



INDIAN SCHOOL SOHAR
UNIT TEST I - 2024-25
PHYSICS (042)
SET-1

No of printed Pages: 03

CLASS: XII
DATE: 22-05-2024

Max Marks: 20
Time: 45 Minutes

General Instructions:

- (i) There are 10 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 **six** questions of **one** mark each, Section **B** contain **one** question of **two** marks, Section **C** contain **one** question of **three** marks, Section **D** contains **one case study-based** question of **four** marks and Section **E** contain one question of **five** marks.
- (iv) There is no overall choice. However, an internal choice has been provided in one question of five mark. You have to attempt only one of the choices in such questions.

Section - A

All questions are compulsory. In case of internal choices, attempt any one of them.

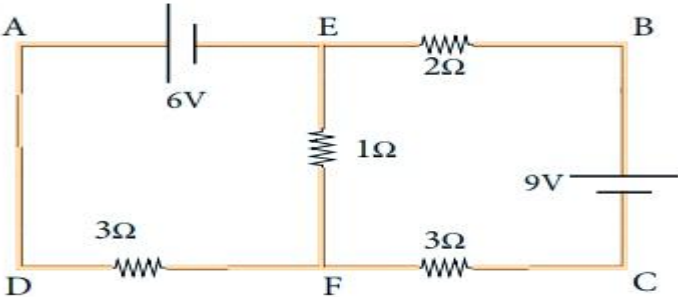
1	Force between two identical charges placed at a distance of r in vacuum is F . Now a slab of dielectric of dielectric constant 4 is inserted between these two charges. If the thickness of the slab is $r/2$, then the force between the charges will become (a) F (b) $F/4$ (c) $F/2$ (d) $4/9 F$	1
2	A parallel plate capacitor C has a charge Q . The actual charges on the plate are (a) Q, Q (b) $Q/2, Q/2$ (c) $Q, -Q$ (d) $Q/2, -Q/2$	1
3	<p>Six equal capacitors each of capacitance C are connected as shown in the figure. The equivalent capacitance between points A and B is:</p> <div style="text-align: center;"> </div> <p>(a) $1.5 C$ (b) C (c) $2C$ (d) $0.5 C$</p>	1
4	<p>In the given circuit, the potential of the point E is</p> <div style="text-align: center;"> </div> <p>(a) zero (b) $-8v$ (c) $-4/3$ (d) $4/3$</p>	1
<p>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.</p> <p>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 correct but R is incorrect d) A is incorrect and R is also incorrect.</p>		
5	Assertion: A deuteron and an alpha-particle are placed in an electric field. If F_1 and F_2 be the forces acting	

	on them and a_1 and a_2 be their accelerations respectively then, $a_1 = a_2$. Reason: Forces will be same in electric field.	1
6	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: Capacity of the capacitor does not depend upon the nature of the material.	1

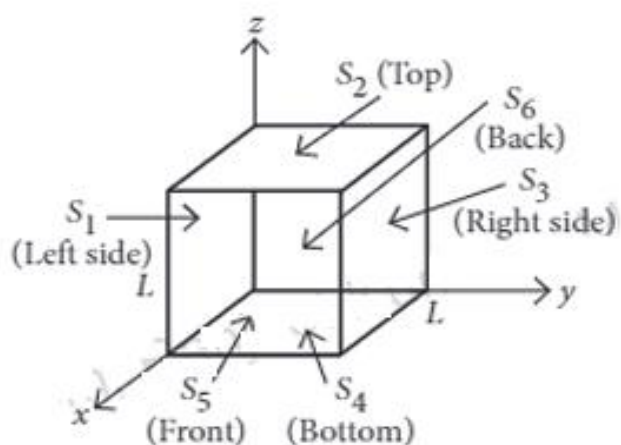
Section - B

7	i) How does the mobility of electrons in a conductor change, if the potential difference applied across the conductor is doubled, keeping the length and temperature of the conductor constant? ii) Nichrome and copper wires of same length and same radius are connected in series. Current (i) is passed through them. Which wire gets heated up more? Justify your answer	2
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Section - C

8	Calculate the current that flows in the 1Ω resistor in the following circuit. 	3
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Section - D (CASE STUDY)

9	<p>Read the following text and answer the following questions on the basis of the same:</p> <p>Electric Flux through a Cube</p> <p>Net electric flux through a cube is the sum of fluxes through its six faces. Consider a cube as shown in figure have sides of length $L = 10.0$ cm. The electric field is uniform has a magnitude $E = 4.00 \times 10^3$ N/C and is parallel to the xy plane at an angle of 37° measured from the $+x$-axis towards the $+y$-axis.</p>  <p>i) Electric flux passing through surface s_6 is (a) $-24 \text{ N m}^2 \text{ C}^{-1}$ (b) $24 \text{ N m}^2 \text{ C}^{-1}$ (c) $32 \text{ N m}^2 \text{ C}^{-1}$ (d) $-32 \text{ N m}^2 \text{ C}^{-1}$</p> <p>ii) Electric flux passing through surface s_3 is (a) $-24 \text{ N m}^2 \text{ C}^{-1}$ (b) $24 \text{ N m}^2 \text{ C}^{-1}$ (c) $32 \text{ N m}^2 \text{ C}^{-1}$ (d) $-32 \text{ N m}^2 \text{ C}^{-1}$</p>	4
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<p>iii) the surfaces that have zero flux are (a) s1 and s2 (b) s5 and s6 (c) s2 and s4 (d) s3 and s2</p> <p>iv) the total net electric flux through all faces of the cube is (a) $8 \text{ N m}^2 \text{ C}^{-1}$ (b) $-8 \text{ N m}^2 \text{ C}^{-1}$ (c) $23 \text{ N m}^2 \text{ C}^{-1}$ (d) zero</p> <p style="text-align: center;">OR</p> <p>The dimensional formula of surface integral $\oint \vec{E} \cdot d\vec{S}$ of an electric field is (a) $[\text{ML}^3\text{I}^{-1}\text{T}^{-3}]$ (b) $[\text{M}^2\text{L}^2\text{I}^{-1}\text{T}^{-2}]$ (c) $[\text{ML}^3\text{I}^1\text{T}^{-3}]$ (d) $[\text{ML}^{-3}\text{I}^{-1}\text{T}^{-3}]$.</p>
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Section - E
In case of internal choices, attempt any one of them.

10	<p>i) Parallel plate capacitor of capacitance C is charged to a potential V. It is then connected to another uncharged capacitor having the same capacitance. Find out the ratio of the energy stored in the combined system to that stored initially in the single capacitor.</p> <p>ii) Two identical parallel plate (air) capacitors C₁ and C₂ have capacitance C each. The space between their plates is now filled with dielectrics as shown in the figure. If the two capacitors still have equal capacitance, then obtain the relation between dielectric constants K, k₁ and k₂</p> <div style="text-align: center;"> </div> <p style="text-align: center;">OR</p> <p>(i) A parallel plate capacitor is charged by a battery to a potential. The battery is disconnected and a dielectric slab is inserted to completely fill the space between the disconnected and a dielectric slab is inserted to completely fill the space between the plates. How will (a) its capacitance (b) electric field between the plates and (c) energy stored in the capacitor be affected? Justify your answer giving necessary mathematical expressions for each case.</p> <p>(ii) (a) Draw the electric field lines due to a conducting sphere. (b) Draw the electric field lines due to a dipole.</p>	5
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