CHEMISTRY

BOOKS - V PUBLICATION

SOME BASIC CONCEPTS OF CHEMISTRY

Question Bank

1. A piece.of metal is, 3 inch (represented by in) Iong.

What is its length in cm ?

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2. A jug contains 2 L of milk. Calculate the volume of the milk in m^3.

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3. How many seconds are there in 2 days?

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4. A compound has 93.70 carbon and 6.29 hydrogen. If its molar mass is 128 $gmol^{-1}$, calculate its molecular formula.

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5. Calculate number of moles produced if $200g$ of hydrogen reacts with nitrogen to form ammonia.

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

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6. Calculate the molecular mass of the following.

(i) H_2O

(ii) CO_2

(iii) CH_4

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7. Calculate the mass percentage of elements present in $NaSO_4$ sodium sulphate

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8. Determine the empirical formula of an oxide of iron which contains 69.9% iron and 30.1% oxygen by mass.

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9. Calculate the amount of CO_2 produced when 1 mole of carbon is burned in air

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10. Calculate the mass of sodium acetate (CH_3COONa) required to make 500 mL of 0.375 M aqueous solution, (Molar mass of $CH_3COONa = 82,0245 gmol^{-1}$

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11. Calculate the concentration of nitric acid in moles per litre in a sample which has a density of $1.41 gmL^{-1}$ and the mass percent of nitric acid in it being 69% .

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12. How much copper can be obtained from 100 g of $CuSO_4$

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13. Determine the empirical formula of an oxide of iron which contains 69.9% iron and 30.1% oxygen by mass.

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14. Calculate the following In three moles of ethane (C_2H_6) Number of moles of carbon atoms

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15. Calculate the concentration of sugar $(C_{12}H_{22}O_{11})$ in mol L^{-1} if its 20g are dissolved in water to make a final volume of 2L.

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16. If the density of methanol is '0.793kgL^(-1)', what is its volume needed for making '2.5 L' of its '0.25M'

solution?

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17. Pressure is determined as force per unit area of the surface. The SI unit of pressure, pascal is as shown below :

'IPa=INm^(-2)'

If mass of air at sea level is 1034 'g cm^(-2)', calculate the pressure in pascal.

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18. What is the SI unit of mass? How is it defined?

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19. What do you mean by significant figures?

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20. A sample of drinking water was found to be severely contaminated with chorororm, 'CHCl_3', supposed to be carcinogenic in nature. The level of contamination was 15 ppm (by mass).

i. Express this in percent by mass.

ii..Determine the molality of chloroform in the water sample.

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21. Express the following in the scientific notation:

i. 0.0048

ii. 234,000

iii. 8008

iv. 500.0

v. 6.0012

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22. How many significant figures are present in the following?

i. 0.0025

ii. 208

iii. 5005

iv. 126,000

v. 500.0

vi. 2.0034

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23. Round up the following upto three significant figures: i. 34.216

ii. 10.4107

iii. 0.04597

iv. 2808

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24. If the speed of light is $3.0 \times 10^8 ms^{-1}$ calculate the distance covered by light in 2.00 ' nanosecond.

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25. In a reaction $A + B_2 \rightarrow AB_2$ Identify the limiting reagent, if any, in the following reaction mixtures.

i. 300 atoms of A+200 molecules of B

ii. 2 mol A+3 mol B

iii. 100 atoms of A+100 molecules of B

iv. 5 mol A+2.5 mol B

v. 2.5 mol A+5 mol B

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26. Dinitrogen and dihydrogen react with each other to produce ammonia according to the following chemical equation:

'N_2(g)+3H_2(g) rarr 2NH_3(g)'

i. Calculate the mass of ammonia produced if '2.00 xx 10^3' g dinitrogen reacts with '1.00 xx 10^3 g of dihydrogen.

ii. Will any of the two reactants remain unreacted?

iii. If yes, which one and what would be its mass?

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27. How are 0.50 mol Na_2CO_3 and 0.50 M of Na_2CO_3 different.

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28. If 10 volumes of dihydrogen reacts with 5 volumes of dioxygen gas, how many volumes of water vapour would be produced (volumes are measured under the same conditions)

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29. Convert the following into basic units:

i. 28.7pm

ii. 15.15pm

iii. 25365 mg

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30. Which one of the following will have largest number of atoms?

1g Au (s)

1g Na(s)

1g Li (s)

1g Cl_2 (g)

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31. calculate the molarity of a Solution of ethanol in water in which the mole fraction of ethanol is 0.40.

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32. Calculate the mass of one 12_C atom in gram.

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33. How many significant figures should be present in the answer of the following calculations?

i. '(0.02856 x 298.15 x 0.112)/(0.5785)'

ii. '5 x5.364'

iii. '0.0125+0.7864+0.0215'

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34. Calculate the number of atoms in each of the following.

(i) 52 moles of Ar.

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35. A welding fuel gas contains carbon and hydrogen only. Burning a small sample of î in oxygen gives 3.38

g carbon dioxide, 0.690 g of water and no other products. A volume of 10.0 L (measured at STP) of this welding gas is found to weigh 11.6 g. Calculate (i) empirical formula, (ii) molar mass of the gas, and (iii) molecular formula.

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36. Calcium carbonate reacts with HCl as $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$ Calculate the mass of $CaCO_3$ required to react completely with 25 Ml of 0.75 M HCl?

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37. Manganese dioxide reacts with hydrochloric acid as $MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$ Calculate the mass of HCl that reacts with 5.0g manganese dioxide (Atomic mass of Mn = 55)

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38. 6.488 g of lead combines directly with 1.002g of oxygen to form lead peroxide. Lead peroxide also can be prepared by heating lead nitrate. It was found that the percentage of oxygen present in lead peroxide prepared by the second experiment is 13.38. Use this data to illustrate the law of definite proportions.

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39. a. Calculate the number of molecules in 5 moles of water.

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40. Express in moles (a) 4 g of oxygen atoms (b) 21 g of nitrogen molecules (or nitorgen gas) (c) 27 g of water (d) 11.2 litres of hydrogen gas at STP.

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41. Calculate the number of molecules in (i) 1 g of water and (ii) 5600 cm^3 of nitrogen at STP.

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42. Calculate the mass of chlorine required to react with 0.20 g of hydrogen to yield hydrogen chloride. Also calculate the amount of HCl formed.

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43. What mass of 60% of sulphuric acid (by mass) is required to decompose 25 g of marble?

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44. How can you illustrate the law of multiple proportions by using oxides of metals containing 78.7% and 64.5% of the metal?

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45. "One mole of all substances contain the same number of specified particles".

a. Justify the statement.

b. How to connect mole, gram atom and gram mole?

c. What is the relation between mole and volume?

d. Calculate the number of mole of a gas in

i. 44.828L at STP ii. 11.207ml at STP

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46. Fill in the blanks.

Name	Dimension	Example
Cubic	$a=b=c, \alpha=\beta=\gamma=(a)$	(b)
Orthorhombic	(c) (d)	Rhombic Sulphur
(e)	$a=b\neq c, \alpha=\beta=(f)$ $\gamma=(g)$	(h)

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47. Arrange the following in the increasing order of their mass.

a. 1 g of Ca

b. 12 amu of carbon

c. 6.023×10^{23} molecules of CO_2

d. 11.2L of N_2 at STP

e. 1 mole of H_2O

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48. One volume of a gaseous compound requires 2 volumes of O_2 for combustion and gives 2 volumes of CO_2 and 1 volume of N_2. Determine the molecular formula of the compound.

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49. "The star of India" sapphire weighs 563 carats If one carat is equal to 200 mg, what is the weight of the gemstone in grams?

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50. $1050cm^3$ of a gas measured at STP weighis 3 g. Catculate the mass of a molecule of the gas.

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51. In the combustion of methane, what is the limiting reactant and why?

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52. Give an example of molecule in which.

(i) Ratio of molecular formula and empirical formula is 6: 1

(ii) Molecular weight is 2 times of the empirical formula weight.

(iii) The empirical formula is CH_2O and ratio of molecular formula weight and empirical fórmula weight is 6 .

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53. Balance the following equations:

a. $H_3PO_3 \rightarrow H_3PO_4 + PH_3$

b. $Ca + H_2O \rightarrow Ca(OH)_2 + H_2$

c.

$$Fe_2(SO_4)_3 + NH_3 + H_2O \rightarrow Fe(OH)_3 + (NH_4)_2SO_4$$

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54. Match the following.

A	B
Cuboidal epithelium	Fallopian tube
Squamous epithelium	Ducts of glands
Columnar epithelium	alveoli
Ciliated epithelium	intestine

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55. Which of the following mixtures are homogeneous?

a. wood

b. tap water

c. soil

d. cloud

e. smoke

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56. 3.00 g of H_2 react with 29.00 g of O_2 to yield H_2O.

(i) Which is the limiting reactant?

(ii) Calculate the maximum amount of H_2O that can be formed.

(iii) Calculate the amount of the reactant which remains unreacted.

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57. If the mass percent of various elements of a compound' is known, its empirical formula can be calculated A compound contains 4.07% hydorgen, 24.27% carbon and 71.65% chlorine. Its molecular mass is 98.96. What are its empirical and molecular formulae?

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58. Calculate the number of atoms in.

a. 1g of hydrógen

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59. Calculate the number of significant figures in the following values.

a. Planck's constant '=6.626 xx 10^(34) Js'

b. Avogadro number '=6.023 xx 10^(23)'

c. Velocity of light '=3.0 xx 10^8 ms^(-1)'

d. Electronic charge '=1.602 xx 10^(-19) C'

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60. Convert 22.4L in cubic metres.

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61. How many significant figures are there in each of the following numbers.

(a) '1.00 xx 10^6'

(b) '0.00010'

(c) 'pi'

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62. Is the law of constant composition true for all types of compounds? Explain why or why not.

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63. Classify each of the following as pure substance or mixture.

(a) Ethyl alcohol

(b) Oxygen

(c) Blood

(d) Carbon

(e) Steel

(f) Distilled water

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64. (a) How many signifficant figures are there in '1.00 xx 10^6' ? (c) Give an example of molecule in which the empirical formula is 'CH_2 O' and the ratio of molecular formula weight and empirical formula weight is 6 .

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65. Calculate the number of moles in each of the following. a. '11 g' of 'CO_2' b. '3.01 xx 10^(22)' molecules of 'CO_2' c. 2.24L of CO at STP

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66. Express the number 0.0000000540 in scientific notation and calculate the number of significant figures.

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67. State the number of significant figures in the following numbers.

i. 62.4

ii. 0.0405

iii. 8.8674

iv. 50.0

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68. 4.62g of sugar and 2.935g of table salt were mixed with 28.2g of water. What is the properly reported mass of the solution?

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69. What is the difference between 3.0 and 3.00 g ?

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70. Express the following numbers to four significant figures.

i. 5.607982

ii. 32.392800

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71. Calculate the molecular mass of the following?

i. $C_6H_{12}O_6$

ii. HNO_3

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72. Boron' occurs in nature in the form of two isotopes '_5^(11)B' and '_5^(10)B' in ratio of 81 and 19 respectively. Calculate its average atomic máss.

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73. Calculate the number of atoms in:

i. 0.25 mole àtoms of carbon

ii. 0.20 mole molecules of oxygen

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74. A flask P contains 0.5 mole of oxygen gas. Another flask Q contains 0.4 mole of ozone gas. Which of the two flask contains greater number of oxygen atoms?

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75. Calculate the number of moles of iron in a sample containing '1.0 xx 10^(22)' atoms.

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76. Calculate the no. of moles of phosphorus in 92.9 g of phosphorus assuming that molecular formula of

phosphorus is 'P_4'. Also calculate the no. of atoms and mólecules of phosphorus in the sample.

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77. Calculate the volume at STP occupied by

i. 14g of nitrogen

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78. Calculate the volume of 34 g of 'NH_3' at STP?

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79. The molecular mass of benzene is 78 and its percentage composition is 92.3 C and 7.69 H. Determine the molecular formula of benzene?

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80. A compound contains $4.07\,\%$ hydrogen, $24.27\,\%$ carbon and $71.65\,\%$ chlorine. Its molar mass is 98.96 g. What are its empirical and molecular formulas?

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81. Calculate the percentage composition of calcium nitrate $\left(Ca(NO_3)_2\right)$.

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82. 1.0 g of Mg is burnt in a closed vessel which contains 0.5 g of O_2 . Which is the limiting reactant? What is the amount of MgO formed in the reaction?

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83. A solution is prepared by dissolving 4 g of NaOH to give 500 ml of it. Calculate the molarity of the solution.

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84. What is the molality of a solution which contians 36 g of glucose '(C_6H_(12) O_6)' in 250g of water.

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85. The molecular mass of an organic compound is 78 and its composition is 92.4% C and 7.6% H. Determine the molecular formula of the compound.

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86. What is the different between the following.

(i) $2.5 \times 10^3 g$ and $2.50 \times 10^3 g$

(ii) $160cm$ and $160.0cm$

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87. Calculate the number of moles of O_2 required to produce 240 g of Mgo by burning magnesium metal

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88. State the number of significant figures in each of the following numbers:

(i) 0.003688

(ii) 2.653×10^4

(iii) 653

(iv) 0.368

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89. In the commercial manufacture of nitric acid, how many moles of NO_2 produce 7.33 moles of HNO_3 in the reaction $3\,NO_2(g)+H_2O(l) \rightarrow 2HNO_3(aq)+NO(g)$

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90. The number of molecules in 4.25 g of ammonia is approximately

A. 1xx10^(23)'

B. 1.5xx10^(23)'

C. 2.0xx10^(23)'

D. 2.5xx10^(23)'

Answer: B

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91. The number of molecules in 32 g of oxygen is $3.2 \times 10^{16}, 6.0 \times 10^{23}, 3.2 \times 10^{23}, 6.0 \times 10^{10}$

A. 3.2xx10^(16)'

B. 6.0xx10^(23)'

C. 3.2xx10^(23)'

D. 6.0xx10^(10)'

Answer: B

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92. One mole of 'CO_2' contains

A. 6.02 xx 10^(23)' atoms of C

B. 6.02xx 10^(23)' atoms of O

C. '18.1xx 10^(23)' molecules of 'CO_2'

D. 3g atoms of 'CO_2'

Answer: A

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93. Number of atoms is 1.4 g nitrogen is,

A. 1.2xx10^(22)'

B. 3.01xx10^(23)'

C. 6.02xx10^(22)'

D. 6.02xx10^(23)'

Answer: C

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94. Which has maximum number of atoms?

A. 24 g of C(12)

B. 56 g of Fe(56)

C. 27 g of Al(27)

D. 108 g of Ag(108)

Answer: A

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95. The empirical formula of sucrose is : $CH_2O, CHO,$

$C_{12}H_{22}O_{11}, C(H_2O_2)$

A. CH_2O'

B. CHO'

C. C_(12)H_(22)O_(11)'

D. C(H_2O_2)'

Answer: C

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96. One mole of helium gas represents. $6.022 \times 10^{23} He,\ 6.022 \times 10^{23} He_2,\ 3.011 \times 10^{23} He_2,$ $12.069 \times 10^{23} He$

A. 6.023 xx 10^(23) He'

B. 6.023 xx 10^(23) He_2'

C. 3.011 xx 10^(23) He_2'

D. 12.069 xx 10^(23) He'

Answer: A

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97. The number of significant figures in 0.050 is

A. 1

B. 2

C. 3

D. 4

Answer: B

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98. The number of molecules in 16 g of methane is

A. 3.0 xx 10^(23)'

B. 6.023 xx 10^(23)'

C. (16)/(6.02)xx10^23'

D. (16)/(3.0)xx10^(23)'

Answer: B

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99. The number of water molecules present in 8 g of oxygen gas are:

A. 6.022 xx 10^(23)'

B. 3.011 xx 10^(23) '

C. 12.044 xx 10^(23)'

D. 1.55 xx 10^(23)'

Answer: D

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100. 10g $CaCO_3$ on reaction with 0.1 M HCl acid will produce CO_2 :- 1120cm^3, 2240cm^3, 112cm^3, 224cm^3

A. 1120 'cm^3

B. 2240 'cm^3

C. 112 'cm^3

D. 224 'cm^3

Answer: B

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101. The percentage of nitrogen in urea is about.

A. 46

B. 85

C. 18

D. 28

Answer: A

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102. 7.5 grams of a gas occupy 5.6 litre of volumes at STP. The gas is

A. NO

B. N_2O'

C. CO

D. CO_2'

Answer: A

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103. The number of water molecules present in a drop of water (volume 0.0018 ml) at room temperature is

A. 6.023 xx 10^(29)'

B. 1.084 xx 10^(18)'

C. 4.84 xx 10^(17)'

D. 6.023 xx 10^(23)'

Answer: A

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104. 10 dm^3 of N_2 gas and 10 dm^3 of gas x at the same temperature contain the same number of molecules. The gas x is CO, CO_2, H_2, NO

A. CO

B. CO_2'

C. H_2'

D. NO

Answer: A

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105. 7.5 grams of a gas occupy 5.6 litre of volumes at STP. The gas is

A. NO

B. N_2O'

C. CO

D. CO_2'

Answer: A

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106. The prefix tera means

A. 10^(12)'

B. 10^4'

C. 10^6'

D. 10^8'

Answer: A

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107. The mass of slaked lime necessary to decompose completely 1.07 g of ammonium chioride is

A. 0.74g

B. 1.48g

C. 7.4g

D. 0.37g

Answer: A

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108. The laws of chemical combination are the basis of the atomic theory. Name the law of chemical combination illustrated by the pair of compounds, CO and CO_2

A. Definite proportions

B. Multiple proportions

C. Reciprocal proportions

D. Gay-Lussac's Law'

Answer: B

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109. The simplest formula of a compound containing 50 % of element X (atomic mass 10) and 50 % of element Y (atomic mass 20) is

A. XY

B. X_2Y'

C. XY_2'

D. X_2Y_3'

Answer: B

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110. Which contains the same number of atoms as in 6g carbon?

A. 24g Mg

B. 23g sodium

C. 20g Ca

D. 63.5g Cu

Answer: C

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111. 32 g of a gas contains 6.022×10^{23} molecules. Its vapour density is $8, 10, 12, 16$

A. 8

B. 10

C. 12

D. 6

Answer: D

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112. If LPG cylinder contains a mixture of butane and isobutane, then the amount of oxygen required for the complete combustion of 1 kg of the mixture will be

A. 1.8kg

B. 2.7kg

C. 4.5kg

D. 3.58kg

Answer: D

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113. How many moles of water would be formed when 4g of methane ('CH_4') are burnt?

A. 0.25

B. 0.5

C. 0.75

D. 1

Answer: B

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114. The number of gram molecule of oxygen in 6.02×10^{24} CO molecules is $1g$ molecule, $0.5g$ molecule, $5g$ molecule, $10g$ molecule

A. 1g molecule

B. 0.5g molecule

C. 5g molecule

D. 10g molecule

Answer: C

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115. The equivalent weight of 'K_2 Cr_2 O_7' in acidic medium is expressed in terms of its molecular weight (M) as

A. M/3

B. M/4

C. M/6

D. M/7

Answer: C

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116. The total number of electrons in 18 mL of water (density =1' g mL^(-1)')

A. 6.023 xx 10^(25)'

B. 6.023 xx 10^(24)'

C. 6.023 xx18XX 10^(23)'

D. 6.023 xx 10^(23)'

Answer: B

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117. An element

A. is one type of atom

B. is two or more types of atom

C. has constant boiling point

D. has constant melting point

Answer: A

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118. The equivalent weight of potassium permanganate in alkafine soiution is equal to

A. 1/5th of the molar mass of 'KMnO_4'

B. 1/6th of the molar mass of 'KMnO_4'

C. 1/3rd of the molar mass of 'KMnO_4'

D. 1/10th of the molar mass of 'KMnO_4'

Answer: C

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119. How many moles of magnesium phosphate 'Mg_3(PO_4)_2' will contain 0.25 mole of oxygen atom?

A. 0.02

B. 3.125 xx 10^(-2)'

C. 1.25 xx 10^(-2)'

D. 2.5 xx 10^(-2)'

Answer: B

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120. The number of sodium atom in 2 moles of sodium ferrocyanide is

A. 12 xx 10^(23)'

B. 26 xx 10^(23)'

C. 34 xx 10^(23)'

D. 48 xx 10^(23)'

Answer: D

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121. A metal oxide hás thẻ formula 'Al_2 O_3' . It can be reduced by hydrogen to give free metai and water. 0.1596g of this metal oxide requires 6 mg of hydrogen for complete reduction. What is the atomic weight of metal?

A. 52.3

B. 57.3

C. 55.8

D. 59.3

Answer: C

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122. Which of the following sets of compounds correctly illustrate the law of reciprocal proportions?

A. P_2 O_3, PH_3, H_2 O'

B. 'P_2 O_5, PH_3, H_2 O'

C. 'N_2 O_5, NH_3, H_2 O'

D. 'N_2 O, NH_3, H_2 O'

Answer: A

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123. The number of atoms in 0.1 mol of a triatomic gas is'

A. 6.023 xx 10^(22)'

B. 1.806 xx 10^(23)'

C. 1.800 xx 10^(22)'

D. 3.600 xx 10^(23)'

Answer: B

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124. Number of atoms present in $4.25g$ of NH_3 is

A. 6.023 xx 10^(23)'

B. 4xx6.023 xx 10^(23)'

C. 1.74xx10^(24)'

D. 4.25xx6.023 xx 10^(23)'

Answer: A

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