V12P

Virudhunagar District Common Examinations
Common Half Yearly Examination - December 2022

Standard 12
PHYSICS
Part - I

Time: 3.00 hrs Marks: 70

Note: i) Answer all the questions. ii) Choose the most appropriate answer from the given four options and write the option code and the corresponding answer. **15×1=15**

1) ${}^{10}_{5}B$ and ${}^{13}_{6}C$ nuclei are examples of
a) Isotpes b) Isobars c) Isotones d) All of the above

2) The electric field at a distance $3R/2$ from the centre of a charged conducting spherical shell of radius 'R' is 'E'. The electric field at a distance $R/2$ from the centre of the sphere is
a) E b) $2E/3$ c) zero d) infinity

3) The temperature co-efficient of resistance of a wire is 0.00125/°C. At 20°C the resistance of the wire is 1Ω. The resistance of the wire is 2Ω at the temperature of
a) 800°C b) 700°C c) 850°C d) 820°C

4) Which of the following metals exhibits positive Thomson effect?
a) Platinum b) Nickel c) Iron d) Zinc

5) A wire of length 'ℓ' carries a current 'I' along the y-direction and magnetic field is given by $\vec{B} = \frac{\beta}{\sqrt{3}}\left(\hat{i}+\hat{j}+\hat{k}\right)$ tesla. The magnitude of Lorentz force acting on the wire is
a) $\sqrt{2/3}\,\beta I\ell$ b) $\sqrt{1/3}\,\beta I\ell$ c) $\sqrt{2}\,\beta I\ell$ d) $\sqrt{1/2}\,\beta I\ell$

6) 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) $Q/2$ b) $Q/\sqrt{3}$ c) $Q/\sqrt{2}$ d) Q

7) In a transformer, the number of turns in the primary and the secondary are 410 and 1230 respectively. If the current in the primary is 6A, then that in the secondary coil is
a) 2A b) 18A c) 12A d) 1A

8) The electric flux between the two plates of a capacitor varies with time as $\phi_E = 3.6\pi \times 10^4 t$ Nm^2c^{-1}. The displacement current between the plates is
a) 5 μA b) 2 μA c) 1 μA d) zero

9) The primary use of a zener diode is
a) Rectifier b) amplifier c) oscillator d) voltage regulator

10) In an electron microscope, the electrons are accelerated by a voltage of 14 KV. If the voltage is changed to 224 KV, then the de Broglie wavelength associated with the elctrons would
a) increase by two times b) decrease by two times
c) decrease by four times d) increase by four times

11) The ratio between the first three orbits of hydrogen atom is
a) 1:2:3 b) 2:4:9 c) 1:4:9 d) 1:3:5

12) The number of neutrons inside a nucleus having the maximum average binding energy per nucleon is
a) 26 b) 30 c) 56 d) 40

13) When a bi convex lens of glass having refractive index 1.47 is dipped in a liquid, it acts as aplane sheet of glass. This implies that the liquid must have refractive index
a) less than one b) less than that of glass
c) greater than that of glass d) equal to that of glass

14) The focal lengths of objective lens and eyepiece of an astronomical telescope are 'f_0' and 'f_e' respectively. The approximate length of the telescope is
a) f_0/f_e b) $f_0 f_e$ c) f_0+f_e d) f_0-f_e

15) The barrier potential of a silicon diode is
a) 0.7 V b) 0.3 V c) 2 V d) 2.2 V

Part - II 6×2=12

Note: i) Answer any six of the following questions.
ii) Questions no. 24 is compulsorily.

16) Mention any two applicatoins of capacitors.
17) A copper wire of cross-sectional area 0.5 mm^2 carries a current of 0.2 A. if the free electron density of copper is $8.4\times10^{28}m^{-3}$, then compute the drift velcoity of free electrons.
18) State Ampere's circuital law.
19) Define RMS value of alternating current.
20) What is meant by Fraunhofer lines?
21) Write any two differences between Fresnel diffraction and Fraunhofer diffraction.
22) Why does sky apper blue?
23) Define impact parameter.
24) Calculate the cut-off wavelength and cut-off frequency of x-rays from an x-ray tube of accelerating potential 20,000 V.

Part - III 6×3=18

Note: i) Answer any six questions.
ii) Questions no 33 is compulsorily.

25) Obtain the expression for energy stored in a capacitor.
26) What is seebeck effect? Mention any two uses of Seebeck effect.
27) A short bar magnet has a magnetic moment of 0.5 JT^{-1}. Calculate the magnitude of the magnetic field produced by the bar magnet at a point on the axial line at a distance of 0.1 m from the centre of the bar magnet.
28) Explain the various energy losses in a transformer.
29) Write any six properties of electromagnetic waves.
30) State and prove Brewster's Law.
31) State the laws of Photoelectric Emission.
32) State and prove De Morgan's Theorems.
33) What is the focal length of the combination if a lens of focal length−70 cm is brought in contact with a lens of focal length 150 cm? What is the power of the combination?

Part - IV 5×5=25

Note: i) Answer all the questions.

34) a] Derive the expressioni for electric field at a point on the equitorial line of an electric dipole. **(OR)**
b] i) Obtain the relation $N = N_0e^{-\lambda t}$ in radio activity.
ii) The energy released per fission of $^{235}_{92}U$ nuclens is 200 MeV. Calculate the number of fissions required for 1 W power.

35) a] Obtain the condition for balancing the Wheatstone's Bridge. **(OR)**
b] Based on Huygen's principle, prove the laws of refraction.

36) a] i) What is a galvanometer? Mention its principle.
ii) Discuss the conversion of a galvanometer into an ammeter. **(OR)**
b] Eplain the construction and working of a full wave rectifier.

37) a] Describe the Davisson - Germer experiment which demonstrated the wave nature of electrons. **(OR)**
b] Write and describe the Maxwell's equiations in integral form.

38) a] Obtain the expressions for (i) Resultant voltage (ii) Impedance and (iii) phase angle in LCR series circuit using phaser diagram. **(OR)**
b] Describethe Fizeau's method to determine the speed of light.