CBSE SAMPLE PAPERS

CLASS-12 (PHYSICS)

Time allowed : 3 hours Maximum Marks : 70

General Instructions:

(i) There are 26 questions in all. All questions are compulsory.

(ii) This question paper has five sections : Section A, Section B, Section C, Section D and Section E.

(iii) Section A contains five questions of one mark each, Section B contains five questions of two marks each, Section C contains twelve questions of three marks each, Section D contains one value based question of four marks and Section E contains three questions of five marks each.

(iv) There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all the three questions of five marks weightage. You have to attempt only one of the choices in such questions.

(v) *You may use the following values of physical constants wherever necessary :*

$c = 3 \times 10^8$ m/s

$h = 6.63 \times 10^{-34}$ Js

$e = 1.6 \times 10^{-19}$ C

$\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1}

$\varepsilon_0 = 8.854 \times 10^{-12}$ C^2 N^{-1} m^{-2}

$\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9$ N m^2 C^{-2}

$m_e = 9.1 \times 10^{-31}$ kg

mass of neutron = 1.675×10^{-27} kg

mass of proton = 1.673×10^{-27} kg

Avogadro's number = 6.023×10^{23} per gram mole

Boltzmann constant = 1.38×10^{-23} JK^{-1}

Section A

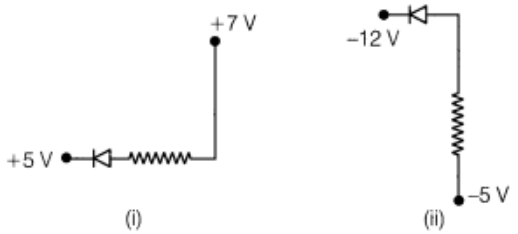
1. What happens to the interference fringes in Young's double slit experiment, if a monochromatic source is replaced by a source of white light?

2. Why is germanium preferred over silicon for making semiconductor devices?

3. State the condition for maximum current to be drawn from a cell.

4. Two charges of magnitudes $-2Q$ and $+Q$ are located at points $(a, 0)$ and $(4a, 0)$, respectively. What is the electric flux due to these charges through a sphere of radius $3a$ with its centre at the origin?

5. In the following diagrams, indicate whether the diodes are forward biased or reverse biased.



Diodes circuit diagrams

Section B

6. A coil with an air core and an electric bulb are connected in series across a 220 V and 50 Hz AC source. The bulb glows with some brightness. How will the glow of the bulb be affected on introducing a capacitor in series, with the circuit? Justify your answer.

7. Sky waves are not used in transmitting TV signals, why? State two factors by which the range of transmission of TV signals can be increased.

8. In a single slit experiment, how is the angular width of central bright maximum changes, when
   (i) the slit width is decreased.
   (ii) the distance between the slit and the screen is increased.
   (iii) light of smaller wavelength is used.

9. A heater coil is rated 100 W, 200 V. It is cut into two identical parts. Both parts are connected together in parallel to the same source of 200 V. Calculate the energy liberated per second in the new combination.

10. (i) A circular coil of 30 turns and radius 8.0 cm carrying a current of 6.0 A is suspended vertically in a uniform horizontal magnetic field of magnitude 1.0 T. The field lines make an angle 60° with the no mal of the coil. Calculate the magnitude of the counter torque that must be applied to prevent the coil from turning.

(ii) Would your answer change, i the circular coil were replaced by a planar coil of some irregular shape that encloses the same area? (All other particulars are also unaltered).

Or

Explain the following.

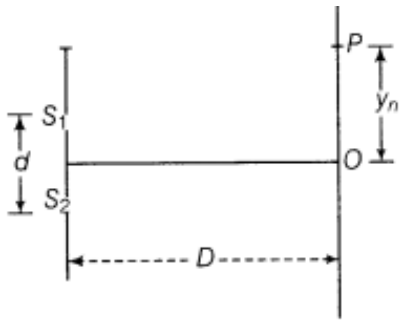
(i) Why do magnetic lines of for e form continuous closed oops?

(ii) Why are the field lines repelled (expelled) when a diamagnetic materials is placed in an external uniform magnetic field?

Section C

11. Net capacitance of three identical capacitors in series is 1 μF. What will be their net capacitance, if connected in parallel? Find the ratio of energy stored in the two configurations, if they are both connected to the same source.

12. The intensity at the central maxima (O) in a Young's double slit experimental is I_0. If the distance OP equals one-third of fringe width of the pattern, then show that the intensity at point P would be $I_0/4$.



Young's double slit experiment

13. Write two applications of :

(i) Infrared waves.

(ii) Microwaves.

(iii) Radiowaves.

14. State Curie law in magnetism. Represent it through graph.

15. How is the mutual inductance of a pair of coils affected when,

(i) separation between the coils is increased?

(ii) the number of turns in each coil is increased?

(iii) a thin iron sheet is placed between the two coils, other factors remaining the same?

Explain your answer in each case.

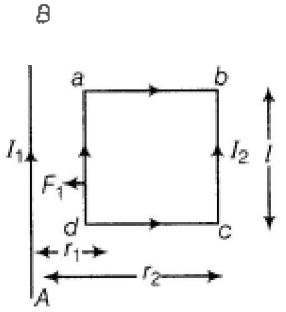
16. Why are de-Broglie waves associated with a moving football not visible? The wavelength, (λ) of a photon and the de-Broglie wavelength of an electron have the same value. Show that the energy of the photon is $2\lambda mc/h$ times th kinetic energy of the electron, where m, c and h have their usual meanings.

17. Does the current in an AC circuit lag, lead or remain in phase with the voltage of frequency (f) applied to the circuit, when (i) $f = f_r$, (ii) $f < f_r$, (iii) $f > f_r$, where f_r is the resonant frequency?

18. Find an expression for the force acting per unit length between two straight parallel currents carrying conductors and hence define one ampere current.

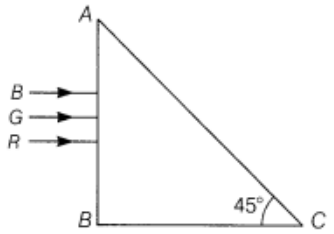
Or

In the figure, the straight wire *AB* is fixed while the loop is free to move under the influence of the electric currents flowing in them. In which direction does the loop begin to move? Give reason for your answer.



Loop with straight wire

19. Three light rays, red (*R*), green (*G*) and blue (*B*) are incident on a right angled prism *ABC* at face *AB*. The refractive indices of the material of the prism for red, green and blue wavelengths are 1.39, 1.44 and 1.47, respectively. Out of the three, which colour of ray will emerge out of face *AC*? Justify your answer. Trace the path of these rays after passing through face *AB*.



Light rays are incident on a right angled prism, *ABC*

20. What is the thermal velocity and a erage thermal velocity of free electrons in a conductor? What is the average velocity of free electrons in the presence of an electric field? The drift speed of free l ctrons in a metallic conductor is only a few ms^{-1}. How then is the current established almost, at the instant the circuit is closed?

21. The ground state energy of hydrogen atom is – 13.6 eV. If an electron makes a transition from an energy level – 0.85 eV to –1.51 eV, calculate the wavelength of the spectral line emitted. To which series of hydrogen spectrum does this wavelength belong?

⁂ *Photon is emitted when ele tron transits from higher energy state to lower energy state, he difference of energy of the states app a in form of energy of photon.*

22. A 50 MHz sky wave takes 4.04 ms to reach a receiver *via* re-transmission from a satellite 600 km above Earth's surface. Assuming re-transmission time by satellite negligible, find the distance between source and receiver. If communication between the two was to be done by Line of Sight (LOS) method, what should size and placement of receiving and transmitting antennas be?

Section D

23. Merrie Curi- and he teach r turned husband Pierre Curie worked hard to extract radium chloride ($RaCl_2$) from uranium o e. They succeed in 1902 after a long struggle. About 0.19 g of $R•Cl_2$ was extracted and its radioa tivity was studied. They were awarded by the nobel prize, which they shared it with Henri Becquerel.

(i What are the values shown by Merrie Curie and her husband?

(ii) What do you understand by radioactivity? How he half-life period is related to the disintegration constant?

(iii) he sequence of stepwise de ays of a radioactive nucleus is

$$D \xrightarrow{\alpha} D_1 \xrightarrow{\beta^-} D_2 \xrightarrow{\alpha} D_3$$

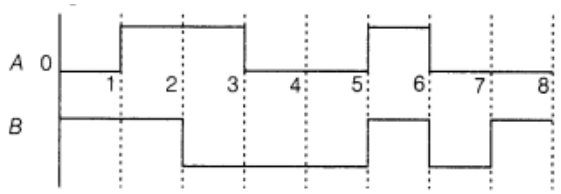
If the nucleon number and atomic number of D_2 are ‹76 and 71, respectively, then what are

th corresponding valu s of and D_3?
Justify your answer in each case.

Section E

24. Draw logic symbol of AND gate and show all possible input and output conditions in a truth table.

Two signals *A* and *B* shown in the figure are used as two inputs of an AND gate. Obtain its output waveform.



Output waveform of two signals

Or

Explain with the help of a circuit diagram, the use of *p-n* junction diode as a half-wave rectifier. Draw a sketch of the input and output waveforms.

25. Plot a graph to show the variation of the angle of deviation as a function of angle of incidence for light rays passing through a prism. Write the relation for the refractive index of the prism in terms of the angle of minimum deviation and the angle of the prism. If the angle of prism is very small, then write the relation for the refractive index of the prism.

Or

With the help of a ray diagram, show the formation of image of a point object by refraction of light at a spherical 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 sign conventions used. What happens to focal length of convex lens, when it is immersed in water?

26. Find an e pression for the torqu acting on an electric dipole placed in uniform electric field. A system of two charges $q_A = 2.5 \times 10^{-7}$ C and $q_B = -2.5 \times 10^{-7}$ C located at points $A(0, 0, -15)$ cm and $B(0, 0, +15)$ cm, respectively. Find the electric dipole moment of the system and the magnitude of th torque acting on it, when it is placed in a uniform electric field 5×10^4 C^{-1}, making an angle 30°.

Or

A capacitor of capacitance C is charged fully by connecting it to a battery of emf E. It is then disconnected from the battery. If the separation between the plates of the capacitor is now doubled, what will happen to

(i) charge stored by the capacitor?

(ii) potential difference across it?

(iii) field strength between the plates?

(iv) energy stored by the capacitor?

(v) capacitance f the capacitor?