

1. FOUNDATION AND FUNDAMENTALS OF CHEMISTRY – MCQs

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Introduction

- Which of the following is not a pure substance?
 - Diamond
 - 24 carat gold
 - Air
 - Ammonia
- A pure substance can only be
 - A compound
 - an element
 - An element or a compound
 - A heterogeneous mixture
- A pure substance that contains only one type of atom is called
 - An element
 - a compound
 - a solid
 - a liquid
- Which one of the following is not a mixture?
 - Distilled water
 - gasoline
 - Sugar dissolved in water
 - Liquefied petroleum gas (LPG)
- Sulphur burns in oxygen to form sulphur dioxide. The properties of sulphur dioxide are:
 - different from sulphur and oxygen
 - Similar to oxygen
 - Similar to sulphur
 - More similar to sulphur than oxygen
- Which of the following is not a chemical change?
 - Sublimation
 - combustion
 - electrolysis
 - rusting
- Which process is a chemical change?
 - boiling water
 - cooking an egg
 - dissolving sugar
 - melting ice cubes
- The atomicity of helium is
 - 1
 - 2
 - 3
 - 4
- The smallest particle of an element that takes part in the chemical reactions is
 - Molecule
 - Atom
 - Electron
 - compound
- Which of the following is a compound?
 - Diamond
 - graphite
 - ozone
 - pure water
- Atomicity of oxygen:
 - 1
 - 2
 - 3
 - 4
- How many atoms are there in 2 molecules of ammonia?
 - 3
 - 4
 - 6
 - 8
- How many nitrogen atoms are there in 2 molecules of ammonium nitrate?
 - 3
 - 4
 - 5
 - 6
- Which of the following is not a molecule?
 - Ar
 - H
 - Cl₂
 - CHCl₃
- The atomic number of calcium is
 - 40
 - 20
 - 35.5
 - 39
- Which of the following sequences is correct if the given elements are arranged according to ascending atomic number
 - Fe, Co, Ni, Cu
 - Co, Fe, Ni, Cu
 - Fe, Ni, Co, Cu
 - Cu, Fe, Co, Ni
- Which of the following is a unique quantity of an element
 - Valency
 - Isotopic mass
 - atomic number
 - Mass number
- The valency of an element depends upon
 - Total number of neutrons in the nucleus of an atom
 - Number of electrons present in the valence shell
 - Net positive charge present in the nucleus
 - All of the above
- Variable valency is generally shown by
 - Representative elements
 - P-block elements
 - Transitional elements
 - Non-metals
- Which of the following elements does not show variable valency
 - Ag
 - Cu
 - Zn
 - Fe

21. Which statement is erroneous?
- Sodium is a monovalent element.
 - Methane is an organic compound.
 - The atomic number of sodium is 11.
 - Calcium shows variable valency.
22. The symbolic representation of a molecule of an element or a compound is called
- Empirical formula
 - Molecular formula
 - Structural formula
 - Geometrical formula

Ions/Radicals and formulas I

23. The symbol of meta-aluminate is
- AlO_2
 - AlO_2^-
 - AlO_3^-
 - AlO_3
24. Sulphate ion is
- A compound
 - An element
 - A divalent radical
 - A trivalent radical
25. Cl^- is
- electropositive ion
 - basic radical
 - cation
 - acid radical
26. The peroxide radical is
- O_2^-
 - O^{2-}
 - O^-
 - O
27. Which one of the following is a complex radical
- CO_3^{2-}
 - Fe^{+3}
 - Hg_2^{+2}
 - $[\text{Fe}(\text{CN})_6]^{-3}$
28. The formulas of sulphite, sulphide, and sulphate are respectively?
- SO_4^{2-} , S^{2-} and SO_3^{2-}
 - S^- , SO_2^{-2} and SO_4^{+2}
 - SO_3 , SO_2 and SO_4
 - SO_3^{2-} , S^{2-} and SO_4^{2-}
29. The formulas of nitrite, sulphite, nitrate, and sulphate ions are respectively?
- N^{-3} , SO_4^{2-} , NO^{-2} and SO_3^{2-}
 - NO_3^{2-} , SO_3^{2-} , NO_3^{2-} and SO_4^{2-}
 - NO_3^- , SO_3^{2-} , NO_2^{-2} and SO_4^{2-}
 - NO_2^- , SO_3^{2-} , NO_3^- and SO_4^{2-}
30. The formulas of sulphite, sulphate, bisulphate, and bisulphite are respectively?
- SO_4^{2-} , SO_3^{2-} , $\text{S}_2\text{O}_3^{2-}$ and HSO_3^-
 - SO_3^{2-} , SO_4^{2-} , $\text{S}_2\text{O}_3^{2-}$, and HSO_3^-
 - SO_3^{2-} , SO_4^{2-} , HSO_4^- and HSO_3^-
 - SO_3^{2-} , $\text{S}_2\text{O}_3^{2-}$, HSO_3^- and HSO_4^-
31. The formulas of sulphite, thiosulphate, chlorate, and perchlorate are respectively?
- SO_4^{2-} , S^{2-} , ClO^- and ClO^-
 - SO_4^{2-} , SO_3^{2-} , ClO_3^- and ClO_4^-
 - SO_3^{2-} , $\text{S}_2\text{O}_3^{2-}$, Cl^- and ClO_4^-
 - SO_3^{2-} , $\text{S}_2\text{O}_3^{2-}$, ClO_3^- and ClO_4^-
32. The molecular formula of Calcium nitrite is
- Ca_3NO_2
 - $\text{Ca}(\text{NO}_2)_2$
 - $\text{Ca}(\text{NO}_3)_2$
 - Ca_3N_2
33. The molecular formula of silver chromate is
- AgCrO_4
 - Ag_2CrO_4
 - Ag_2CrO_6
 - Ag_2CrO_7
34. Which pair of formulae is correct?
- A** Ag_2CO_3 and $(\text{NH}_4)_3\text{NO}_3$ **B** K_2HCO_3 and $\text{Zn}_3(\text{PO}_4)_2$ **C** AgHCO_3 and K_3PO_4 **D** ZnCO_3 and $(\text{NH}_4)_2\text{PO}_4$
35. Which pair of formulae is correct?
- A** Ca_2SO_4 and MgCl_2 **B** Na_2HCO_3 and $\text{Mg}_3(\text{PO}_4)_2$
C NH_4HCO_3 and K_2SO_4 **D** CaNO_3 and $(\text{NH}_4)_2\text{OH}$
36. The formulas of sodium hypochlorite, potassium thiosulfate, and sodium dichromate ions are, respectively:
- NaClO , $\text{K}_2\text{S}_2\text{O}_3$, $\text{Na}_2\text{Cr}_2\text{O}_7$
 - NaClO_3 , KS_2O_3 , $\text{Na}_2\text{Cr}_2\text{O}_7$
 - NaClO , $\text{K}_2\text{S}_2\text{O}_3$, NaCr_2O_7
 - NaClO_3 , $\text{K}_2\text{S}_2\text{O}_3^{2-}$, $\text{Na}_2\text{Cr}_2\text{O}_7$
37. The molecular formulas of silver chloride, ferrous carbonate, and cupric nitrate are, respectively
- AgCl , FeCO_3 and $\text{Cu}(\text{NO}_3)_2$
 - AgCl_2 , Fe_2CO_3 , CuNO_3
 - AgCl , $\text{Fe}_2(\text{CO}_3)_3$, $\text{Cu}(\text{NO}_3)_2$
 - AgCl_2 , FeCO_2 , Cu_2NO_3

Ions/Radicals and formulas II

38. The molecular formulas of sodium bicarbonate, sodium carbonate, magnesium nitrite, and magnesium nitrate are, respectively.
- NaHCO_3 , Na_2CO_3 , $\text{Mg}(\text{NO}_2)_2$, $\text{Mg}(\text{NO}_3)_2$
 - NaHCO_3 , NaCO_3 , MgNO_2 , $\text{Mg}(\text{NO}_3)_2$
 - NaCO_3 , Na_2HCO_3 , $\text{Mg}(\text{NO}_2)_2$, $\text{Mg}(\text{NO}_3)_2$
 - NaHCO_3 , Na_2CO_3 , $\text{Mg}(\text{NO}_2)_3$, $\text{Mg}(\text{NO}_3)_2$
39. What is the valency of mercury in Hg_2Cl_2 ?
- 1
 - 2
 - 1/2
 - 2/3
40. The valency of Iron in ferric oxide (Fe_2O_3) is
- 1
 - 1.5
 - 2
 - 3
41. The valency of Mn in MnO_2 and P in PH_3 is, respectively.
- 4 and 3
 - 2 and 3
 - 1 and 1
 - 3 and 3

42. A and B atoms have 2 and 6 valence electrons in their outermost orbit, respectively. The compound that A and B are most likely to form is
 a. AB_2 b. A_2B c. AB d. A_3B
43. The radicals present in sodium thiosulfate are;
 a. $1 Na^+$ and $2 S_2O_3^{2-}$ b. $2 Na^+$ and $1 S_2O_3^{2-}$ c. $2 Na^+$ and $1 S_2O_4^{2-}$ d. $2 Na^+$ and $1 SO_4^{2-}$
44. Formula of certain metal bicarbonate is $M(HCO_3)$, what is the formula of its chloride is
 a. MCl b. M_2Cl c. MCl_2 d. MCl_3
45. The formula of a metal sulphate is M_2SO_4 . What is the formula of the metal nitrate?
 a. MNO_3 b. M_2NO_3 c. $M(NO_3)_2$ d. $M_2(NO_3)_2$
46. A symbol not only represents the name of the element but also its:
 a. Atomic mass c. atomic number b. Atomicity d. atomic volume
47. The number of electrons in an atom of an element is equal to its
 a. atomic weight b. electron affinity c. atomic number d. mass number

Relative masses of atoms and molecules

48. The relative atomic mass of chlorine is
 a. 35 b. 36 c. 37 d. 35.5
49. The relative atomic mass of sodium is
 a. 23 g b. 23 c. 22 amu d. 23/12 g
50. The relative atomic mass of C in Na_2CO_3 is
 a. 6 b. 12 c. 24 d. 16
51. What is the correct match of the elements and their atomic weights?
 A. Ar i. 40
 B. Cu ii. 63.5
 C. Zn iii. 65.5
 D. K iv. 39
 (b) A-i, B-ii, C-iv, D-iii (c) D-i, C-iii, B-ii, A-iv
 (c) A-i, B-ii, C-iii, D-iv (d) A-iv, B-iii, C-ii, D-i
52. What is the correct match of the elements and their atomic weights?
 E. S i. 31
 F. Cl ii. 63.5
 G. Zn iii. 65.5
 H. P iv. 35.5
 (d) A-i, B-ii, D-i (c) D-i, C-iii, A-iv
 (e) B-iv, C-iii, D-i (d) A-iv, B-iii, C-ii
53. The mass spectrum of a sample of lithium shows that it contains two isotopes, 6Li and 7Li . The isotopic abundances are shown in the table.

isotope	isotopic abundance
6Li	7.42%
7Li	92.58%

What is the relative atomic mass of this sample of lithium, given to three significant figures?

- A** 6.07 **B** 6.50 **C** 6.90 **D** 6.93
54. A sample of sulfur consists mostly of ${}^{32}S$. It also contains 4.2% ${}^{34}S$ and 2.8% ${}^{36}S$. No other isotopes of sulfur are present.
 What is the relative atomic mass, A_r , of this sample of sulfur?
A 32.1 **B** 32.2 **C** 34.0 **D** 34.3
55. Relative atomic mass is
 a. Number of protons
 b. Number of protons + number of electrons
 c. The number of times by which an atom is heavier than an oxygen atom.
 d. Number of times an atom is heavier than $1/12^{th}$ of the C^{12} isotope.
56. According to IUPAC, atomic mass is expressed in terms of
 a. H-1 b. C-12 c. O-16 d. Cl-35

57. What makes the atomic mass fractional?
- number of unpaired electrons
 - wave nature of electrons
 - presence of isotopes
 - presence of isomers

Empirical Formula and % Composition

58. The formula that represents the exact number of atoms in a molecule is
- condensed formula
 - empirical formula
 - spatial formula
 - molecular formula
59. The empirical formula of water is
- H₂O
 - HO
 - O₂H
 - OH
60. The empirical formula of hydrogen peroxide is
- H₂O₂
 - HO
 - H₂O
 - HO₂
61. The empirical formula of glucose (C₆H₁₂O₆) is
- C₆H₁₂O₆
 - C₃H₆O₃
 - CH₂O
 - CHO
62. A compound has an empirical formula of CH and its molecular mass is 65 amu. What is its molecular formula?
- C₂H₂
 - C₄H₄
 - C₅H₁₀
 - C₅H₅
63. An organic compound has an empirical formula CH₂O and a molecular weight of 90. Its molecular formula will be
- C₆H₁₂O₆
 - C₃H₆O₃
 - C₂H₄O₂
 - CH₂O
64. A compound has a molecular weight of 78 and the empirical formula CH. Its molecular formula
- C₅H₁₂
 - C₆H₆
 - C₄H₁₀O
 - C₁₀H₉
65. Compound Q contains 40% carbon by mass. What could Q be?
- glucose, C₆H₁₂O₆
 - starch, (C₆H₁₀O₅)_n
 - sucrose, C₁₂H₂₂O₁₁
66. Which sodium compound contains 74.2% by mass of sodium
- sodium carbonate
 - sodium chloride
 - sodium hydroxide
 - sodium oxide
67. The percentage of hydrogen is maximum in
- CH₄
 - C₂H₄
 - C₆H₆
 - C₂H₆

Particles in Atoms, Ions, and Molecules

68. An atom of an element has 2K, 8L and 6M electrons. The total number of electrons is
- 10
 - 12
 - 14
 - 16
69. An element has an atomic number of 11 and a mass number of 24. What does the nucleus contain?
- 11 protons, 13 neutrons
 - 11 protons, 13 neutrons, 13 electrons
 - 13 protons, 11 neutrons
 - 13 protons, 11 electrons
70. What is the number of electrons in ¹²24Mg²⁺?
- 12
 - 24
 - 2
 - 10
71. What number of protons, neutrons, and electrons are present in the ion ⁵⁴Fe³⁺?

	protons	neutrons	electrons
A	26	28	23
B	26	28	29
C	29	25	23
D	29	25	26

72. An element M has an atomic mass of 19 and atomic number 9; its ion is represented by
- M⁺
 - M⁺²
 - M⁻
 - M⁻²
73. An element X has an atomic mass of 39 and an atomic number of 19; its ion is represented by
- X⁺
 - X⁺²
 - X⁻
 - X⁻²
74. How many electrons, protons, and neutrons are present in the element represented by the symbol ₂₁X⁴³?
- 22, 21, 21
 - 21, 21, 22
 - 22, 22, 22
 - 22, 21, 22
75. Which atom has the same number of electrons as the hydroxide ion, OH⁻?
- F
 - Ne
 - Na
 - Mg
76. Which atom has the same number of electrons as an ammonium ion?
- Mg
 - Na
 - Ne
 - O

77. HCN has been detected in interstellar gas. The molecules below have also been detected in interstellar gas.

Which molecule contains the same total number of valence shell (outer shell) electrons as HCN?

A HNO

B NH

C NO

D PN

78. Sodium azide, NaN_3 , is an explosive used to inflate airbags in cars when they crash. It consists of positive sodium ions and negative azide ions.

What are the numbers of electrons in the sodium ion and the azide ion?

	sodium ion	azide ion
A	10	20
B	10	22
C	12	20
D	12	22

79. The ion Y^{3-} contains 18 electrons and has a mass number of 31. How many protons and neutrons does Y^{3-} contain?

	protons	neutrons
A	15	16
B	15	18
C	18	13
D	21	10

80. Which species contains a different number of electrons from the other three?

A C/O_4^-

B H_2SO_4

C SO_4^{2-}

D Te^{2-}

81. Which statement about $^{131}_{53}\text{I}$ is correct?

A A negative ion of $^{131}_{53}\text{I}$ contains 53 neutrons and 52 electrons.

B A negative ion of $^{131}_{53}\text{I}$ contains 53 neutrons and 54 electrons.

C A negative ion of $^{131}_{53}\text{I}$ contains 78 neutrons and 52 electrons.

D A negative ion of $^{131}_{53}\text{I}$ contains 78 neutrons and 54 electrons.

82. Which particle contains 8 protons, 9 neutrons, and 10 electrons?

A $^{16}_8\text{O}^-$

B $^{16}_8\text{O}^{2-}$

C $^{17}_8\text{O}^-$

D $^{17}_8\text{O}^{2-}$

83. Which atom contains four times as many neutrons as the ^7_3Li atom?

A $^{40}_{20}\text{Ca}$

B $^{24}_{12}\text{Mg}$

C $^{31}_{15}\text{P}$

D $^{26}_{14}\text{Si}$

84. In which species are the numbers of protons, neutrons, and electrons all different?

A $^{19}_9\text{F}^-$

B $^{23}_{11}\text{Na}^+$

C $^{31}_{15}\text{P}$

D $^{32}_{16}\text{S}^{2-}$

85. Which species contains the same number of neutrons as $^{14}_6\text{C}$ and the same number of electrons as $^{23}_{11}\text{Na}^+$?

A $^{17}_9\text{F}$

B $^{16}_7\text{N}^{3-}$

C $^{20}_{10}\text{Ne}$

D $^{16}_8\text{O}^{2-}$

86. What is the total number of protons, neutrons, and electrons present in an ammonium ion with a relative formula mass of 21?

	Number of protons	Number of neutrons	Number of electrons
A	11	10	10
B	10	11	11
C	10	11	10
D	11	10	11

87. The chemical formula of water is

a) CO_2

b) HO

c) O_2

d) HSO_4

88. The formula of ammonia is

a) NH_3

b) NO_2

c) HNO_3

d) N_2

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