CLASS XII
SAMPLE PAPER
PHYSICS

F.P.B/XII/70

All questions are compulsory.This question paper have five sections: Section-A, Section-B, Section-C, Section-D and Section-E

Section A contains 5 questions of 1 marks each,

Section B contains 7questions of 2 marks each,

Section C contains 12questions of 3 marks each,

Section D contains 3 questions of 5 marks each.

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 may use the following values of physical constant:

$C = 3 \times 10^8 ms^{-1}$

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

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

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

$\varepsilon_0 = 8.854 \times 10^8 ms^{-1} C^2 N^{-1} m^{-2}$

$\frac{1}{4\pi\varepsilon} = 9 \times 10^9 Nm^2 C^{-2}$

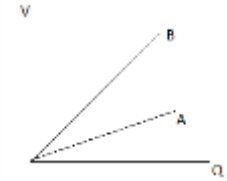
SECTION –A

1. What does $q_1 + q_2 = 0$ signify in electrostatics?
2. In a certain 0.1m^3 of space, electric potential is found to be 5V throughout. What is the electric field in this region?
3. There are two conductors A and B of same material having lengths l and 2l; and having radii r and r/2 respectively what is the ratio of their resistances?
4. Why should we get the null point in the middle of meter bridge wire?

5. Out of three radiations of wavelengths of radiations of wavelengths 8000 Å, 5000 Å and 1000 Å which one corresponds to lyman series?

SECTION –B

6. An electric dipole is free to move is placed in a uniform electric field. Explain with a diagram when it is placed (a) parallel to the field (b) perpendicular to the field.
7. Find the amount of work done in arranging three point charges $6\mu C$,6 μC,-6 μC on the vertices of an equilateral triangle ABC of side 10 cm.
8. The graph shows the variation of voltage across the plates of two capacitos A and B versus increase of charge Q stored on them. Which of the capacitors has higher capacitance? Give reason for your answer.



9. Prove that the radius of the n^{th}Bohr's orbit of an atom is directly proportional to n^2, where n is principal quantum number.
10. Show that the shortest wavelength lines in Lyman, Balmer and Paschen series have their wavelengths in ratio 1:4:9.

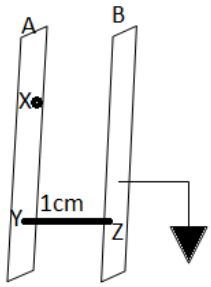
OR

Using the Rydberg formula, calculate the wavelengths of the first four spectral lines in the Lyman series of hydrogen spectrum.

11. An electron and alpha particle have the same kinetic energy how is the wavelengths associated with them related?
12. A dry cell of emf 1.6V and internal resistance 0.10 Ωis connected to a resistance of R ohm. The current drawn from the cell is 2.0 A. find the voltage drop across R.

SECTION –C

13. Two identical plane metallic surfaces A and B kept parallel to each other in air, separated by a distance of 1 cm as shown in figure.
    A is given a positive potential of 10V and other surface B is earthed
    (i) What is the magnitude and direction of the uniform electric field between X and Y?
    (ii) What is the work done in moving the charge of 20 μC from X to Y?



14. An electric dipole is held in a uniform electric field .
    (i) Show that the net force acting on it is zero.
    (ii) The dipole is aligned parallel to the field. Find the work done in rotating it through an angle of 180^{o}.
15. A uniform electric field $\vec{E} = E_x \hat{\imath} N/C$ for $x > 0$and $\vec{E} = -E_x \hat{\imath} N/C$ for $x < 0$ are given. Aright circular cylinder of length $l$and radius r cm has its centre at the origin and its axis along x axis. Find out the net outward flux. Using gauss's law write the expression for the net charge within the cylinder.
16. Two cells of emf's ε_1 and $\varepsilon_2$and internal resistances $r_1$and $r_2$are connected in parallel points A and B. deduce the expression for
    (a) The equivalent emf of the combination
    (b) The equivalent resistance of the combination and
    (c) The potential difference between the points A and B
17. Draw a diagram which can be used to determine the resistance of a given wire. Explain the principle of the experiment and give the formula used.
18. Calculate temperature at which the resistance of a conductor becomes 20%more than its resistance at 25°C. The value of temperature coefficient of the resistance of the conductor is 2.0×10^{-4}/K.
19. An electromagnetic wave of wavelength λ is incident on a photosensitive surface of negligible work function**.** if the photoelectrons emitted from this surface have the de Broglie wavelength $\lambda_1$prove that$\lambda = \left(\frac{2mc}{h}\right)\lambda_1^2$ **.**
20. (a) Using the Bohr's model calculate the speed of the electron in hydrogen atom in the *n* = 1, 2, and 3 levels. (b) Calculate the orbital period in each of these levels.
21. In a Geiger-Marsden experiment, what is the distance of closest approach to the nucleus of a 7.7 MeV α-particle before it comes momentarily to rest and reverses its direction?
22. Using de Broglie hypothesis, explain with the help of a suitable diagram,Bohr's second postulate of quantization of energy levels in a hydrogen atom.
23. Photoelectric effect cannot be explained using wave theory. Justify the statement.
24. Monochromatic light of wavelength 632.8 nm is produced by a helium neon laser. The power emitted is 9.42 mW.
    i) Find the energy and momentum of each photon in the light beam,
    ii) How many photons per second, on the average, arrive at a target irradiated by this beam? Assume the beam to have uniform cross-section which is less than the target area), and

iii) How fast does a hydrogen atom have to travel in order to have the same momentum as that of the photon?

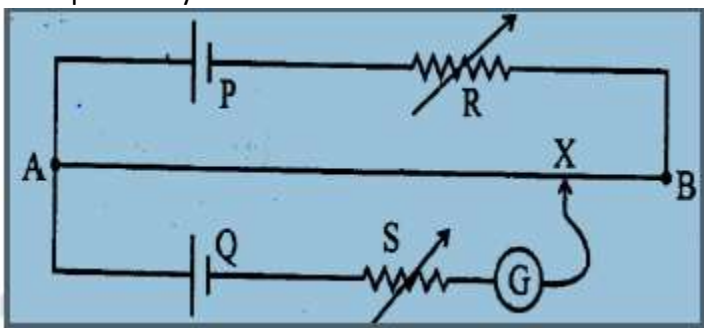
SECTION D

25. A spherical conducting shell of inner radius r_1 and outer radius r_2 has a charge 'Q'. A charge 'q' is placed at the centre of the shell.
(a) What is the surface charge density on the (i) inner surface, (ii) outer surface of the shell?
(b) Write the expression for the electric field at a point $x>r_2$ from the centre of the shell.

OR

Two charge, thin metal plates are parallel and close to each other. On their inner faces, the plates have surface charge densities of opposite signs and of magnitude 17.0 $x10^{-22}$ C/m^2. What is E: (a) in the outer region of the first plate, (b) in the outer region of the second plate, and (c) between the plates.

26. In the potentiometer circuit shown, the balance point is at X. State with reason, where the balance point will be shifted, when
(a) Resistance R is increased, keeping all parameters unchanged.
(b) Resistance S is increased, keeping R constant.
(c) Cell P is replaced by another cell whose emf is lower than that of cell Q.



OR

Using a neat connection diagram explain how potentiometer can be used to find the internal resistance of a cell.

27. What are matter waves? Give expression for the De-Broglie wave length of a particle. What is the de-Broglie wavelength associated with an electron,accelerated through a potential difference of 100 volts?

OR

The work function of cesium metal is 2.14eV. When light of frequency 6×10 14Hz is incident on the metal surface, photoemission ofelectrons occurs. What is the
(a) Maximum kinetic energy of the emitted electrons,
(b) Stopping potential, and
(c) Maximum speed of the emitted photoelectrons?