INDIAN SCHOOL SOHAR **SET B**
UNIT TEST I (2022-23) No. of printed pages: 3
PHYSICS THEORY (042)

CLASS: XII **Max Marks: 20**
DATE: 22/05/2022 **Duration: 45 Minutes**

General Instructions:

(i) All questions are compulsory. There are 13 questions in all.
(ii) This question paper has four sections: Section A, Section B, Section C and Section D.
(iii) Section A contains five MCQ questions of **one mark** each, Section B contains two questions of **two marks** each; Section C contains two questions of **three marks** each and Section D contains case study questions total **five marks**.
(iv) There is no overall choice. However, internal choice has been provided in two questions of one mark, two questions of two marks, four questions of three marks and all the three questions of five marks weightage. You have to attempt only one of the choices in such questions.

Section A

1. What will be the value of electric field at the centre of the electric dipole : -
   a) Zero
   b) Equal to the electric field due to one charge at centre
   c) Twice the electric field due to one charge at centre
   d) half the value of electric field due to one charge at centre
2. Four charges + 8Q, - 3Q +5Q and -10Q are kept inside a closed surface. What will be the outgoing flux through the surface?

   (a) 26 V-m (b) 0 V-m (c) 10 V-m (d) 8 V-m

3. A charge Q is supplied to a metallic conductor. Which is true?
   a) Electric field inside it is same as on the surface.
   b) Electric potential inside is zero.
   b) Electric potential on the surface is zero
   c) Electric potential inside it is constant.

4. Three capacitors of capacitances 1μf, 2μF & 3μF are connected in series and a potential difference of 11V is applied across the combination. The potential difference across the plates of 1μF capacitor is

   a) 2V b) 4V c) 1V d) 6V

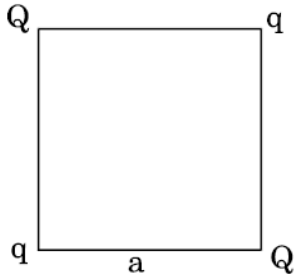
5. Work done to bring a unit positive charge un-accelerated from infinity to a point inside electric field is called:
   a) Electric field b) Electric potential
   c) Capacitance d) Electric flux

Section B

6. Two point charges 4 μC and +1 μC are separated by a distance of 2 m in air. Find the point on the line joining charges at which the net electric field of the system is zero.

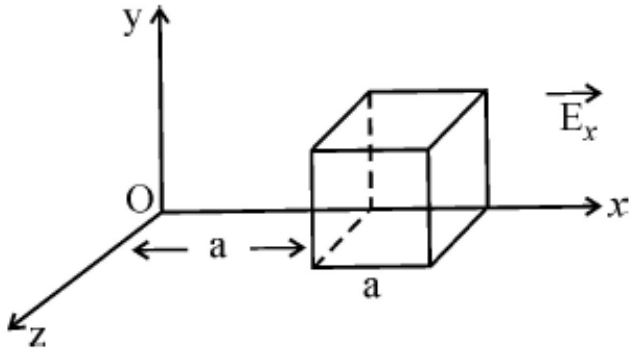
(2)

7. Four point charges Q, q, Q and q are placed at the corners of a square of side 'a' as shown in the figure. Find the potential energy of the system. (2)



Section C

8. Define electric flux and write its SI unit. The electric field components in the figure shown are: Ex = $\alpha x^{1/2}$, Ey = 0, Ez = 0 where α =100 NC^{-1} $m^{1/2}$. Calculate the charge within the cube, assuming a = 0.1m. (3)



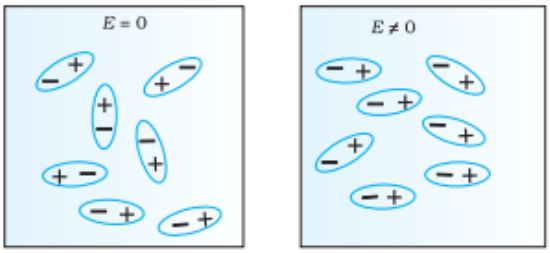
9. A parallel plate capacitor of capacitance C is charged to a potential V by a battery. Without disconnecting the battery, the distance between the plates is tripled and a dielectric medium of k **=10** is introduced between the plates of the capacitor. Explain giving reasons, how will the following be affected: (3)
   (i) Capacitance of the capacitor
   (ii) Charge on the capacitor, and
   (iii) Energy density of the capacitor.

Section D

Case Study

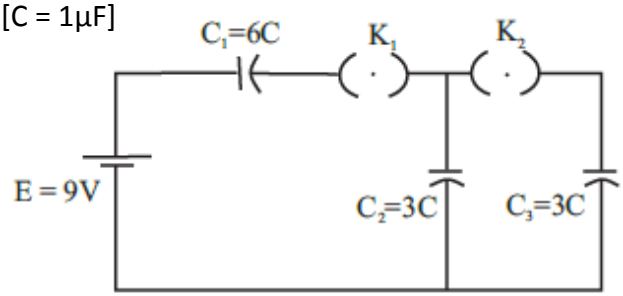
Dielectric with polar molecules also develops a net dipole moment in an external field since the individual dipole moments tend to align with the field. When summed overall the molecules, there is then a net dipole moment in the direction of the external field, i.e., the dielectric is polarised. The extent of polarisation depends on the relative strength of two factors: the dipole potential energy in the external field tending to align the dipoles mutually opposite with the field

and thermal energy tending to disrupt the alignment. Thus in either case, whether polar or non-polar, a dielectric develops a net dipole moment in the presence of an external field. The dipole moment per unit volume is called polarisation.



(b) Polar molecules

10. Define Polarisation. (1)
11. Polarisation causes the electric field in the dielectrics decreases: True/False? (1)
12. Electric field inside the capacitor is 50 V/m and the dielectric constant = 4.5. What is polarisation? (1)
13. In the circuit shown, initially K_1 is closed and K_2 is open. What are the charges on each capacitor? Then K1 was opened and K2 was closed (order is important), what will be the charge on each capacitor now? [C = 1μF]



(2)

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