GUJCET-2022

Time: 1 Hours
Maximum Marks: 40

PHYSICS

General Instructions

1. The Physics test consists of 40 questions. Each question carries 1 mark. For each
2. correct response, the candidate will get **1** mark. For each incorrect response, **1/4** mark will be deducted. The maximum marks are **40**.
3. This Test is of 1 hour duration.

(1) "The polarity of induced emf is such that it tends to produce a current which oppose the change in magnetic flux that produced it." This statement is known as...

(A) Kirchhoff (B) Maxwell (C) Faraday (D) Lenz

(2) A pair of adjacent coil has a mutual inductance of 1.5 H. If the current in one coil changes from 0 to 10 A in 0.5 s, what is the change of flux linkage with the other coil?

(A) 15 Wb (B) 1.5 Wb (C) 30 Wb (D) 0.15 Wb

(3) An air-cored solenoid with length 30 cm, area of cross-section 25 cm^2 and number of turns 500, carries a current of 2.5 A. The current is suddenly switched off in a brief time of 10^{-3} s. How much is the average back emf induced across the ends of the open switch in the circuit? Ignore the variation in magnetic field near the ends of the solenoid.

(A) 654 V (B) 65.4 V (C) 6.54 V (D) 0.654 V

(4) For an ideal transformer, if $N_s > N_p$ then.....

(A) $V_s < V_p$ (B) $V_s > V_p$ (C) $V_s = V_p$ (D) None of these

(5) A charged 10μF capacitor is connected to a 16mH inductor. What is the angular frequency of free oscillations of the circuit?

(A) 1111 rad s^{-1} (B) 25 rad s^{-1} (C) 250 rad s^{-1} (D) 2500 rad s^{-1}

201, Rajpath Complex, Vasna - Bhayli Main Rd, Near Bright Day School, Opp Essar Petrol Pump, Vadodara - 391 410 | **8780755750, 8780753078**
www.infinityscholarshub.com

(6) A light bulb is rated at 200 W for a 220 V supply. Find the resistance of the bulb.

(A) 242 Ω (B) 484 Ω (C) 220 Ω (D) 400 Ω

(7) A radio can tune into any station in the 6 MHz to 12 MHz band. What is the corresponding wavelength band? ($c = 3 \times 10^8$ m/s)

(A) 20 m to 30 m (B) 25 m to 50 m (C) 40 m to 60 m (D) 10 m to 20 m

(8) A charged particle oscillates about its mean equilibrium position with a frequency of 10^9 Hz. What is the frequency of the electromagnetic waves produced by the oscillator?

(A) 10^{-9} Hz (B) 10^9 Hz (C) 10^{18} Hz (D) 10^{10} Hz

(9) Light from a point source in air falls on a spherical glass surface (n = 1.5 and radius of curvature = 20 cm). The distance of the light source from the glass surface is 100 cm. Find the image distance.

(a) 200 cm (B) –200 cm (C) –100 cm (D) 100 cm

(10) Double – convex lenses are to be manufactured from a glass of refractive index 1.55 with both faces of the same radius of curvature. What is the radius of curvature required if the focal length is to be 20 cm?

(A) 22 cm (B) 2.2 cm (C) 44 cm (D) 4.4 cm

(11) What is the focal length of a convex lens of focal length 30 cm in contact with a concave lens of focal length 10 cm? [Ignore thickness of lens]

(A) –20 cm (B) –40 cm (C) –15 cm (D) –30 cm

(12) Unpolarised light is incident on a plane glass surface. What should be the angle of incidence so that the reflected and refracted rays are perpendicular to each other?

(A) 58° (B) 57° (C) 56° (D) 59°

(13) Two slits are made 3 millimetre (3 mm) apart and the screen is placed 2 m away. What is the fringe separation when blue-green light of wavelength 600 nm is used?

(A) 0.5 mm (B) 0.6 mm (C) 0.4 mm (D) 0.7 mm

(14) Estimate the distance for which ray optics is good approximation for an aperture of 5 mm and wavelength 500 nm.

(A) 40 m (B) 18 m (C) 50 m (D) 60 m

(15) What is the de-Broglie wavelength associated with an electron moving with a speed of 6.4×10^6 m/s?

[Mass of electron me = 9.11×10^{-31} kg. Planck's constant h = 6.63×10^{-34} J.s.]

(A) 0.135 nm (B) 0.114 nm (C) 0.124 nm (D) 0.145 nm

201, Rajpath Complex, Vasna - Bhayli Main Rd, Near Bright Day School, Opp Essar Petrol Pump, Vadodara - 391 410 | **8780755750, 8780753078**
www.infinityscholarshub.com

(16) An electron, an α-particle and a proton have the same kinetic energy. Which of these particles has the shortest de-Broglie wavelength?

(A) α-particle (B) Electron (C) Proton (D) None of these

(17) A difference of 5.4 eV separates two energy levels in an atom. What is the frequency of radiation emitted when the atom makes a transition from the upper level to the lower level?

[1 eV = 1.6×10^{-19} J, h = 6.625×10^{-34} J.s.]

(A) 5.6×10^{14} Hz (B) 5.6×10^{15} Hz

(C) 1.304×10^{15} Hz (D) 1.304×10^{14} Hz

(18) What is the shortest wavelength present in the Paschen series of spectral lines?

(A) 840 nm (B) 720 nm (C) 320 nm (D) 820 nm

(19) The radius of the innermost electron orbit of a hydrogen atom is 5.3×10^{-11} m. What are the radii of the n = 3 orbit?

(A) 2.12×10^{-10} m (B) 4.77×10^{-10} m

(C) 4.12×10^{-10} m (D) 2.24×10^{-10} m

(20) In accordance with the Bohr's model, find the quantum number that characterises the earth's revolution around the sun in an orbit of radius 1.5×10^{11} m with orbital speed 3×10^{4} m/s. (Mass of earth = 6×10^{24} kg, h = 6.625×10^{-34} J.s.)

(A) 2.6×10^{74} (B) 1.6×10^{74} (C) 3.6×10^{74} (D) 4.6×10^{74}

(21) Given the following atomic masses

$^{238}_{92}\mathrm{U} = 238.05079\,\mathrm{u}$

$^{4}_{2}\mathrm{He} = 4.00260\,\mathrm{u}$

$^{234}_{90}\mathrm{Th} = 234.04363\,\mathrm{u}$

Calculate the energy released during the alpha decay of $^{238}_{92}\mathrm{U}$.

$\left(1\mathrm{u} = 931.5\frac{\mathrm{MeV}}{\mathrm{C}^2}\right)$

(A) 5.75 MeV (B) 6.23 MeV (C) 4.25 MeV (D) 3.25 MeV

(22) A radioactive isotope has a half-life of T years. How long will it take the activity to reduce to 6.250%?

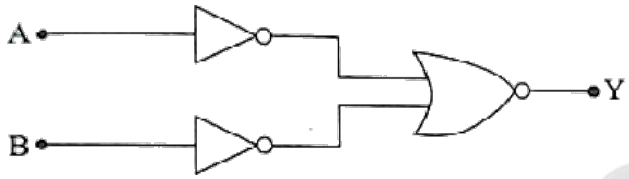
(A) 5T (B) 6T (C) 3T (D) 4T

201, Rajpath Complex, Vasna - Bhayli Main Rd, Near Bright Day School, Opp Essar Petrol Pump, Vadodara - 391 410 | **8780755750, 8780753078**
www.infinityscholarshub.com

(23) The half-life of $^{90}_{38}Sr$ is 28 years. What is the disintegration rate of 38g of this isotope? [$N_A = 6.023 \times 10^{23}$ mol^{-1}]

(A) 3.7×10^{14} Bq (B) 4.7×10^{14} Bq (C) 2.7×10^{14} Bq (D) 5.7×10^{14} Bq

(24) The circuits shown in fig. works as which gate?



(A) AND gate (B) OR gate (C) NAND gate (D) NOR gate

(25) When a forward bias is applied to a p-n junction, it.....

(A) raises the potential barrier

(B) reduces the majority carrier current to zero

(C) lowers the potential barrier

(D) none of the above

(26) Suppose a pure Si crystal has 5×10^{28} atoms m^{-3}. It is doped by 1 ppm concentration of pentavalent As. Calculate the number of electrons and holes. Given that $n_i = 1.5 \times 10^{16}$ m^{-3}

(A) 5.5×10^{9} m^{-3} (B) 4.5×10^{9} m^{-3} (C) 6.5×10^{9} m^{-3} (D) 5.5×10^{-9} m^{-3}

(27) Dimensional formula of Electric flux =.....

(A) $M^1 L^3 T^{-3} A^{-1}$ (B) $M^1 L^3 T^3 A^{-1}$ (C) $M^1 L^{-3} T^{-3} A^{-1}$ (D) $M^{-1} L^3 T^{-3} A^{-1}$

(28) An electric dipole with dipole moment 4×10^{-9} C-m is aligned at 60° with the direction of a uniform electric field of magnitude 5×10^4 NC^{-1}. Calculate the magnitude of the torque acting on the dipole.

(A) 1.73×10^{-5} Nm (B) 1.73×10^{-4} Nm

(C) 17.3×10^{-5} Nm (D) 17.3×10^{-4} Nm

(29) An infinite line charge produces a field of 9×10^4 NC^{-1} at a distance of 2 cm. Calculate Electrical field produced at a distance of 3 cm.

(A) 6×10^{-5} NC^{-1} (B) 6×10^{3} NC^{-1} (C) 6×10^{4} NC^{-1} (D) 6×10^{2} NC^{-1}

201, Rajpath Complex, Vasna - Bhayli Main Rd, Near Bright Day School, Opp Essar Petrol Pump, Vadodara - 391 410 | **8780755750, 8780753078**
www.infinityscholarshub.com

(30) How will you connect 4 (four) capacitors, each of capacitance 4μF for having equivalent capacitance 1.6 μF?

(A) All four in parallel

(B) All four in series

(C) Two in parallel and two in series

(D) Three in parallel and one in series

(31) A slab of material of dielectric constant 3 has the same area as the plates of a parallel plate capacitor but has a thickness $\left(\frac{3}{4}\right)$d, where d is the separation of the plates. What is the Electrical potential difference between the plates, when the slab is inserted between the plates? Initial electrical potential difference V_0.

(A) $\frac{V_0}{2}$ (B) $\frac{V_0}{4}$ (C) $\frac{V_0}{6}$ (D) $\frac{V_0}{3}$

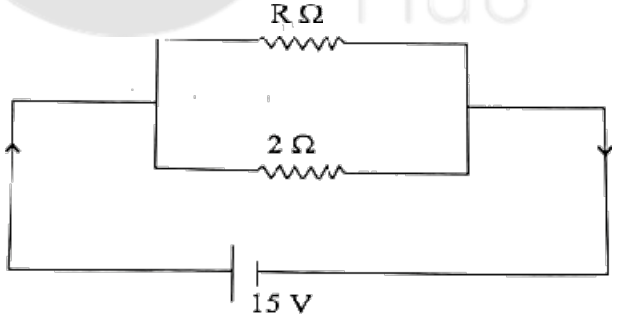
(32) A molecule of a substance has a permanent electric dipole moment of magnitude 10^{-29} C-m. 2 mole of this substance is polarised (at low temperature) by applying a strong electrostatic field of magnitude 10^6 Vm^{-1}. What should be potential energy of its? [1 mole of the substance contains 6×10^{23} molecules]

(A) 12 J (B) –12 J (C) –6 J (D) 6 J

(33) At room temperature (27°C) the resistance of a heating element is 100 Ω. What is the temperature of the element if the resistance is found to be 137Ω, given that the temperature coefficient of the material of the resistor is 1.35×10^{-4} $°C^{-1}$.

(A) 1027 °C (B) 1227 °C (C) 2767 °C (D) 2327 °C

(34) For the given following circuit diagram, the dissipated of electrical power 150 W, then find value of Resistance R =.....



(A) 6Ω (B) 8Ω (C) 5Ω (D) 3Ω

201, Rajpath Complex, Vasna - Bhayli Main Rd, Near Bright Day School, Opp Essar Petrol Pump, Vadodara - 391 410 | **8780755750, 8780753078**
www.infinityscholarshub.com

(35) The number density of free electrons in a copper conductor estimated 8.5×10^{28} m^{-3}. How long does an electron take to drift from one end of a wire 6 m long to its other end? The area of cross-section of the wire is 1.0×10^{-6} m^2 and it is carrying a current of 1.5 A.

(A) 12.7×10^4 s (B) 5.4×10^4 s (C) 8.1×10^4 s (D) 4.5×10^4 s

(36) A solenoid of length 0.25 m has a radius of 1 cm and is made up of 500 turns. It carries a current of 2.5 A. What is the magnitude of the magnetic field inside the solenoid? ($\mu_0 = 4\pi \times 10^{-7}$ SI)

(A) 6.28×10^{-4} T (B) 6.28×10^{-2} T (C) 6.28×10^{-3} T (D) 6.28×10^{-1} T

(37) How the shunt wire should be?

(A) long and thick (B) long and thin (C) short and thin (D) short and thick

(38) Two long and parallel straight wires A and B carrying currents of 10 A and 4 A in the same direction are separated by a distance of 2 cm. Estimate the force on a 4 cm section of wire A. ($\mu_0 = 4\pi \times 10^{-7}$ SI)

(A) 1.6×10^{-6} N (B) 1.6×10^{-5} N (C) 1.6×10^{-4} N (D) 1.6×10^{-3} N

(39) A solenoid has a core of a material with relative permeability 400. The windings of the solenoid are insulated from the core and carry a current of 1 A. If the number of turns is 1000 per metre, find magnetic field (B) ..... T. ($\mu_0 = 4\pi \times 10^{-7}$ SI)

(A) $16\pi \times 10^{-2}$ (B) $16\pi \times 10^{2}$ (C) $1.6\pi \times 10^{+2}$ (D) $0.16\pi \times 10^{-2}$

(40) A short bar magnet placed with its axis at 30° with a uniform external magnetic field of 0.25 T experience a torque of magnitude equal to 4.5×10^{-2} J. What is the magnitude of magnetic moment of the magnet?

(A) 3.6 J T^{-1} (B) 0.036 J T^{-1} (C) 0.36 J T^{-1} (D) 36 J T^{-1}

201, Rajpath Complex, Vasna - Bhayli Main Rd, Near Bright Day School, Opp Essar Petrol Pump, Vadodara - 391 410 | **8780755750, 8780753078**
www.infinityscholarshub.com

Answer Key

1. D	2. A	3. C	4. B	5. D
6. A	7. B	8. B	9. D	10. A
11. C	12. C	13. C	14. C	15. B
16. A	17. C	18. A	19. B	20. A
21. C	22. D	23. C	24. A	25. C
26. B	27. A	28. B	29. C	30. C
31. A	32. B	33. C	34. A	35. B
36. C	37. D	38. A	39. A	40. C

Analysis

Easy	**20**
Moderate	**14**
Difficult	**6**

Chapter-wise Break-up

Chapter	Questions
Chapter 1 - Electric Charges and Fields	**3**
Chapter 2 - Electrostatic Potential and Capacitance	**4**
Chapter 3 - Current Electricity	**2**
Chapter 4 - Moving Charges and Magnetism	**3**
Chapter 5 - Magnetism and Matter	**2**
Chapter 6 - Electromagnetic Induction	**3**
Chapter 7 - Alternating Current	**2**
Chapter 8 - Electromagnetic Waves	**3**
Chapter 9 - Ray Optics and Optical Instruments	**3**
Chapter 10 - Wave Optics	**3**

201, Rajpath Complex, Vasna - Bhayli Main Rd, Near Bright Day School, Opp Essar Petrol Pump, Vadodara - 391 410 | **8780755750, 8780753078**
www.infinityscholarshub.com

Chapter 11 - Dual Nature of Radiation and Matter	**2**
Chapter 12 - Atoms	**4**
Chapter 13 - Nuclei	**3**
Chapter 14 - Semiconductor Electronics Materials, Devices and Simple Circuits	**3**

201, Rajpath Complex, Vasna - Bhayli Main Rd, Near Bright Day School, Opp Essar Petrol Pump, Vadodara - 391 410 | **8780755750, 8780753078**
www.infinityscholarshub.com