Kerala Board Class 10 Chemistry 2018

Q1. The number of moles in 400 g of $CaCO_3$ is
[Gram atomic masses: Ca = 40 g, C = 12 g, O = 16 g]

Solution:

4 moles

Molecular weight $= 40 + 12 + (3 \times 16) = 100$ g.

Given weight $= 400$ g.

Hence, the number of moles in the 400 g of CaCO = given weight/molecular weight.

Therefore, no. of moles is = 400/100 = 4 moles.

Q2. Which of the following is a reversible reaction?

A: $NaCl(aq) + AgNO_3(aq) \rightarrow NaNO_3(aq) + AgCl(s)$
B: $NH_4Cl(s) \rightleftharpoons NH_3(g) + HCl(g)$

Solution:

This is reversible reaction: $NH_4Cl(s) \rightleftharpoons NH_3(g) + HCl(g)$. When you heat ammonium chloride (NH_4Cl), it breaks down into ammonia gas (NH_3) and hydrogen chloride gas (HCl).

But if you cool the gases (NH_3 and HCl), they can combine again to form solid ammonium chloride.

Q3. Find the relation and fill in the blank.
Amino group: - NH_2
Carboxylic group: _____

Solution: -

The correct relation would be Carboxylic Acid: -COOH.

Q4. Which colour is given by cobalt oxides to glass?

Solution:

Cobalt oxides are used to make glass look blue. They help in adding a bright blue shade to the glass.

Q5. The medicines which relieve pain are called _____.

Solution:

The medicines which relieve pain are called analgesics. They are commonly used to ease discomfort caused by injuries, illnesses, or medical conditions.

Q6. The balanced chemical equation for the formation of ammonia gas by the reaction between nitrogen gas and hydrogen gas is given.

$N_2 + 3H_2 \rightarrow 2NH_3$

(a) Write the ratio between the number of moles of reactants and products in the correct order.

(b) How many moles of ammonia are formed when 6 moles of N_2 react with 6 moles of H_2?

Solution:

(a) The ratio of moles of reactants to products is 1:3:2, following the correct sequence.

(b) When 6 moles of nitrogen (N_2) react with 6 moles of hydrogen (H_2), 4 molecules of ammonia (NH_3) are produced. This shows the balanced proportion of reactants and products in the reaction.

Q7. (a) Which of the following statements is correct about chemical equilibrium?

(i) At equilibrium, both the reactants and products coexist.

(ii) At equilibrium, the rate of forward reaction is greater than the rate of backward reaction.

(b) Write any one activity to increase the red colour in the following reaction:

$Fe(NO_3)_3(aq) + 3KCNS(aq) \rightleftharpoons Fe(CNS)_3(aq) + 3KNO_3(aq)$

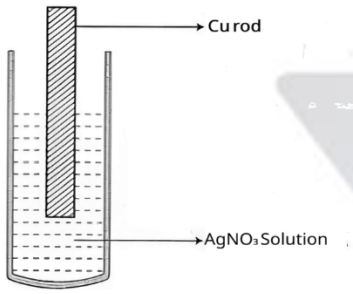
(light yellow) (colourless) (Red) (Colourless)

Solution:

(a) At equilibrium, reactants and products are present together. This means the chemical reaction has reached a stable state where their amounts remain constant over time.

(b) In this reaction, adding more reactants can help to increase the red colour in the given reaction, hence adding $Fe(NO_3)_3$ or KCNS is enough to increase the red colour in the reaction.

Observe the diagram showing a copper rod kept immersed in silver nitrate solution.



a. What is the colour change of the solution?
b. Write the balanced chemical equation for the reaction.

Solution:

(a) The solution changes its colour to blue.

(b) $Cu(s) + 2AgNO_3(aq) \rightarrow Cu(NO_3)_2(aq) + 2Ag(s)$ is the balanced chemical equation for the reaction

Q8. (a) Write an example for a metal, which can be refined by liquation.
(b) What is calcination?

Solution:

(a) Tin and lead are metals that can be purified using the liquation process. This method involves melting the metals to separate them based on their different melting points.

(b) Calcination is the process of heating the concentrated ore to a temperature below its melting point in order to remove any impurities that can easily evaporate. This helps purify the ore by getting rid of unwanted substances.

Q9. Esters are obtained by the reaction between alcohols and carboxylic acids.
a. Write the chemical formula of ethyl ethanoate.
b. Write the chemical equation for the formation of ethyl ethanoate.

Solution:

(a) $CH_3 - COO - CH_2 - CH_3$ is the chemical formula for ethyl ethanoate
(b) $CH_3 - COOH + CH_3 - CH_2 - OH \rightarrow CH_3 - COO - CH_2 - CH_3 + H_2O$ is the chemical equation for the formation of ethyl ethanoate.

Q10. (a) What is gram atomic mass?
(b) Calculate the following:
(i) How many gram atoms of sodium are present in 115 g sodium?
(ii) Mass of 5 g atoms of calcium.
[Hint: Gram atomic masses: Na = 23 g, Ca = 40 g]

Solution:

(a) The mass in grams of an element is equal to its atomic mass

(b) (i) $\left(\frac{115}{23}\right) = 5$

(ii) $5 \times 40\ \text{g} = 200\ \text{g}$

Q11. The outermost shell electronic configuration of an element 'A' (symbol given is not real) is $3S^2, 3P^4$.
a. To which period of the periodic table does this element belong?
b. Find the group number of the element.
c. Which is the block to which the element belongs?

Solution:

(a) This element belongs to the 3rd period of the periodic table.
(b) The group number of the element is 16.
(c) The element belongs to the 'p' block.

Q12. What happens to the rate of the forward reaction of the equilibrium,
$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g) + \text{Heat}$, during the situations?
a. increase in temperature
b. SO_3 is removed
c. pressure is decreased

Solution:

(a) When the temperature increases, the rate of the forward reaction decreases.

(b) If SO_3 is removed, the rate of the forward reaction increases.

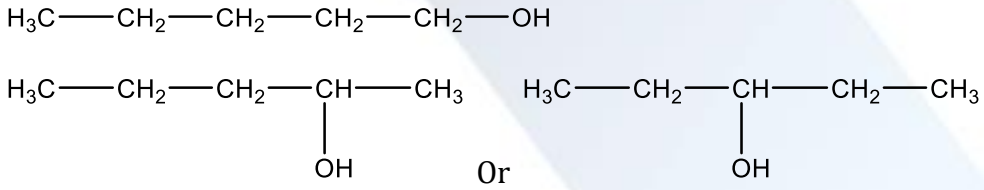
(c) When the pressure is decreased, the rate of the forward reaction decreases as well.

Q13. (a) What are isomers?
(b) Write the structural formulae of any two positions of isomers of alcohol with molecular formula $C_5H_{12}O$.

Solution:

(a) Isomers are compounds that share the same molecular formula but differ in their physical and chemical characteristics.

(b) Structural formulas of any two positional isomers of alcohol with the same molecular formula are:
$C_5H_{12}O$ are given below:



Q14. Petroleum is a mixture of different hydrocarbons.
a. Which method is used for separating the components of petroleum?
b. Which is the hydrocarbon present in liquified petroleum gas(LPG)?
c. Write any two environmental issues caused by the excessive consumption of fossil fuels.

Solution:

(a) Fractional distillation is a process used to separate different parts of petroleum based on their boiling points.

(b) Butane is the main hydrocarbon found in LPG. It is one of the gases that is commonly used as a fuel in homes.

(C) Excessive use of fossil fuels leads to two major environmental problems: carbon monoxide poisoning and the increase of carbon dioxide, which causes global warming. These issues not only harm human health but also contribute to the overall warming of the planet.

Q15. There are subshells in shells around the nucleus.
a. What is the maximum number of electrons that can be accommodated in the d-subshell?
b. Write the possible subshells in the 3rd shell in the increasing order of energy.
c. Which of the following is the outermost electronic configuration of copper? (Atomic number = 29)

A: $3d4s^2$

B: $3d^{10}4s^1$

Justify your answer.

Solution:

(a) The d-subshell can hold up to 10 electrons at most. This is because it has five orbitals, and each orbital can hold two electrons. Therefore, the total capacity of the d-subshell is 10 electrons.

(b) The possible subshells in the 3rd shell in the increasing order of energy is as given below:
3s<3p<3d

(c) Copper's outermost electron configuration is $3d^{10}4s^1$ because it needs extra stability. This arrangement helps copper maintain a stable state, as the 3d orbital is filled while the 4s orbital has one electron.

Q16. Ions are the current carriers in electrolytes.
a. Sodium chloride in a solid-state is not an electrical conductor, but molten sodium chloride can conduct electricity. Give reason
b. What are the products obtained at anode and cathode during electrolysis of molten sodium chloride?
c. If an aqueous solution of sodium chloride is subjected to electrolysis, what are the products obtained at each electrode?

Solution:

(a) Electrolyte ions can move freely when the electrolyte is in a molten state or dissolved in water (aqueous solution). This movement of ions allows the electrolyte to conduct electricity. In contrast, solid sodium chloride cannot conduct electricity because its ions are fixed in place and cannot move freely.

(b) When molten sodium chloride undergoes electrolysis, sodium is produced at the cathode, and chlorine is released at the anode. This happens because the ions move towards the respective electrodes where they gain or lose electrons.

(c) During the electrolysis of an aqueous solution of sodium chloride, hydrogen gas is produced at the cathode, while chlorine gas is released at the anode. This is due to the presence of water, which affects the movement and discharge of ions.

Q17. Different methods are used for the concentration of ores.
(a) 'What is the ore of aluminium?'
(b) Explain how the ore of aluminium is concentrated by leaching.

Solution:

(a) Aluminium is obtained from an ore called bauxite ($Al_2O_3.2H_2O$). This ore is the main source of aluminium used in various products.
(b) A common example of the leaching process is the extraction of aluminum from bauxite ($Al_2O_3.2H_2O$). In this process, bauxite is treated with a hot, concentrated sodium hydroxide (NaOH) solution. Sodium hydroxide reacts with aluminum in the bauxite, dissolving it into the solution. However, impurities like iron oxide (Fe_2O_3), titanium dioxide (TiO_2), and silicon dioxide (SiO_2) do not dissolve and remain as solid residues. This helps in separating aluminum from the unwanted materials.

Q18. Organic compounds are obtained through different chemical reactions.
a. What is the difference between substitution reactions and addition reactions?
b. Complete the following reactions:
(i) $CH_3 - CH_3 + Cl_2 \rightarrow +HCl$
(ii) $CH_3 - CH = CH - CH_3 + HI \rightarrow$

Solution:

(a) Substitution reactions occur when an atom or a group of atoms in a molecule is replaced by another atom or group. On the other hand, addition reactions involve unsaturated organic compounds, which have double or triple bonds, reacting with other molecules to form saturated compounds. In substitution, one part is swapped, while in addition, new parts are added without removing anything.

(b) (i) $CH_3 - CH_3 + Cl_2 \rightarrow CH_3 - CH_2 - Cl + HCl$
(ii) $CH_3 - CH = CH - CH_3 + HI \rightarrow CH_3 - CH_2 - CH - CH_3$

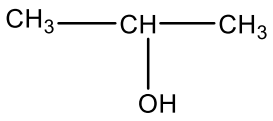
Q19. The structural formulae of some organic compounds are given below:
(i) $CH_3 - CH_2 - CO - CH_3$
(ii) $CH_3 - CH_2 - CH_2 - CHO$
(iii) $CH_3 - CH_2 - CH_2 - OH$
(iv) $CH_3 - CH_2 - CH_2 - CH_3$
a. Which of these is an alkane?
b. Write the structural formula of the position isomer of the third compound.

c. Which of these given compounds are functional isomers?
d. Write the structural formula of the chain isomer of the fourth compound.

Solution:

(a) (iv) The alkane among these is CH_3-CH_2-CH_2-CH_3.

(b) The structural formula for the positional isomer of the third compound is given as follows:



(c) (i) $CH_3 - CH_2 - CO - CH_3$ and (ii) $CH_3 - CH_2 - CH_2 - CHO$ are functional isomers.

(d) The structural formula of the chain isomer of the fourth compound is given as follows: