

OSDAV Public School,Kaithal First Unit Test (May,2024) Class : XII Subject : PHYSICS

Set -B

Ti	me: 1 hr M.M.:3	0
Q.No.	Questions	Marks
	SECTION – A	
1	Two point charges –q and +q are placed at distance L. The magnitude of electric	1
	potential at distance R (R>>L) varies as	
	a) $1/R^2$ b) $1/R^3$ c) $1/R^4$ d) None of these	
2	In the given figure, two positive charges q_2 and q_3 fixed along the y axis, exert a net	1
	electric force in the +x direction on a charge q_1 fixed along the x-axis. If a positive	
	charge Q is added at($x,0$), the force on q1	
	↑ <i>q</i> ₂ ↑ <i>q</i> ₂	
	the state of the s	
	q_1 $x q_1$ $(x, 0)$ x	
	43	
	a) shall increase along the positive x axis	
	b) shall decrease along the positive x axis	
	c) shall point along the negative x axis	
	d) shall increase but the direction changes because of intersection of Q with q2 and q3	
3	A square sheet of side 'a' is lying parallel to XY plane at $z = a$. The electric field in the	1
	region is $\vec{E} = \operatorname{cz} \hat{k}$. The electric flux through the sheet is	
	a) $ca^{3}/2$ b) ca^{3} c) $a^{4}c$ d) $a^{4}c/2$	
4	The electric potential on the axis of an electric dipole at distance r from its centre is V.	1
	Then the potential at a point at the same distance on its equatorial line will be	
_	a) $2V$ b) $V/2$ c) $-V$ d) zero	
5	An electric dipole of dipole moment 4 x 10^{-3} Cm kept in a uniform electric field of 10^{-3}	1
	"N/C experiences a Torque of 2 x 10 "Nm. The angle which the dipole makes with the	
	electric field is $(2)^{20^{\circ}}$ b) 45° c) 60° d) 00°	
6	Assortion: The surface charge densities of two spherical conductors of different radii	1
U	are equal. Then the electric field intensities near their surface are also equal	1
	Reason: Surface charge density is equal to charge per unit volume.	
	(a) Both A and R are true and R is the correct explanation of A	
	(b) Both A and R are true but 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	
7	Assertion: A negative charge in an electric field moves along the direction of electric	1
	field.	
	Reason: On a negative charge a force acts in the direction of electric field.	
	(a) Both A and R are true and R is the correct explanation of A	
	(b) Both A and R are true but R is not the correct explanation of A	
	(c) A is true but K is false (1) A \dot{c} (1) (1) (1)	
	(d) A is false and K is also false	
0	SEUTION -B	2
ð	An arourary surface encloses a dipole. What is the electric flux through this surface.	2
	with the answer change on mereasing of decreasing the charge of dipole.	1

9	Two large thin metal plates are parallel and close to each other. On their inner faces,	2
	the plates have surface charge densities of opposite signs and magnitude 17 x 10 ⁻	
	22 C/m ² .What will be the value of electric field a) in outer region of first plate and	
	second plate and b) between the plates?	
	I $+\sigma$ II $-\sigma$ III	
10	Two identical point charges, q each, are kept 2m apart in the air. A third point charge	2
	Q of unknown magnitude and sign is placed on line joining the charges such that the	
	system remains in equilibrium. Find the position and nature of Q.	
11	A test charge q is moved without acceleration from A to C along the path from the	2
	point A to B and then from B to C in the electric field as shown in figure.	
	B ₂ (1,3)	
	E	
	i) Calculate the potential difference between A and C.	
	ii) At which point (of the two) is the electric potential more and why.	
	SECTION - C	-
12	Find expression for electric potential at any point due to electric dipole.	3
13	Two identical charged spheres are suspended by strings of equal lengths. The strings	3
	make an angle 30° with each other. When suspended in a liquid of density 800	
	kg/m^2 , the angle remains the same. What is the defective constant of the figure ? The density of meterial of the sphere is 1600 kg/m ³	
	SECTION - D	
14	Coulomb's law states that the electrostatic force of attraction or repulsion acting	4
	between two stationary points charges is given by	•
	<i>q1q2</i>	
	$F = \frac{1}{4\pi\epsilon r^2}$	
	Where F denotes the force between two charges q1 and q2 separated by distance r in	
	C reate and C	
	ifee space.	
	i) In coulomb's law, $F = kq1q2/r^2$, then on which of the following factors does the	
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Time: 1 hr

SET- A

Q.N.	Questions	Marks
	SECTION – A	
1	Two point charges –q and +q are placed at distance L. The magnitude of electric field	1
	intensity at distance R (R>>L) varies as	
	a) $1/R^2$ b) $1/R^3$ c) $1/R^4$ d) None of these	
2	In the given figure, two positive charges q2 and q3 fixed along the y axis, exert a net	1
	electric force in the +x direction on a charge q1 fixed along the x-axis. If a positive	
	charge Q is added $at(x,0)$, the force on q1	
	¥92 1 92	
	q_1 x q_1 $(x, 0)$ x	
	93 93	
	a) shall increase along the positive x axis	
	b) shall decrease along the positive x axis	
	c) shall point along the negative x axis	
	d) shall increase but the direction changes because of intersection of Q with q2 and q3	
3	A square sheet of side 'a' is lying parallel to XY plane at $z = a$. The electric field in the	1
	region is $\vec{E} = cz^2 \hat{k}$. The electric flux through the sheet is	
	a) $ca^{3}/2$ b) zero c) $a^{4}c$ d) $a^{4}c/2$	
4	The electric potential on the axis of an electric dipole at distance r from its centre is V.	1
	Then the potential at a point at the same distance on its equatorial line will be:- a) 2V	
5	b) $V/2$ c)-V d) zero	1
Э	An electric dipole of dipole moment 4 x 10^{-5} Cm kept in a uniform electric field of 10^{-3} N/C experiences a Targue of 2 x 10^{-8} Nm. The angle which the dipole makes with the	1
	10° C experiences a forque of 2 x 10 10° mm. The angle which the uppole makes with the aloctric field is 10° and 10° aloctric field is 10° and 10° aloctric field is 10° aloct	
6	Assertion: The surface charge densities of two suberical conductors of different radii	1
U	are equal. Then the electric field intensities near their surface are also equal.	1
	Reason: Surface charge density is equal to charge per unit volume.	
	(a) Both A and R are true and R is the correct explanation of A	
	(b) Both A and R are true but 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	
7	Assertion: A negative charge in an electric field moves along the direction of electric	1
	field.	
	Reason: On a negative charge a force acts in the direction of electric field.	
	(a) Both A and R are true and R is the correct explanation of A (b) Dath A and D are true but D is not the correct explanation of A	
	(b) Doth A and K are true but K is not the correct explanation of A (a) A is true but D is folse	
	(c) A is fully but K is false (d) A is false and R is also false	
	SECTION –R	
8	An arbitrary surface encloses a dipole. What is the electric flux through this surface	2
~	Will the answer change on increasing or decreasing the charge on dipole.	-
9	Two large thin metal plates are parallel and close to each other. On their inner faces,	2
	the plates have surface charge densities of opposite signs and magnitude 17 x 10 ⁻	

	²² C/m ² .What will be the value of electric field a) in outer region of first plate and second plate and b) between the plates?	
10	Two identical point charges, q each, are kept 2m apart in the air. A third point charge Q of unknown magnitude and sign is placed on line joining the charges such that the system remains in equilibrium. Find the position and nature of Q.	2
11	A test charge q is moved without acceleration from A to C along the path from the point A to B and then from B to C in the electric field as shown in figure.	2
	$C_{(1,0)}^{(1,0)}$	
	i) Calculate the potential difference between A and C. ii) At which point (of the two) is the electric potential more and why.	
12	a) An electric dipole is held in uniform electric field. Using suitable diagram show that it does not undergo any translation motion. Derive the expression for the torque acting on it.	3
13	Two identical charged spheres are suspended by strings of equal lengths. The strings make an angle 30° with each other. When suspended in a liquid of density 800 kg/m ³ , the angle remains the same. What is the dielectric constant of the liquid? The density of material of the sphere is 1600 kg/m ³ .	3
	SECTION - D	
14	Coulomb's law states that the electrostatic force of attraction or repulsion acting	4
	between two stationary points charges is given by	
	$\mathbf{F} = \frac{q_1 q_2}{4 - c_1 q_2}$	
	$4\pi\epsilon r$ Where F denotes the force between two charges q1 and q2 separated by distance r in	
	i) In coulomb's law, $F = kq1q2/r^2$, then on which of the following factors does the	
	a) Electrostatic force acting between two charges	
	b) Nature of medium between two charges	
	c) Magnitude of two charges	
	d) Distance between two charges	
	a) $[M^{-1}L^{3}T^{2}A^{2}]$ b) $[ML^{-3}T^{2}A^{2}]$ c) $[M^{-1}L^{-3}T^{4}A^{2}]$ d) none of these	
	iii) The force of repulsion between two charges of 1C each, kept 1m apart in vacuum is	
	a) $1/(9x10^9)$ N b) $9x10^9$ N c) $9x10^{-9}$ N d) none of these	
	1V) I we identical charges reper each other with a force equal to 10mg wt. When they are 0.6 m anart in the air ($\sigma = 10m/s^2$) The value of each charge is	
	a) $2mC$ b) $2uC$ c) $2 \times 10^{-7} C$ d) none of these	
	SECTION - E	
15	Using Gauss law, deduce the expression for the electric field due to uniformly charged	5
	hollow sphere of radius R at a point a) outside the shell b) at the surface of the shell and a) inside the shell. Also draw a graph showing the variation of electric field	
	intensity with distance r from centre of the sphere.	

OSDAV Public School Kaithal Marking Scheme Physics - XII Set - A

2A13C14D15A16C17D18Electric flux through this surface is zero as positive and negative charge cancel out each other. No the answer will not change on increasing or decreasing the charge on dipole.19a)In the outer region of first and second plate , the electric field will be zero. The figure shows the two plates, plate A and plate B are placed parallel to each other. Region 1 and region III are the outer region of the plate and region III are the outer region of the plate A and plate B are placed parallel to each other. Region 1 and region III are the outer region of the plate A and plate B respectively and the charge density or plate A is positive. Here, $\sigma A = 17 \times 10 - 22 C/m 2 \sigma B = -17 \times 10 - 22 C/m 2$ In the outer region of plate A that is region II, there is no charge enclosed by plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. C)0.59Where, the surface charge density is o. The electric field in the region II is given as. E = $\sigma \in 0$ Where, the surface charge density is o. The e ob the permittivity of free space, $e \circ = 3.854 \times 10 - 12 < C / Mn2$ By substituting the given values in the above equation, we get E = $17 \times 10 - 22 \times 8.854 \times 10 - 12 = 1.92 \times 10 - 10$ N/C1 <th>1</th> <th>В</th> <th>1</th>	1	В	1
3C14D15A16C17D18Electric flux through this surface is zero as positive and negative charge cancel out each other. No the answer will not change on increasing or decreasing the charge on dipole.19a) In the outer region of first and second plate, the electric field will be zero.19a) In the outer region of first and second plate, the electric field will be zero.19a) In the outer region of first and second plate, the electric field will be zero.0.59The figure shows the two plates, plate A and plate B are placed parallel to each other. Region I and region III are the outer region of the plate and region III are the outer region of the plate adh or B be the charge density of the plate A and plate B respectively and the charge density on plate A is positive. Here, a A = 17× 10 - 22 C/m 2 o B = -17× 10 - 22 C/m m 20.51n the outer region of plate A that is region II, there is no charge enclosed by plate A. Thus, the intensity of electric field is zero in the outer region of plate A. b) In the outer region of plate B. c) The electric field in the region II is given as, E = $\sigma \in 0$ Where, the surface charge density is σ . The electric field in the region II is given as, E = $\sigma \in 0$ Where, the surface charge density is σ . The electric field in the region II is given as, E = $\sigma \in 0$ Where, the surface charge density is σ . The electric field in the region II is given as, E = $\sigma \in 0$ Where, the surface charge density is σ . The electric field in the region II is given as, E = $\sigma \in 0$ Where, the surface charge density is σ . The electric field in	2	A	1
4D15A16C17D18Electric flux through this surface is zero as positive and negative charge cancel out each other. No the answer will not change on increasing or decreasing the charge on dipole.19a)In the outer region of first and second plate , the electric field will be zero. Region 1 and region III are the outer region of the plate and region III are the outer region of the plate and plate B respectively and the charge density on plate A is positive. Here, o A = 17× 10 -22 C/m 2 o B = -17× 10 -22 C/m m 2 In the outer region of plate A. b) In the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. C) The electric field in the region II is given as, E = o \in 0 Where, the surface charge density is o. The electric field in the region II is given as, E = o \in 0 Where, the surface charge density is o. The electric field in the region II is given as, E = o \in 0 Hy substituting the given values in the above equation, we get E = 17× 10 -22 8.854× 10 -12 = 1.92× 10 -10 N/C0.5	3	С	1
5A16C17D18Electric flux through this surface is zero as positive and negative charge cancel out each other. No the answer will not change on increasing or decreasing the charge on dipole.19a) In the outer region of first and second plate, the electric field will be zero.19a) In the outer region of first and second plate, the electric field will be zero.19a) In the outer region of and region III are the outer region of the plate and o B be the charge density of the plate A and plate B respectively and the charge density on plate A is positive. Here, o A = 17x 10 -22 C/m 2 o B = -17x 10 -22 C/m m 20.50.5In the outer region of plate A that is region I, there is no charge enclosed by plate A. b) In the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. C)0.50.5E = σ C Where, the surface charge density is c. The ε 0 be the permittivity of free space, ε σ $< 0.5.834 \times 10 -12 C 2 / Nm 2By substituting the given values in the aboveequation, we getE = 17 \times 10 -22.8.854 \times 10 -12 = 1.92 \times 10 -101$	4	D	1
6C17D18Electric flux through this surface is zero as positive and negative charge cancel out each other. No the answer will not change on increasing or decreasing the charge on dipole.19a)In the outer region of first and second plate , the electric field will be zero. The figure shows the two plates, plate A and plate B are placed parallel to each other. Region I and region III are the outer region of the plate and region III are the outer region of the plate and region III are the outer region of the plate A and plate B respectively and the charge density on plate A is positive. Here, $\sigma A = 17 \times 10 - 22 \text{ C/m } 2 \sigma B = -17 \times 10 - 22 \text{ C/m}$ 0.50.5In the outer region of plate A that is region II, there is no charge enclosed by plate A. Thus, the intensity of electric field is zero in the outer region of plate A. B)0.50.5The electric field in the region II is given as, $E = \sigma c 0$ Where, the surface charge density is σ . The c be the permittivity of free space, $c 0 = 8.854 \times 10 - 12 \text{ C } 2 \text{ / Mm } 2$ By substituting the given values in the above equation, we get $E = 17 \times 10 - 22 \text{ 8.854 } \times 10 - 12 \text{ c } 2 \text{ / Mm } 2$ By substituting the given values in the above equation, we get $E = 17 \times 10 - 22 \text{ 8.854 } \times 10 - 12 \text{ c } 2 \text{ / Mm } 2$ 1	5	A	1
7D18Electric flux through this surface is zero as positive and negative charge cancel out each other. No the answer will not change on increasing or decreasing the charge on dipole.19a)In the outer region of first and second plate , the electric field will be zero. The figure shows the two plates, plate A and plate B are placed parallel to each other. Region I and region II are the outer region of the plate and region II are the outer region of the plate and region II are the outer region of the plate. Let σ A and σ B be the charge density of the plate A and plate B respectively and the charge density on plate A is positive. Here. σ A =17× 10 -22 C/ m 2 σ B =-17× 10 -22 C/ m 2 In the outer region of plate A that is region II, there is no charge enclosed by plate A. Thus, the intensity of electric field is zero in the outer region of plate B. O) In the outer region of plate B. C) Thus, the intensity of electric field is zero in the outer region of plate B. C) Thus, the intensity of plate Chi given as. E= $\sigma \in 0$ Where, the surface charge density is σ . The electric field in the region II is given as. E= $\sigma \in 0$ Where, the surface charge density is σ . The electric field in the region II is given as. E= $\sigma \in 0$ Where, the surface charge density is σ . The electric field in the region II is given as. E= $\sigma \in 0$ Where, the surface charge density is σ . The electric field in the region II is given as. E= $17 \times 10 -22 8.854 \times 10 -12 2.92 \times 10 -10$ N/C1	6	С	1
8Electric flux through this surface is zero as positive and negative charge cancel out each other. No the answer will not change on increasing or decreasing the charge on dipole.19a) In the outer region of first and second plate , the electric field will be zero.The figure shows the two plates, plate A and plate B are placed parallel to each other. Region 1 and region III are the outer region of the plate. Let σ A and σ B be the charge density of the plate A and plate B respectively and the charge density on plate A is positive. Here, σ A =17×10 -22 C/ m 2 σ B =-17×10 -22 C/ m 2 In the outer region of plate A. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of plate B. C) The electric field in the region II is given as, E= $\sigma \in 0$ Where, the surface charge density is σ . The $\varepsilon = 0$ substituting the given values in the above equation, we get E= 17×10 -22 R/ Nm 2 By substituting the given values in the above equation, we get E= 17×10 -22 R/ SR = 1.92×10 -10 N/C0.5	7	D	1
Out each other.19a) In the outer region of first and second plate , the electric field will be zero.19a) In the outer region of first and second plate , the electric field will be zero.The figure shows the two plates, plate A and plate B are placed parallel to each other. Region I and region III are the outer region of the plate and region III are the outer region of the plate and region II is the inner region of the plate A and o B be the charge density of the plate A and plate B respectively and the charge density on plate A is positive. Here, $\sigma A = 17 \times 10 - 22 C/m 2 \sigma B = -17 \times 10 - 22 C/m 2^20.51In the outer region of plate A that is region I,there is no charge enclosed by plate A.Thus, the intensity of electric field is zero inthe outer region of plate B.Thus, the intensity of electric field is zero inthe outer region of plate B.C)0.510.50.5The electric field in the region II is given as,E = \sigma \epsilon 0Where, the surface charge density is \sigma.The \epsilon 0 be the permittivity of free space,\epsilon 0 = 8.854 \times 10 - 12 C / Mm 2By substituting the given values in the aboveequation, we getE = 17 \times 10 - 22 8.854 \times 10 - 12 = 1.92 \times 10 - 10N/C1$	8	Electric flux through this surface is zero as positive and negative charge cancel	1
9a) In the outer region of first and second plate , the electric field will be zero.The figure shows the two plates, plate A and plate B are placed parallel to each other. Region I and region III are the outer region of the plate and region III are the outer region of the plate. Let σ A and σ B be the charge density of the plate A and plate B respectively and the charge density on plate A is positive. Here, σ A = 17 × 10 -22 C/m 2 σ B = -17 × 10 -22 C/m 2 In the outer region of plate A that is region I, there is no charge enclosed by plate A. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of field is zero in the outer region of plate B. Thus, the intensity of field is zero in the outer region of plate B. Thus, the intensity of field is zero in the outer region of plate B. Thus, the intensity of field is zero in the outer region of plate B. C)0.50Where, the surface charge density is σ . The s 0 be the permittivity of free space, $\varepsilon \ 0 = 8.854 \times 10 \ -12 \ C \ 2 \ Nm \ 2$ By substituting the given values in the above equation, we get E = 17 \times 10 \ -22 \ 8.854 \times 10 \ -12 \ 2.92 \ 10 \ -10 \ N/C1		No the answer will not change on increasing or decreasing the charge on dipole.	1
Thus, the magnitude of electric field between the plates is $1.92 \times 10 -10$ N/C.	9	a) In the outer region of first and second plate , the electric field will be zero. The figure shows the two plates, plate A and plate B are placed parallel to each other. Region I and region III are the outer region of the plate and region II is the inner region of the plate. Let σ A and σ B be the charge density of the plate A and plate B respectively and the charge density on plate A is positive. Here, σ A =17× 10 -22 C/m 2 σ B =-17× 10 -22 C/m 2 In the outer region of plate A that is region I, there is no charge enclosed by plate A. Thus, the intensity of electric field is zero in the outer region of plate B that is region III, there is no charge enclosed by plate B. Thus, the intensity of electric field is zero in the outer region of plate B. c) The electric field in the region II is given as, E= $\sigma \epsilon 0$ Where, the surface charge density is σ . The ϵ 0 set the permittivity of free space, ϵ 0 = 8.854× 10 -12 C 2 / Nm 2 By substituting the given values in the above equation, we get E= 17× 10 -22 8.854× 10 -12 =1.92× 10 -10 N/C Thus, the magnitude of electric field between the plates is 192× 10 -10 N/C.	0.5 0.5 1

10	For equilibrium of system the net force on any charges must be zero. Considering net force on charge Q, we have $\overrightarrow{R} + \overrightarrow{R} = \overrightarrow{Q} = \overrightarrow{Q} = \overrightarrow{R} = \overrightarrow{R}$	
	$\therefore \frac{1}{4\pi \in_0} \frac{qQ}{x^2} = \frac{1}{4\pi \in_0} \cdot \frac{qQ}{(2-x)^2}$	0.5
	$\Rightarrow \qquad x = 2 - x \text{ or } x = 1m$ Again considering net force on charge q situated at point A, we have	0.5
	$\overrightarrow{F_{AC}}+\overrightarrow{F_{AB}}=\overrightarrow{0}$ 1 qQ 1 q^2	
	$egin{array}{c} \Rightarrow & \displaystyle rac{1}{4\pi \ \in_0} \cdot \displaystyle rac{1}{(1)^2} + \displaystyle rac{1}{4\pi \ \in_0} \cdot \displaystyle rac{1}{(2)^2} = 0 \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	0.5
	$\begin{array}{c} q \\ A \\ \hline \\ \hline$	
		0.5
11	i) Potential difference = E d = E $(5 - 1)$	
	= 4E	1
	direction of decreasing potential.	1
12	a) Derivationb) It will also exhibit translational motion.	2 1
13	From fig,	
	$\tan\theta = qE/mg$	1
	$\tan 15^{\circ} = \frac{\mathbf{kq}^2}{\mathbf{d}^2 \mathbf{mg}}$	
	$\tan 15^{\circ} = \frac{kq^2}{1.6V \text{ gd}^2}$ [v is the volume](1)	
	When system is suspended in liquid,	
	$\tan 15^{\circ} = \frac{\mathrm{kq}^2}{\mathrm{K}(\mathrm{mg} - \rho \mathrm{V} \mathrm{g})\mathrm{d}^2}$	0.5 0.5
	$\tan 15^{\circ} = \frac{\mathrm{kq}^2}{\mathrm{K}(1.6 - 0.8)\mathrm{V}\mathrm{gd}^2} \dots (2)$	
	from (1) and (2) we get,	
	$\frac{kq^2}{K(1.6-0.8)V gd^2} = \frac{kq^2}{1.6V gd^2}$	0.5
	\therefore K = 2 =Dielectric constant of liquid.	
		0.5

14	i) b ii) c iii) b iv) d	1 1 1
15	Derivation only	5

OSDAV Public School Kaithal Marking Scheme Physics - XII Set - B

2A13B14D15A16C17D18Electric flux through this surface is zero as positive and negative charge cancel out each other. No the answer will not change on increasing or decreasing the charge on dipole.19a) In the outer region of first and second plate , the electric field will be zero. The figure shows the two plates, plate A and plate B are placed parallel to each other. Region I and region III are the outer region of the plate A and or B be the charge density of the plate A and or B be the charge density of the plate A and or B be the charge density of the plate A and or B be the charge density of the plate A and or B be the charge density of the charge density on plate A is positive. Here, $\sigma A = 17 \times 10 - 22 C/m 2 \sigma B = -17 \times 10 - 22 C/m 2 \sigma C = 17 \times 10 - 22 C/m 2 \sigma B = -17 \times 10 -$	1	A	1
3B14D15A16C17D18Electric flux through this surface is zero as positive and negative charge cancel out each other. No the answer will not change on increasing or decreasing the charge on dipole.19a)In the outer region of first and second plate, the electric field will be zero. The figure shows the two plates, plate A and plate B are placed parallel to each other. Region 1 and region III are the outer region of the plate. Let σ A and σ B be the charge density of the plate A and plate B respectively and the charge density on plate A is positive. Here, σ A = 17× 10 -22 C/m 2 G B = -17× 10 -22 C/m m 2 In the outer region of plate A that is region II, there is no charge enclosed by plate A. D) In the outer region of plate B that is region III, there is no charge enclosed by plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus the intensity of electric field is zero in the outer region of plate B. C)0.5	2	A	1
4D15A16C17D18Electric flux through this surface is zero as positive and negative charge cancel out each other. No the answer will not change on increasing or decreasing the charge on dipole.19a)In the outer region of first and second plate , the electric field will be zero.19a)In the outer region of first and second plate , the electric field will be zero.19a)In the outer region of first and second plate , the electric field will be zero.0.59The figure shows the two plates, plate A and plate B are placed parallel to each other. Region I and region II is the inner region of the plate and region II is the inner region of the plate A and plate B respectively and the charge density on plate A is positive. Here, $\sigma A = 17 \times 10 - 22 C / m 2 \sigma B = -17 \times 10 - 22 C / m 2 $	3	В	1
5A16C17D18Electric flux through this surface is zero as positive and negative charge cancel out each other. No the answer will not change on increasing or decreasing the charge on dipole.19a)In the outer region of first and second plate , the electric field will be zero.19a)In the outer region of first and second plate , the electric field will be zero.19a)In the outer region of first and second plate , the electric field will be zero.0.59The figure shows the two plates, plate A and plate B are placed parallel to each other. Region I and region III are the outer region of the plate A and plate B respectively and the charge density on plate A is positive. Here, $\sigma A = 17 \times 10 - 22 \ C/m 2 \ \sigma B = -17 \times 10 - 22 \ C/m 2 \ M = -17 \times 10 - 22 \ C/m 2 \ M = -17 \times 10 - 22 \ M = -17 \times 10 - 21 \ M = -17 $	4	D	1
6 C 1 7 D 1 8 Electric flux through this surface is zero as positive and negative charge cancel out each other. No the answer will not change on increasing or decreasing the charge on dipole. 1 9 a) In the outer region of first and second plate , the electric field will be zero. The figure shows the two plates, plate A and plate B are placed parallel to each other. Region I and region III are the outer region of the plate and region III are the outer region of the plate A and plate B respectively and the charge density on plate A is positive. Here, σ A = 17 × 10 - 22 C/ m 2 σ B = -17 × 10 - 22 C/	5	A	1
7 D 1 8 Electric flux through this surface is zero as positive and negative charge cancel out each other. No the answer will not change on increasing or decreasing the charge on dipole. 1 9 a) In the outer region of first and second plate , the electric field will be zero. 1 9 a) In the outer region of first and second plate , the electric field will be zero. 1 9 a) In the outer region of first and second plate , the electric field will be zero. 1 9 a) In the outer region of first and second plate , the electric field will be zero. 1 9 a) In the outer region of first and second plate , the electric field will be zero. 1 9 a) In the outer region of first and second plate A and plate B are placed parallel to each other. Region I and region III are the outer region of the plate A and plate B respectively and the charge density on plate A is positive. Here, o A = 17 × 10 - 22 C/m 2 σ B = -17	6	C	1
 8 Electric flux through this surface is zero as positive and negative charge cancel out each other. No the answer will not change on increasing or decreasing the charge on dipole. 9 a) In the outer region of first and second plate , the electric field will be zero. The figure shows the two plates, plate A and plate B are placed parallel to each other. Region I and region III are the outer region of the plate. Let σ A and σ B be the charge density of the plate. Let σ A and σ B be the charge density of the plate A and glate B respectively and the charge density on plate A is positive. Here, σ A = 17×10 - 22 C/m 2 σ B = -17×10 - 22 C/m 2 In the outer region of plate A. Thus, the intensity of electric field is zero in the outer region of plate A. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus the intensity of plate B. 0.5 	7	D	1
Out each offiel. No the answer will not change on increasing or decreasing the charge on dipole.19a) In the outer region of first and second plate , the electric field will be zero. The figure shows the two plates, plate A and plate B are placed parallel to each other. Region I and region III are the outer region of the plate and region III are the outer region of the plate and region III are the outer region of the plate A and plate B respectively and the charge density on plate A is positive. Here, $\sigma A = 17 \times 10 -22 C/m 2 \sigma B = -17 \times 10 -22 C/m 2$ In the outer region of plate A that is region I, there is no charge enclosed by plate A. Thus, the intensity of electric field is zero in the outer region of plate B. b) In the outer region of plate B. c)0.50.5	8	Electric flux through this surface is zero as positive and negative charge cancel	1
9 a) In the outer region of first and second plate , the electric field will be zero. The figure shows the two plates, plate A and plate B are placed parallel to each other. Region I and region III are the outer region of the plate and region III are the outer region of the plate. Let σ A and σ B be the charge density of the plate A and plate B respectively and the charge density on plate A is positive. Here, σ A =17×10 -22 C/m 2 σ B =-17×10 -22 C/m 2 In the outer region of plate A that is region I, there is no charge enclosed by plate A. Thus, the intensity of electric field is zero in the outer region of plate B. b) In the outer region of plate B that is region III, there is no charge enclosed by plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B. Thus, the intensity of electric field is zero in the outer region of plate B.		No the answer will not change on increasing or decreasing the charge on dipole.	1
E= $\sigma \epsilon O$ Where, the surface charge density is σ . The ϵO be the permittivity of free space, $\epsilon O = 8.854 \times 10 - 12 C 2 / Nm 2$ By substituting the given values in the above equation, we get E= $17 \times 10 - 22 8.854 \times 10 - 12 = 1.92 \times 10 - 10$ N/C Thus, the magnitude of electric field between the plates is $1.92 \times 10 - 10$ N/C.	9	a) In the outer region of first and second plate , the electric field will be zero. The figure shows the two plates, plate A and plate B are placed parallel to each other. Region I and region III are the outer region of the plate and region III is the inner region of the plate and region II is the inner region of the plate A and σ B be the charge density of the plate A and plate B respectively and the charge density on plate A is positive. Here, $\sigma A = 17 \times 10 - 22 C/m 2 \sigma B = -17 \times 10 - 22 C/m 2$ In the outer region of plate A that is region I, there is no charge enclosed by plate A. Thus, the intensity of electric field is zero in the outer region of plate B that is region III, there is no charge enclosed by plate B. Thus, the intensity of electric field is zero in the outer region of plate B. c) The electric field in the region II is given as, $E = \sigma \varepsilon 0$ Where, the surface charge density is σ . The $\varepsilon 0$ be the permittivity of free space, $\varepsilon 0 = 8.854 \times 10 - 12 C 2 / Mm 2$ By substituting the given values in the above equation, we get $E = 17 \times 10 - 22 8.854 \times 10 - 12 = 1.92 \times 10 - 10$ N/C Thus, the magnitude of electric field between the plates is 1.92 \times 10 - 10 N/C.	0.5 0.5

10	For equilibrium of system the net force on any charges must be zero. Considering net force on charge Q, we have $\overrightarrow{R} + \overrightarrow{R} = \overrightarrow{Q} = \overrightarrow{Q} = \overrightarrow{R} = \overrightarrow{R}$	
	$\therefore \frac{1}{4\pi \in_0} \frac{qQ}{x^2} = \frac{1}{4\pi \in_0} \cdot \frac{qQ}{(2-x)^2}$	0.5
	$\Rightarrow \qquad x = 2 - x \text{ or } x = 1m$ Again considering net force on charge q situated at point A, we have	0.5
	$\overrightarrow{F_{AC}}+\overrightarrow{F_{AB}}=\overrightarrow{0}$ 1 qQ 1 q^2	
	$egin{array}{c} \Rightarrow & \displaystyle rac{1}{4\pi \ \in_0} \cdot \displaystyle rac{1}{(1)^2} + \displaystyle rac{1}{4\pi \ \in_0} \cdot \displaystyle rac{1}{(2)^2} = 0 \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	0.5
	$\begin{array}{c} q \\ A \\ \hline \\ \hline$	
		0.5
11	i) Potential difference = E d = E $(5 - 1)$	
	= 4E	1
	direction of decreasing potential.	1
12	a) Derivationb) It will also exhibit translational motion.	2 1
13	From fig,	
	$\tan\theta = qE/mg$	1
	$\tan 15^{\circ} = \frac{\mathbf{kq}^2}{\mathbf{d}^2 \mathbf{mg}}$	
	$\tan 15^{\circ} = \frac{kq^2}{1.6V \text{ gd}^2}$ [v is the volume](1)	
	When system is suspended in liquid,	
	$\tan 15^{\circ} = \frac{\mathrm{kq}^2}{\mathrm{K}(\mathrm{mg} - \rho \mathrm{V} \mathrm{g})\mathrm{d}^2}$	0.5 0.5
	$\tan 15^{\circ} = \frac{\mathrm{kq}^2}{\mathrm{K}(1.6 - 0.8)\mathrm{V}\mathrm{gd}^2} \dots (2)$	
	from (1) and (2) we get,	
	$\frac{kq^2}{K(1.6-0.8)V gd^2} = \frac{kq^2}{1.6V gd^2}$	0.5
	\therefore K = 2 =Dielectric constant of liquid.	
		0.5

14	i) b ii) c iii) b iv) d	1 1 1
15	Derivation only	5