CHEMISTRY

JEE MAIN AND ADVANCED

SOME BASIC CONCEPTS OF CHEMISTRY

Example

1. Define science in short.

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2. Classify the following as pure substances or mixtures, give reasons.

(i) Graphite (ii) Milk

(iii) Air (iv) Diamond

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3. Classify the following substances into element, compound and mixture.

(i) Smoke (ii) Mercury.

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4. Identify the following as homogeneous and heterogeneous mixture.

(i) Aerated drinks (ii) Brass

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5. Prefix yocto, atto and zeta stands for which multiples ?

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6. Define metre.

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7. Write the SI unit of luminous intensity and the amount of substance.

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8. Chromium is added to steel to impart strength and shine. If the density of chromium is $7.19 g / cm^3$. Express in SI unit $\left(kg / m^3\right)$.

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9. Express the following in scientific notation.

(1) 175000

(2) 0.17

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10. Express the following mathematical operations in scientific notation.

(1) $\left(6.6 \times 10^5\right) \times \left(7.7 \times 10^9\right)$

(2) $\left(6.6 \times 10^{5}\right) \times \left(7.7 \times 10^{-7}\right)$

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11. Express the following mathematical operations in scientific notation.

(1) $\dfrac{7.7 \times 10^{9}}{6.6 \times 10^{5}}$

(2) $\dfrac{7.7 \times 10^{-7}}{6.6 \times 10^{-5}}$

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12. Express the following mathematical operations in scientific notation.

(1) $\left(7.7 \times 10^{4}\right) + \left(0.77 \times 10^{5}\right)$

(2) $\left(8.7 \times 10^{4}\right) - \left(0.77 \times 10^{5}\right)$

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13. Express the following numbers to four significant figures.

(1) 6.608792 (2) 42.392800

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14. Express the following numbers to four significant figures.

(1) 1.81234×10^3

(2) 0.008837

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15. What is the sum of 3.368 kg and 2.02 kg ?

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16. The mass of wood block is 6.932 g. If density of wood is $7.7g/cm^3$, what is its volume ?

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17. Express the result of the following calculations to the appropriate number of significant digits.

$6.66 \times 3.33 + 216.67$

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18. Express the following calculations to the proper number of significant figures.

$$\frac{\left(2.34 \times 10^{-8}\right)(0.5)}{6.4}$$

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19. A tumbler contains 3 L of water Calculate the volume of the water in m^3.

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20. Express the following in SI units.

(i) $-20^{\circ} C$

(ii) 60 mg

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21. Density of a metallic object is $5.6 g / cm^3$. Express it in kg / m^3.

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22. 10.0 g of $CaCO_3$ on heating gave 4.4 g of CO_2 and x g of CaO. Applying law of conservation of mass calculate the mass of CaO.

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23. Copper oxide was prepared by two different methods. In case, 1.75 g of the metal gave 2. 19 g of oxide. In the second case, 1.14 g of the metal gave

1.43 g of the oxide, show that the given data illustrate the law of constant proportions.

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24. Hydrogen and oxygen are known to from two compounds. The hydrogen content in one one of these is 5.93% while in the other it is 11.2%. Show that this data illustrates the law of multiple proportions.

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25. Nitrogen occurs in nature in the form of two isotopes with atomic mass 14 and 15 respectively. If average atomic mass of nitrogen is 14.0067, what is the % abundabce of the two isotopes ?

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26. Calculate the molecular mass of NH_3 molecule.

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27. Calculate mass of one atom of nitrogen in gram.

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28. Calculate mass of one molecule of methane (CH_4)

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29. Calculate the number of atoms in 0.5 mole atoms of nitrogen.

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30. Find the percentage of calcium in calcium carbonate $(CaCO_3)$.

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31. What is the simplest formula of the compound which has the following percentage composition - Carbon 80%. Hydrogen 20% ? If the molecular mass is 30, calculate its molecular formula.

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32. How many gram of oxygen (O_2) is required to completely react with 0.200 g of hydrogen (H_2) to yield water (H_2O) ? Also calculate the amount of water formed (molecular mass H = 2, O = 32).

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33. How much magnesium sulphide can be obtained from $2.00g$ of Mg and $2.00g$ of S by the reaction.

$Mg + S \rightarrow MgS$. Which is the limiting reagent? Calculate the amount of one of the reactants which remains unreacted?

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34. A solution is prepared by adding 5 g of a substance x to 18 g of water. Calculate the mass percent of the solute.

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35. A solution is prepared by adding 360 g of glucose to 864 g of water. Calculate mole fraction of glucose (molar mass of glucose = 180).

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36. A given solution of NaOH contains 4.00 g of NaOH per litre of solution. Calculate the molarity of this solution.

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37. A solution contains 10 moles of sucrose in 1 kg of solvent. Calculate the molality of solution.

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38. Calculate Molarity of 40% NaOH (w/W). The density of solution is 1.2 g/ml.

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39. The molarity of $NaNO_3$ solution is 1 M. The density of solution is 1.25 g/ml. Calculate molality of solution. (Molar-Mass of $NaNO_3 = 85g$).

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40. 500 ml of $0.1MAlCl_3$ is mixed with 500 ml of $0.1MMgCl_2$ solution. Then calculate the molarity of Cl^- in final solution.

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41. Mole fraction of urea in its aqueous solution is 0.2, them molality of the solution will be.

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42. 20 g mixture of Na_2CO_3 and $CaCO_3$ is gently heated. On heating this sample produces 2.24 litre of CO_2 at STP. Calculate the % weight of Na_2CO_3 in that sample.

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43. 0.9031 g of a mixture of NaCl and KCl on treatment with H_2SO_4 gave 1.0784 g of a mixture of Na_2SO_4 and K_2SO_4. Calculate percentage composition of the original mixture.

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44. When 15 g of a mixture of NaCl and Na_2CO_3 is heated with dilute HCl, 2.5 g of CO_3 is evolved at NTP. Calculate percentage composition of the original mixture.

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45. 1 g sample of $KClO_3$ was heated under such conditions that a part of it decomposed according to the equation :

$2KClO_3 \rightarrow 2KCl + 3O_2$ and the remaining underwent change according to the equation : $4KClO_3 \rightarrow 3KClO_4 + KCl$

If the amount of O_2 evolved was 146.8 ml at S.T.P., calculate the % by weight of $KClO_4$ in the reside.

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46. 1 mole of hydrocarbon on complete combustion give 4 mole of CO_2. Calculate no of carbon in hydrocarbon.

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47. 56 g of an element M combines with 16 g of oxygen to form its oxide of type MO. Find out

(a) Equivalent mass of element

(b) Equivalent mass of oxide

(Assume law of conservation of mass to be valid).

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48. Calculate the normality of solution of 4.9 % (w/v) of H_2SO_4.

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49. How many equivalents of H_2SO_4 are required to completely react with 4 g NaOH ?

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50. Calculate the normality of HCl solution whose 500 ml is utillised to neutralise the 1500 ml of $\frac{N}{10}$ NaOH solution.

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51. Calculate the % of free SO_3 in an oleum, that is labelled 118%.

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Try Yourself

1. Name two life saving drugs.

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2. Write two challenges to chemists of future.

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3. Classify the following as pure substances or mixtures, give reasons.

A. Petrol

B. Tap water

C. Distilled water

D. Oxygen

Answer:

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4. Classify the following as pure substance or mixture and given reasons.

A. 22 carat gold

B. Wood

C. Cloud

D. Iron

Answer:

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5. Classify the following substances into element, compound and mixture.

(i) Brass

(ii) Distilled water

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6. Classify the following substances into element, compound and mixture.

(i) Dry ice.

(ii) Sodium chloride.

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7. Identify the following as homogeneous and heterogeneous mixtures.

(i) Sugar dissolved in water.

(ii) Oil and water

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8. Identify the following as homogeneous and heterogeneous mixtures.

(i) Alcohol and water

(ii) Sand and iron filings

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9. Prefix zepto and femto stands for which multiples ?

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10. Prefix tera and giga stands for which multiples ?

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11. Define second.

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12. Define kelvin.

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13. Write the SI unit of thermodynamic temperature.

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14. Write the SI unit of electric current.

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15. Express $20^{\circ} C$ in kelvin scale.

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16. Express $-20^{\circ}C$ in kelvin scale.

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17. Express 900.00 in scientific notation.

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18. Express $\left(2.2 \times 10^{4}\right) \times \left(3.3 \times 10^{5}\right)$ in scientific notation.

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19. Express $\frac{6.6 \times 10^{9}}{5.5 \times 10^{7}}$ in scientific notation.

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20. Express $\left(6.6 \times 10^4\right) + \left(0.55 \times 10^5\right)$ in scientific notation.

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21. Express $\left(6.6 \times 10^4\right) - \left(0.55 \times 10^5\right)$ in scientific notation.

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22. Express the following number to two significant figures

(i) 5.602792

(ii) 3.3402800

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23. Express the following numbers to three significant figures.

(i) 6.022×10^{23}

(ii) 44.216

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24. What is the sum of 5.228 kg and 1.02 kg ? Express the result to the appropriate significant figures .

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25. What will be the length of a metre stick of 5.602 m when 2.8 m portion is cut from it ? Express the result to the appropriate significant figures.

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26. The mass of a metal block is 5.432 g. If density of metal is $6.4 g / cm^3$, what is its volume ? Express the result to the appropriate significant figures.

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27. Perform the following calculations to the appropriate number of signficiant digits $2.6 \times 10^3 + 2.4 \times 10^2 - 1.4 \times 10^2$

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28. Perform the following calculations to the appropriate number of signficiant digits $\frac{6.02 \times 10^{23} \times 4.00}{4.0 \times 10^{20}}$

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29. Convert the following in kilogram.

(i) $0.91 \times 10^{-27} g$ (Mass of electron)

(ii) $3.34 \times 10^{-24} g$ (Mass of hydrogen molecule)

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30. Density of an object is $3g/cm^3$. Express it in kg/m^3.

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31. When 6.4 g of $NaHCO_3$ is added to a solution of CH_3COOH weighing 20. It is observed that 4.4 g of CO_2 is released into atmosphere and a residue is left behind Calculate the mass of residue by applying law of conservation of mass.

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32. If 12.6 g of $NaHCO_3$ are added to 30.0 g of CH_3COOH solution, the residue is found is found to weight 36.0 g. What is the mass CO_2 released in the reaction ?

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33. 2,75 g of cupric oxide was reduced by heating in a current of hydrogen and the weight of copper that remained was 2.196 g. Another experiment, 2.358 g of copper was dissolved in nitric acid and the resulting copper nitrate converted into cupric oxide by ignition. The weight of cupric oxide

formed was 2.952 g. Show that these results illustrate law of constant composition.

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34. 12.976 g of lead combines with 2.004 g of oxygen to form PbO_2. PbO_2 can also be produced by heating lead nitrate and it was found that the percentage of oxygen present in PbO_2 is 13.38 %. With the help of given informations, illustrate the law of constant composition.

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35. On analysis it was found that the black oxide of copper and red oxide of copper contain 80% and 89% of copper respectively. Show that this data is in accordance with law of multiple proportions.

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36. Sulphur and oxygen are known to form two compounds. The sulphur content in one of these is 51 % while in the other is 41 %. Show that this data is in agreement with the law of multiple proportions.

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37. Boron has two isotopes, B-10 and B-11. The average atomic mass of boron is found to be 10.80u. Calculate the percentage of abundance of these isotopes.

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38. Carbon found nature as a mixture of C-12 and C-13. The average atomic mass of carbon is 12.011u. What is the percentage abundance of carbon-12 in nature ?

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39. Calculate the molecular mass of CH_4 molecule in amu.

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40. Calculate the molecular mass of glucose $(C_6H_{12}O_6)$ molecule in amu.

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41. Calculate mass of one atom of calcium in gram.

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42. Calculate mass of one molecule of sulphur dioxide (SO_2) in gram.

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43. Calculate number of atoms in 0.5 mole of oxygen atoms.

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44. Calculate number of atoms in 0.2 mole of oxygen atoms.

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45. Calculate percentage of sulphur in sulphuric acid (H_2SO_4).

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46. Calculate percentage of carbon in ethanol (C_2H_5OH).

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47. A substance on analysis, gave the following percentage composition : Na = 43.4 %, C = 11.3%, O = 45.3 %. Calculate the empirical formula. (Na = 23, C = 12, O = 16).

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48. An organic compound on analysis gave the following data : C = 57.82%, H=3.6%, and 38.58% is oxygen. Find its empirical formula.

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49. Calculate the amount of water (g) produced by the combustion of 16 g of methane.

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50. How many moles of methane are required to produce $22gCO_2$ for combustion ?

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51. 50.0 kg of $N_2(g)$ and 10.0 kg of $H_2(g)$ are mixed to produce $NH_3(g)$. Calculate the $NH_3(g)$ formed. Identify the limiting reagent in the production of NH_3 in this situation.

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52. 80 g of H_2 is reacted with 80 g of O_2 to form water. Find out the mass of water obtained. Which substance is the limiting reagent ?

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53. A solution is prepared by dissolved 4 g of a solute in 18 g of water. Calculate the mass percent of the solute.

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54. A solution is prepared by dissolved 2 g of a solute in 36 g of water. Calculate the mass percent of the solute.

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55. A solution is prepared by adding 10 g of NaCl to 18 g of water. Calculate mole fraction of NaCl. (Molar mass of NaCl = 58.5 g).

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56. A solution is prepared by adding 64 g of CH_3OH to 180 g of water. Calculate the mole fraction of CH_3OH. (Molar mass of $CH_3OH = 32g$) .

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57. A given solution of NaOH contains 2.00 g of NaOH per litre of solution. Calculate the molarity of this solution.

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58. How many moles of HCl are present in 1 litre of 1 M HCl solution ?

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59. Calculate the molality of a solution containing 8 moles of sucrose in 250 g of solvent.

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60. The density of 3 M solution of NaCl is $1.25 \mathrm{g\ mL}^{-1}$. The molality of the solution is :

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Assignment Section A Objective Type Questions One Option Is Correct

1. Which of the following is not a unit of length / distance ?

A. Picometer

B. Light year

C. Kilometre

D. Radian

Answer: D

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2. The correctly reported difference of 19.3226 and 8.06 will have siginificant figures equal to

A. Three

B. Four

C. Six

D. Five

Answer: B

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3. On dividing 0.86 by 16.564, the actual answer is 0.0519198. The correctly reported answer will be

A. 0.05

B. 0.051

C. 0.0519

D. 0.05191

Answer: B

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4. The correctly reported answer of the addition of 142. 138, 3.214 and 17 will be

A. 162.352

B. 162.35

C. 162.4

D. 162

Answer: D

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5. After rounding of 5.235 and 5.225 to three significant figures , we will have answers respectively as

A. $5.23, 5.22$

B. $5.24, 5.123$

C. $5.23, 5.23$

D. $5.24, 5.22$

Answer: D

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6. The actual product of 5.786 and 4.2 is 24.3012 . The correctly reported answer will be

A. 24

B. 24.3

C. 24.30

D. 24.301

Answer: A

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7. Which one of the following samples contains the smallest number of atoms ?

A. 1 g of CO_2

B. 1 g of C_8H_{18}

C. 1 g of C_2H_6

D. 1 g of LIF

Answer: A

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8. A sample of ammonium phosphate $(NH_4)_3PO_4$ contains 3.18 moles of hyrogen atoms . The number of moles of oxygen atoms in the sample is

A. 0.265

B. 0.795

C. 1.06

D. 4.00

Answer: C

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9. 4.0 g of NaOH contains

A. 6.022×10^{23} atoms of H

B. 4 g atoms of Na

C. 6.022×10^{22} atoms of Na

D. 4 moles of NaOH

Answer: C

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10. The number of significant figures in 0.0035 is

A. 4

B. 5

C. 2

D. 3

Answer: C

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11. Atomic weight of chlorine is 35.5 . It has two isotopes of atomic weight 35 and 37 . What is the percentage of the heavier isotope in the sample ?

A. 5

B. 10

C. 25

D. 20

Answer: C

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12. In which of the following numbers all zeros are significant ?

A. 0.0007

B. 0.007

C. 70

D. 0.7

Answer: C

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13. The prefix atto stands for

A. 10^{-9}

B. 10^{-12}

C. 10^{-18}

D. 10^{-15}

Answer: C

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14. Which one of the following is not an element ?

A. Graphite

B. Water

C. Diamond

D. Nitrogen

Answer: B

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15. Which one of the following statements is correct ?

A. All elements are heterogenous in nature

B. Compounds made up of a number of elements are heterogenous

C. A mixture is always heterogenous

D. Air is a homogenous mixture

Answer: D

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16. Which one of the following statements is false ?

A. An element of a substance contains only one kind of atoms

B. Milk is a homogenous mixture

C. A compound can be decomposed into its constituents

D. All homogenous mixtures are called solutions

Answer: B

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17. A balanced chemical equation is in accordance with

A. Avogadro's law

B. Law of constant proportions

C. Law of conservation of mass

D. Law of gaseous volumes

Answer: C

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18. When pentane , C_5H_{12} is burned in excess oxygen , the products of the reaction are $CO_2(g)$ and $H_2O(l)$. The balanced equation for this combustion is $C_5H_{12}(g) + xO_2(g) \rightarrow 5CO_2(g) + 6H_2O(l)$

The coefficient (x) of oxygen should be

A. 16

B. 12

C. 11

D. 8

Answer: D

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19. Which one of the following best explains the law of conservation of mass ?

A. No change in mass is observed when 2.0 g of Mg is heated in vacuum

B. 1.2 g of carbon when burnt in excess of oxygen consumes only 3.2 g of it to form 4.4 g of carbon dioxide

C. 12.g of carbon when heated in air produces only 20 g of carbon monoxide

D. A sample of $CaCO_3$ on heating does not show any change in mass of C_aCO_3 but volume increases

Answer: B

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20. The percentage of hydrogen in water and hydrogen peroxide is 11 .1 and 5.9 respectively . These figures illustrate

A. Law of multiple proportions

B. Law of conservation of mass

C. Law of constant proportions

D. Law of combining volumes

Answer: A

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21. Element X forms five stable oxides with oxygen of formula X_2O, XO, X_2O_3, X_2O_5 . The formation of these oxides explains

A. Law of definite proportions

B. Law of partial pressures

C. Law of multiple proportions

D. Law of reciprocal proportions

Answer: C

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22. Which of the following represents Avogadro's hypothesis ?

A. Gases react together in volumes which bear a simple ratio to one another

B. Equal volumes of all gases under same conditions of temperature and pressure contain equal number of molecules

C. Equal volumes of all gases under same condition of temperature and pressure contain equal number of atoms

D. The rates of diffusion of gases are inversely proportional to the square root of their densities

Answer: B

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23. Two oxides of a metal contain 27.6% and 30.0% of Oxygen, respecttively. If the formula of the first be M_3O_4. Find that of the second.

A. XO

B. XO_2

C. X_2O_5

D. X_2O_3

Answer: D

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24. Which of the following is not a physical quantity of measurement ?

A. Length

B. Rust

C. Mass

D. Density

Answer: B

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25. Physical properties can be measured

A. By changing density of a substance

B. By changing composition of a substance

C. Without changing the composition of a substance

D. By oxidation of a substance

Answer: C

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26. When 200 g of lime strongly heated , it undergoes thermal decomposition to form 112 g of lime and unknown mass of carbon dioxide gas as $\underset{200g}{CaCO_3} \rightarrow \underset{112g}{CaO} + \underset{?}{CO_2}$

What will be the mass of CO_2 formed ?

A. 88 g

B. 24 g

C. 64 g

D. 40 g

Answer: A

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27. Carbon and oxygen react in ratio 3 : 8 by mass to form CO_2 . What weight of carbon should be used to react completely with 32 g of oxygen ?

A. 10 g

B. 15 g

C. 12 g

D. 7 g

Answer: C

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28. Molecular mass of C_3H_7OH is

A. 60 u

B. 40 u

C. 30 u

D. 50 u

Answer: A

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29. If an atom of an element has twice the mass of C-12 , then its atomic mass will be nearly

A. 12 u

B. 24 u

C. 36 u

D. 48 u

Answer: B

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30. Formula unit mass of K_2CO_3 is

(Atomic mass of $K = 39u$, $C = 12u$ and O = 16 u)

A. 67 u

B. 138 u

C. 150 u

D. 134 u

Answer: B

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31. The number of moles of nitrogen atom in 56 g nitrogen is

A. 2 mol

B. 4 mol

C. 8 mol

D. 10 mol

Answer: B

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32. The number of mole of N - atom in $18.066x10^{23}$ nitrogen atoms is

A. 1 mol

B. 2 mol

C. 3 mol

D. 4 mol

Answer: C

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33. The number of particles presents in 1 mol of nitrogen atom are

A. 6.022×10^{25}

B. 6.022×10^{24}

C. 6.022×10^{23}

D. 6.022×10^{22}

Answer: C

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34. Molality is expressed in units of

A. mol kg^{-1}

B. mol L^{-1}

C. mol $L^{-1}s^{-1}$

D. $mol^{1}g^{-1}s^{-1}$

Answer: A

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35. Which of the following is correct ?

A. The sum of mole fractions of all the components in a solution is always unity

B. Mole fraction depends upon temperature

C. Mole fraction is always negative

D. Mole fraction is independent of content of solute in solution

Answer: A

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36. What weight in grams is represented by 1.5 moles of sulphur dioxide ?

A. 60 g

B. 74 g

C. 96 g

D. 91 g

Answer: C

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37. The number of atoms in 20 g of SO_3 is approximately

A. 1×10^{23}

B. 1.5×10^{23}

C. 2×10^{23}

D. 6×10^{23}

Answer: D

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38. A solution is prepared by dissolving 10 g of KOH in 100 ml of solution . Its molarity is

A. 4.0 M

B. 1 .09 M

C. 1.78 M

D. 2.50 M

Answer: C

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39. How many moles of sodium chloride present in 250 mL of a 0.50 M NaCl solution ?

A. 0.125 mol

B. 0.150 mol

C. 0.075 mol

D. 0.02 mol

Answer: A

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40. Calculate the molality of solution containing 3 g glucose dissolved in 30 g of water . (molar mass of glucose = 180)

A. 0.50 m

B. 0.56 m

C. 0.091 m

D. 0.05 m

Answer: B

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41. Which of the following methods of expressing concentration varies with temperature ?

A. Molality

B. Weight percent

C. Molarity

D. Mole fraction

Answer: C

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42. Which of the following is incorrect according to Dalton's atomic theory ?

A. Matter is made up of atoms

B. Atoms of same element are different in mass and properties

C. Atoms combine in a simple whole number ratio

D. Atoms take part in a chemical combination

Answer: B

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43. What is the molarity of NaOH solution if 250 mL of it contains 1 mg of NaOH ?

A. $10^{-1}M$

B. $10^{-2}M$

C. $10^{-4}M$

D. $10^{-3}M$

Answer: C

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44. The percentage of nitrogen in HNO_3 is

A. $22.22\ \%$

B. 0.35

C. 0.2857

D. 0.45

Answer: A

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45. The precentage composition of calcium , carbon and oxygen in C_aCO_3 respectively are

A. 40% , 12% and 48%

B. 12% , 40% and 48%

C. 40% , 48% and 12%

D. 12% , 48% and 40%

Answer: A

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46. The correct relationship between molecular mass (M) and vapour (VD) is

A. VD = 2 M

B. $VD = \frac{M}{2}$

C. VD = M^2

D. M = $(VD)^{\frac{1}{2}}$

Answer: B

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Assignment Section B Objective Type Questions One Option Is Correct

1. The total number of ions present in 1 ml of 0.1 M barium nitrate solution is

A. 6.02×10^8

B. 6.02×10^{10}

C. $3.0 \times 6.03 \times 10^{19}$

D. $3.0 \times 6.02 \times 10^8$

Answer: C

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2. Which of the following has lowest weight ?

A. 6.023×10^{22} molecules of glucose

B. 18 ml of water at $4^\circ C$

C. 11200 ml of CH_4 at STP

D. 5.6 litre of CO_2 at STP

Answer: C

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3. The volume of 0.1 M $Ca(OH)_2$ needed for the neutralization of 40 ml of 0.05 M oxalic acid is

A. 10 ml

B. 20 ml

C. 30 ml

D. 40 ml

Answer: B

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4. A compound contains 3.2% of oxygen. The minimum mol. Wt. of the compound is

A. 300

B. 440

C. 350

D. 500

Answer: D

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5. The mole fraction of glucose in aqueous solution is 0.2 then molality of solution will be

A. 13.8

B. 55.56

C. 2

D. 12

Answer: A

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6. A metal oxide contains 60% metal . The equivalent weight of metal is

A. 12

B. 60

C. 40

D. 24

Answer: A

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7. The number of meutrons in a drop water $(20drops = 1mL)$ at $4^\circ C$

A. 6.023×10^{22}

B. 1.338×10^{22}

C. 6.023×10^{20}

D. 7.338×10^{22}

Answer: B

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8. What volume of CO_2 at STP will evolve when 1 g of $CaCO_3$ reacts with excess of dill . HCI ?

A. 224 ml

B. 112 ml

C. 56 ml

D. 448 ml

Answer: A

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9. 1.82 g of a metal required 32.5 mL of N-HCl to dissolve it what is the equivalent weight of metal?

A. 46

B. 65

C. 56

D. 42

Answer: C

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10. $1g$ of calcium was burnt in excess of O_2 and the oxide was dissolved in water to make up $1L$ solution. Calculate the normality of alkaline soluiton.

A. 0.04

B. 0.4

C. 0.05

D. 0.5

Answer: C

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11. The normality of solution obtained by mixing 100 ml of 0.2 M H_2SO_4 with 100 ml of 0.2 M NaOH is

A. 0.1

B. 0.2

C. 0.5

D. 0.3

Answer: A

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12. 0.45 g of a dibasic acid is completely netralised with 100 ml $\frac{N}{10}$ NaOH . The molecular weight of acid is

A. 45

B. 90

C. 180

D. 22.5

Answer: B

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13. A sample of pure calcium weighing 1.35 g was quantitatively converted to 1.88 g of pure CaO . Atomic mass of calcium is

A. 20

B. 40

C. 60

D. 30

Answer: B

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14. For the reaction,

$3Zn^{2+} + 2K_4\left[Fe(CN)_6\right] \rightarrow K_2Zn_3\left[Fe(CN)_6\right]_2 + 6K^+$, what will be the equivalent weight of $K_4\left[Fe(CN)_6\right]$, if the molecular weight of $K_4\left[Fe(CN)_6\right]$ is M ?

A. M

B. $\frac{M}{2}$

C. $\frac{M}{3}$

D. $\frac{M}{4}$

Answer: C

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15. Equivalent weight of H_3PO_2 is ($M \rightarrow$ molecular weight)

A. $\frac{M}{1}$

B. $\frac{M}{2}$

C. $\frac{M}{3}$

D. $\frac{M}{4}$

Answer: A

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16. 0.92 g of Ag_2CO_3 is heated strongly beyond its melting point . After heating the amount of residue is

A. 0.36 g

B. 0.39 g

C. 0.77 g

D. 0.72 g

Answer: D

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17. When 400 g of a 20% solution by weight was cooled, 50 g of solute precipitated. What is the percentage by mass of solute in the remaining solution ?

A. 8.57%

B. 15%

C. 12.25%

D. 9.5%

Answer: A

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18. Which of the following solution has normality equal to molarity ?

A. H_2SO_4 aqueous solution

B. H_3PO_4 aqueous solution

C. HNO_3 aqueous solution

D. $Mg(OH)_2$ aqueous solution

Answer: C

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19. For the reaction

$Ba(OH)_2 + 2HClO_3 \rightarrow Ba(ClO_3)_2 + 2H_2O$ calculate the no. of moles of H_2O formed when 0.1 mole of $Ba(OH)_2$ is treated with 0.0250 moles of $HClO_3$.

A. 0.1

B. 0.125

C. 0.25

D. 0.025

Answer: D

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20. Ammonia gas is passed into water, yielding a solution of density $0.93g/cm^3$ and containing 18.6% NH_3 by weight. The mass of NH3 per cc of the solution is :

A. 0.17 g / cm^3

B. 0.34 g / cm^3

C. 0.51 g / cm^3

D. 0.68 g / cm^3

Answer: A

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21. The molecular formula of a commercial resin used for exchanging ions in water softening is $C_8H_7SO_3Na(mol.\ Wt.\ 206)$. What would be the maximum uptake of Ca^{2+} ions by the resin when expressed in mole per gram resin?

A. 0.00246

B. 0.0246

C. 0.246

D. 0.0048

Answer: A

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22. A mixture of 1.65×10^{21} molecules of X and 1.85×10^{21} molecules of Y weighs 0.688 g . The mol . wt . Of X is (Assume mol . wt . Of Y is 187)

A. 52

B. 84

C. 126

D. 41.47

Answer: D

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23. Vapour density of mixture of NO_2 and N_2O_4 is 34.5 , then percentage abundance of NO_2 in mixture is

A. $50\ \%$

B. $25\ \%$

C. $40\ \%$

D. $60\ \%$

Answer: A

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24. A mixture of FeO and Fe_3O_4 when heated in air to a constant weight, gains 5% of its weight. Find the composition of the intial mixutre.

A. 79 . 75

B. 20 . 25

C. 30 . 25

D. 10 . 25

Answer: B

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25. 1 ml of gaseous aliphatic compound $C_nH_{3n}O_m$ is completely burnt in an excess of O_2 . The contraction in volume is

A. $\left(1+\frac{1}{2}n-\frac{3}{4}m\right)$

B. $\left(1+\frac{3}{4}n-\frac{1}{4}m\right)$

C. $\left(1+\frac{1}{4}n-\frac{1}{4}m\right)$

D. $\left(1+\frac{3}{4}n-\frac{1}{2}m\right)$

Answer: D

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Assignment Section C Objective Type Questions More Than One Options Are Correct

1. Which of the following contains the greatest number of atoms ?

A. 1 g of O

B. 1 g of O_2

C. 1g of O_3

D. 1 g F_2

Answer: A::B::C

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2. Many elements have non -integral atomic masses because

A. They have isotopes

B. The isotopes have non - integral atomic masses

C. Their isotopes have different masses

D. The constituents neutrons , protons and electrons combine to give fractional masses

Answer: A::C

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3. For the reaction ,

A + 2B ___ C + 2D

The correct statement is

A. Equivalents of A = 2 x equivalents of B

B. Moles of A reacted = Moles of D formed

C. Equivalents of B = Equivalents of C

D. Moles of B reacted = $\frac{\text{Moles of C formed}}{2}$

Answer: C::D

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4. 10 g carbon reacts with 100 g CI_2 to form CCI_4 The correct statement is

A. Carbon is the limiting reagent

B. CI_2 is the limiting reagent

C. 108 . 41 g CCI_4 is formed

D. 0.833 moles of CCI_4 are formed

Answer: B::C

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5. 12 g of Mg (at. Mass 24) will react completely with acid to give

A. 1 mole of O_2

B. $\frac{1}{2}$ mole of H_2

C. 1 equivalent of H_2

D. 2 equivalents of H_2

Answer: B::C

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6. 0.5 gm of fuming H_2SO_4 (Oleum) is diluted with water. This solution is completely neutralised by 26.7 ml of 0.4 M $NaOH$ solution. Calculate the percentage of free SO_3 in the given sample. Give your answer excluding the decimal places.

A. Mass of SO_3 is 0.104 g

B. % of free $SO_3 = 20:7$

C. Normality of H_2SO_4 for neutralization is 0.2 N

D. Weight of H_2SO_4 is 0.104 g

Answer: A::B

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7. A given solution of H_2SO_4 is labelled as 49% (w/w) , then correct statement regarding the solution is $\left(d = 1.3\frac{g}{m}l\right)$

A. $m = \frac{500}{51}$

B. $N = \frac{1000}{51}$

C. $\% \frac{w}{v} = (49 \times 1.3)\%$

D. M = 6.5

Answer: A::C::D

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8. Out of following , which molecules has same weight under identical volume at STP ?

A. $._{}^{14}CO_2$

B. NO_2

C. $._{}^{13}CO_2$

D. CO_2^{18}

Answer: A::B

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9. Choose the correct statement regarding equivalent weight

A. Equivalent weight of a substance always remain same

B. Equivalent weight of substance depends on reaction

C. Equivalent weight may be greater than atomic weight

D. Equivalent weight may be less than atomic weight

Answer: B::C::D

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10. 11.2 L of CH_4 and 22.4 L of C_2H_6 at STP are mixed. Then choose correct statement/ statements

A. Vapour density of the mixture is 12.67

B. Average molecular wt. will be less than 16

C. Average molecular wt. will be greater than 16 and less than 30

D. Average molecular wt. will be greater than 30

Answer: A::C

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11. Choose the correct match/matches

A. 18 ml of H_2O at $4^\circ C - N_A$ molecule of H_2O

B. 11.2 L of CO_2 at - $\frac{N_A}{2}$ molecule of $CO_2 273^\circ C$ and 1 atm

C. 56 g of $Fe^{57} - N_A$ atom

D. 5.6 L of CH_4 at STP - 4 g weight

Answer: A::D

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Assignment Section D Linked Comprehension Type Questions

1. Avogadro's law states that under similar condition of T and P, equal number of particles. Experiments show that at one atmosphere pressure and at a temperature 273 K (i.e. at STP) one mole of any gas occupy a volume approximately 22.4 litre. Therefore number of moles of any sample of gas can be found by comparing its volume at STP with 22.4. 1

mole of any species contains 6.023×10^{23} particles which is denoted by symbol N_A. Number of atoms present in 1 gm-atom of an element or number of molecules present in 1 gm-molecule of any substance is equal to N_A. Hence it is number of particles present in one mole of the substance.

If N_{AV} is Avogardo's number, then 10 amu will be equal to _____ gram.

A. $10N_{AV}$

B. $\frac{N_{AV}}{10}$

C. $\frac{10}{N_{AV}}$

D. N_{AV}

Answer: C

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2. Avogadro's law states that under similar condition of T and P, equal number of particles. Experiments show that at one atmosphere pressure and at a temperature 273 K (i.e. at STP) one mole of any gas occupies a

volume approximately 22.4 litre. Therefore number of moles of any sample of gas can be found by comparing its volume at STP with 22.4. 1 mole of any species contains 6.023×10^{23} particles which is denoted by symbol N_A. Number of atoms present in 1 gm-atom of an element or number of molecules present in 1 gm-molecule of any substance is equal to N_A. Hence it is number of particles present in one mole of the substance.

At STP 11.2 L of CO_2 contains.

A. 1 mol

B. 2 mol

C. 0.5 mol

D. 3 mol

Answer: C

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3. Avogadro's law states that under similar condition of T and P, equal number of particles. Experiments show that at one atmosphere pressure and at a temperature 273 K (i.e. at STP) one mole of any gas occupies a volume approximately 22.4 litre. Therefore number of moles of any sample of gas can be found by comparing its volume at STP with 22.4. 1 mole of any species contains 6.023×10^{23} particles which is denoted by symbol N_A. Number of atoms present in 1 gm-atom of an element or number of molecules present in 1 gm-molecule of any substance is equal to N_A. Hence it is number of particles present in one mole of the substance.

The number of gm atoms of oxygen present in 0.2 mole of $H_2S_2O_8$ is.

A. 0.2

B. 8

C. 1.6

D. 0.8

Answer: C

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4. 36 ml of a gaseous mixture consisting of a gaseous organic compound A and just sufficient amount of oxygen required for complete combustion gives 16 ml of CO_2, 24 ml water vapour and 8 ml of N_2. The volumes are measured at same temperature and pressure.

Volume of O_2 required for complete combustion

A. 8 ml

B. 28 ml

C. 74 ml

D. 22 ml

Answer: B

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5. 36 ml of a gaseous mixture consisting of a gaseous organic compound A and just sufficient amount of oxygen required for complete combustion gives 16 ml of CO_2, 24 ml water vapour and 8 ml of N_2. The volumes are measured at same temperature and pressure.

The molecular formula of compound will be.

A. CH_5N

B. C_2H_5N

C. $C_2H_6N_2$

D. $C_4H_{10}N_2$

Answer: C

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Assignment Section E Assertion Reason Type Questions

1. STATEMENT -1 : H_3PO_4 is a tribasic acid.

and

STATEMENT -2 : In H_3PO_4, only two H-atoms are replaceable.

A. Statement -1 is True, Statement -2 is True, Statement -2 is a correct explanation for Statmenet -1.

B. Statement -1 is True, Statement -2 is True, Statement-2 is NOT a correct explanation for Statement -1

C. Statement -1 is True, Statement -2 is False

D. Statement -1 is False, Statmenet -2 is True

Answer: C

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2. STATEMENT -1 : Solvent have always same physical state as that of solution.

and

STATEMENT -2 : Solution contains more than one solvent.

A. Statement -1 is True, Statement -2 is True, Statement -2 is a correct explanation for Statmenet -1.

B. Statement -1 is True, Statement -2 is True, Statement-2 is NOT a correct explanation for Statement -2

C. Statement -1 is True, Statement -2 is False

D. Statement -1 is False, Statmenet -2 is True

Answer: C

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3. STATEMENT -1 : Molality is equal to molarity, if density of solution is one.

and

STATEMENT -2 : Molality does not depend on the temperature.

A. Statement -1 is True, Statement -2 is True, Statement -2 is a correct explanation for Statmenet -1.

B. Statement -1 is True, Statement -2 is True, Statement-2 is NOT a correct explanation for Statement -1

C. Statement -1 is True, Statement -2 is False

D. Statement -1 is False, Statmenet -2 is True

Answer: D

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4. STATEMENT -1 : On dilution, molarity of solution changes.

and

STATEMENT -2 : Number of moles of solute in a solution does not change on dilution.

A. Statement -1 is True, Statement -2 is True, Statement -2 is a correct explanation for Statmenet -1.

B. Statement -1 is True, Statement -2 is True, Statement-2 is NOT a correct explanation for Statement -1

C. Statement -1 is True, Statement -2 is False

D. Statement -1 is False, Statmenet -2 is True

Answer: B

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5. STATEMENT -1 : Equivalent weight of an acid is always less than its molecular weight.

and

STATEMENT -2 : Equivalent weight of acid $= \frac{\text{Molecular weight}}{\text{n-factor}}$

A. Statement -1 is True, Statement -2 is True, Statement -2 is a correct explanation for Statmenet -1.

B. Statement -1 is True, Statement -2 is True, Statement-2 is NOT a correct explanation for Statement -1

C. Statement -1 is True, Statement -2 is False

D. Statement -1 is False, Statmenet -2 is True

Answer: D

6. STATEMENT -1 : In any chemical reaction, total No. of molecules are conserved.

and

STATEMENT -2 : Atom can neither be created nor be destroyed.

A. Statement -1 is True, Statement -2 is True, Statement -2 is a correct explanation for Statmenet -1.

B. Statement -1 is True, Statement -2 is True, Statement-2 is NOT a correct explanation for Statement -6

C. Statement -1 is True, Statement -2 is False

D. Statement -1 is False, Statmenet -2 is True

Answer: D

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7. STATEMENT -1 : During a chemical reaction, total mass remains constant.

and

STATEMETN -2 : Moles may vary in a reaction.

A. Statement -1 is True, Statement -2 is True, Statement -2 is a correct explanation for Statmenet -1.

B. Statement -1 is True, Statement -2 is True, Statement-2 is NOT a correct explanation for Statement -1

C. Statement -1 is True, Statement -2 is False

D. Statement -1 is False, Statmenet -2 is True

Answer: C

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8. STATEMENT -1 : Compound having same general formula may have different empirical formula.

and

STATEMENT -2 : Compound having same empiricals formula may have different general formula.

A. Statement -1 is True, Statement -2 is True, Statement -2 is a correct explanation for Statmenet -1.

B. Statement -1 is True, Statement -2 is True, Statement-2 is NOT a correct explanation for Statement -1

C. Statement -1 is True, Statement -2 is False

D. Statement -1 is False, Statmenet -2 is True

Answer: D

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9. STATEMENT -1 : 18 ml of H_2O and 18 ml of CO_2 at 277 K have same no. of moles.

and

STATEMENT -2 : Density of H_2O is more than CO_2.

A. Statement -1 is True, Statement -2 is True, Statement -2 is a correct explanation for Statmenet -1.

B. Statement -1 is True, Statement -2 is True, Statement-2 is NOT a correct explanation for Statement -9

C. Statement -1 is True, Statement -2 is False

D. Statement -1 is False, Statmenet -2 is True

Answer: D

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10. STATEMENT -1 : In 32 g of O_2, two gram of oxygen atom are present.

and

STATEMENT -2 : Molecular weight of O_2 will be 32 g.

A. Statement -1 is True, Statement -2 is True, Statement -2 is a correct explanation for Statmenet -1.

B. Statement -1 is True, Statement -2 is True, Statement-2 is NOT a correct explanation for Statement -10

C. Statement -1 is True, Statement -2 is False

D. Statement -1 is False, Statmenet -2 is True

Answer: C

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Assignment Section F Matrix Match Type Questions

1. Match the following

	Column -I		Column -II
(A)	Number of carbon atoms in 1 g molecule of CO_2	(p)	$0.5N_0$
(B)	Number of molecules in 48 g O_2	(q)	N_0
(C)	No. of molecules in 11.2 L H_2 at STP	(r)	$3N_0$
(D)	No of hydrogen atoms in 1 Mole of NH_3	(s)	$1.5N_0$
	(N_0 = Avogadro's Number)		

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2. Match the following

	Column -I		Column -II
(A)	$\underset{3g}{2H_2} + \underset{22.66g}{O_2} \rightarrow 2H_2O$	(p)	25.5g product
(B)	$\underset{21g}{N_2} + \underset{5g}{3H_2} \rightarrow 2NH_3$	(q)	H_2 is present in excess
(C)	$\underset{1g}{H_2} + \underset{40g}{Cl_2} \rightarrow 2HCl$	(r)	H_2 is the limiting reagent
(D)	$\underset{20g}{C} + \underset{6.375g}{2H_2} \rightarrow CH_4$	(s)	36.5g product

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3. Match the followin

	Column -I		Column -II (mole fractio
(A)	1 mole $KClO_3$ + 2 mole	$KClO_4$	(p) K^+ ions is 0.5
(B)	1 mole K_2CO_3 + 1 mole	$NaNO_3$	(q) HCO_3^- ions is 0.166
(C)	1 mole $KHCO_3$ + 2 mole	$KClO_4$	(r) Na^+ ions is 0.2
(D)	2 mole $NaClO_4$ + 1 mole	$KHCO_3$	(s) ClO_4^- ions is 0.33
			(t) No. of mole of oxygen ato

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Assignment Section G Integer Answer Type Questions

1. Number of hydrogen atoms in 36 ml of H_2O at 277 K are x N_A. X is _____.

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2. 5.6 litre of the gas have 1 g weight at STP Then atomic weight of the gas is _____.

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3. How much amount of $CaCO_3$ in gram having percentage purity 50 percent produces 0.56 litre of CO_2 at STP on heating ?

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4. Equivalent weight of Pottash alum is $\frac{M_1}{x}$ and equivalent weight of gypusum is $\frac{M_2}{y}$. Then x - y will be.

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5. An Oleum is labelled as 105%. Then 100 g of this Oleum will react with y gram of water. What will be value of y ?

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Assignment Section H Multiple True False Type Questions

1. STATEMENT -1 : Solution is the example of homogeneous mixture.

STATEMENT -2 : Homogeneous mixture have uniform composition.

STATEMENT -3 : A solution may contain more than one solute.

A. TTT

B. FTT

C. TTF

D. FFT

Answer: A

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2. STATEMENT -1 : Equal weight of $.^{14}$ CO_2 and NO_2 have same number of molecule.

STATEMENT -2 : $.^{14}$ CO_2 and NO_2 have same molecular weight.

STATEMENT - 3 : Equal volume of CO_2 and NO_2 have same weight.

A. TFF

B. TTF

C. FTT

D. FFT

Answer: B

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3. STATEMENT - 1 : Equivalent weight of Mohr salt is $\frac{M}{4}$, where M is molecular weight.

STATEMENT - 2 : Mohr salt contains only one metallic cation i.e., Fe^{2+}

STATEMENT - 3 : Equivalent weight of a salt $= \frac{\text{Molecular weight}}{\text{Total positive charge}}$

A. TTT

B. FTF

C. TFT

D. FFT

Answer: A

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4. STATEMENT - 1 : Equivalent weight of a substance can never be greater than its molecular weight.

STATEMENT - 2 : Equivalent weight of boric acid is $\frac{M}{1}$ where M is the molecular weight.

STATEMENT - 3 : Equivalent weight of H_3PO_2 is $\frac{M}{3}$.

A. TTF

B. TFT

C. FTT

D. TFF

Answer: A

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5. STATEMENT - 1 : Law of conservation of mass is valid in nuclear reaction.

STATEMENT - 2 : On dilution, normality of the solution changes.

STATEMENT - 3 : Molarity of the solution does not depend on amount of solution.

A. TTT

B. FTT

C. FFT

D. TFF

Answer: B

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Assignment Section I Subjective Type Questions

1. A gaseous mixture contains $40\,\%\,O_2, 40\,\%\,N_2, 10\,\%\,CO_2, 10\,\%\,CH_4$ by volume. Calculate the vapour density of the gaseous mixture.

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2. 11.2 litre of a hydrocarbon at STP produces 44.8 litre of CO_2 at STP and 36 gm of H_2O during its combustion. Calculate the molecular formula of hydrocarbon.

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3. 10 g impure NaOH is completely neutralised by 1000 ml of $\frac{1}{10}NHCl$. Calculate the percentage purity of the impure NaOH.

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4. Calculate the total number of atoms in 2 litre gaseous mixture of CH_4 and SO_2 at STP which have vapour density 26.

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5. P and Q arer two elements which form P_2Q_3 and PQ_2. If 0.15 mole of P_2Q_3 weights 15.9 g and 0.15 mole og PQ_2 weighs 9.3 g then, what are atomic weights of P and Q ?

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6. How many sulphur atom will be present in 2 litre of centi normal aq. Solution of H_2SO_4 ?

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7. Calculate the equivalent weight of following assuming molecular weight M

(i) H_3BO_3

(ii) H_3PO_2

(iii) $FeSO_4.(NH_4)_2.6H_2O$

(iv) $K_2SO_4Cr_2(SO_4)_3.24H_2O$

(v) Al_2O_3

(vi) HNO_3

(vii) $MgCO_3$

(Viii) $CaSO_4$

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8. Calculate the molality of aq. Glucose solution in which mole fraction of glucose is 0.05.

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9. 18.4 gram mixture of $MgCO_3$ and $CaCO_3$ produce 4.48 litre of CO_2 at STP. Then calculate the amount of $MgCO_3$ and $CaCO_3$ in mixture.

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10. 31.3 gram mixture NaBr and NaCl treated with H_2SO_4.28.4 gram of Na_2SO_4 is produced. Then calculate the amount of NaCl and NaBr in the

mixture.

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Assignment Section J Aakash Challenges Questions

1. Mixture of 1 mole of each CH_4 and C_2H_6 absorb 5 mole of Cl_2 to form CCl_4 and C_2Cl_6. Then average molecular wt. of the gaseous mixture is

A. 20

B. 23

C. 35

D. 15

Answer: B

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2. 4.6 g Na is dissolved in 1 litre of water. Then how much H_2 gas will be evolved ?

A. 2.24 L

B. 1.12 L

C. 4.48 L

D. 11.2 L

Answer: A

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3. 5 g of $SrCl_2.6H_2O$ gave 3.442 gm of dry $SrSO_4$, then eq. wt. of Sr will be

A. 43.8

B. 50

C. 87.4

D. 100

Answer: A

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4. One mole of $KClO_3$ is heated in presence of MnO_2. The produced oxygen is used in burning of Al. Then oxide of Al that will be formed.

A. 2 mole

B. 1 mole

C. 4 mole

D. 3 mole

Answer: B

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5. 24 g C is burnt in presence of air gas produced from 1M dibasic acid when passed through 1L water, then correct statement is

A. 12 g C react to form CO_2

B. 8 g C react to form CO_(2)

C. 16 g C react to form CO_(2)

D. 9 g C react to form CO_2

Answer: A

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6. When a gaseous olefinic hydrocarbon is burnt completely in excess of O_2, a contraction in volume equal to double to the volume of hydrocarbon is noticed then hydrocarbon will be

A. C_2H_2

B. C_2H_4

C. C_2H_6

D. C_3H_8

Answer: B

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7. Metal chloride contains 71% chlorine. Then calculate equivanlent weight of that metal bromide (at. Wt. of Br = 80)

A. 14.5

B. 85

C. 94.5

D. 100

Answer: C

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8. A compound contains elements X and Y in 1 : 4 mass ratio. If the atomic masses of X and Y are in ratio 1 : 2, then empirical formula will be

A. XY

B. XY_2

C. X_2Y

D. X_4Y

Answer: B

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9. In which of the following reaction, law of mass conservation is not valid

A. $._4Be^9 + ._2He^4 \rightarrow ._6C^{12} + ._0^1n$

B. $C + O_2 \rightarrow CO_2$

C. $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

D. $NaOH + HCl \rightarrow NaCl + H_2O$

Answer: A

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10. Molarity of pure D_2O will be

A. 55.56

B. 1

C. 50

D. 10

Answer: C

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