1.	A battery is used to charge a parallel-plate capacitor after which it is disconnected. Then the plates are pulled apart to twice their original separation. This process will double the: (a) Capacitance (b) Surface charge density on each plate (c) Stored energy (d) Electric field between the two plates
2.	Equipotential at a great distance from a collection of charges whose total sum is not zero are approximately (a) sphere (b) planes (c) paraboloids (d) ellipsoids
3.	The electrostatic potential on the surface of a charged conducting sphere is 100V. Two statements are made in this regard **S_1:** At any point inside the sphere, electric intensity is zero **S_2:** At any point inside the sphere, the electrostatic potential is 100V Which of the following is a correct statement? (a) **S_1** is true and **S_2**is false (b) Both **S_1** and **S_2** are false (c) **S_1** is true. **S_2** is also true and **S_1** is the cause of **S_2**. (d) **S_1** is true, **S_2** is also true but the statement are independent
4.	A positively charged particle is released from rest in a uniform electric field. The electric potential energy of the charge. (a) remains a constant because the electric field is uniform. (b) Increase because the charge moves along the electric field. (c) Decreases because the charge moves along the electric field. (d) Decreases because the charge moves opposite to the electric field.

5. Figure shows some equipotential lines distributed in space. A charged object is moved from point A to point B

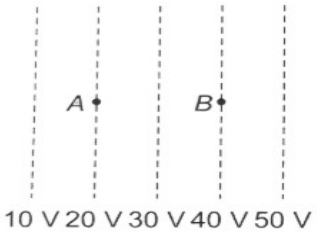


Fig. (i)

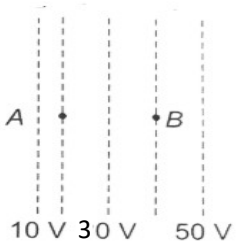


Fig. (ii)

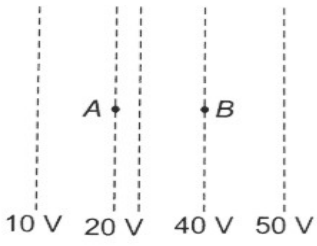


Fig. (iii)

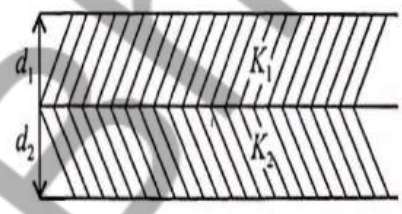
(a) The work done in Fig. (i) is the greatest

(b) The work done in Fig. (ii) is least

(c) The work done is the same in Fig. (i), Fig. (ii) and Fig. (iii)

(d) The work done in Fig. (iii) is greater than Fig. (ii) but equal to that in Fig. (i)

6. A parallel plate capacitor is made of two dielectric blocks in series. One of the blocks has thickness d_1 and dielectric constant K_1 and the other has thickness d_2 and dielectric constant K_2 as shown in figure. This arrangement can be through as a dielectric slab of thickness $d= (d_1+d_2)$ and effective dielectric constant K. The K is.

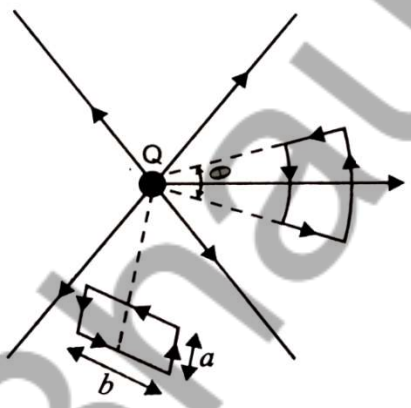


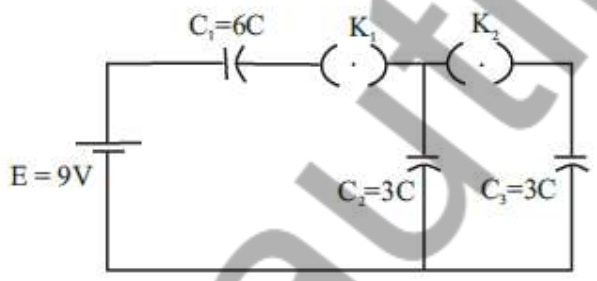
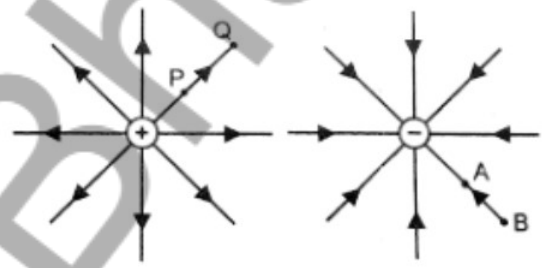
(a) $\frac{k_1d_1+k_2d_2}{d_1+d_2}$

(b) $\frac{k_1d_1+k_2d_2}{k_1+k_2}$

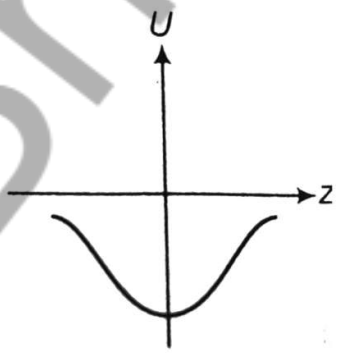
(c) $\frac{k_1k_2(d_1+d_2)}{k_1d_2+k_2d_3}$

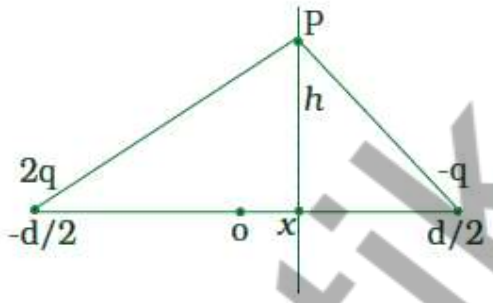
(d) $\frac{2k_1k_2}{k_1+k_2}$

7.	An air-filled parallel plate capacitor has a capacitance of 1 nF. The plate separation is then tripled and a dielectric is inserted, completely filling the space between the plates. As a result, the capacitance increases to 3 nF. What is the dielectric constant of the dielectric? (a) 2 (b) 4 (c) 6 (d) 9
8.	When the separation between two charges is increase the electric potential energy of the charges. (a) Increases (b) decreases (c) Remains the same. (d) May increase or decrease
	Short Answer Type Qs (2 & 3 Marks)
9.	Consider two conducting spheres of radii R_1 and R_2 with $R_1 > R_2$. If the two are at the same potential, the larger sphere has more charge than the smaller sphere. State whether the charge density of the smaller sphere is more or less than that of the larger one.
10.	A test charge q is made to move in the electric field of a point charge Q along two different closed paths as shown in the figure. First path has sections along and perpendicular to lines of electric field. Second path is a rectangular loop of the same area as the first loop. How does the work done compare in the two cases? 
11.	Prove that a closed equipotential surface with no charge within itself must enclose an equipotential volume.
12.	A capacitor has some dielectric between its plates, and the capacitor is connected to a DC source. The battery is now disconnected and then the dielectric is removed. State whether the capacitance, the energy stored in it, electric field, charge stored and the voltage will increase, decrease or remain constant.

13.	Calculate potential on the axis of a ring due to charge Q uniformly distributed along the ring of radius a.
14.	Calculate potential energy of a point charge −q placed along the axis due to a charged +Q uniformly distributed along a ring of radius R. Sketch P.E. as a function of a axial distance z from the centre of the ring, Looking at graph, can you see what happen if -q is placed slightly from the centre of the ring (along the axis)?
15.	An electric dipole is placed in a uniform electric field $\vec{\mathbf{E}}$ with its dipole moment $\vec{\mathbf{P}}$.parallel to the field. Find (a) The work done in turning the dipole till its dipole moment points in the direction opposite to $\vec{\mathbf{E}}$. (b) The orientation of the dipole for which the torque acting on it become the maximum.
	Long Answer Type Qs (5 Marks)
16.	In the circuit shown in Fig. initially K_1 is closed and K_2 is open. What are the charges on each capacitors Then K_1 was opened and k_2 is closed. What will be the charge on each capacitor now? [C=1μF] 
17.	Figures (a) and (b) show the field lines of a positive and negative point charge respectively.  (a) Give the signs of the potential difference $V_P - V_Q, V_B - V_A$. (b) Give the sign of the potential energy difference of a small negative charge between the points Q and P, A and B. (c) Give the sign of the work done by the field in moving a small positive charge from Q to P.

	(d) Give the sign of the work done by the external agency in moving a small negative charge from B to A. (e) Does the kinetic energy of a small negative charge increase or decrease in going from B to A?
18.	A small sphere of radius a carrying a positive charge q, is placed concentrically inside a larger hollowconducting shell of radius R (R > r). This outer shell has charge Q on it. Show that if these spheres are connected by a conducting wire, charge will always flow from the inner sphere to the outer sphere irrespective of the magnitude of the two charges.
19	Two point charges of magnitude +q and -q are placed at $(\frac{-d}{2}, 0, 0)$ and $(\frac{d}{2}, 0, 0)$ respectively. Find the equation of the equipotential surface where the potential is zero.

	HINTS AND ANSWER
1.	(c)
2.	(a)
3.	(c)
4.	(c)
5.	(c)
6.	(c)
7.	(d)
8.	(d)
9.	The charge density of the smaller sphere is more than that of the larger one
10.	Work done will be zero in both the cases beacuase the electrostatic field is conservative, and in this field work doen by the elelctric force on the charge in a closed loop is zero.
11.	**Conceptual**
12.	The electric field between the plates of the capacitor, E= V/d therefore E increases.
13.	**Expression type Question** The potential V at a point on the axis of a ring with charge Q uniformly distributed along its circumference and radius R is given by: $V = \frac{Q}{4\pi\epsilon_0\sqrt{R^2+z^2}}$
14.	**Expression Type Question** 

15.	(A) W=-2pE (B) $\Theta = 90^0$
16.	$Q_1 = Q_2 = 18\ \mu C$ and $Q_3=0$
17.	(A) (V_p-V_Q) is positive (V_B-V_A) is positive (B) Sign of potential energy differences is positive. (C) Work done by the field is negative. (D) it is positive. (E) Kintic energy decreases in going from B to A.
18.	**Expression type question** $\frac{1}{4\pi\varepsilon_0} q_1 \left(\frac{1}{r_1} - \frac{1}{r_2}\right)$ The charge q will flow entirely to the outer surface.
19.	 X = 0 So, the required plane is y-z plane

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