HiLCoE

School of Computer Science & Technology

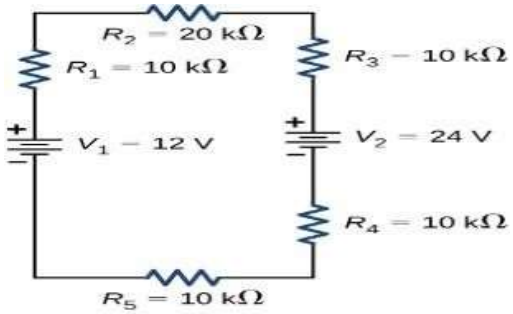
WINTER 2023

General Physics (CC140)

Worksheet 6

April, 2022

1. What is the strength of the electric field between two parallel conducting plates separated by 1.00 cm and having a potential difference (voltage) between them of 1.5V?
2. Consider the circuit shown below. (a) Find the voltage across each resistor. (b)What is the power supplied to the circuit and the power dissipated or consumed by the circuit?



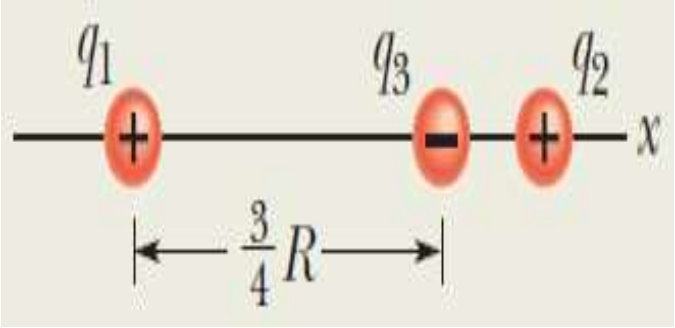
3. A rectangular coil of dimensions 5.40 cm x 8.50 cm is by a magnetic field of magnitude of0.350T parallel to the plane of the loop. What is the magnetic flux on the rectangular loop?
4. A proton moves with a speed of 8.0 x 10^6 m/s along the x-axis. It enters a region where thereis a field of magnitude 2.5 T, directed at an angle of 60^0 to the x-axis and lying in the xy plane. Calculate the initial magnetic force and acceleration of the proton.
5. A proton is moving in a circular orbit of radius 14 cm in a uniform magnetic field of magnitude 0.35 T directed perpendicular to the velocity of the proton. Find the orbital speedof the proton.
6. A small object of mass 3.80 g and charge - 18.0 mC is suspended motionless above the ground when immersed in a uniform electric field perpendicular to the ground. What is the magnitude and direction of the electric field?
7. The electric field of an atom in an ionized helium atom, the most

probable distance between the nucleus and the electron is r = 26.5 x 10^{-12}m. What is the electric field due to the nucleus at the location of the electron?

8. A charged particle *A* exerts a force of 2.62 N to the right on charged particle *B* when the particles are 13.7 mm apart. Particle *B* moves straight away from *A* to make the distance between them 17.7 mm. What vector force does particle *B* then exert on *A*?

9. The force between two identical charges separated by 1 cm is equal to 90 N. What is the magnitude of the two charges?

10. In figure below three particle lies on the x-axis between particle 1 ($q1 = 1.6 \times 10^{-19}C$) and 2($q2 = 3.2 \times 10^{-19}C$).Particle 3 has charge $q3 = -3.20´10^{-19}\ C$ and is at a distance $\frac{3}{4}\ R$ from particle 1 (R is the total distance between particle 1 and 2 and it is 20 cm). What is the net electrostatic force $F1,net$ on particle 1 due to particles 2 and 3?

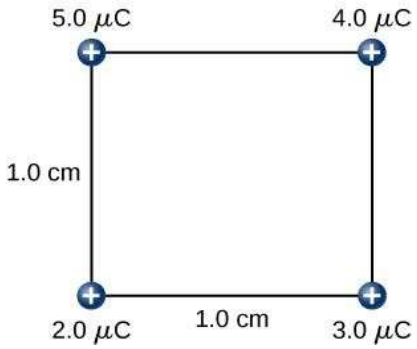


11. A 7.50-nC point charge is located 1.80 m from a 4.20-nC point charge. (a) Find the magnitude of the electric force that one particle exerts on the other. (b) Is the force attractive or repulsive?

12. A particular 12 V car battery can send a total charge of 84.0*A.h* (ampere-hours) through a circuit, from one terminal to the other. (a) How many coulombs of charge does this represent (b) If this entire charge undergoes a change in electric potential of 12 V, how much energy is involved?

13. Find the electric potential energy in assembling four charges at the vertices of a square of side 1.0cm, starting each charge from infinity

as shown in the figure below?

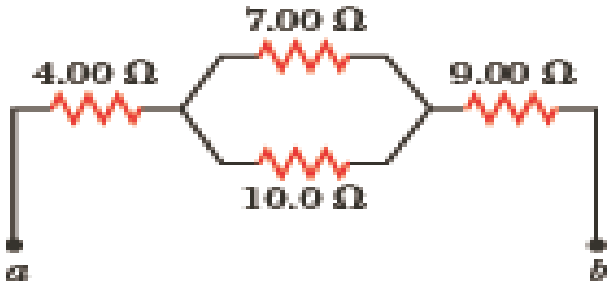


14. A battery having an emf of 9.0 y V delivers 117mA when connected to a 72.0fi load. Determine the internal resistance of the battery.

15. A typical lightning bolt may last for 0.200 s and transfer 1.0 $\times 10^{20}$ electrons. Calculate the average current in the lightning bolt and the resistance if a voltage of 30kV is produced by this lightning.

16. How long does it take electrons to get from a car battery to the starting motor? Assume the current is 300 A and the electrons travel through a copper wire with cross-sectional area0.21 cm^2 and length 0.85m .The number of charge carriers per unit volume is $\mathbf{8.49\times10^{28}}$ $\boldsymbol{m^{-3}}$

17. You have a 12.0-V motorcycle battery that can move 5000 C of charge, and a 12.0-V car battery that can move 60,000 C of charge. How much energy does each deliver? (a). Find the equivalent resistance between points a and b in Figure. (b) Calculate the current in each resistor if a potential difference of 34.0 V is applied between points a and b.



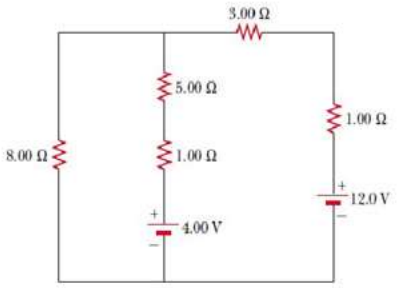
18. A 5.0 A current is set up in a circuit for 6.0 min by a rechargeable battery with a 6.0 V emf. By how much is the chemical energy of the battery reduced?

19. Show that the maximum power delivered to the load resistor R occurs

when the load resistance matches to the internal resistance.

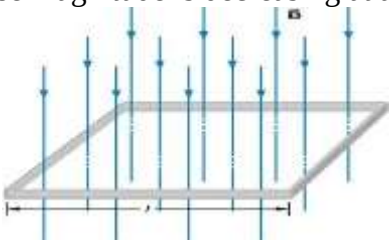
20. An electric cell with $s = 12V \; and \; r = 1\Omega$ is connected with a $5\,\Omega$ load resistor. Calculate thecurrent in the circuit.

21. Determine the current in each branch of the circuitshown in Figure shown below.



22. Calculate the emitter current in a transistor for which β = 100 and the base current is 40 μA.

23. The square coil shown in the Figure above has sides $l = 40cm$ long and is tightly wound with 400 turns of the wire with resistance $10\boldsymbol{\Omega}$. The coil is placed in spatially in a uniform magnetic field that is perpendicular to the face of the coil and whose magnitude is decreasing at a rate of 0.008T/s.



24. What is the magnitude of induced emf in the coil?

25. What is the magnitude of the current circulating in the coil?

26. What if the magnetic flux through the square loop?

27. A wire is formed into a circle having a diameter of 10.0 cm and is placed in a uniform magneticfield of 3.00 mT. The wire carries a current of 5.00 A. Find the maximum torque on the wire.

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@ HiLCoE, April, 2023