O. P. JINDAL SCHOOL, SAVITRI NAGAR

Periodic Test - I (2023 – 2024)

Class: XII **MM: 20**

Subject: Physics **Time: 1 Hr.**

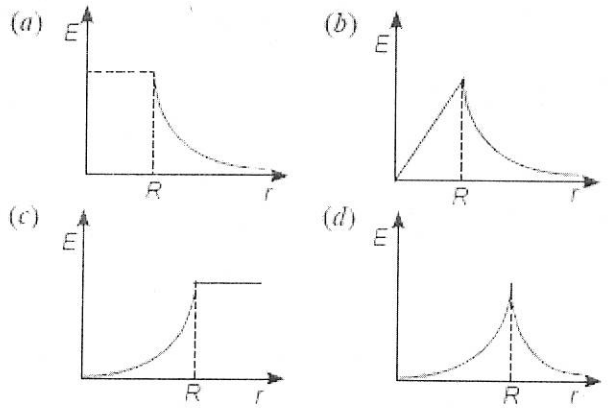
General Instructions: ***All the questions are compulsory.***

1 An electric charge q is placed at the centre of a cube of side a. The electric flux on one of its faces will be

(a) $\frac{q}{6\varepsilon_0}$ (b) $\frac{q}{\varepsilon_0 a^2}$

(c) $\frac{q}{4\pi\varepsilon_0 a^2}$ (d) $\frac{q}{\varepsilon_0}$ 1

2 Which of the following graphs shows the variation of electric field E due to a hollow spherical conductor of radius R as a function of distance from the centre of the sphere?



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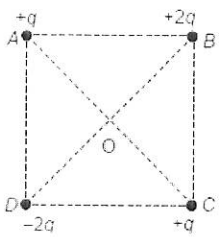
3 Four charges are arranged at the corners of a square ABCD, as shown. The force on the charge kept at the centre O is



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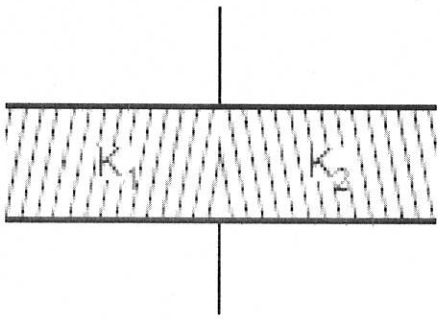
(a) zero
(b) along the diagonal AC
(c) along the diagonal BD
(d) perpendicular to side AB

4 A parallel plate capacitor with air as medium between the plates has a capacitance of 10 μF. The area of capacitor is divided into two equal halves and filled with two media having dielectric constant $k_1 = 2$ and $k_2 = 4$ as shown in the figure. The capacitance of the system will now be



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(a) 10 μF

(b) 20 μF

(c) 30 μF

(d) 40 μF

5 **Two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.**
a) Both A and R are true and R is the correct explanation of A
b) Both A and R are true and R is NOT the correct explanation of A
c) A is true but R is false
d) A is false and R is also false

1

ASSERTION:. Work done in moving a charge between any two points in an electric field is independent of the path followed by the charge, between these points.

REASON: Electrostatic force is a non conservative force.

6 **Two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.**
a) Both A and R are true and R is the correct explanation of A
b) Both A and R are true and R is NOT the correct explanation of A
c) A is true but R is false
d) A is false and R is also false

1

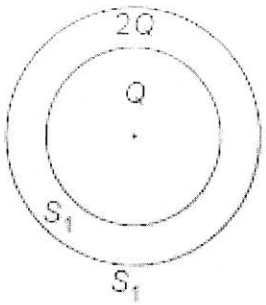
ASSERTION: If the distance between parallel plates of a capacitor is halved and dielectric constant is three times, then the capacitance becomes 6 times.
REASON: Two equipotential surfaces cannot cut each other.

7 Draw equipotential surfaces due to a point $Q > 0$. (*b*) Are these surfaces equidistant from each other? If not, explain why. 2

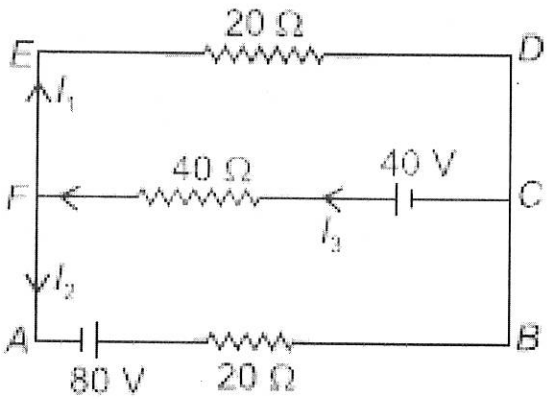
8 An electric dipole is free to move in a uniform electric field. Explain its motion when it is placed (i) parallel to the field, and (ii) perpendicular to the field. 2

9 A battery of emf 10 V and internal resistance 3 ohms is connected to a resistor. If the current in the circuit is 0.5 A. What is the resistance of the resistor? What is the terminal voltage of the battery when the circuit is closed? 2

10 S_1 and S_2 are two hollow concentric spheres enclosing charge Q and $2Q$ respectively as shown in figure.
(i) What is the ratio of the electric flux through S_1 and S_2?
(ii) How will the electric flux through the sphere S_1 change, if a medium of dielectric constant 5 isintroduced in the space inside S_1 in place of air? 2



11 Using the Kirchhoff's rules determine the value of the current I_1 in the electric circuit given below. 3



12 (a) A point charge (+Q) is kept in the vicinity of uncharged conducting plate. Sketch electric field lines between the charge and the plate.
(b) Two infinitely large plane thin parallel sheets having surface charge densities σ_1 and σ_2 ($\sigma_1 > \sigma_2$) are shown in the figure. Write the magnitudes and directions of net fields in the regions marked II and III. 3