

**PLUS TWO PHYSICS ~ CONSTANTS AND UNITS**

| S.NO. | PHYSICAL QUANTITIES  | UNITS                                      |
|-------|--|--|
| 1.    | Permittivity   | $C^2 N^{-1} m^{-2}$                        |
| 2.    | Electric charge  | coulomb or A s                             |
| 3.    | Electric field intensity                                     | $N C^{-1}$ or $V m^{-1}$                   |
| 4.    | Electric dipole moment                                       | C m or coulomb metre                       |
| 5.    | Torque   | N m  |
| 6.    | Electric potential   | volt (V)                                   |
| 7.    | Electric flux  | $N m^2 C^{-1}$                             |
| 8.    | Linear charge density  | $C m^{-1}$                                 |
| 9.    | Surface charge density                                       | $C m^{-2}$                                 |
| 10.   | Capacitance  | farad                                      |
| 11.   | The unit of molecular polarisability                         | $C^2 N^{-1} m$ (or) $C m^2 V^{-1}$         |
| 12.   | Electric current   | ampere or $C s^{-1}$                       |
| 13.   | Drift velocity   | $m s^{-1}$                                 |
| 14.   | Mobility   | $m^2 V^{-1} s^{-1}$                        |
| 15.   | Current density  | $A m^{-2}$                                 |
| 16.   | Resistance   | ohm or $\Omega$                            |
| 17.   | Resistivity  | ohm m or $\Omega m$                        |
| 18.   | Conductance  | mho or $\Omega^{-1}$                       |
| 19.   | Conductivity   | mho $m^{-1}$ or $\Omega^{-1} m^{-1}$       |
| 20.   | Electrochemical equivalent                                   | $kg C^{-1}$                                |
| 21.   | Electric energy  | joule or J                                 |
| 22.   | Temperature coefficient of resistance                        | $^{\circ}C$                                |
| 23.   | Peltier coefficient  | volt (V)                                   |
| 24.   | Thomson coefficient  | volt $^{\circ}C$ or $V/^{\circ}C$          |
| 25.   | Magnetic induction   | tesla(T) or weber $m^{-2}$ ( $Wb m^{-2}$ ) |
| 26.   | Gyromagnetic ratio   | $C kg^{-1}$                                |
| 27.   | Bohr magneton  | $A m^2$                                    |
| 28.   | Coefficient of self induction                                | henry (H)                                  |
| 29.   | Coefficient of mutual induction                              | henry (H)                                  |
| 30.   | Inductive reactance  | ohm  |
| 31.   | Capacitive reactance   | ohm  |
| 32.   | Permeability of free space                                   | $H m^{-1}$ or H/m                          |
| 33.   | Grating element  | metre or m                                 |
| 34.   | The unit of number of lines per unit length of the grating N | $metre^{-1}$ or $m^{-1}$                   |
| 35.   | Specific charge e/m  | $C kg^{-1}$                                |
| 36.   | Rydberg's constant   | $m^{-1}$                                   |
| 37.   | Nuclear density  | $kg m^{-3}$                                |

| S.NO. | PHYSICAL QUANTITIES  | CONSTANTS   |
|-------|--|---|
| 1.    | Permittivity of free space   | $8.854 \times 10^{-12} \text{ C}^2\text{N}^{-1}\text{m}^{-2}$               |
| 2.    | Permittivity of free space   | $36\pi \times 10^{-9} \text{ C}^2\text{N}^{-1}\text{m}^{-2}$                |
| 3.    | Permittivity of free space   | $\frac{1}{4\pi \times 9 \times 10^9} \text{ C}^2\text{N}^{-1}\text{m}^{-2}$ |
| 4.    | Relative permittivity for air or vacuum                              | $\epsilon_r = 1$ (or) equals to one   |
| 5.    | Relative permittivity other than air medium                          | $\epsilon_r > 1$ (or) greater than one                                      |
| 6.    | Drift velocity   | $0.1 \text{ cm s}^{-1}$ (or) $0.001 \text{ ms}^{-1}$                        |
| 7.    | Resistivity of conductors  | $10^{-6} \Omega\text{m} - 10^{-8} \Omega\text{m}$                           |
| 8.    | Resistivity of insulators  | $10^8 \Omega\text{m} - 10^{14} \Omega\text{m}$                              |
| 9.    | Resistivity of semiconductors  | $10^{-2} \Omega\text{m} - 10^4 \Omega\text{m}$                              |
| 10.   | Transition or critical temperature of mercury                        | 4.2 K   |
| 11.   | Emf of voltaic cell  | 1.08 V  |
| 12.   | Emf of Daniel cell   | 1.08 V  |
| 13.   | Emf of Leclanche cell  | 1.5 V   |
| 14.   | Current drawn from Leclanche cell                                    | 0.25 A  |
| 15.   | Fuse wire is an alloy of   | Lead 37% and Tin 63%<br>(or) Pb 37% and Sn 63%                              |
| 16.   | Melting point of Tungsten filament                                   | $3380^\circ\text{C}$  |
| 17.   | Gyro magnetic ratio  | $8.8 \times 10^{10} \text{ C kg}^{-1}$                                      |
| 18.   | Bohr magneton  | $9.27 \times 10^{-27} \text{ A m}^2$  |
| 19.   | Efficiency of an ideal transformer                                   | 100% (or) equals to one<br>(or) $\eta = 1$                                  |
| 20.   | rms value of a.c.  | 0.707 times the peak value  |
| 21.   | The percentage of rms value of a.c.                                  | 70.7% times its peak value  |
| 22.   | The number of coils or armature used in three phase a.c. generator   | 3   |
| 23.   | The angle between the coils in three phase a.c. generator            | $120^\circ$   |
| 24.   | The value of permeability of free space $\mu_0$                      | $4\pi \times 10^{-7} \text{ Hm}^{-1}$                                       |
| 25.   | The frequency of electromagnetic wave obtained from Hertz experiment | $5 \times 10^7 \text{ Hz}$  |
| 26.   | The frequency range of radio waves for amplitude modulated (AM) band | 530 kHz to 1710 kHz   |
| 27.   | The frequency range of radio waves for television                    | 54 MHz to 890 MHz   |
| 28.   | The frequency range of radio waves for frequency modulated (FM) band | 88 MHz to 108 MHz   |
| 29.   | The wavelength range of visible light                                | 4000 Å to 8000 Å  |

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| 30. | The wavelength of spectral lines of sodium in the yellow region                                     | 5896 Å, 5890 Å (or)<br>5896 x 10 <sup>-10</sup> m, 5890 x 10 <sup>-10</sup> m<br>(or) 589.6 nm, 589 nm |
| 31. | Face angles of Nicol prism  | 72° and 108°   |
| 32. | Cathode rays ( electrons ) travel with velocity   | $\frac{1}{10}$ of the velocity of light  |
| 33. | Specific charge (e/m)   | 1.7592 x 10 <sup>11</sup> C kg <sup>-1</sup>   |
| 34. | The charge of an electron   | 1.602 x 10 <sup>-19</sup> C  |
| 35. | Bohr radius   | 0.53 Å   |
| 36. | Rydberg's constant  | 1.094 x 10 <sup>7</sup> m <sup>-1</sup>  |
| 37. | Ground state energy hydrogen atom   | -13.6 eV   |
| 38. | First excited state energy of hydrogen atom   | -3.4 eV  |
| 39. | Ionisation potential energy of hydrogen atom  | 13.6 eV  |
| 40. | The energy required to raise an electron in hydrogen atom from ground state to first excited state  | 10.2 eV  |
| 41. | The energy required to raise an electron in hydrogen atom from ground state to second excited state | 12.09 eV   |
| 42. | Wavelength of X-rays  | 0.5 Å to 10 Å  |
| 43. | Wavelength soft X- rays   | above 4 Å  |
| 44. | Wavelength of hard X-rays   | less than 1 Å  |
| 45. | The life time of atoms in the excited state   | 10 <sup>-8</sup> s   |
| 46. | The life time of atoms in the meta stable state   | 10 <sup>-3</sup> s   |
| 47. | The shortest wavelength of Lyman series   | $\frac{1}{R}$  |
| 48. | The shortest wavelength of Balmer series  | $\frac{4}{R}$  |
| 49. | The shortest wavelength of Paschen series   | $\frac{9}{R}$  |
| 50. | The shortest wavelength of Brackett series  | $\frac{16}{R}$   |
| 51. | The shortest wavelength of Pfund series   | $\frac{25}{R}$   |
| 52. | The pressure inside the Coolidge tube   | 10 <sup>-6</sup> mm of Hg  |
| 53. | The potential applied between the anode and the cathode in Coolidge tube experiment                 | 24000 V or 24 kV   |
| 54. | The wavelength emitted by ruby laser  | 6943 Å   |
| 55. | The wavelength emitted by He-Ne laser   | 6328 Å   |
| 56. | In hydrogen atom, the ratio of the radii of the first three orbits                                  | 1 : 4 : 9  |
| 57. | The wavelength associated with an electron accelerated by 100 V                                     | 1.227 Å  |

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| 58. | The wavelength associated with an electron accelerated by 10000 V or 10 kV | 0.1227 Å   |
| 59. | The resolving power of electron microscope                                 | $10^5$   |
| 60. | Nuclear size or radius   | 1.3 F  |
| 61. | 1 fermi equals to  | $10^{-15}$ m   |
| 62. | Nuclear density  | $1.816 \times 10^{17}$ kg m <sup>-3</sup>  |
| 63. | The value of 1 amu   | $1.66 \times 10^{-27}$ kg  |
| 64. | Energy equivalence of 1 amu  | 931 MeV  |
| 65. | Nuclear force is stronger than gravitational force by                      | $10^{40}$  |
| 66. | The velocity range of $\beta$ -rays  | 0.3 c to 0.99c (or)<br>$0.9 \times 10^8$ ms <sup>-1</sup> to $2.77 \times 10^8$ ms <sup>-1</sup> |
| 67. | The velocity range of $\alpha$ -rays                                       | $100 > \beta$ and $10000 > \gamma$   |
| 68. | Half life period   | $T_{1/2} = \frac{0.6931}{\lambda}$   |
| 69. | Relation between half life and mean life periods                           | $T_{1/2} = 0.6931\tau$ (or) $\tau = \frac{T_{1/2}}{0.6931}$                                      |
| 70. | The kinetic energy of slow neutrons  | 0 eV to 1000 eV  |
| 71. | The kinetic energy of fast neutrons  | 0.5 MeV to 10 MeV  |
| 72. | The kinetic energy of thermal neutrons                                     | 0.025 eV   |
| 73. | Half life period of neutron  | 13 minutes   |
| 74. | Half life period of phosphorous  | 3 minutes  |
| 75. | Half life period of nitrogen   | 10.1 minutes   |
| 76. | Half life period of radio carbon ( ${}_6\text{C}^{14}$ )                   | 5570 years   |
| 77. | The value of exposure of radiation causes death                            | 600 R  |
| 78. | The value of radiation causes leukemia or cancer                           | 100 R  |
| 79. | The value of safe limit of radiations                                      | 250 m R or 0.25 R  |
| 80. | 1 Curie equals to  | $3.7 \times 10^{10}$ becquerel (or)<br>$3.7 \times 10^{10}$ disintegration/sec                   |
| 81. | 1 Becquerel equals to  | 1 disintegration/second  |
| 82. | The number of neutrons released per fission reaction                       | 3  |
| 83. | Natural uranium contains   | 99.28% of $\text{U}^{238}$ and 0.72 % of $\text{U}^{235}$  |
| 84. | The temperature of the photosphere of the sun                              | $1.4 \times 10^7$ K or 14 MK   |
| 85. | The energy of the primary cosmic rays                                      | $10^8$ MeV   |
| 86. | Primary cosmic rays contains   | 90% of Protons, 9% helium and 1% heavier nucleus   |
| 87. | Secondary cosmic rays contains   | alpha particles, protons, electrons, positrons, mesons and photons                               |

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| 88.  | The mass of leptons equals to  | $207 m_e$   |
| 89.  | The rest mass of mesons  | $207 m_e$ and $1000 m_e$                                  |
| 90.  | The mass of hyperons   | $2180 m_e$ and $3275 m_e$                                 |
| 91.  | The forbidden energy gap for insulators  | 10 eV   |
| 92.  | The forbidden energy gap for conductors  | 0 eV  |
| 93.  | The forbidden energy gap for germanium   | 0.7 eV  |
| 94.  | The forbidden energy gap for silicon   | 1.1 eV  |
| 95.  | The potential barrier for germanium  | 0.3 V   |
| 96.  | The potential barrier for silicon  | 0.7 V   |
| 97.  | The efficiency of half wave rectifier  | 40.6%   |
| 98.  | The efficiency of bridge rectifier   | 81.2%   |
| 99.  | In a CE(common emitter) amplifier, the phase reversal between input and output voltages        | $180^\circ$   |
| 100. | In an operational amplifier, pin 2 indicates   | inverting input terminal                                  |
| 101. | In an operational amplifier, pin 3 indicates   | non inverting input terminal                              |
| 102. | In an operational amplifier, pin 6 indicates   | output terminal   |
| 103. | In an operational amplifier, pin 4 indicates   | -ve power supply terminal                                 |
| 104. | In an operational amplifier, pin 7 indicates   | +ve power supply terminal                                 |
| 105. | In an operational amplifier, pin 8 indicates   | no connection   |
| 106. | In an operational amplifier, pins 1 and 5 indicate   | null adjustment   |
| 107. | The resistance to be connected to a galvanometer to measure the maximum voltage range upto 10V | $9900 \Omega$ in series                                   |
| 108. | The resistance to be connected to a galvanometer to measure the maximum current range upto 10A | $\frac{100}{9900} \Omega$ in parallel ( or) $0.01 \Omega$ |
| 109. | The frequency of radio waves for space wave propagation  | 30 MHz  |
| 110. | Audio frequency range  | 20 Hz to 20000 Hz<br>or 20 Hz to 20 kHz                   |
| 111. | Frequency modulated systems are operated at a frequency  | above 40 MHz  |
| 112. | The intermediate frequency of superheterodyne AM receiver                                      | 455 kHz   |
| 113. | The intermediate frequency of superheterodyne FM receiver                                      | 10.7 MHz  |
| 114. | The time taken to scan one line in interlaced scanning   | $64 \mu s$ (or) 64 micro seconds                          |
| 115. | In interlaced scanning the time taken to scan vertical field                                   | 20 ms or 20 milli second                                  |
| 116. | The distance covered by the Radar pulse in every micro second                                  | 300 m   |

| S.no. | CONCEPT QUESTIONS  | ANSWERS  |
|-------|--|--|
| 1.    | The principle used in lightning conductor  | corona discharge or action of points   |
| 2.    | The direction of electric field at a point on the equatorial line due to an electric dipole  | parallel to the axis of the dipole and opposite to the direction of dipole moment                                      |
| 3.    | The law that governs the force between the electric charges is   | Coulomb's law  |
| 4.    | The negative gradient of potential is equal to   | Electric field intensity   |
| 5.    | An electric dipole of moment $\vec{p}$ is placed in uniform electric field of intensity $\vec{E}$ at an angle $\theta$ with respect to the field. The direction of the torque is   | Perpendicular to the plane containing $\vec{p}$ and $\vec{E}$  |
| 6.    | The capacitance of a capacitor is  | directly proportional to the charge $q$ and inversely proportional to the potential $V$                                |
| 7.    | The unit of number of electric lines of force passing through a given area is  | $\text{Nm}^2\text{C}^{-1}$   |
| 8.    | A dielectric medium is placed in an electric field $E_0$ . The field induced inside the medium   | acts opposite to $E_0$   |
| 9.    | A non-polar dielectric is placed in an electric field $E$ , its induced dipole moment  | acts in the direction of $E$   |
| 10.   | When the charge given to a capacitor is doubled, its capacitance   | does not change  |
| 11.   | Two point charges $+q$ and $-q$ are placed at points A and B respectively separated by a small distance. The electric field intensity at the midpoint O of AB  | acts along AB  |
| 12.   | An electric dipole of dipole moment $P$ is kept parallel to an electric field of intensity $E$ . The work done in rotating the dipole through an angle $90^\circ$  | $-PE$  |
| 13.   | Point charges $+q, +q, -q$ and $-q$ are placed at the corners A, B, C and D respectively of a square. O is the point of Intersection of the diagonals AC and BD. The resultant electric field intensity at the point O         | acts in the direction BC   |
| 14.   | Two point charges $+q_1$ and $+q_2$ are placed in air at a distance of $2m$ apart, one of the charges is moved towards the other through a distance of $1m$ . The work done is   | $\frac{q_1q_2}{8\pi\epsilon_0}$  |
| 15.   | The equipotential surface of an electric dipole is   | a plane surface passing through the centre of the electric dipole and perpendicular to the axis of the electric dipole |
| 16.   | A and B are two hollow metal spheres of radii $50\text{ cm}$ and $1\text{ m}$ carrying charges $0.6\mu\text{C}$ and $1\mu\text{C}$ respectively. They are connected externally by a conducting wire. Now the charge flows from | A to B till the potentials become equal  |
| 17.   | When a dielectric slab is introduced between the plates of a charged parallel plate capacitor, its   | Electric field decreases   |
| 18.   | The force between two charges situated in a medium of permittivity $\epsilon$ is   | $\frac{9 \times 10^9}{\epsilon_r} \frac{q_1q_2}{r^2}$  |
| 19.   | When the diameter of a conductor is doubled, its resistance  | decreases four times   |
| 20.   | The electrical resistivity of a thin copper wire and a thick copper rod are respectively $\rho_1 \Omega\text{m}$ and $\rho_2 \Omega\text{m}$ . Then  | $\rho_1 = \rho_2$  |

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| 21. | When 'n' resistors of equal resistance (R) are connected in series and parallel respectively, then the ratio of their effective resistance  | $n^2 : 1$   |
| 22. | A graph is drawn taking potential difference across the ends of a conductor along x – axis and current through the conductor along y – axis, the slope of the straight line gives   | conductance   |
| 23. | The torque experienced by a rectangular current loop placed perpendicular to a uniform magnetic field is  | Zero  |
| 24. | The following pair of metals of a thermocouple produces the maximum e.m.f.  | Sb – Bi   |
| 25. | The principle used in thermopile is   | Seebeck effect                                      |
| 26. | Fuse wire is an alloy of  | Lead and Tin  |
| 27. | Thermopile is used to detect  | thermal radiation                                   |
| 28. | For a given thermocouple, the neutral temperature   | is a constant                                       |
| 29. | When the number of turns in the galvanometer is doubled, current sensitivity  | increases twice                                     |
| 30. | Fuse wire has   | high resistance                                     |
| 31. | The large joule heating effect is produced when   | 3 A current through $2\Omega$ resistor for 1 second |
| 32. | In the experiment to verify Joule's law when the current passed through the circuit is doubled keeping resistance ( R ) and time of passage of current ( t ) constant, temperature of the liquid                              | increases four times                                |
| 33. | The force on a current carrying conductor placed in a magnetic field is given by  | Fleming's Left hand rule                            |
| 34. | AB is a rod of lead, the end A is heated. A current I is allowed to flow along AB. Now due to Thomson effect in rod AB  | heat is neither absorbed nor liberated              |
| 35. | A proton and $\alpha$ – particle are projects with this same velocity normal to a uniform magnetic field. The ratio of the magnetic Lorentz force experienced by the proton and the $\alpha$ – particle is                    | 1 : 2   |
| 36. | In a thermocouple, when the temperature of cold junction is increased ( but less than neutral temperature) the temperature of inversion   | does not change                                     |
| 37. | A beam of cathode rays moves from left to right in a plane of the paper and it enters into a uniform magnetic field acting perpendicular to the plane of the paper and inwards. Now, the cathode rays are deflected           | downwards   |
| 38. | The generator rule is   | Fleming's right hand rule                           |
| 39. | In LCR circuit when $X_L = X_C$ , the current   | is in phase with the voltage                        |
| 40. | In AC circuit with capacitor only, if the frequency of the signal is zero, then the capacitive reactance is   | infinity  |
| 41. | The core used in audio frequency chokes is  | iron  |
| 42. | In a transformer, eddy current loss is minimized by   | laminated core made of stelloy                      |
| 43. | For a D.C. circuit, the value of capacitive reactance is  | infinity  |
| 44. | The effective value of alternating current is   | $\frac{I_0}{\sqrt{2}}$                              |
| 45. | A rectangular coil is uniformly rotated in a uniform magnetic field such that the axis of rotation is perpendicular to the direction of the magnetic field. When the plane of the coil is perpendicular to the magnetic field | magnetic flux is maximum, induced e.m.f. is zero    |
| 46. | In an a.c. circuit, the voltage leads the current by a phase  | only an inductor L                                  |

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|     | of $\frac{\pi}{2}$ , then the circuit has   |   |
| 47. | The resonant frequency of RLC circuit is $\nu_0$ .<br>The inductance is doubled. The capacitance is also doubled<br>Now the resonant frequency of the circuit is  | $\frac{\nu_0}{2}$                       |
| 48. | A rectangular coil of wire is placed in a uniform magnetic field such that the plane of the coil is parallel to the magnetic field. The magnetic flux linked with the coil and the emf induced are respectively | zero and zero                           |
| 49. | The existence of electromagnetic waves was confirmed by   | Hertz                                   |
| 50. | Unpolarised light passes through a tourmaline crystal. the emergent light is analysed by an analyser. When the analyser is rotated through 90°. The intensity of light  | varies between maximum and zero         |
| 51. | The radiations used in physiotherapy is   | infra – red                             |
| 52. | Optically active material   | sodium chloride                         |
| 53. | Electric filament lamp gives rise to  | continuous spectrum                     |
| 54. | In Young's double slit experiment, the separation between the slits is halved and the distance between the slits and the screen is doubled. Then the fringe width is  | quadrupled                              |
| 55. | The phenomenon of light used in the formation of Newton's rings experiment is   | interference                            |
| 56. | In Raman effect, the spectral line with lower frequency than the incident frequency is  | Stokes lines                            |
| 57. | The optical rotation does not depend on   | Intensity of the light used.            |
| 58. | In case of Fraunhofer diffraction, the wavefront undergoing diffraction is  | plane wavefront                         |
| 59. | Soap bubbles exhibit a brilliant colours in sun light due to  | interference of light                   |
| 60. | The radii of the Newton's dark rings are in the ratio   | $\sqrt{1} : \sqrt{2} : \sqrt{3}$        |
| 61. | The ratio of the radii of the 4 <sup>th</sup> and 9 <sup>th</sup> dark ring in Newton's ring experiment is  | 2 : 3                                   |
| 62. | The dark lines found in solar spectrum are called   | Fraunhofer lines                        |
| 63. | Waves from two coherent sources interfere with each other. At a point where the trough of one wave superimposes with the trough of the other wave. The intensity of light is                                    | maximum                                 |
| 64. | The nature of wavefront corresponding to extraordinary ray inside a calcite crystal is  | elliptical                              |
| 65. | Increasing order of wavelength of spectral lines  | $H_\delta, H_\gamma, H_\beta, H_\alpha$ |
| 66. | In a Nicol prism, the ordinary ray is prevented from coming out of Canada balsam by the phenomenon of   | total internal reflection               |
| 67. | In Young's double slit experiment bandwidth $\beta$ contains  | both a bright band and dark band        |
| 68. | According to Foucault and Michelson experiment the velocity of light in a rarer medium is   | greater than in a denser medium         |
| 69. | A ray of light is incident normally on a glass surface of index 1.5. The angle of refraction is   | zero                                    |
| 70. | In Raman effect, wavelength of incident light is 5890Å.<br>The wavelength of Stokes and anti-Stokes lines are   | 5895 Å and 5885 Å                       |