## Q 1 / Choose the correct answer to the following:

1- A battery has an emf of 10 V and an internal resistance of 0.4 Ω. Its terminals are connected to a load resistance of 2 Ω. The power delivered to the internal resistance is…….
a 34.6 W b 6.92 W c 3.46 W d 69.2 W

2- Pick out the SI unit of magnetic flux.
a Ampere b N/ Ampere c Weber d None of them

3- A uniform magnetic field (B=2.2T) towards the east, ejects a proton into the field with a velocity of (V= $4\times10^5$ m/sec). When the proton enters the field towards the east, the magnitude of the force is .....
a $14.08\times10^{-14}$ N b $1.408\times10^{-14}$ N c 0 N d None of them

4- A copper wire has a diameter of 1.02 mm. This wire carries a constant current of 1.67 A. The density of free electrons is (8.5 X $10^{28}$ ) electrons per cubic meter. the current density is…….
a 4.04 X $10^7$ A/$m^2$ b 2.04 X $10^7$ A/$m^2$ c 4.04 X $10^6$ A/$m^2$ d 2.04 X $10^6$ A/$m^2$

5- A parallel-plate capacitor has plates of dimensions 2.0 cm by 3.0 cm separated by a 1.0-mm thickness of paper and the dielectric constant for paper is K= 3.7. Its capacitance……..

a 29.64F b 29.64pF c 19.64 pF d 19.64 F

6- Parallel plates capacitor 1 $\mu F$, the distance between two plates 0.1mm, and the electric field is $3 * 10^3$ V/m. The energy stored in parallel plates capacitor is ……

a 45 X $10^{-8}$J b 4.5 X $10^{-6}$J c 4.5 X $10^{-8}$J d 45 X $10^{-6}$J

7- The length of copper wire is 8 m, E=$4*10^6$ N/C and the current passing through it is 2A, where the cross-section area of copper is $4*10^{-6}$ $m^2$. The conductivity of copper is ……..
a 0.125 (Ω.m) b 0.125 $(\Omega.m)^{-1}$ c 1.125 $(\Omega.m)^{-1}$ d 1.125 (Ω.m)

8- In a particular cathode ray tube, the measured beam current is 3 A. How many electrons strike the tube screen every 1 minute?.....
a 11.25X $10^{20}$electron b 1.125X $10^{20}$electron c 11.25X $10^{22}$electron d 1.125X $10^{22}$electron

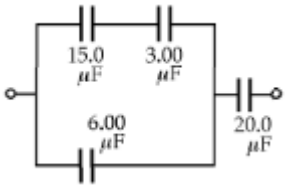
9-A bar magnet is divided in two pieces. Which of the following statements is true?
a- The bar magnet is demagnetized.
b- Two new bar magnets are created.
c- The magnetic poles are separated.
d- The magnetic field of each separated piece becomes stronger.

10- An (4 Ω) and (6Ω) resistors are connected in series across a (20V) battery. The voltage drop across the first resistor is …….

.a 12 V b 33.32. V c 49.88 V d 8 V

11- The equivalent capacitance of the network in the figure is ……

a 6.5µF b 28.5O µF c 10.5 µF d 5.96 µF

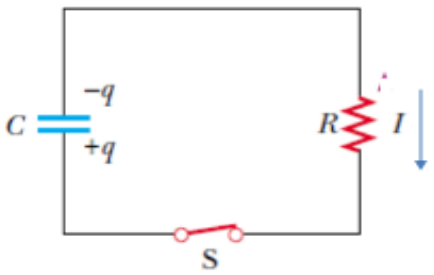



**$Q_2$/ Define the following:**

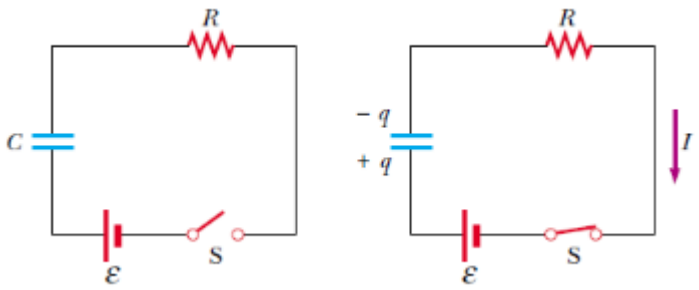
1. Instantaneous current. 2- Conductivity. 3- Energy density. 4- Dielectric strength. 5- Resistivity. 6- joule heating 7- electromotive force. 8- Tesla **9**-Drift velocity 10 Lodestones 11-Magnetic field 12- Magnetic flux 13- Time constant 15-Wheatstone bridge.

**Q 3**/ Consider a spherical capacitor which consists of two concentric spherical shells of radii (a) and (b). The inner shell has a charge (+Q) uniformly distributed over its surface and the outer shell has an equal but opposite charge (-Q). Find the capacitance of this spherical capacitor.

**Q4/** Consider the circuit and the capacitor with an initial charge $(Q_0)$ at the instant (S) is closed the process of discharging charge through the resistor begins, as shown in the figure. Then Calculate the electric charge (q).




**Q5/** Consider a capacitor of capacitance $(C)$ placed in series with a switch$(S)$, resistor of resistance $(R)$ and battery of $e.m.f$ $(\varepsilon)$ as shown in the figure initially the capacitor is uncharged. When $(S)$ is closed, the battery begins transforming charges from one capacitor plate to the others. Calculate the electric charge (q).



**Q6**/ A cylindrical capacitor consists of a solid cylindrical conductor of radius (*a)* and length (L) surrounded by a coaxial cylindrical shell of radius (*b*). Find the capacitance of this cylindrical capacitor if its length is (L).

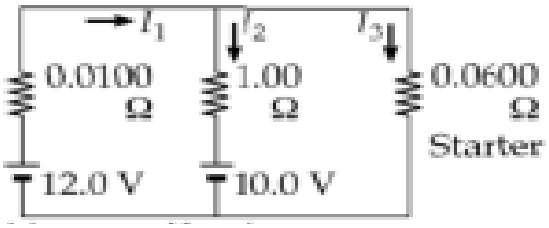
**Q7/** The SI unit for magnetic field strength B is called the Tesla (T). Determine how the tesla relates to other SI units.

**Q8 /** Prove the capacitance of the capacitor increases by the factor (k) when the dielectric completely fills the region between the plates.

**Q9/** Prove the resistance of a conductor depends on the material and the geometry of the material.

**Q10/** Prove the unit of time constant is sec.

**Q11/** Find the currents I1, I2, and I3 in the circuit shown in Figure.




**Q12**/ A conductor of uniform radius 1.20 cm carries a current of 3.00 A produced by an electric field of 120 V/m. What is the resistivity of the material?

**Q13**/ When a potential difference of 150 V is applied to the plates of a parallel-plate capacitor, the plates carry a surface charge density of 30.0 nC/cm2. What is the spacing between the plates?

**Q14**/ A 0.900 V potential difference is maintained across a 1.50 m length of tungsten wire that has a cross-sectional area of 0.600 $mm^2$, and a resistivity of $5.6 \times 10^{-8}\ \Omega.m$ .Wat is the current in the wire?

**Q15**/ (a) What is the current in a 5.60Ω resistor connected to a battery that has a 0.200Ω internal resistance if the terminal voltage of the battery is 10.0 V? (b) What is the $emf$ of the battery?

**Q16/** A Van de Graaff generator is operating so that the potential difference between the high-voltage electrode B and the charging needles at A is 15.0 kV. Calculate the power required to drive the belt against electrical forces at an instant when the effective current delivered to the high-voltage electrode is 500 μA.

**Q17**/ A uniform electric field $E = 3\,000\ V/m$ exists within a certain region. What volume of space contains an energy equal to $1.00 \times 10^{-7}\ J$?