PHYSICS
SAMPLE QUESTION PAPER

CBSE 2025-26

General Instructions :

(1) There are 33 questions in all. All questions are compulsory.

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

(3) All the sections are compulsory.

(4) **Section A** contains **sixteen questions, twelve MCQ and four assertion reasoning based of 1 mark each, Section B** contains **five questions of two marks each, Section C** contains seven questions of three marks each, **Section D** contains **two case study-based questions of four marks each** and Section E contains three long answer questions of five marks each.

(5) There is no overall choice. However, an internal choice has been provided in two questions in Section B, one question in Section C and all three questions in Section E. You have to attempt only one of the choices in such questions.

(6) Use of calculators is not allowed.

(7) You may use the following values of physical constants whereever necessary

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

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

iii. $m_p = 1.7 \times 10^{-27}$ kg

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

v. $\mu_0 = 4\pi \times 10^{-7}$ TmA^{-1}

vi. $h = 6.63 \times 10^{-34}$ J s

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

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

Time Allowed : 3 hours **Maximum Marks :** 70

SECTION A

1. The radius of the n^{th} orbit in Bohr model of hydrogen atom is proportional to

(a) n^2 (b) $\frac{1}{n^2}$ (c) n (d) $\frac{1}{n}$

2. A convex lens of focal length 20 cm is in contact with a concave lens of focal length f cm. If the power of combination is 2 Dioptre, then find focal length of concave lens.

(a) 3/100 cm (b) 100/3 cm

(c) 50 cm (d) 25 cm

3. A bar magnet has a magnetic moment of 200 A m^2. The magnet is suspended in a magnetic field of 0.30 N A^{-1} m^{-1}. The torque required to rotate the magnet from its equilibrium position through an angle of 30°, will be

(a) 30 N m (b) $30\sqrt{3}$ N m

(c) 60 N m (d) $60\sqrt{3}$ N m

4. Two identical light waves having phase difference ϕ propagate in same direction. When they superpose, the intensity of resultant wave is proportional to

(a) $\cos^2\phi$ (b) $\cos^2\frac{\phi}{2}$ (c) $\cos^2\frac{\phi}{3}$ (d) $\cos^2\frac{\phi}{4}$

5. Identify the correct statements from among the following

I. The constancy of the binding energy per nucleon in the range $30 < A < 170$ is a consequence of the fact that the nuclear force is short ranged.

II. The nuclear force does not depend on the charge of nucleons.

III. The nuclear force is repulsive when distance between two nucleons is less than 0.8 fm.

(a) I only (b) II, III

(c) I, II (d) I, II, III

6. What is the conductivity of a semiconductor sample having electron concentration of 5×10^{18} m^{-3}, hole concentration of 5×10^{19} m^{-3}, electron mobility of 2.0 m^2 V^{-1} s^{-1} and hole mobility of 0.01 m^2 V^{-1} s^{-1}? (Take charg e of electron as 1.6×10^{-19} C)

(a) 1.83 $(\Omega\text{-m})^{-1}$ (b) 1.68 $(\Omega\text{-m})^{-1}$

(c) 1.20 $(\Omega\text{-m})^{-1}$ (d) 0.59 $(\Omega\text{-m})^{-1}$

7. The resistance of a galvanometer is 2.5 Ω and it requires 50 mA for full scale deflection. The value of shunt resistance required to convert it into an ammeter of range 0 to 5 A is

(a) 2.5×10^{-2} Ω (b) 0.25×10^{-2} Ω

(c) 0.025×10^{-2} Ω (d) 0.0025×10^{-2} Ω

8. The intensity of light emerging from one of the slits in Young's double slit experiment is found to be 1.5 times the intensity of light emerging from the other slit. What will be the approximate ratio of intensity of an interference maximum to that of an interference minimum?

(a) 2.25 (b) 98 (c) 5 (d) 9.9

9. If the current through a coil changes from 1 A to 3 A in 0.02 s to produce an emf of 6 V, then the self-inductance of the coil is

(a) 0.12 H (b) 0.06 H

(c) 0.02 H (d) 0.01 H

10. Identify the wrong statement.

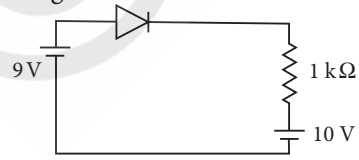
(a) Equipotential surface due to a single point charge is spherical.

(b) Equipotential surface can be constructed for dipoles too.

(c) The electric field is normal to the equipotential surface through the point.

(d) The work done to move a test charge on the equipotential surface is positive.

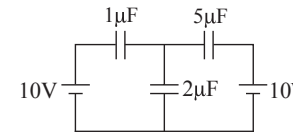
11. What is the value of current through the diode in the circuit given?



(a) 0 mA (b) 1 mA

(c) 19 mA (d) 9 mA

12. Find the charge on 2μF.



(a) 18 μC (b) 25 μC (c) 15 μC (d) 17 μC

For Questions 13 to 16, two statements are given one labelled Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the options as given below.

(a) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(b) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(c) Assertion is true but Reason is false.

(d) Both Assertion and Reason are false.

13. **Assertion (A) :** When a semiconductor is doped with a donor impurity, the hole concentration decreases and the electron concentration increases.
Reason (R) : A donor impurity is an atom with valence electrons of five always.

14. **Assertion (A) :** In Young's double slit experiment the two slits are at distance *D* apart. Interference pattern is observed on a screen at distance *D* from the slits. At a point on the screen when it is directly opposite to one of the slits, a dark fringe is observed. Then the wavelength of wave is proportional to square of distance of two slits.
Reason (R) : For a dark fringe intensity is zero.

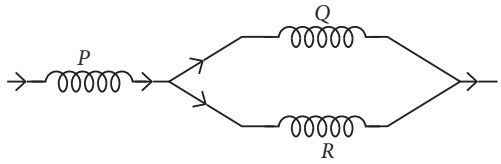
15. **Assertion (A)** : Work function of aluminium is 4.2 eV. Emission of electrons will not be possible if two photons each of energy 2.5 eV strike an electron of aluminium.
Reason (R) : For photoelectric emission the energy of each photon should be greater than the work function of aluminium.

16. **Assertion (A) :** Diffusion current in a *p-n* junction is greater than the drift current in magnitude if the junction is forward biased.
Reason (R) : Diffusion current in a *p-n* junction is from the *n*-side to the *p*-side if the junction is forward biased.

SECTION B

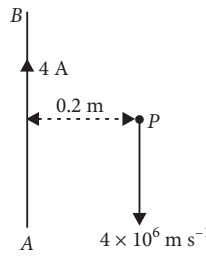
17. You are given two converging lenses of focal lengths 1.25 cm and 5 cm to design magnification of 30, find out separation between the objective and eye piece.

18. (I) Three identical long solenoids *P*, *Q* and *R* are connected to each other as shown in figure. If the magnetic field at the centre of *P* is 2.0 T, what would be the field at the centre of *Q*? Assume that the field due to any solenoid is confined within the volume of the solenoid only.



OR

18. (II) A long straight wire *AB* carries a current of 4 A. A proton *P* travels at 4×10^6 m s^{-1} parallel to the wire 0.2 m from it and in a direction opposite to the current as shown in the figure. Calculate the force which the magnetic field due to the current carrying wire exerts on the proton. Also specify its direction.



19. The focal length of an equi-concave lens is 3/4 times of radius of curvature of its surfaces. Find the refractive index of the material of the lens. Under what condition will this lens behave as a converging lens?

20. (I) Draw a graph between the frequency of incident radiation, υ and the maximum kinetic energy of the electrons emitted from the surface of a photosensitive material. State clearly how this graph can used to determine (i) Planck's constant and (ii) work function of the material.

OR

20. (II) Two monochromatic radiations, blue and violet, of the same intensity, are incident on a photosensitive surface and cause photoelectric emission. Would (i) the number of electrons emitted per second and (ii) the maximum kinetic energy of the electrons, be equal in the two cases? Justify your answer.

21. The magnetic field in a plane electromagnetic wave is given by
$B = (300\ \mu T) \sin (5.0 \times 10^{-5}\ s^{-1})(t - x/c)$
Find (i) the maximum electric field and (ii) the average energy density corresponding to the electric field.

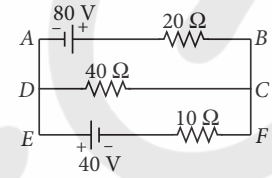
SECTION C

22. (I) (A) Define the terms drift velocity and relaxation time giving their physical significance.

(B) A conductor of length *L* is connected across a dc source of emf *E*. If the conductor is replaced by another of the same material and area of cross-section but of length 5 *L*, by what factor will the drift velocity change?

OR

22. (II) Using Kirchhoff's rules, calculate the current through the 40 Ω and 20 Ω resistors in the following circuit.



23. A bar magnet of magnetic moment 6 J T^{-1} is aligned at 60° with a uniform external magnetic field of 0.44 T. Calculate

(I) the work done in turning the magnet to align its magnetic moment (A) normal to the magnetic field, (B) opposite to the magnetic field,

(II) the torque on the magnet in the final orientation in case (ii).

24. (I) Draw *V-I* characteristics of a *p-n* junction diode.

(II) Answer the following giving reasons :

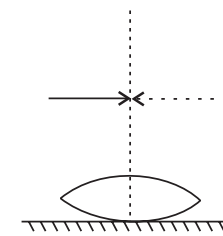
(A) Why is the reverse bias current almost independent of applied voltage up to breakdown voltage?

(B) Why does the reverse current show a sudden increase at breakdown voltage?

25. (I) Distinguish between nuclear fission and fusion giving an example of each.

(II) Explain the release of energy in nuclear fission and fusion on the basis of binding energy per nucleon curve.

26. A symmetric biconvex lens of radius of curvature *R* and made of glass of refractive index 1.5, is placed on a layer of liquid placed on top of a plane mirror as shown in the figure. An optical needle with its tip on the



principal axis of the lens is moved along the axis until its real, inverted image coincides with the needle itself. The distance of the needle from the lens is measured to be x. On removing the liquid layer and repeating the experiment, the distance is found to be y. Obtain the expression for the refractive index of the liquid in terms of x and y.

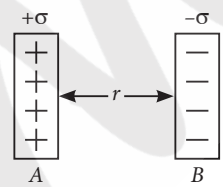
27. (I) An α-particle having kinetic energy K approaches a nucleus of atomic number Z. It gets close to the nucleus and then approaches a distance (d) and reverses its direction. Obtain an expression for the distance of closest approach (d) in terms of kinetic energy of the α-particle.

(II) A proton and an alpha particle approach a target nucleus in head-on position, with equal velocities. Find the ratio of their distances of closest approach to the target nucleus.

28. Draw a plot showing the variation of potential energy of two nucleons as a function of distances between them. Identify the regions in which the force between the nucleons is (i) attractive, and (ii) repulsive. Justify your answers.

SECTION D

29. Surface charge density is defined as charge per unit surface area of surface charge distribution. *i.e.*, $\sigma = \frac{dq}{dS}$. Two large, thin metal plates are parallel and close to each other. On their inner faces, the plates have surface charge densities of opposite signs having magnitude of 17.0×10^{-22} C m^{-2} as shown. The intensity of electric field at a point is $E = \frac{\sigma}{\varepsilon_0}$, where ε_0 = permittivity of free space.



(I) E in the outer region of the first plate is
(a) 17×10^{-22} N/C (b) 1.5×10^{-25} N/C
(c) 1.9×10^{-10} N/C (d) zero

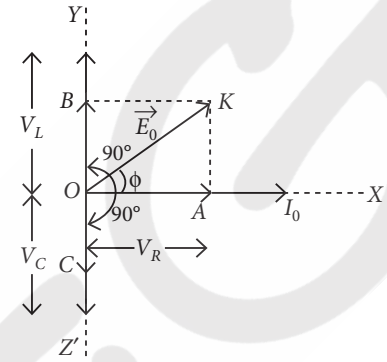
(II) E in the outer region of the second plate is
(a) 17×10^{-22} N/C (b) 1.5×10^{-15} N/C
(c) 1.9×10^{-10} N/C (d) zero

(III) E between the plates is
(a) 17×10^{-22} N/C (b) 1.5×10^{-15} N/C
(c) 1.9×10^{-10} N/C (d) zero

(IV) The ratio of E from right side of B at distances 2 cm and 4 cm, respectively is
(a) 1 : 2 (b) 2 : 1 (c) 1 : 1 (d) $1:\sqrt{2}$

30. When a pure resistance R, pure inductor L and an ideal capacitor of capacitance C is connected in series to a source of alternating e.m.f., then current at any instant through the three elements has the same amplitude and is represented as $I = I_0 \sin\omega t$. However, voltage across each element has a different phase relationship with the current as shown in graph.

The effective resistance of RLC circuit is called impedance (Z) of the circuit and the voltage leads the current by a phase angle ϕ.



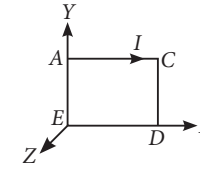
A resistor of 12 Ω, a capacitor of reactance 14 Ω and a pure inductor of inductance 0.1 H are joined in series and placed across 200 V, 50 Hz a.c. supply.

(I) Find the value of inductive reactance.
(II) Find the value of impedance.
(III) What is the value of current in the circuit?

SECTION E

31. (I) (A) An α-particle, a deuteron and a proton enter into a uniform magnetic field normally with the same kinetic energy and describe circular paths. Find the ratio of radii of their paths.

(B) Give the direction of magnetic field acting on the current carrying coil $ACDE$ shown in the figure so that the coil is in unstable equilibrium.



(C) Why do we use a low resistance ammeter in a circuit to measure current?

OR

31. (II) (A) Derive the expression for the force acting between two long parallel current carrying conductors. Hence, define 1 A current.

(B) A bar magnet of dipole moment 3 A m^2 rests with its centre on a frictionless pivot. A force F is applied at right angles to the axis of the magnet, 10 cm from the pivot. It is observed that an external magnetic field of 0.25 T is required to hold the magnet in equilibrium at an angle of 30° with the field. Calculate the value of F. How will the equilibrium be effected if F is withdrawn ?

32. (I) (A) The focal lengths of the objective and eye piece of an astronomical telescope are 25 cm and 2.5 cm respectively. The telescope is focused on an object 1.5 m from objective, the final image being formed 25 cm from eye of the observer. Calculate the length of the telescope.

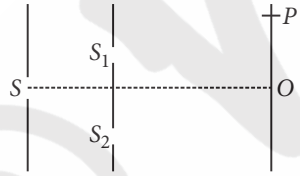
(B) An optical instrument uses an objective lens of power 100 D and an eyepiece of power 40 D. The final image is formed at infinity when the tube length of the instrument is kept at 20 cm.

(i) Identify the optical instrument.

(ii) Calculate the angular magnification produced by the instrument.

OR

32. (II) In a modified set-up of Young's double slit experiment, it is given that $SS_2 - SS_1 = \lambda/4$, *i.e.* the source 'S' is not equidistant from the slits S_1 and S_2.

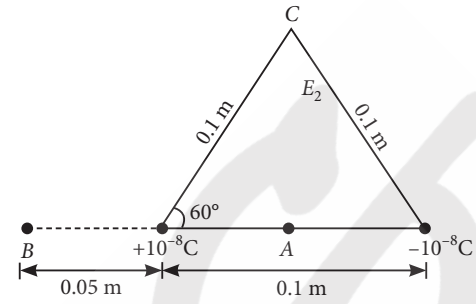


(A) Obtain the conditions for constructive and destructive interference at any point P on the screen in terms of the path difference
$\delta = S_2P - S_1P$.

(B) Does the observed central bright fringe lie above or below 'O'? Give reason to support your answer.

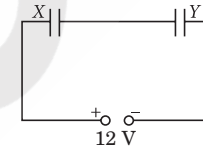
33. (I) Two point charges $+10^{-8}$ C and 10^{-8} C are placed 0.1 m apart. Calculate the electric fields at points

(i) A (ii) B and (iii) C.



OR

33. (II) (A) Two parallel plate capacitors X and Y have the same area of plates and same separation between them. X has air between the plates while Y contains a dielectric of $\varepsilon_r = 5$.



(i) Calculate capacitance of each capacitor if equivalent capacitance of the combination is 4 μF.

(ii) Calculate the potential difference between the plates of X and Y.

(iii) Estimate the ratio of electrostatic energy stored in X and Y.

(B) A 12 pF capacitor is connected to a 50 V battery. How much electrostatic energy is stored in the capacitor? If another capacitor of 6 pF is connected in series with it with the same battery connected across the combination, find the charge stored and potential difference across each capacitor.