T COMMON HALF YEARLY EXAMINATION - 2024

Standard - XII

Reg.No. ☐ ☐ ☐ 2 4 1 9

**Time: 3.00 hrs.**   **PHYSICS**   **Marks: 70**

I.   Answer all the questions: **15×1=15**

1) If voltage applied on a capacitor is increased from V to 2V, choose the correct conclusion.

- a) Q remains the same, C is doubled
- b) Q is doubled, C doubled
- c) C remains same, Q doubled
- d) Both Q and C remain same

2) There is a current of 1.0 A in the circuit shown below. What is the resistance of P?

(Circuit: 10V source, 3Ω, 2.5Ω, P)

- a) 3.5Ω
- b) 1.5Ω
- c) 4.5Ω
- d) 2.5Ω
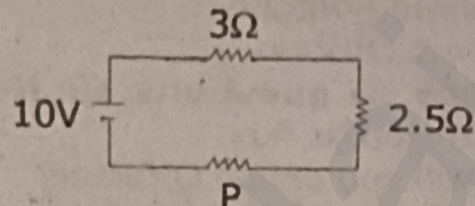
3) A toaster operating at 240V has a resistance of 120Ω. Its power is

- a) 400W
- b) 2W
- c) 480W
- d) 240W

4) A bar magnet of length ℓ and magnetic moment Pm is bent in the form of an arc as shown in figure. The new magnetic or pole moment will be

(Figure showing arc with 60° angle and r)
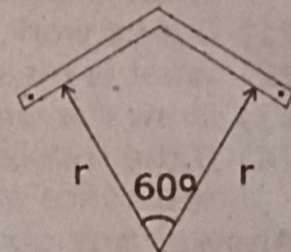
- a) Pm
- b) $\frac{3}{11}$ Pm
- c) $\frac{2}{11}$ Pm
- d) $\frac{1}{2}$ Pm

5) In an oscillating LC circuit, the maximum charge on the capacitor is Q. The charge on the capacitor when the energy is stored equally between the electric and magnetic fields is

- a) $\frac{Q}{2}$
- b) $\frac{Q}{\sqrt{3}}$
- c) $\frac{Q}{\sqrt{2}}$
- d) Q

6) In a series RL circuit, the resistance and inductive reactance are the same. Then the phase difference between the voltage and current in the circuit is

- a) $\frac{\pi}{4}$
- b) $\frac{\pi}{2}$
- c) $\frac{\pi}{6}$
- d) zero

7) An e.m wave is propagating in a medium with a velocity $\vec{v} = v\hat{i}$. The instantaneous oscillating electric field of this e.m wave is along +y axis, then the direction of oscillating magnetic field of the e.m wave will be along

- a) −y direction
- b) −x direction
- c) +z direction
- d) −z direction

8) The speed of light in an isotropic medium depends on

- a) its intensity
- b) its wavelength
- c) the nature of propagation
- d) the motion of the source w.r.t. medium

9) The transverse nature of light is shown in

- a) interference
- b) diffraction
- c) scattering
- d) polarisation

10) The wavelength λe of an electron and λp of a photon of same energy E are related by

- a) $\lambda p \propto \lambda e$
- b) $\lambda p \propto \sqrt{\lambda e}$
- c) $\lambda p \propto \frac{1}{\sqrt{\lambda e}}$
- d) $\lambda p \propto \lambda e^2$

11) The threshold wavelength for a metal surface whose photo electric work function is 3.313eV is

- a) 4125Å
- b) 3750Å
- c) 6000Å
- d) 2062.5Å

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12) In an hydrogen atom, the electron reducing in the second orbit, has angular momentum.

   a) h b) $\dfrac{h}{\pi}$ c) $\dfrac{4h}{\pi}$ d) $\dfrac{2h}{\pi}$

13) The barrier potential of a germanium diode is approximately
   a) 0.7V   b) 0.3V   c) 2.0V   d) 2.2V

14) The zener diode is primarily used as
   a) Rectifier   b) Amplifier   c) Oscillator   d) Voltage regulator

15) The gravitational waves were theoretically proposed by
   a) Conrad Rontgen   b) Marie Curie
   c) Albert Einstein   d) Edward Purcell

II. Answer any six questions. Qn.No. 24 is compulsory: **6×2=12**

16) Define electric flux.
17) How will you define Q-factor?
18) State Coulomb's inverse law.
19) Explain the reason for the glittering of diamond.
20) The ratio of intensities of two waves in an interference pattern is 36:1. What is the ratio of the amplitudes of the two interfering waves?
21) Define work function of a metal. Give its unit.
22) What is meant by activity or decay rate? Give its unit.
23) Draw the circuit diagram of a half wave rectifier.
24) If the resistance of coil is 3Ω at 20°C and $\alpha = 0.004/°C$ then determine its resistance at 100°C.

III. Answer any six questions. Qn.No. 33 is compulsory: **6×3=18**

25) Derive an expression for electrostatic potential due to a point charge.
26) State Kirchoff's First and Second Rules.
27) Explain the conversion of galvanometer into an ammeter.
28) How will you induce an emf by changing the area enclosed by the coil?
29) Give the uses of Infrared rays.
30) Give the Barkhausen conditions for sustained oscillations.
31) Find the dispersive power of a prism of the refractive indices of flint glass for red, green and violet colours are 1.613, 1.620 and 1.633 respectively.
32) Write any three laws of photoelectric effect.

33) Calculate the amount of energy released in Joules when 1 kg of $^{235}_{92}U$ undergoes fission reaction.

IV. Answer all the questions: **5×5=25**

34) Calculate the electric field due to a dipole on its axial line and equatorial line.   **(OR)**
Describe the microscopic model of current and obtain general form of ohm's law.

35) Derive an equation for magnetic field due to a long current carrying solenoid.   **(OR)**
Derive an expression for phase angle between the applied voltage and current in a series RLC circuit.

36) Explain the types of emission spectrum.   **(OR)**
Derive the mirror equation and the equation for lateral magnification.

37) Discuss the diffraction at single slit and obtain the condition for nth minimum.   **(OR)**
Obtain Einstein's photoelectric equation with necessary explanation.

38) Obtain the law of radioactivity. **(OR)**
State and prove Demorgan's first and second theorem.