SIR .CV. RAMAN COACHING CENTRE – IDAPPADI, SALEM -2025

XII- PHYSICS UNIT -1 – PROBLEM QUESTION PAPER -2025

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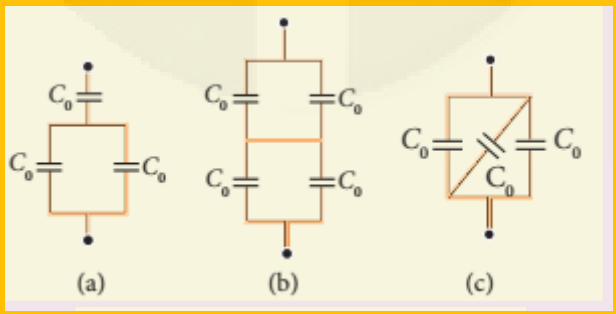
TOTAL MARK : 35 M ,TIME : 1 HRS

SECTION – A (7 X 5 = 35 M)

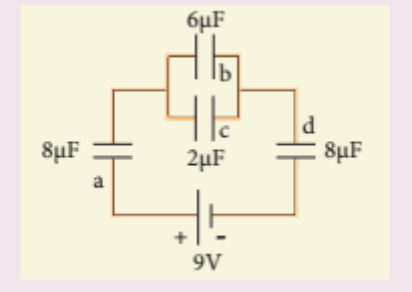
ANSWER ANY SEVEN QUESTION

1. When two objects are rubbed with each other, approximately a charge of 50 nC can be produced in each object. Calculate the number of electrons that must be transferred to produce this charge
2. A spark plug in a bike or a car is used to ignite the air-fuel mixture in the engine. It consists of two electrodes separated by a gap of around 0.6 mm gap as shown in the figure. To create the spark, an electric field of magnitude 3×10^6 Vm–1 is required. (a) What potential difference must be applied to produce the spark? (b) If the gap is increased, does the potential difference increase, decrease or remains the same? (c) find the potential difference if the gap is 1 mm

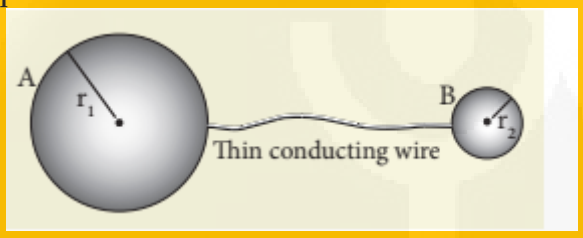
3. Calculate the resultant capacitances for each of the following combinations of capacitors



4. For the given capacitor configuration (a) Find the charges on each capacitor (b) potential difference across them (c) energy stored in each capacitor



5. Dielectric strength of air is 3×10^6 V m–1. Suppose the radius of a hollow sphere in the Van de Graff generator is R = 0.5 m, calculate the maximum potential difference created by this Van de Graaff generator.
6. Two conducting spheres of radius *r 1* = 8 cm and *r2* = 2 cm are separated by a distance much larger than 8 cm and are connected by a thin conducting wire as shown in the figure. A total charge of *Q* = +100 nC is placed on one of the spheres. After a fraction of a second, the charge *Q* is redistributed and both the spheres attain electrostatic equilibrium

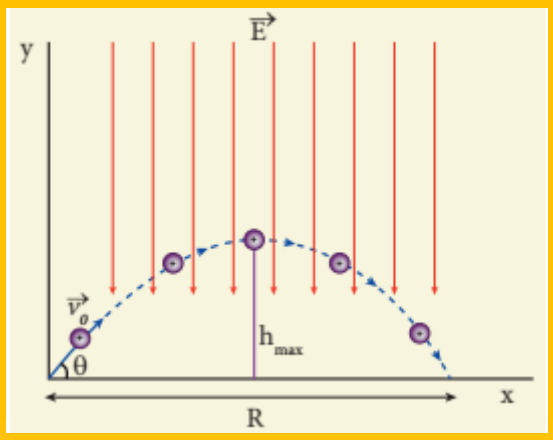


a) Calculate the charge and surface charge density on each sphere.
(b) Calculate the potential at the surface of each sphere

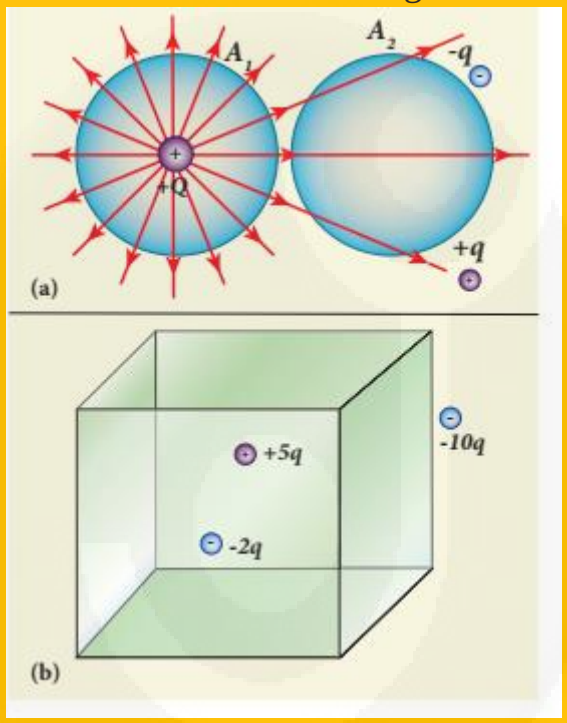
7. A parallel plate capacitor filled with mica having $\varepsilon r = 5$ is connected to a 10 V battery. The area of each parallel plate is 6 cm2 and separation distance is 6 mm. (a) Find the capacitance and stored charge. (b) After the capacitor is fully charged, the battery is disconnected and the dielectric is removed carefully. Calculate the new values of capacitance, stored energy and charge

8. A parallel plate capacitor has square plates of side 5 cm and separated by a distance of 1 mm. (a) Calculate the capacitance of this capacitor. (b) If a 10 V battery is connected to the capacitor, what is the charge stored in any one of the plates?

9. A small ball of conducting material having a charge $+q$ and mass m is thrown upward at an angle θ to horizontal surface with an initial speed *v*o as shown in the figure. There exists an uniform electric field *E* downward along with the gravitational field *g*. Calculate the range, maximum height and time of flight in the motion of this charged ball. Neglect the effect of air and treat the ball as a point mass.



10.**(i)** In figure (a), calculate the electric flux through the closed areas *A1* and *A2*.
(ii) In figure (b), calculate the electric flux through the cube



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