample of water	P	Q	R	P	Q	R
Volume of soap solution required to form permanent lather (cm^3)	2	8	5	2	8	3

(a) Identify which sample was:
(i) Rain water
(ii) Temporary hard water
(iii) Permanent hard water
Give reasons for your answer.
(b) Name one substance which can cause permanent hardness in water

4. (a) What is meant by hard water?
(b) (i) Name two ions responsible for the hardness of water
(ii) Write an ionic equation for the reaction that takes place when soap solution is added to hard water
(iii) State one advantage of hard water

Chemical Equations

5. Write symbolic chemical equations for the following reactions:
(a) Sodium hydroxide reacts with dilute hydrochloric acid to form sodium chloride and water
(b) Potassium carbonate reacts with dilute nitric acid to form potassium nitrate, carbon dioxide, and water
(c) Sodium metal reacts with water to form sodium hydroxide and hydrogen gas
(d) Lead (II) nitrate reacts with sodium sulphate to form lead (II) sulphate salt and sodium nitrate

6. Write word and symbolic equations for the following reactions:
(a) Sulphur burns in oxygen to form sulphur dioxide gas
(b) Methane gas burns in oxygen to form carbon dioxide and water
(c) Zinc metal reacts with hydrochloric acid to form zinc chloride and hydrogen gas
(d) Copper oxide reacts with hydrogen gas to form copper metal and water vapour

7.Write balanced chemical equations for the following reactions:
(a) Calcium metal burns in oxygen to form calcium oxide
(b) Copper oxide powder reacts with warm dilute sulphuric acid to form copper (II) sulphate and water
(c) Lead (II) nitrate crystals are heated to form lead (II) oxide, nitrogen dioxide, and oxygen
(d) Barium chloride solution reacts with sodium sulphate solution to form barium sulphate precipitate and sodium chloride solution

8.Balance the following chemical equations:
(a) $H_2(g) + O_2(g) \rightarrow H_2O(l)$
(b) $N_2(g) + H_2(g) \rightarrow NH_3(g)$
(c) $Cu(s) + NO_2(g) \rightarrow CuO(s) + N_2(g)$
(d) $CuO(s) + NH_3(g) \rightarrow Cu(s) + H_2O(l) + N_2(g)$

Chemical Equation: Additional Exercises

1. Write word equations for the following reactions:
   i) Carbon burning in excess oxygen to form carbon dioxide
   ii) Hydrogen reacting with oxygen at high temperature to form steam
   iii) Sodium hydroxide solution reacting with dilute sulphuric acid to form sodium sulphate and water
   iv) Methane reacting with oxygen gas to form carbon dioxide and water

2. Convert the following word equations into symbolic chemical equations:
   i) Nitrogen + hydrogen → ammonia
   ii) Sulphur + oxygen → sulphur dioxide
   iii) Sulphur + iron → iron (II) sulphide

3. Balance the following chemical equations:
   i) $Li(s) + O_2(g) \rightarrow Li_2O(s)$
   ii) $Mg(s) + HNO_3(aq) \rightarrow Mg(NO_3)_2(aq) + H_2(g)$
   iii) $Zn(NO_3)(s) \rightarrow ZnO(s) + NO_2(g) + O_2(g)$
   iv) $Cl_2(g) + KOH(aq) \rightarrow KCl(aq) + KClO_3(aq) + H_2O(l)$
   v) $Al(s) + HCl(aq) \rightarrow AlCl_3(aq) + H_2(g)$
   vi) $FeCl_2(aq) + Cl_2(g) \rightarrow FeCl_3(aq)$

4. Translate the following chemical equations into word equations:
   i) $2Na(s) + Cl_2(g) \rightarrow 2NaCl(s)$
   ii) $CaCO_3(s) + 2HNO_3(aq) \rightarrow Ca(NO_3)_2(aq) + CO_2(g) + H_2O(l)$
   iii) $Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$
   iv) $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$

5. Write balanced chemical equations for the following reactions:
   (a) Calcium metal burns in oxygen to form calcium oxide
   (b) Copper oxide powder reacts with warm dilute sulphuric acid to form copper (II) sulphate and water
   (c) Lead (II) nitrate crystals are heated to form lead (II) oxide, nitrogen dioxide, and oxygen
   (d) Barium chloride solution reacts with sodium sulphate solution to form barium sulphate precipitate and sodium chloride solution

6. Show the chemical formulae of the following compounds using:
   (a) Balancing of charges
   (b) Interchanging of valencies
   i) Aluminum chloride
   ii) Sodium nitrate
   iii) Magnesium hydrogen carbonate
   iv) Zinc nitrate

Acids, Bases and Salts

ABS Multiple Choice Questions

i. Which one of the following substances will dissolve in water to give a solution that would turn red litmus paper blue?
A. Sodium chloride
B. Sodium hydroxide
C. Sodium sulphate
D. Sodium nitrate

ii. Most metals react with dilute mineral acids to form:
A. Hydrogen gas only
B. The salt of the metal and water
C. The salt of the metal only
D. The salt of the metal and hydrogen gas

iii. Which one of the following carbonates decomposes to leave a metal?
A. Potassium carbonate
B. Zinc carbonate
C. Magnesium chloride
D. Silver carbonate

iv. Which one of the following aqueous solutions will produce hydrogen gas with a magnesium ribbon? That of:
A. pH = 14
B. pH = 7
C. pH = 11
D. pH = 2

v. Giving examples in each case, write equations for the reaction of sulphuric acid with:
(a) A metal
(b) A metal oxide
(c) A metal hydroxide
(d) A metal carbonate
(e) A metal hydrogen carbonate

1. (a) What is an acid?
(b) State three physical properties of acids
(c) Write the name and formula of the 3 common mineral acids used in the laboratory
(d) Write chemical equations to illustrate the properties of acids using hydrochloric acid and the following compounds:
(i) Copper(II) oxide
(ii) Magnesium metal
(iii) Potassium carbonate solution
(iv) Potassium hydrogen carbonate solution

2. A bee sting contains methanoic acid. That is why it is so painful. How then can you treat someone who has been stung by a bee?

3. Which ions are responsible for:
   (a) Acidic properties?
   (b) Basic properties?

4. Define the term tribasic salt

5. (a) Define the terms:
   (i) Base
   (ii) Alkali
   (iii) Neutralization reaction
   (b) Give two examples of:
   (i) Bases
   (ii) Alkalis
   (b) Describe an experiment to prepare an indicator in the laboratory from either colored flower petals or red cabbage leaves

© Match the acid with the salt name associated with it:

Acid	**General name of the salts**
i. Nitric acid	(a) Chlorides
ii. Hydrochloric acid	(b) Sulphates
iii. Carbonic acid	© Nitrates
iv. Sulphuric acid	(d) Carbonates

6. State whether these acids form normal salts only or can form both normal and acid salts:
(a) Carbonic acid
(b) Hydrochloric acid
(c) Sulphuric acid
(d) Nitric acid

7. Give the names of salts formed when:
(a) Sodium metal replaces hydrogen ions of nitric acid
(b) Calcium metal partially replaces hydrogen ion of carbonic acid
(c) Ammonium ion replaces the hydrogen ions of hydrochloric acid
(d) Potassium metal partially replaces the hydrogen ion of sulphuric acid

8. The table below gives examples of some salts. Give missing information in the table:

Name of salt	Formulae of salt	Source (acid)
Zinc nitrate	(a)	(b)
(c)	K_2SO_4	(d)
(e)	(f)	Hydrochloric acid
Ammonium sulphate	(g)	(h)

9.Direct reaction between calcium carbonate and dilute sulphuric acid is not advisable in the preparation of calcium sulphate. Explain.

10.(a) Comment on the solubility of calcium sulphate and lead(II) chloride
(b) State an example of a salt which exists as:
(i) White crystal
(ii) White powder.

11. Give the general name given to the salts derived from the following acids:
(a) Nitric acid
(b) Carbonic acid
(c) Sulphuric acid

12. (a) What do you understand by the term salt?
(b) A certain salt is made when ammonium ion displaces all the hydrogen ion of sulphuric acid. Give the name and formula of the salt formed.

13. (a) Name two metal carbonates, which do not decompose when heated
(b) Name the products formed when the following carbonates are heated:
(i) Zinc carbonate
(ii) Lead (II) carbonate
(c) Write equations to show the action of heat on the carbonates in (b)
(d) Write a chemical equation to represent the action of heat on sodium hydrogen carbonate

13. (a) State and explain the observation made when hydrated copper (II) sulphate crystals are heated gently then strongly
(b) State and explain the observations made when anhydrous iron(II) sulphate is heated gently then strongly
(c) Write equations for the reactions that occur in 2(a) and (b) above

14. (a) Predict the products that would be formed if the following nitrates are heated:
(i) Calcium nitrate
(ii) Magnesium nitrate
(b) Write equations for the reactions in 3(a) above

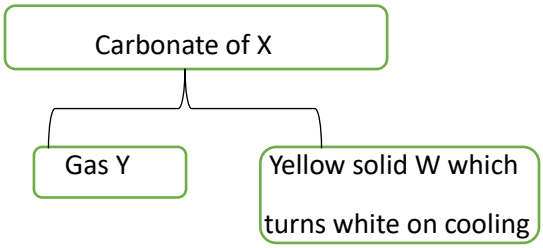
15. (i) State the observations made when hydrated copper (II) sulphate crystals are heated gently then strongly
(ii) Write the chemical equations for the changes that take place in 15(i)

16. Classify the following salts as either normal salt or acid salt:
(a) $FeSO_4$
(b) $NaHCO_3$
(c) $ZnBr_2$
(d) PbI_2

16. Classify the following salts as either soluble or insoluble:
(i) $AgNO_3$ (ii) $Zn(NO_3)_2$ (iii)$CaCO_3$ (iv) $MgSO_4$ (v) $NaHSO_4$ (vi) $PbCl_2$ (vii) $BaSO_4$(viii) AgCl

17. (a) State the products formed when sodium hydrogencarbonate is heated
(b) Write a chemical equation for the reaction in 17(a) above.

18. The following flow diagram shows what happens when a certain carbonate of metal X is heated strongly:



(a) Identify:
(i) Gas Y
(ii) Yellow Solid W
(b) What is the colour of the carbonate of X?
(c) What is metal X?

19. (a) State the products formed when sodium hydrogencarbonate is heated
(b) Write a chemical equation for the reaction in 19(a) above.

(c) The table below shows the pH values for some aqueous solutions:

Solutions	**R**	**S**	**T**	**U**	**V**	**W**
pH	10.5	6.5	2.0	7.0	7.5	11.0

Which solution(s):
(i) Is the most acidic?
(ii) Is the most alkaline?
(iii) Is likely to be lemon juice?
(iv) Is pure water?

(d) Name the acid present in:
(i) Sour milk

(ii) Lemons
(iii) Tea
(iv) bee sting

20. Sulphuric acid is a strong dibasic acid.
(a) Explain the terms "strong acid" and "basicity"
(b) Dilute sulphuric acid was added to a solution of lead(II) nitrate:
(i) State what was observed
(ii) Write an equation for the reaction
(b) Write equations for the reactions that occur when dilute sulphuric acid is added to:
(i) Zinc carbonate
(ii) Sodium hydroxide solution
(iii) Magnesium ribbon

21. (a) What is basicity of an acid?
(b) Complete and balance the following equations:
(i) $KOH(aq) + H_2SO_4(aq) \rightarrow$
(ii) $CaCl_2(aq) + H_2SO_4(aq) \rightarrow$
(c) Complete the following equations to show the effect of heat on the salts:
(i) $Cu(OH)_2(s) \rightarrow$
(ii) $CuCO_3(s) \rightarrow$
(iii) $Pb(NO_3)_2(s) \rightarrow$

22. (a) Explain giving example(s) what is meant by:
(i) Basicity of an acid
(ii) An acid salt
(b) Outline how a pure dry sample of sodium sulphate can be prepared in the laboratory

23. Sodium carbonate decahydrate is an example of efflorescent salt.

(a) Define the term efflorescence.

(b) differentiate between hygroscopic salt and hygroscopy.

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