COLLECTION OF IMPORTANT FORMULAS

1. Formula used to calculate number of moles (n)

a. $n = \dfrac{\text{mass (gram)}}{\text{molar mass}}$

b. $n = \dfrac{\text{number of particles}}{\text{Avogadro's number } (N_A)}$

c. $n = \dfrac{\text{volume } (dm^3)}{\text{molar volume } (22.4 dm^3)}$

d. $n = \dfrac{\text{percentage of an element}}{\text{atomic mass}}$

2. Formula used to calculate mass of a substance

Mass = Moles x Molar mass

3. Formula used to calculate number of particles:

Number of particles = Moles x Avogadro's number

Number of particles = $n \times N_A$

4. Percentage of an element = $\dfrac{\text{mass of element in the compound}}{\text{total mass of the compound}}$

5. Percent yield = $\dfrac{\text{actual yield}}{\text{theoretical yield}} \times 100$

6. $r_n = 0.529 \times n^2$

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(Radius of any orbit)

7. $E_n = -\dfrac{Z^2e^4m}{8\varepsilon_o^2n^2h^2}$ (OR) $E_n = -1313\left(\dfrac{1}{n^2}\right)$ kj/mol	Energy of any orbit
8. $\Delta E = \dfrac{Z^2e^4m}{8\varepsilon_o^2h^2}\left[\dfrac{1}{n_1^2} - \dfrac{1}{n_2^2}\right]$ kj/mol (OR) $\Delta E = 1313\left[\dfrac{1}{n_1^2} - \dfrac{1}{n_2^2}\right]$ kj/mol	Energy difference between the two orbits.
9. $\upsilon = \dfrac{\Delta E}{h}$ (OR) $\upsilon = \dfrac{Z^2e^4m}{8\varepsilon_o^2h^3}\left[\dfrac{1}{n_1^2} - \dfrac{1}{n_2^2}\right]$ Hz	Frequency of the radiation.

10. $\bar{\upsilon} = \frac{\upsilon}{C}$ (OR) $\bar{\upsilon} = \frac{Z^2 e^4 m}{8\varepsilon_o^2 h^3 \cdot C}\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right] m^{-1}$ (OR) $\bar{\upsilon} = R\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right] m^{-1}$ (OR) $\bar{\upsilon} = 1.097 \times 10^7 \left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right] m^{-1}$	Wave number of the radiation.
11. $E = h\upsilon$	Plank's equation
12. $\upsilon = \frac{C}{\lambda}$	Frequency
13. $\bar{\upsilon} = \frac{1}{\lambda}$	Wave number
14. $E = \frac{hC}{\lambda}$	Energy of radiation
15. $2n^2$	Total number of electrons in an orbit
16. $\ell = n - 1$	Azimuthal quantum number
17. $2(2\ell + 1)$ (OR) $4\ell + 2$	Total number of electrons in a subshell i.e. s, p, d, f
18. $2\ell + 1$	Total number of orbitals in a sub-shell
19. $n - 1$ $n - \ell - 1$ Angular nodes $= \ell$	Total nodes Radial nodes OR spherical nodes Angular nodes
20. No. of attached atoms to central atom + lone pair of electrons	Type of hybridization
21. $\frac{N_b - N_a}{2}$	Bond order
22. $u = q \cdot d$	Dipole moment
23. Percentage of ionic characters $= \frac{\mu_{observed}}{\mu_{ionic}} \times 100$	Percentage of ionic characters

24. $P = \frac{F}{A}$	Pressure of gas
25. $PV = K$ $P_1V_1 = P_2V_2$	Boyle's equation
26. $\frac{V}{T} = K$ $\frac{V_1}{T_1} = \frac{V_2}{T_2}$	Charles' equation
27. $V_T = V_o\left(1 + \frac{T}{273}\right)$	Volume of a gas at any temperature
28. $PV = nRT$	Ideal gas equation
29. $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$	Generalized form of ideal gas equation
30. $R = \frac{PV}{nT}$	To calculate units and values of "R"
31. $m = \frac{PVM}{RT}$	Mass of a gas
32. $d = \frac{PM}{RT}$	Density of a gas
33. $C = \frac{P}{RT}$	Concentration of a gas
34. $M = \frac{mRT}{PV}$	Molecular mass of a gas
35. $Z = \frac{PV}{RT}$	Compressibility factor
36. $\left(P + \frac{a}{V^2}\right)(V - B) = RT$	Vander Waal's equation or non ideal gas equation
37. $P_T = P_A + P_B + P_C \cdots\cdots P_n$	Dalton's equation
38. $\frac{r_A}{r_B} = \sqrt{\frac{M_B}{M_A}}$ or $\sqrt{\frac{d_B}{d_A}}$	Graham's law mathematical form/ equation
39. $U_{rms} = \sqrt{\frac{v_1^2 + v_2^2 + v_3^2 + \cdots + v_n^2}{n}}$ $U_{rms} = \sqrt{\frac{3RT}{M}}$	Root mean square velocity

40. $\gamma_l = \frac{n_w \cdot d_l}{n_l \cdot d_w} \times \gamma_w$	Surface tension of a liquid
41. $\eta_l = \frac{d_l \cdot t_l}{d_w \cdot t_w} \times \eta_w$	Viscosity of a liquid
42. Radius ratio $= \frac{r^+}{r^-}$	Radius ratio
43. $Q_c = \frac{[products]_o}{[reactants]_o}$	Reaction quotient
44. $K_c = \frac{[products]}{[reactants]}$	Equilibrium constant
45. $K_p = K_c \times RT^{\Delta n}$	Relationship between K_p and K_c
46. $K_p = K_x \cdot \left(\frac{RT}{V}\right)^{\Delta n}$	Relation between K_p and K_x
47. $K_p = K_n \left[\frac{P}{N}\right]^{\Delta n}$	Relationship between K_p and K_n
48. $K_{sp} = [+ive\ ion][-ive\ ion]$	Solubility product
49. $Kw = [H^+][\bar{O}H]$	Ionization constant of water
50. $pH = -\log[H^+]$	pH formula
51. $pOH = -\log[\bar{O}H]$	pOH formula
52. $K_a = \frac{[H^+][\bar{O}H]}{[HA]}$	Acid ionization constant
53. $K_b = \frac{[HA][\bar{O}H]}{[\bar{A}]}$	Base ionization constant
54. $pK_a = -\log K_a$	Power of K_a
55. $pK_b = -\log K_b$	Power of K_b
56. $K_a \propto \frac{1}{K_b}$	Relation between K_a and K_b
57. $pH + pOH = 14$ $pK_a + pK_b = 14$	To find out acidity and basicity of a solution

58. $Rate = \frac{\Delta C}{\Delta t}$	Rate o chemical reaction
59. $Rate = K[X][Y]$	General form of rate equation
60. $Rate = K[A]^1$ $Rate = K[A]^2$ $Rate = K[A]^3$	1st order reaction 2nd order reaction 3rd order reaction
61. $K = \frac{Rate}{[Reactant]}$	To find out the value of specific rate constant
62. $C = \frac{n}{v}$	Concentration of solution
63. $\frac{m}{m}\% = \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$ $\frac{m}{v}\% = \frac{\text{Mass of solute}}{\text{Volume of solution}} \times 100$ $\frac{v}{m}\% = \frac{\text{Volume of solute}}{\text{Mass of solution}} \times 100$ $\frac{v}{v}\% = \frac{\text{Volume of solute}}{\text{Volume of solution}} \times 100$	Mass by mass percentage Mass by volume percentage Volume by mass percentage Volume by volume percentage
64. $M = \frac{\text{No. of moles of solute}}{\text{Volume of solution in } dm^3}$	Molarity calculation
65. $m = \frac{\text{No. of moles of solute}}{\text{Mass of solvent in Kg}}$	Molality calculation
66. $X = \frac{\text{No. of moles of 1 component}}{\text{Total number of moles}}$	Mole fraction calculation
67. $ppm = \frac{\text{Mass or volume of solute}}{\text{Mass or volume of solution}} \times 10^6$	Parts per million calculation
68. $ppb = \frac{\text{Mass or volume of solute}}{\text{Mas or volume of solution}} \times 10^9$	Parts per billion calculation
69. $ppt = \frac{\text{Mass or volume of solute}}{\text{Mass or volume of solution}} \times 10^{12}$	Parts per trillion calculation
70. $P = P^o X_1$ $\frac{\Delta P}{P^o} = X_2$	Roult's law Mathematical form of Roult's law

71. $\frac{\Delta P}{P^o} = \frac{w_2 \cdot M_1}{M_2 \cdot w_1}$	Lowering of vapours pressure
72. $\Delta T_b = K_b = \frac{w_2 \cdot 1000}{M_2 \cdot w_1}$	Elevation in boiling point
73. $\Delta T_f = K_f = \frac{w_2 \cdot 1000}{M_2 \cdot w_1}$	Depression in freezing point
74. $q = \Delta E + w$	1st law of thermodynamics
75. $W = P\Delta V$	Pressure volume work
76. $q_v = \Delta E$	Process at constant volume
77. $H = E + PV$	Calculation of enthalpy
78. $q = \Delta H$	Process at constant external pressure
79. $\Delta H_{reaction} = \sum \Delta H_{(products)} - \sum \Delta H^o_{(reactants)}$	Standard enthalpy of reaction
80. $C = ms$	Specific heat capacity
81. $q = ms\Delta T$ $q = C\Delta T$	Calculation of heat change
82. $E^o_{cell} = E^o_{oxi} + E^o_{red}$ $E^o_{cell} = E^o_{anode} + E^o_{cathode}$	Standard cell potential
83. $Zn \mid Zn^{++}_{(1M)} \parallel Cu^{++}_{(1M)} \mid Cu$ Anode (Oxidation) Cathode (Reduction)	Representation of galvanic cell
84. $W = ZIt$	Faraday 1st law of electrolysis
85. $W = \frac{1}{F} It e$	Faraday 2nd law of electrolysis

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