CHEMISTRY

NCERT - FULL MARKS CHEMISTRY(TAMIL)

BASIC CONCEPTS OF CHEMISTRY AND CHEMICAL CALCULATIONS

Calculations Based On Stoichiometry

1. How many moles of hydrogen is required to produce 10 moles of ammonia ?

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2. Calculate the amount of water produced by the combustion of 32 g of methane.

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3. How much volume of carbon dioxide is produced when 50 g of calcium carbonate is heated completely under standard conditions?

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4. How much volume of chlorine is required to form 11.2 L of HCl at 273 K and 1 atm pressure ?

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5. Calculate the percentage composition of the elements present in magnesium carbonate. How many kilogram of CO_2 can be obtained by heating 1 kg of 90 % pure magnesium carbonate.

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Evaluate Yourself

1. By applying the knowledge of chemical classification, classify each of the following into elements, compounds or mixtures.

(i) Sugar

(ii) Sea water

(iii) Distilled water

(iv) Carbon dioxide

(v) Copper wire

(vi) Table salt

(vii) Silver plate

(viii) Naphthalene balls

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2. Calculate the molar mass of the following.

Ethanol (C_2H_5OH)

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3. Calculate the molar mass of the following.

Potassium permanganate $(KMnO_4)$

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4. Calculate the molar mass of the following.

Potassium dichromate $(K_2Cr_2O_7)$

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5. Calculate the molar mass of the following.

Sucrose $(C_{12}H_{22}O_{11})$

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6. Calculate the number of moles present in 9 g of ethane.

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7. Calculate the number of molecules of oxygen gas that occupies a volume of 224 ml at 273 K and 3 atm pressure.

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8. 0.456 g of a metal gives 0.606 g of its chloride. Calculate the equivalent mass of the metal.

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9. Calculate the equivalent mass of potassium dichromate. The reduction half-reaction in acid medium is,

$$Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O$$

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10. A Compound on analysis gave the following percentage composition C=54.55%, H=9.09%, O=36.36%. Determine the empirical formula of the compound.

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11. Experimental analysis of a compound containing the elements x,y,z on analysis gave the following data. x = 32 %, y = 24 %, z = 44 %. The relative number of atoms of x, y and z are 2, 1 and 0.5, respectively. (Molecular mass of the compound is 400 g) Find out.

i) The atomic masses of the element x,y,z.

ii) Empirical formula of the compound and

iii) Molecular formula of the compound.

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12. The balanced equation for a reaction is given below

$2x + 3y \rightarrow 4l + m$

When 8 moles of x react with 15 moles of y, then

i) Which is the limiting reagent?

ii) Calculate the amount of products formed.

iii) Calculate the amount of excess reactant left at the end of the reaction.

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13. Balance the following equation using oxidation number method

$$Ag_2S_3 + HNO_3 + H_2O \rightarrow H_3AsO_4 + H_2SO_4 + NO$$

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Evaluation Choose The Best Answer

1. 40 ml of methane is completely burnt using 80 ml of oxygen at room temperature The volume of gas left after cooling to room temperature is

A. 40 ml CO_2 gas

B. 40 ml CO_2 gas and 80 ml H_2O gas

C. 60 ml CO_2 gas and 60 ml H_2O gas

D. 120 ml CO_2 gas

Answer: a

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2. An element X has the following isotopic composition $^{200}X = 90\,\%$, $^{199}X = 8\,\%$ and $^{202}X = 2\,\%$. The weighted average atomic mass of the element X is closest to

A. 201 u

B. 202 u

C. 199 u

D. 200 u

Answer: d

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3. Assertion : Two mole of glucose contains 12.044×10^{23} molecules of glucose

Reason : Total number of entities present in one mole of any substance is equal to 6.02×10^{22}

A. both assertion and reason are true and the reason is the correct explanation of assertion

B. both assertion and reason are true but reason is not the correct explanation of assertion

C. assertion is true but reason is false

D. both assertion and reason are false

Answer: c

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4. Carbon forms two oxides, namely carbon monoxide and carbon dioxide. The equivalent mass of which element remains constant?

A. Carbon

B. oxygen

C. both carbon and oxygen

D. neither carbon nor oxygen

Answer: b

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5. The equivalent mass of a trivalent metal element is 9 g eq^{-1} the molar mass of its anhydrous oxide is

A. 102 g

B. 27 g

C. 270 g

D. 78 g

Answer: a

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6. The number of water molecules in a drop of water weighing 0.018 g is

A. 6.022×10^{26}

B. 6.022×10^{23}

C. 6.022×10^{20}

D. 9.9×10^{22}

Answer: c

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7. 1 g of an impure sample of magnesium carbonate (containing no thermally decomposable impurities) on complete thermal decomposition gave 0.44 g of carbon dioxide gas. The percentage of impurity in the sample is

A. $0\ \%$

B. $4.4\ \%$

C. $16\ \%$

D. 8.4%

Answer: c

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8. When 6.3 g of sodium bicarbonate is added to 30 g of acetic acid solution, the residual solution is found to weigh 33 g. The number of moles of carbon dioxide released in the reaction is

A. 3

B. 0.75

C. 0.075

D. 0.3

Answer: c

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9. When 22.4 litres of H_2 (g) is mixed with 11.2 litres of Cl_2 (g), each at 273 K at 1 atm the moles of HCl (g), formed is equal to

A. 2 moles of HCl (g)

B. 0.5 moles of HCl (g)

C. 1.5 moles of HCl (g)

D. 1 moles of HCl (g)

Answer: d

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10. Hot concentrated sulphuric acid is a moderately strong oxidising agent. Which of the following reactions does not show oxidising behaviour?

A. $Cu + 2H_2SO_4 \rightarrow CuSO_4 + SO_2 + 2H_2O$

B. $C + 2H_2SO_4 \rightarrow CO_2 + 2SO_2 + 2H_2O$

C. $BaCl_2 + H_2SO(4) \rightarrow BaSO_4 + 2HCl$

D. none of the above

Answer: c

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11. Choose the disproportionation reaction among the following redox reactions.

A. $3Mg(s) + N_2(g) \rightarrow Mg_3N_2(s)$

B. $P_4(s) + 3NaOH + 3H_2O \rightarrow PH_3(g) + 3NaH_2PO_2(aq)$

C. $Cl_2(g) + 2KI(aq) \rightarrow 2KCl(aq) + I_2$

D. $Cr_2O_3(s) + 2Al(s) \rightarrow Al_2O_3(s) + 2Cr(s)$

Answer: b

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12. The equivalent mass of potassium permanganate in alkaline medium is

$$MnO_4^- + 2H_2O + 3e^- \rightarrow MnO_2 + 4OH^-$$

A. 31.6

B. 52.7

C. 79

D. None of these

Answer: b

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13. Which one of the following represents 180g of water?

A. 5 Moles of water

B. 90 moles of water

C. $\frac{6.0[illegible] \quad 3}{[illegible]}$ molecules of water

D. 6.022×10^{24} molecules of water

Answer: d

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14. 7.5 g of a gas occupies a volume of 5.6 litres at $0^{\circ}C$ and 1 atm pressure. The gas is

A. NO

B. N_2O

C. CO

D. CO_2

Answer: a

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15. Total number of electrons present in 1.7 g of ammonia is

A. 6.022×10^{23}

B. $\frac{6.022 \times 10^{22}}{1.7}$

C. $\frac{6.022 \times 10^{24}}{1.7}$

D. $\frac{6.022 \times 10^{23}}{1.7}$

Answer: a

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16. The correct increasing order of the oxidation state of sulphur in the anions

$SO_4^{2-}, SO_3^{2-}, S_2O_4^{2-}, S_2O_6^{2-}$ is

A. $SO_3^{2-} < SO_4^{2-} < S_2O_4^{2-} < S_2O_6^{2-}$

B. $SO_4^{2-} < S_2O_4^{2-} < S_2O_6^{2-} < SO_3^{2-}$

C. $S_2O_4^{2-} < SO_3^{2-} < S_2O_6^{2-} < SO_4^{2-}$

D. $S_2O_6^{2-} < S_2O_4^{2-} < SO_4^{2-} < SO_3^{2-}$

Answer: c

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17. The equivalent mass of ferrous oxalate is

A. $\frac{\text{molar mass of ferrous oxalate}}{1}$

B. $\frac{\text{molar mass of ferrous oxalate}}{2}$

C. $\frac{\text{molar mass of ferrous oxalate}}{3}$

D. none of these

Answer: c

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18. If Avogadro number were changed from 6.022×10^{23} to 6.022×10^{20}, this would change

A. the ratio of chemical species to each other in a balanced equation

B. the ratio of elements to each other in a compound

C. the definition of mass in units of grams

D. the mass of one mole of carbon

Answer: d

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19. Two 22.4 litre containers A and B contains 8 g of O_2 and 8 g of SO_2 respectively at 273 K and 1 atm pressure, then

A. Number of molecules in A and B are same

B. Number of molecules in B is more than that in A

C. The ratio between the number of molecules in A to number of molecules in B is 2:1

D. Number of molecules in B is three times greater than the number of molecules in A.

Answer: c

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20. What is the mass of precipitate formed when 50 ml of 8.5 % solution of $AgNO_3$ is mixed with 100 ml of 1.865 % potassium chloride solution?

A. 3.59 g

B. 7 g

C. 14 g

D. 28 g

Answer: a

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21. The mass of a gas that occupies a volume of 612.5 ml at room temperature and pressure (25° c and 1 atm pressure) is 1.1g. The

molar mass of the gas is

A. $66.25 g\ mol^{-1}$

B. $44 g\ mol^{-1}$

C. $24.5\ g\ mol^{-1}$

D. $662.5 g\ mol^{-1}$

Answer: b

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22. Which of the following contain same number of carbon atoms as in 6 g of carbon-12.

A. 7.5 g ethane

B. 8 g methane

C. both (a) and (b)

D. none of these

Answer: c

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23. Which of the following compound(s) has /have percentage of carbon same as that in ethylene (C_2H_4)

A. propene

B. ethyne

C. benzene

D. ethane

Answer: a

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24. Which of the following is/are true with respect to carbon -12.

A. relative atomic mass is 12 u

B. oxidation number of carbon is +4 in all its compounds.

C. 1 mole of carbon-12 contain 6.022×10^{22} carbon atoms.

D. all of these

Answer: a

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25. Which one of the following is used as a standard for atomic mass.

A. ${}_6C^{12}$

B. ${}_7C^{12}$

C. ${}_6C^{13}$

D. ${}_6C^{14}$

Answer: a

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Evaluation Write Brief Answer To The Following Questions

1. The density of carbon dioxide is equal to 1.965 kgm^{-3} at 273 K and 1 atm pressure. Calculate the molar mass of CO_2

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2. Which contains the greatest number of moles of oxygen atoms

i) 1 mol of ethanol

ii) 1 mol of formic acid

iii) 1 mol of H_2O

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3. Calculate the average atomic mass of naturally occurring magnesium using the following data

Isotope	Isotopic atomic mass	Abundance (%)
Mg^{24}	23.99	78.99
Mg^{26}	24.99	10.00
Mg^{25}	25.98	11.01

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4. In a reaction $x + y + z_2 = \quad xyz_2$ identify the Limiting reagent if any, in the following reaction mixtures.

(a) 200 atoms of x + 200 atoms of y + 50 molecules of z_2

(b) 1 mol of $x + 1$ mol of $y + 3$ mol of z_2

(c) 50 atoms of $x + 25$ atoms of $y + 50$ molecules of z_2

(d) 2.5 mol of $x + 5$ mol of $y + 5$ mol of z_2

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5. Mass of one atom of an element is 6.645×10^{-23} g. How many moles of element are there in 0.320 kg.

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6. What is the empirical formula of the following ?

(i) Fructose $(C_6H_{12}O_6)$ found in honey

(ii) Caffeine $(C_8H_{10}N_4O_2)$ a substance found in tea and coffee.

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7. The reaction between aluminium and ferric oxide can generate temperatures up to 3273 K and is used in welding metals. (Atomic mass of AC = 27 u Atomic mass of 0 = 16 u)

$2Al + Fe_2O_3 \rightarrow Al_2O_3 + 2Fe$, If, in this process, 324 g of aluminium is allowed to react with 1.12 kg of ferric oxide.

i) Calculate the mass of Al_2O_3 formed.

ii) How much of the excess reagent is left at the end of the reaction?

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8. How many moles of ethane is required to produce 44 g of $CO_{2(g)}$ after combustion.

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9. Hydrogen peroxide is an oxidising agent. It oxidises ferrous ion to ferric ion and reduced itself to water. Write a balanced equation.

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10. Calculate the empirical and molecular formula of a compound containing 76.6% carbon, 6.38 % hydrogen and rest oxygen its vapour density is 47.

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11. A Compound on analysis gave Na = 14.31% S = 9.97% H= 6.22% and O= 69.5% calculate the molecular formula of the compound if all the hydrogen in the compound is present in combination with

oxygen as water of crystallization. (molecular mass of the compound is 322).

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12. Balance the following equations by oxidation number method

$$K_2Cr_2O_7 + KI + H_2SO_4 \rightarrow K_2SO_4 + Cr_2(SO_4)_3 + I_2 + H_2O$$

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13. Balance the following equations by oxidation number method

$$KMnO_4 + Na_2SO_3 \rightarrow MnO_2 + Na_2SO_4 + KOH$$

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14. Balance the following equations by oxidation number method

$$Cu + HNO_3 \rightarrow Cu(NO_3)_2 + NO_2 + H_2O$$

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15. Balance the following equations by oxidation number method

$$KMnO_4 + H_2C_2O_4 + H_2SO_4 \rightarrow K_2SO_4 + MnSO_4 + CO_2 + H_2O$$

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16. Balance the following equations by ion electron method.

$$KMnO_4 + SnCl_2 + HCl \rightarrow MnCl_2 + SnCl_4 + H_2O + KCl$$

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17. Balance the following equations by ion electron method.

$C_2O_4^{2-} + Cr_2O_7^{2-} \rightarrow Cr^{3+} + CO_2$ (in acid medium)

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18. Balance the following equations by ion electron method.

$Na_2S_2O_3 + I_2 \rightarrow Na_2S_4O_6 + NaI$ (in acid medium)

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19. Balance the following equations by ion electron method.

$Zn + NO_3^- \rightarrow Zn^{2+} + NO$

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