

# MODEL QUESTION PAPER FOR AISSCE 2008

## PHYSICS

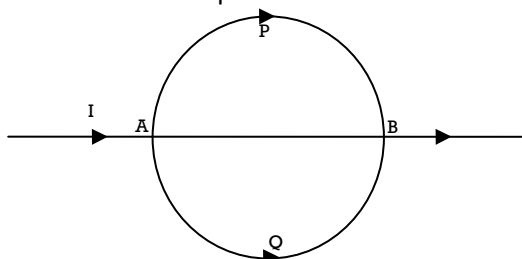
TIME 3 HRS

MAX MARKS: 70

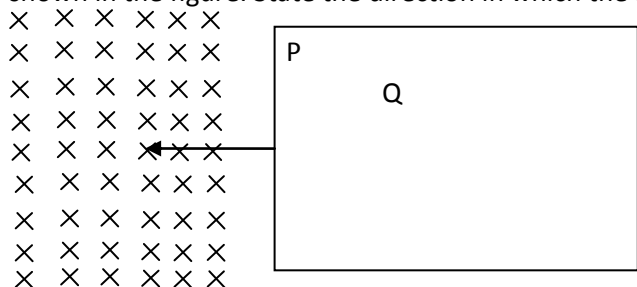
### GENERAL INSTRUCTIONS:

- All questions are compulsory.
- There are 30 questions in total. Questions 1 to 8 carry one mark each, questions 9 to 18 carry 2 marks each, questions 19 to 27 carry 3 marks each and questions 28 to 30 carry 5 marks each.
- There is no overall choice. However an internal choice has been provided in one question of two marks, one question of 3 marks and all three questions of five marks. You have to attempt any one of the choices in such cases.
- Use of calculators is not permitted.

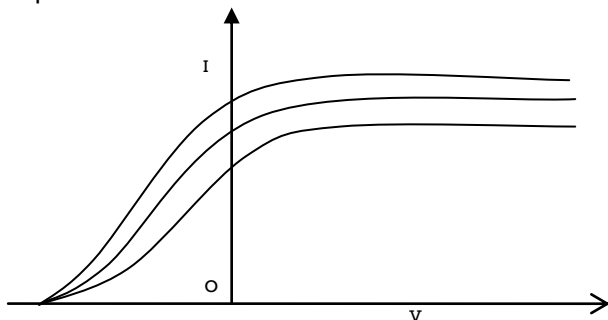
- What is the polarizing angle of a medium of refractive index  $\sqrt{3}$  ?
- Consider the circuit shown, where APB and AQB are semicircles. What will be the magnetic field at the centre 'C' of the circular loop?



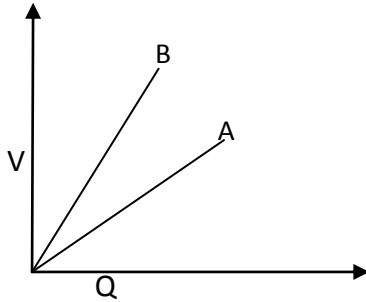
- The closed loop PQRS is moving into uniform magnetic field acting at right angles to the plane of the paper as shown in the figure. State the direction in which the induced current flows in the loop.



- What is the angle between the directions of electric field at any point on the equatorial line of an electric dipole and the dipole moment?
- Draw the voltage current characteristics of a zener diode.
- What is the shortest wavelength present in the Paschen series of spectral lines?
- Name the constituent radiation of the electromagnetic spectrum which
  - Has the wavelength range between 390 nm and 770 nm
  - Is absorbed from sunlight by ozone layer.
- In an experiment on photoelectric effect the following graphs were obtained between the photoelectric current (I) and the anode potential (V). Name the characteristic of the incident radiation that was kept constant in this experiment.



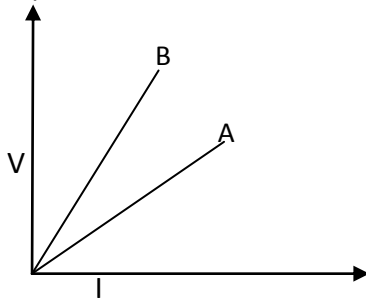
9. Calculate the potential at the centre of a square of side  $\sqrt{2}$  m, which carries at its four corners, charges of  $+2nC$ ,  $+1nC$ ,  $-2nC$  and  $-3nC$  respectively.
10. State the condition under which the phenomenon of resonance occurs in a series LCR circuit. Plot a graph showing the variation of current with frequency of the ac source in an LCR circuit.
11. Show that the total energy stored in an inductor  $L$ , when a current  $I$  is established through it is  $\frac{1}{2} LI^2$ .
12. Draw the energy level diagram showing the ground state and next few excited states for H atom. Mark the transition which corresponds to the emission of the spectral series for Balmer series.
13. The graph shows the variation of voltage( $V$ ) across the plates of two capacitors A and B versus increase of charge ( $Q$ ) stored on them, which of the two capacitors have higher capacitance? Give reason for your answer.



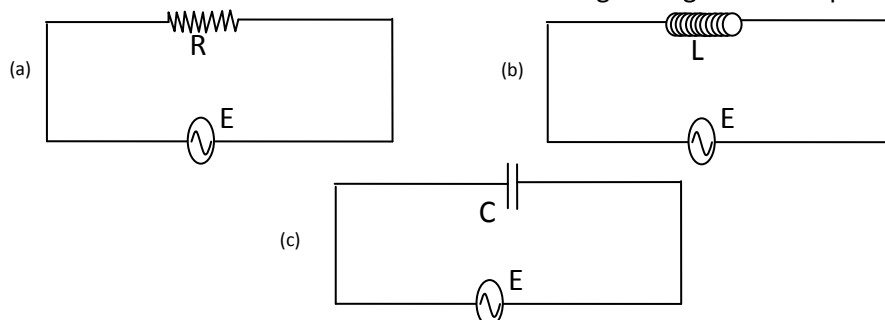
14. A TV tower has a height of 400m at a given place. Calculate its coverage range if the radius of the earth is 6400 km.
15. Find the wavelength of electromagnetic waves of  $5 \times 10^{19}$  Hz in free space. Give its two applications.
16. How does the resolving power of a compound microscope change on]
  - a. Decreasing the wavelength of light used
  - b. Decreasing the diameter of its objective lens
 OR

In a single slit diffraction pattern, how does the angular width of the central maximum vary when

- a. Aperture of slit is increased
  - b. Distance between the slit and screen is decreased. Justify your answer in each case.
17. A galvanometer coil has a resistance of 12 ohm and the meter shows full scale deflection for a current of 3 mA. How can you convert the galvanometer into a voltmeter of range 0 to 18 V
  18. V-I graphs for parallel and series combination of two metallic resistors are shown in figure. Which graph represents series combination? Justify your answer.



19. Apply Gauss' theorem to obtain an expression for electric field due to an infinite plain sheet of charge.
20. In figures (a), (b) and (c) are shown three ac circuits with equal currents. If the frequency of the emf is increased, then what will be the effects on the current flowing through them? Explain with reason.



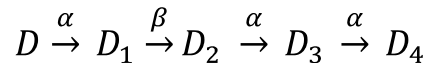
21. A convex lens made of a material of refractive index  $n_1$  is kept in a medium of refractive index  $n_2$ . Parallel rays of light are incident on the lens. Complete the path of the light rays emerging from the convex lens if,  
 (i)  $n_1 > n_2$       (ii)  $n_1 = n_2$       (iii)  $n_1 < n_2$
22. Derive an expression for the angular width of central maximum of diffraction pattern produced by a single slit illuminated with monochromatic light.
23. Radiation of frequency  $10^{15}$  Hz are incident on two photosensitive surfaces A and B. Following observation are recorded.

Surface A: no photoemission takes place

Surface B: Photoemission takes place but photoelectron has zero energy

Explain the above observation on the basis of Einstein's photoelectric equation. How will the observation with surface B changes when the wavelength of incident radiation is decreased?

24. The sequence of stepwise decays of radioactive nucleus is



If the mass number and atomic number of  $D_2$  are respectively 176 and 71, what are the corresponding values for D and  $D_4$  nuclei. Justify your answer.

25. Explain with the help of a neat diagram, the action of transistor as a switch.

OR

Explain through a labeled circuit diagram the use of a transistor as an oscillator.

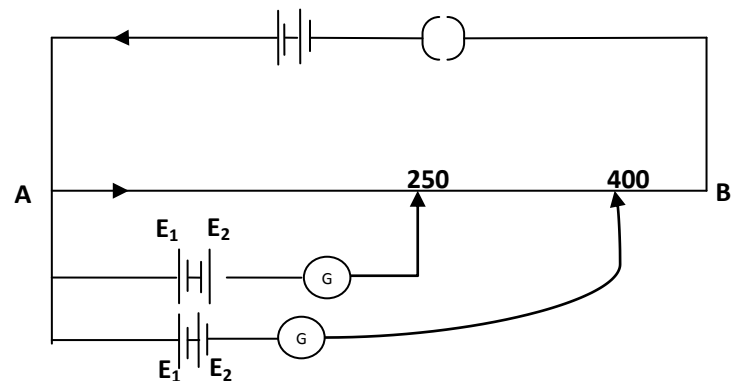
26. What is amplitude modulation? Represent the process graphically. Write two limitations.
27. What is an intrinsic semiconductor? How can these materials be converted into (i) P-type (ii) n-type extrinsic semiconductor. Explain with the help of energy band diagram.
28. Find the magnetic field induction at a point on the axis of a circular coil carrying current and hence find the magnetic field at the centre.

OR

(a) Explain briefly the magnetic elements of earth.

(b) At a certain location in Africa, a compass points  $12^\circ$  west of the geographic north. The north tip of the magnetic needle of a dip circle placed in the plane of magnetic meridian points  $60^\circ$  above the horizontal. The horizontal component of earth's magnetic field is measured to be 16 gauss, specify the magnitude of earth's field at the location.

29. (a) State the principle of a potentiometer with the help of circuit diagram. Describe a method to find the internal resistance of a primary cell.  
 (b) Two primary cells of emf  $E_1$  and  $E_2$  ( $E_1 > E_2$ ) are connected to the potentiometer wire AB as shown in figure.



If the balancing lengths of the two combinations of cells are 250 m and 400 m. find the ratio of  $E_1$  and  $E_2$

OR

What is drift velocity? Establish the relation between drift velocity and electric current. Deduce ohm's law using the concept of drift velocity.

30. With the help of a ray diagram, show the formation of image of a point object by refraction of light at the convex spherical refracting surface separating two media of refractive indices  $n_1$  and  $n_2$  ( $n_2 > n_1$ ) respectively. Using this diagram derive the relation

$$\frac{n_2}{v} - \frac{n_1}{u} = \frac{n_2 - n_1}{R}$$

Write the conventions used.

OR

Deduce lens maker's formula for a thin biconvex lens. How does the focal length of a convex lens change if monochromatic red light is used instead of monochromatic blue light?