

Roll No. _____ To be filled in by the candidate.

(For all sessions)

Paper Code

8	4	7	5
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Physics (Objective)

Group - I

Time: 20 Minutes

Marks: 17

Note: Write answers to the questions on the objective answer sheet provided. Four possible answers A, B, C & D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or pen ink on the answer sheet provided.

Q1.

1. The force applied on unit area to produce any change in the shape of the body is:
(A) Tensile stress (B) Strain (C) Shear stress (D) Volumetric stress
2. The potential barrier in case of germanium is:
(A) 0.7 V (B) 0.6 V (C) 0.5 V (D) 0.3 V
3. Mathematical relation for XOR gate is:
(A) $X = \overline{AB} + \overline{A}B$ (B) $X = \overline{A+B}$ (C) $X = A + B$ (D) $X = A\overline{B} + \overline{A}B$
4. When platinum wire is heated, it appears cherry red at about:
(A) 500 °C (B) 900 °C (C) 1100 °C (D) 1300 °C
5. Compton effect is associated with:
(A) X-rays (B) γ -rays (C) α -rays (D) β -rays
6. The energy required to completely remove an electron from the first Bohr orbit is:
(A) $E_0 = 13.6$ eV (B) $E_0 = 13.6$ J (C) $E_0 = 1.6 \times 10^{-19}$ J (D) $E_0 = 3.2 \times 10^{-19}$ J
7. Neutron was discovered in 1932 by:
(A) Newton (B) Maxwell (C) Plank (D) James Chadwick
8. Both Xenon and Caesium each have:
(A) 66 isotopes (B) 50 isotopes (C) 46 isotopes (D) 36 isotopes
9. The presence of a dielectric between two point charges always reduces the:
(A) Magnetic force (B) Nuclear force (C) Coulomb's force (D) Gravitational force
10. The value of k (Coulomb's constant) is:
(A) $9 \times 10^9 \text{ Nm}^2 \text{ C}^{-2}$ (B) $9 \times 10^9 \text{ Ncm}^2 \text{ C}^{-2}$ (C) $9 \times 10^9 \text{ Nm}^{-2} \text{ C}^{-2}$ (D) $9 \times 10^9 \text{ N}^{-1} \text{ C}^{-2}$
11. The unit of resistivity is:
(A) $\Omega^{-1} \text{ m}^{-1}$ (B) $\Omega \text{ m}$ (C) $\Omega \text{ m}^{-1}$ (D) Ω
12. Two long parallel wires carrying currents I_1 and I_2 in the same direction:
(A) May repel or attract each other (B) Attract each other
(C) Repel each other (D) No effect
13. The Lorentz's force is:
(A) $\vec{F} = q\vec{E} + q(\vec{v} \times \vec{B})$ (B) $\vec{F} = q\vec{E}$ (C) $\vec{F} = I(\vec{L} \times \vec{B})$ (D) $\vec{F} = q(\vec{v} \times \vec{B})$
14. If we make the magnetic field stronger, the value of induced current:
(A) Decreases (B) Increases (C) Vanishes (D) Remains same
15. In case of inductor (solenoid) the formula for energy density is:
(A) $Um = \frac{B^2}{2\mu_0}$ (B) $Um = \frac{B}{2\mu_0}$ (C) $Um = \frac{B}{2\mu_0^2}$ (D) $Um = \frac{2B}{\mu_0^2}$
16. The waveform of an alternating voltage is a:
(A) Cotangent curve (B) Cosine curve (C) Tangent curve (D) Sine curve
17. The slope of q-t curve at any instant of time gives:
(A) Current (B) Voltage (C) Charge (D) Resistance

SECTION - I**Q2. Write short answers of any eight parts from the following:****(8×2=16)**

- Do electrons tend to go to the region of high potential or of low potential?
- What is decay constant? Write its mathematical relation with half life.
- If a point charge q of mass m is released in a non-uniform field with field lines pointing in the same direction, will it make a rectilinear motion?
- State the right hand rule to find the direction of magnetic field around a straight current carrying wire.
- Why does the picture on a TV screen become distorted when a magnet is brought near the screen?
- A particle carrying a charge of $2e$ falls through a potential difference of $3.0V$. Calculate the energy acquired by it.
- Draw the schematic diagram of inkjet printer.
- Why the resistance of ammeter should be very low?
- How can we increase the sensitivity of a galvanometer?
- Why are heavy nuclei unstable?
- What factors make a fusion reaction difficult to achieve?
- Differentiate between Hadrons and Leptons.

Q3. Write short answers of any eight parts from the following:**(8×2=16)**

- What is Wheatstone bridge? How can it be used to determine an unknown resistance?
- What are the difficulties in testing whether the filament of a lighted bulb obeys Ohm's law?
- Which theory failed to explain vast diverse electric behavior of solids? On which model this theory was based?
- A sinusoidal current has rms value of 10 A . What is the maximum or peak value?
- Write one advantage and one disadvantage of amplitude and frequency modulation.
- Why direct current cannot pass through a capacitor continuously?
- Distinguish between intrinsic and extrinsic semiconductor. Give one example of each.
- The inputs of a gate are 1 and 0 . Identify the gate if its output is: (a) 0 , (b) 1
- Why a potentiometer is preferred over an ordinary voltmeter?
- Define stress and strain. Give their SI units.
- Why a photodiode is operated in reverse biased state?
- What is a digital system? Give two examples.

Q4. Write short answers of any six parts from the following:**(6×2=12)**

- In a certain region the earth's magnetic field points vertically down. When a plane flies due north, which wingtip is positively charged?
- Can an electric motor be used to drive an electric generator with the output from the generator being used to operate the motor?
- What do we mean when we say that the atom is excited?
- Compton shift ($\Delta\lambda$) in wave is zero. Calculate scattering angle of photon.
- Will bright light eject more electrons from a metal surface than dimmer light of the same colour?
- Write down the postulates of special theory of relativity?
- Write four uses of X-rays.
- Why don't we observe a Compton effect with visible light?
- Distinguish between slip rings and split rings.

SECTION - II**Note: Attempt any THREE questions. Each question carries equal marks:****(3×8=24)**

- State and explain the Kirchhoff's first and second rules. 5
 - A point charge $q = 8.0 \times 10^{-8}\text{ C}$ is placed at the origin. Calculate electric field at a point 2.0 m from the origin on z -axis. 3
- Discuss the conversion of a galvanometer into an ammeter and voltmeter. 5
 - A.C. motor operates at 240 V and has a resistance of $0.5\ \Omega$. When the motor is running at normal speed the armature current is 15 A . Find the back emf in the armature. 3
- Explain the working of series resonance circuit. Write down its properties. 5
 - In a certain circuit, the transistor has a collector current of 10 mA and a base current of $40\ \mu\text{A}$. What is the current gain of the transistor? 3
- What is de-Broglie wavelength? Explain the experimental evidence of wave nature of electron by Davisson and Germer. 5
 - A 1.0 m long copper wire is subjected to stretching force and its length increases by 20 cm . Calculate the tensile strain and the percent elongation which the wire undergoes? 3
- Explain construction and working of mass spectrograph 5
 - Find the speed of the electron in the first Bohr orbit. 3