This print-out should have 14 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering. The due time is Central time.

Please notice that for your homework to be considered towards your grade, it needs to be submitted one hour before the corresponding recitation starts. Work submitted after this time, but before the DUE DATE on top of this page, will be accepted but not graded.

PLEASE REMEMBER THAT YOU MUST CARRY OUT YOUR CALCULATIONS TO AT LEAST THREE SIGNIFICANT FIGURES. YOUR ANSWER MUST BE WITHIN ONE PERCENT OF THE CORRECT RESULT TO BE MARKED AS CORRECT BY THE SERVER.

Transfer of Electrons

26:01, trigonometry, numeric, > 1 min, normal.

001

Two conductors insulated from each other are charged by transferring electrons from one conductor to the other. After 1.6×10^{12} have been transferred, the potential difference between the conductors is 14 V.

The charge on an electron is -1.60218×10^{-19} C.

What is the capacitance of the system? Answer in units of F.

Air Filled Capacitor

26:02, calculus, numeric, > 1 min, normal.

002

An air-filled capacitor consists of two parallel plates, each with an area of 7.6 cm^2, separated by a distance 1.8 mm. A 20 V potential difference is applied to these plates.

The permittivity of a vacuum is 8.85419×10^{-12} $\text{C}^2/\text{N} \cdot \text{m}^2$. 1 pF is equal to 10^{-12} F.

The magnitude of the electric field between the plates is

1. $E = \dfrac{V}{d}$.

2. $E = V\,d$.

3. $E = \dfrac{d}{V}$.

4. $E = \left(\dfrac{V}{d}\right)^2$.

5. $E = \left(\dfrac{d}{V}\right)^2$.

6. $E = (V\,d)^2$.

7. $E = \dfrac{1}{V\,d}$.

8. $E = \dfrac{1}{(V\,d)^2}$.

9. None of these

003

The magnitude of the surface charge density on each plate is

1. $\sigma = \epsilon_0\,(V\,d)^2$.

2. $\sigma = \epsilon_0\,V\,d$

3. $\sigma = \dfrac{\epsilon_0\,d}{V}$.

4. $\sigma = \epsilon_0 \left(\dfrac{V}{d}\right)^2$.

5. $\sigma = \epsilon_0 \left(\dfrac{d}{V}\right)^2$.

6. $\sigma = \dfrac{\epsilon_0\,V}{d}$.

7. $\sigma = \dfrac{\epsilon_0}{V\,d}$.

8. $\sigma = \dfrac{\epsilon_0}{(V\,d)^2}$.

9. None of these

004

Calculate the capacitance. Answer in units of pF.

005

Calculate plate charge; *i.e.*, the magnitude of the charge on each plate. Answer in units of pC.

Spherical Capacitor 03

26:02, trigonometry, numeric, > 1 min, normal.

006

An air-filled spherical capacitor is constructed with inner and outer shell radii of 7 cm and 14 cm, respectively.

The Coulomb constant is $8.98755 \times 10^9\ \mathrm{N \cdot m^2/C^2}$.

Calculate the capacitance of the device. Answer in units of pF.

007

What potential difference between the spheres results in a charge of 4 μC on the capacitor? Answer in units of kV.

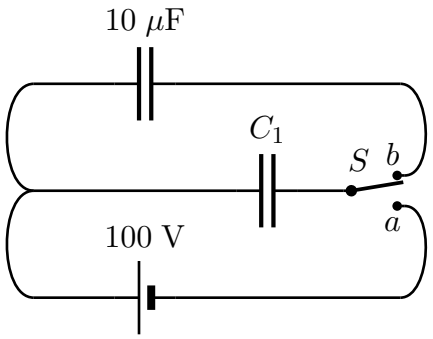
Capacitors in Parallel

26:03, trigonometry, numeric, > 1 min, normal.

008

When the switch is in position a, an isolated capacitor of unknown capacitance has been charged to a potential difference of 100 V.

When the switch is moved to position b, this charged capacitor is then connected parallel to the uncharged 10 μF capacitor. The voltage across the combination becomes 30 V.



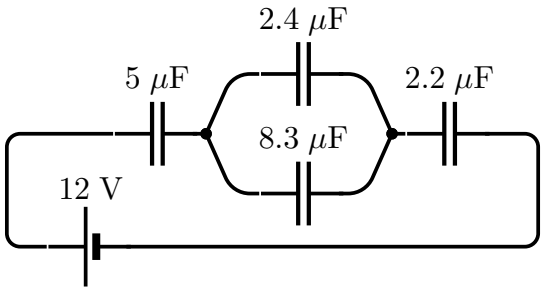
Calculate the unknown capacitance. Answer in units of μF.

Capacitor Circuit 04

26:03, trigonometry, numeric, > 1 min, normal.

009

Consider the group of capacitors shown in the figure.



Find the equivalent capacitance of the circuit. Answer in units of μF.

010

Determine the charge on 5 μF capacitor on the left. Answer in units of μC.

011

Determine the charge on 2.4 μF capacitor on the top. Answer in units of μC.

012

Determine the charge on 8.3 μF capacitor on the bottom. Answer in units of μC.

013

Determine the charge on 2.2 μF capacitor on the left. Answer in units of μC.

Energy Stored in a Capacitor

26:04, trigonometry, numeric, > 1 min, nor-

mal.

014

Calculate the energy stored in a(n) 18 μF capacitor when it is charged to a potential of 100 V. Answer in units of mJ.