Acid Bases and Salts MCQ Chemistry Questions with Solutions

Q-1: Which of the following is the correct classification of Dolomite?

a) An acid salt
b) A mixed salt
c) A normal salt
d) A double salt

Answer: d) double salt

Explanation: A double salt is a crystalline salt with the content of a mixture of two simple salts but a distinct crystal structure.
Dolomite is a double salt consisting of calcium carbonate ($CaCO_3$) and magnesium carbonate ($MgCO_3$) salts.

Q-2: Acetic acid is weak acid because

a) Its aqueous solution is acidic
b) It is highly ionised
c) It is weakly ionised
d) It contains the COOH group.

Answer: c) It is weakly ionised

Explanation:

In an aqueous solution, a weak acid is one that ionises just minimally. Acetic acid (found in vinegar) is a highly common weak acid because it doesn't dissociate much in solution, Its ionisation may be seen below.

$CH_3COOH(aq) \rightleftarrows H^+(aq) + CH_3COO^-(aq)$

As a result, it is less effective at donating protons.

Because acetic acid's ionisation is incomplete, the equation is shown with a double arrow.

Q-3: What will be the pH of the solution on mixing a 50 mL solution of a strong acid of pH=1 with a 50 mL solution of strong acid of pH =2.

a) 0.74
b) 1.76
c) 1.5
d) 1.26

Answer: d) 1.26

Explanation:

We know that pH= -log[H^+]

Molarity= number of moles/V(L)

Step-1: Calculate the [H^+] for a strong acid with pH =1

1=-log [H^+]

[H^+]= 10^{-1}M

Step-2: Calculate the [H^+] for a strong acid with pH= 2

2=-log[H^+]

[H^+]= 10^{-2}M

Step-3: Calculate the moles of H^+ for a strong acid with pH =1

Moles of H^+= [H^+] ×V(L)

= 10^{-1}M × 0.050

= 0.005moles

Step-4: Calculate the moles of H^+ for a strong acid with pH =2

Moles of H^+= [H^+] ×V(L)

= 10^{-2}M × 0.050

= 0.0005 moles

Step-5 Calculate the total moles of H^+ in the solution

Total moles of H^+ = (0.005+ 0.0005) moles

= 0.0055 mol

Total volume of mixture = (0.05 +0.05)L
= 0.1L

Step-6 Calculate the total concentration of H^+ in the solution.

[H^+] = Total moles of H^+/ Total volume

= 0.0055 mol /0.1L

= 0.055 M

Now, pH of the solution = -log[H^+]

=-log[0.055]

= 1.26

Q-4: Which of the following is not an amphiprotic species?

a) HCO_3^-
b) HPO_4^{2-}
c) OH^-
d) $H_2PO_4^{2-}$

Answer: c) OH^-

Explanation: Amphiprotic ions are those ions which can gain or lose hydrogen ions.

Except OH^-, all other species are amphiprotic in nature. OH^- can gain a proton to form H_2O but it cannot lose. Hence it is not amphiprotic.

Q-5: Three reactions involving $H_2PO_4^-$ are given below :

i) $H_3PO_4 + H_2O \rightarrow H_3O^+ + H_2PO_4^-$

ii) $H_2PO_4^- + H_2O \rightarrow HPO_4^{2-} + H_3O^+$

iii) $H_2PO_4^- + OH^- \rightarrow H_3PO_4 + O^{2-}$

In which of the following above $H_2PO_4^-$ act as an acid?

a) ii only
b) i) and ii)
c) iii) only
d) i) only

Answer: a) ii only

Explanation: An acid is a material that loses protons and we can clearly see that, only in ii) $H_2PO_4^-$ is donating a proton to water . Thus it acts as an acid.

Q-6: Which of the following compound is most acidic?

a) Cl_2O_7
b) P_4O_{10}
c) SO_3
d) B_2O_3

Answer: a) Cl_2O_7

Explanation: Acidic strength is the tendency of a molecule/compound to liberate protons. In case of proton deficient compounds, acidic strength is governed by the positive oxidation state of the central atom. More is the value of positive oxidation state, more is the acidic strength.

The oxidation states of Cl,P,S and B are +7,+5,+6 and +3 respectively.
This shows that Cl_2O_7 is the most acidic.

Q-7: Identify the basic salt from the following.

a) Na_2CO_3
b) $NaNO_3$
c) KCl
d) NH_4Cl

Answer: a) Na_2CO_3

Explanation: There are three main classification of salts:

Acidic Salt: A salt that is formed by the neutralisation of strong acid and weak base.
Basic Salt: A salt that is formed by the neutralisation of strong base and weak acid.
Neutral Salt: A salt that is formed by the neutralisation of strong acid and strong base.

The hydrolysis of salt can let us know the acid and base from which it is made up.

On hydrolysis of Na_2CO_3 , we will get NaOH(strong base) and H_2CO_3 (weak acid). Since the effect of strong things is always taken into account, hence it is a basic salt.

Q-8: Which of the following can be considered as an example of olfactory indicators?

a) Onion
b) Methyl orange
c) Turmeric
d) China rose

Answer: a) Onion

Explanation: A substance whose smell varies when it is mixed with an acidic or basic solution is said to be an olfactory indicator. In the laboratory, olfactory indicators can be used to determine whether a solution is a basic or an acid, a procedure known as olfactory titration.

Some common examples are Onion, vanilla, clove oil etc.

Q-9: The pH of a solution obtained by mixing 50.00 mL of 0.20 M weak acid HA ($K_a = 10^{-5}$) and 50.00 mL of 0.20M NaOH at room temperature is

a) 2
b) 3
c) 5
d) 9

Answer: d) 9

Explanation: Salt is formed when equal amounts of acids and bases react neutralising the effect of each other.
Here, weak acid(HA) reacts with strong base(NaOH) in the same proportion, thus a basic salt is formed.

Step-1- Calculate the moles of acid
Moles of acid = Molarity × V(L)
= (0.20 mol/L)×(0.05L)
= 0.01 mol

Step-2- Calculate the moles of base
Moles of acid = Molarity × V(L)
= (0.20 mol/L)×(0.05L)
= 0.01 mol

The formula used for calculating pH of a basic salt is:
$pH = \frac{1}{2}(pK_a + pK_w + \log c)$

As $pK_a = -\log K_a$
$= -\log(10^{-5})$
$= 5$
At room temperature, $pK_w = 14$

'C' is the concentration of the salt (NaA)
Let us consider a reaction,

	HA	+ NaOH →	NaA + H_2O	
Initial	0,01mol	0.01 mol	-	-
After reaction	-	-	0.01 mol	

Total volume(L)= (0.05+0.05)L= 0.1L

C= Moles of NaA/Total volume
= 0.01/0.1

= 0.1M

Substituting the values in the formula,
pH= ½(5+14+log(0.1)
= 9

Hence, the pH of the solution is 9.

Q-10: The pH of a solution prepared from 0.005 mole of $Ca(OH)_2$ in 100cc water is
a)10
b) 12
c) 11
d) 13

Answer: d) 13
Explanation:

Step-1-Calculate the $[OH^-]$ in the solution

We know that,

Molarity = Number of moles/Volume(in L)
$[OH^-]$ = 0.005 mol /0.1L
= 0.05 M
Since there are two OH^- ions, therefore $[OH^-]$ = 2× 0.05
= 0.1 M
Note: 100cc =100mL = 0.1L

Step-2- Calculate pOH
pOH = -log$[OH^-]$
= -log(0.1)
= 1
As, pK_w = pH +pOH
Also, at room temperature, pK_w = 14
Substituting the values,
14= pH+1
pH= 13

Hence, the pH of the solution is 13.

Q-11: The pH of 0.1 M solution of the following salts increases in the order

a) NaCl<NH_4Cl<NaCN<HCl
b) HCl< NH_4Cl<NaCl<NaCN
c) NaCN<NH_4Cl<NaCl<HCl
d) HCl<NaCl<NaCN<NH_4Cl

Answer: HCl< NH_4Cl<NaCl<NaCN

Explanation: pH is the measure of whether the solution is acidic, basic or neutral on the basis of its value.

With a pH of 7, salts of a strong acid and a strong base are neutral. Salts of a strong acid and weak base, on the other hand, are acidic with a pH less than 7, and salts of a strong base and weak acid are basic with a pH greater than 7.

NaCl is the salt of strong acid(HCl) and strong base (NaOH) which makes it overall neutral

NH_4Cl is the salt of strong acid (HCl) and weak base(NH_4OH) which makes it acidic but not more than HCl.

NaCN is the salt of weak acid (HCN) and strong base (NaOH) which makes it basic.

HCl is a strong acid.

Thus, the correct order of pH is

HCl< NH_4Cl<NaCl<NaCN

Q-12: Which of the following is not a use of Bleaching powder?

a) Bleaching agent
b) Oxidising agent
c) Used in soda-acid fire extinguishers.
d) Disinfectant

Answer: c) Used in soda-acid fire extinguishers

Explanation: Bleaching powder is represented as $CaOCl_2$.

There are many applications of Bleaching powder:

(i) It is used for bleaching cotton and linen in the textile industry.

(ii) bleaching wood pulp in paper factories and for bleaching washed clothes in laundry.

(iii) as an oxidising agent in many chemical industries.

(iv) to make drinking water free from germs.

Q-13: What is the correct formula of Plaster of Paris?

a) $CaSO_4$
b) $CaSO_4.1/2H_2O$
c) $CaSO_4.2H_2O$
d) $Ca(OH)_2$

Answer: b) $CaSO_4.1/2H_2O$

Explanation:

Plaster of Paris is a material used by doctors to maintain shattered bones in the proper position. Plaster of Paris is a white powder that transforms into gypsum when mixed with water, resulting in a hard solid mass.

Its chemical name is calcium sulphate hemihydrate with the chemical formula of $CaSO_4.1/2H_2O$.

Q-14: If a solution of sodium hydrocarbonate is heated, the product formed is

a) NH_4Cl
b) $NaNO_3$
c) Na_2CO_3
d) $Na_2CO_3.10H_2O$

Answer: c) Na_2CO_3

Explanation: The following reaction takes place:

$$2NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + H_2O + CO_2$$

Q-15: Which of the following salts do not contain water of crystallisation?

a) Baking Soda

b) Gypsum

c) Red vitriol

d) Copper sulphate

Answer: a) Baking soda

Explanation: Water molecules found inside crystals are known as water of crystallisation or water of hydration in chemistry.

Gypsum has a chemical formula of $CaSO_4.2H_2O$

Baking soda has a chemical formula of Na_2CO_3

Red vitriol has a chemical formula of $CoSO_4.7H_2O$

Copper sulphate has a chemical formula of $CuSO_4.5H_2O$

Practise Questions on Acid Bases and Salts

Q-1: What happens when an acid solution is combined with a base solution in a test tube?

a) the solution's temperature rises.
b) The temperature of the solution drops.
c) The solution's temperature remains constant.
d) The production of salt occurs

Select the correct option from below:

(A) (a) only

(B) (a) and (c)

(C) (b) and (d)

(D) (a) and (d)

Answer: D)

Explanation: A reaction of acid with base yields a salt. Such reactions are said to be neutralisation reactions.

A neutralisation reaction is an example of an exothermic reaction(heat releases).

Q-2: To make Plaster of Paris, what temperature is gypsum heated to?

a) 25°C
b) 75°C
c) 80°C
d) 100°C

Answer: d) 100°C

Q-3: The pH of a 2.0 M solution of NH_4Cl is

($K_b(NH_3) = 1.8\times 10^{-5}$)

a) 4.48
b) 6
c) 8
d) 3

Answer: a) 4.48

Explanation: NH_4Cl is a salt of weak base(NH_4OH) and strong acid(HCl)

The pH can be found out using the following formula:

pH= ½(pK_w-pK_b-logC)

=½(14-4.74-log(2))

= 4.48

Note: pK_b= -logK_b

Q-4: The salt having pH dependent of its concentration is

a)$(CH_3COO)C_5H_5NH$

b) NH_4CN

c) NaCl

d) K_2CO_3

Answer: d) K_2CO_3

Explanation: Except weak acid and weak base salt, all other salts pH are dependent on their concentration.

Neutral salts like NaCl are also concentration independent.

Q-5: In a dilute aqueous solution of ammonia, which of the following is present?

a) OH^- + NH_3
b) OH^- + NH_4^+
c) H_3O^+ + NH_2^-
d) None of these

Answer: b) OH^- + NH_4^+

Explanation: $NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$