

AMRITA VIDYALAYAM

AMRITA PRE BOARD EXAMINATION 2019 - 20

Class : XII

Marks : 70

Time : 3 hrs

PHYSICS (042)

GENERAL INSTRUCTIONS:

1. All questions are compulsory.
2. There are 37 question in total.
3. Questions 1 to 20 carry one mark each.
4. Questions 21 to 27 carry 2 marks each.
5. Question 28 to 34 carry 3 marks each.
6. Question 35 to 37 carry 5 marks each.
7. There is no overall choice. However an internal choice has been provided in one question of 2 marks, one of 3 marks and all the three of 5 marks. Only one of the given choices in such questions is to be attempted.
8. Use of calculator is not permitted.

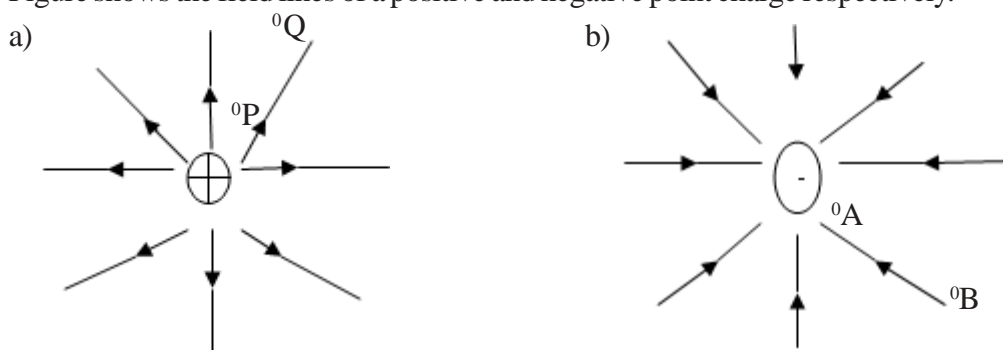
SECTION - A

1. Charge on a body is integral multiple of $\pm e$. It is given by the Law of _____.
(Conservation of charge, Conservation of energy, Conservation of mass, Quantisation of charge)
2. A dipole is placed parallel to electric field. If w is the work done in rotating the dipole by 60° , then work done in rotating it by 180° is _____.
($2w$, $3w$, $4w$, $w/2$)
3. The colour sequence in a carbon resistor is red, brown, orange and silver. The resistance of resistor is _____.
($21 \times 10^3 \pm 10\%$, $23 \times 10^1 \pm 10\%$, $21 \times 10^3 \pm 5\%$, $12 \times 10^3 \pm 5\%$)
4. A solenoid has 100 turns per metre length. If a current of 5 A is flowing through it, then magnetic field inside the solenoid is _____.
($2\pi \times 10^{-3}$ T, $2\pi \times 10^{-5}$ T, $4\pi \times 10^{-3}$ T, $4\pi \times 10^{-5}$ T)
5. An emf of 200V is induced in a circuit when current in the circuit falls from 5 A to 0 A in 0.1 second. The emf inductances of the circuit is _____.
(3.5 H, 3.9 H, 4 H, 4.2 H)
6. In series L CR circuit, quality factor can be improved by _____.
(decreasing L, increasing C, decreasing R, decreasing R and L)
7. Optical fibres are based on the phenomenon of _____.
(reflection, refraction, dispersion, total internal reflection)
8. The phenomenon of polarization is exhibited by _____.
(longitudinal wave, matter wave, transverse wave, mechanical wave)
9. Colours appearing on a thin film of a soap and a soap bubble is due to _____.
(diffraction, refraction, dispersion, interference)
10. Which of the following has maximum stopping potential when metal is illuminated by visible light?
(blue, yellow, violet, red)
11. Four nuclei of an element fuse together to form a heavier nucleus. If the process is accompanied by the release of energy, _____ would have a higher binding energy / nucleons.
12. The number of waves contained in unit length of the medium is called _____.
13. In an insulator, the forbidden energy gap between the valence band and the conduction band is of the order of _____.

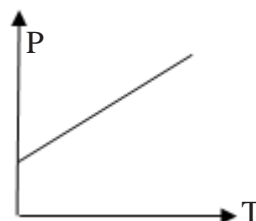
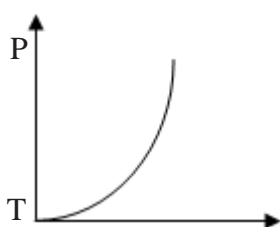
14. Net electrostatic field inside a positively charged conductor is _____.
15. The ratio of angular momentum (L) to magnetic moment (M) of an electron revolving in a circular orbit is _____.
16. Maximum torque acts on a current carrying coil when it is suspended in magnetic field such that its plane is _____ to magnetic field.
17. An oscillating charge particle radiates _____.
18. When light undergoes refraction, its frequency remains _____.
19. The angle of scattering θ for value of impact parameter b is _____.
20. The resistance of P-N junction is _____ when reverse biased.

SECTION - B

21. Figure shows the field lines of a positive and negative point charge respectively.



- a) Give the signs of the potential difference $V_P - V_Q$; $V_B - V_A$.
 - b) Give the sign of the potential energy difference of a small negative charge between the points Q and P; A and B.
22. Two students X and Y performed one lab activity using two different materials and result was as follows.



Interpret the graph and identify the material.

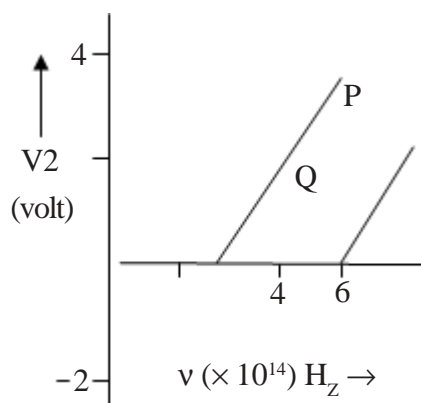
23. The principle of working of microwave oven is related to resonance. Justify the statement.
24. Distinguish between angle of inclination and angle of declination.
25. What is the significance of angle of minimum deviation? Explain with suitable diagram and equations.
26. State Bohr's postulate for the 'permitted orbits' for the electron in a hydrogen atom. Use this postulate to prove that the circumference of the n th permitted orbit for the electron can contain exactly n wavelength of the de Broglie wave length associated with the electron in that orbit.
27. Define Zener diode and Draw I - V characteristics of a Zener diode.

OR

What is LED? Give any one advantage of LED over conventional incandescent low power lamps.

SECTION - C

28. In the study of a photoelectric effect the graph between the stopping potential V and frequency ν of the incident radiation on two different metals P and Q is shown below.

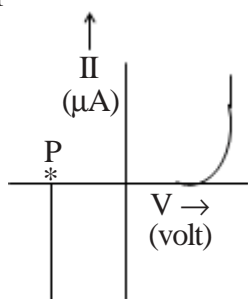


- Which one of the two metals has higher threshold frequency?
- Determine the work function of the metal which has greater value.
- Find the maximum kinetic energy of electron emitted by light of frequency $8 \times 10^{14} \text{ Hz}$ for this metal.

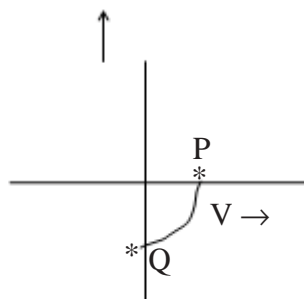
29. Compare half-life and mean life of a radio active nucleus.

30.

(i)



(ii)



- Name the type of a diode whose characteristics are shown in the figure (i) and figure (ii).
- What does the point P in figure (i) represent?
- What does the points P and Q in figure (ii) represent?

31. An electric field is uniform and in the positive x direction for positive x and uniform with the same magnitude but in the negative x direction for negative x . It is given that $E = 200 \hat{i} \text{ N/C}$ for $x > 0$ and $E = -200 \hat{i} \text{ N/C}$ for $x < 0$. A right circular cylinder of length 20 cm and radius 5 cm has its centre at the origin and its axis along the x -axis so that one face is at $x = +10 \text{ cm}$ and the other is at $x = -10 \text{ cm}$.

- What is the net outward flux through each flat face?
- What is the flux through the side of the cylinder?
- What is the net outward flux through the cylinder?
- What is the net charge inside the cylinder?

32. Increasing the current sensitivity of a galvanometer may not necessarily increase the voltage sensitivity. How will you apply the theory of galvanometer to prove the above statement?

- Obtain the expression for the magnetic energy stored in a solenoid in terms of magnetic field B , area A and length l of the solenoid.
- How does this magnetic energy compare with the electrostatic energy stored in a capacitor?

OR

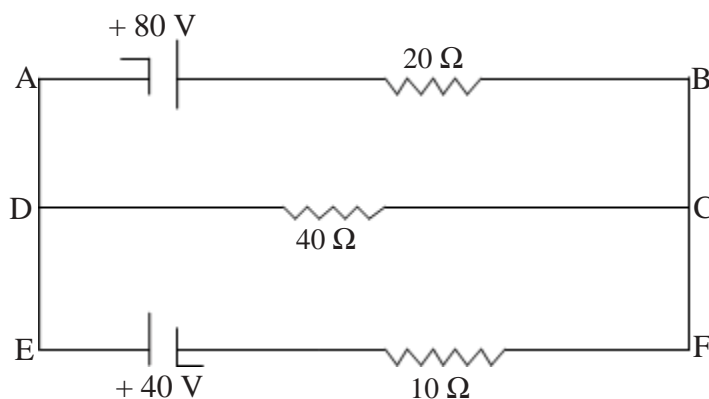
Explain how eddy currents in the metallic cores of transformers are reduced?

34. In Young's double slit experiment, the two slits 0.15 mm apart are illuminated by monochromatic light of wavelength 450 nm. The screen is 1.0 m away from the slits.

- Find the distance of the second
 - bright fringe?
 - dark fringe from the central maximum?
- How will the fringe pattern change if the screen is moved away from the slits?

SECTION - D

35. a) Using Kirchoff's rules, calculate the current through the $40\ \Omega$ and $20\ \Omega$ resistors in the following circuits.



- b) Deduce the balancing condition of Wheatstone's bridge.

OR

What is potentiometer? State its principle and explain with the help of a circuit diagram that how a potentiometer is used to compare the emf's of two primary cells.

36. a) In a series LCR circuit connected across an ac source of variable frequency, obtain the expression for its impedance and draw a plot showing its variation with frequency of the ac source.
 b) What is the phase difference between the voltages across inductor and the capacitor at resonance in the LCR circuit?
 c) When an inductor is connected to a 200 V dc voltage, a current of 1A flows through it. When the same inductor is connected to a 200 V, 50 Hz ac source, only 0.5 A current flows. Explain why? Also calculate the self-inductance of the inductor.

OR

Draw a schematic sketch of an ac generator describing its basic elements. State briefly its working principle. Show a plot of variation of

- a) Magnetic, flux and
 b) Alternating emf versus time generated by a loop of wire rotating in a magnetic field.
37. a) Discuss refraction of light from rarer to denser medium at a concave spherical surface and prove that

$$-\frac{\mu_1}{u} + \frac{\mu_2}{v} = \frac{\mu_2 - \mu_1}{R}$$

- b) A magician during a show makes a glass lens with $n = 1.47$ disappear in a trough of liquid. What is the refractive index of the liquid? Could the liquid be water?

OR

- a) With the help of a ray diagram, explain and derive expression for the magnifying power of a simple microscope.
 b) A thin convex lens of focal length 5 cm is used as simple microscope by a person with normal near point 25 cm. What is the magnifying power of the microscope?