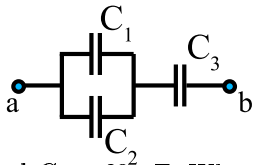
PHY 232C, INTRODUCTORY PHYSICS II, EXAM II, Oct. 13, 2003

Choose the best answer. For T/F problems, choose only ONE answer.

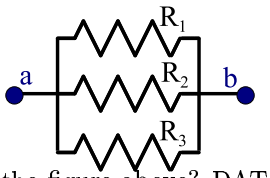


1. For the figure above, $C_1 = C_2 = 30$ μF and $C_3 = 60$ μF. What is C_{ab}, the capacitance of the combination?

   (a) 15 μF
   (b) 30 μF
   (c) 45 μF
   (d) 60 μF
   (e) 120 μF

2. Referring to the figure and data used in the preceding problem, assume that a voltage $V_{ab} = 12$ V is applied between a and b. Choose the ONE statement $(a - d)$ which is FALSE, unless they are all true, then choose e.

   (a) The charge on C_1 equals the charge on C_2.
   (b) The charge on C_1 equals the charge on C_3.
   (c) The voltage across C_1 equals the voltage across C_2.
   (d) The voltage across C_1 equals the voltage across C_3.
   (e) None of these statements is false.

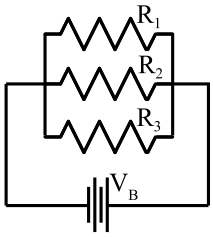


3. What is the equivalent resistance R_{ab} in the figure above? DATA: $R_1 = R_2 = 20$ ohms, $R_3 = 10$ ohms.

   (a) 5 ohms
   (b) 15 ohms
   (c) 20 ohms
   (d) 30 ohms
   (e) 50 ohms

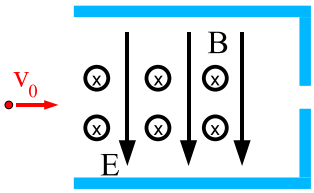
4. Referring to the figure and data used in the preceeding problem, assume that a voltage $V_{ab} = 12$ V is applied between a and b. Choose the ONE statement $(a - d)$ which is FALSE, unless they are all true, then choose e.

   (a) The current through R_1 equals the current through R_2.
   (b) The current through R_1 equals the current through R_3.
   (c) The voltage across R_1 equals the voltage across R_2.
   (d) The voltage across R_1 equals the voltage across R_3.
   (e) None of these statements is false.



5. In the figure above, how much power is dissipated in R_1? DATA: $R_1 = R_2 = 20$ ohms, $R_3 = 40$ ohms, $V_B = 12$ V.

   (a) 2.5 W
   (b) 4.0 W
   (c) 7.2 W
   (d) 12.0 W
   (e) 24.0 W
   (f) 33.3 W



6. A proton that is accelerated from rest through a potential of 15 kV enters the velocity filter, consisting of a parallel plate capacitor and a magnetic field, shown above. The electric field between the parallel capacitor plates is 5×10^4 N/C. What magnetic field is required so that the protons are not deflected? DATA: $e = 1.609 \times 10^{-19}$ C, $m_p = 1.67 \times 10^{-27}$ kg.

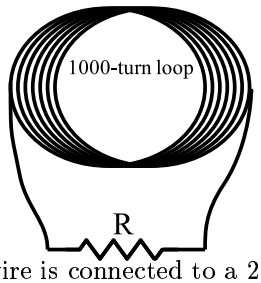
   (a) 0.0294 T
   (b) 0.072 T
   (c) 0.235 T
   (d) 0.290 T
   (e) 0.501 T

7. A 80 cm long wire is located entirely inside a uniform magnetic field of B=0.5 T. The wire is perpendicular to the direction of the magnetic field. When a current runs through the wire a magnetic force of F=0.4 N act on the wire. What is the size of the current?

   (a) 0.333 A
   (b) 0.425 A
   (c) 0.625 A
   (d) 1.0 A
   (e) 2.5 A

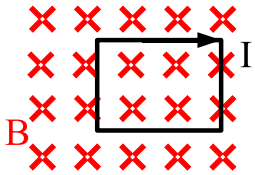
8. Assume that a lightning bolt can be represented by a long straight line of current. If 15.0 C of charge passes by in a time of 1.5×10^{-3} s, what is the magnitude of the magnetic field at a distance of 24.0 m from the bolt?

   (a) 9.0×10^{-4} T
   (b) 9.67×10^{-5} T
   (c) 8.33×10^{-5} T
   (d) 4.5×10^{-5} T
   (e) 2.25×10^{-5} T



9. A 1000-turn loop (radius = 0.05 m) of wire is connected to a 25 ohm resistor as shown in the figure avove. A magnetic field is directed perpendicular to the plane of the loop. The field points into the paper and has a magnitude that varies in time as $B = gt$, where $g = 0.25$ T/s. Neglect the resistance of the wire. What is the current through the resistor?

   (a) 1.26 A
   (b) 0.995 A
   (c) 0.523 A
   (d) 0.203 A
   (e) 0.0785 A



10. Consider the square coil immersed in a magnetic field as shown above. Choose the ONE FALSE statement from the list $(a - d)$. If none of statements is false, choose e.

    (a) A current will be induced in the loop by a steady magnetic field B.
    (b) A current will be induced in the loop by a decreasing magnetic field.
    (c) A current will be induced in the loop by pulling the loop out of the region where there is a field.
    (d) A current can be induced in the loop by rotating the loop.
    (e) None of these statements is false.

11. The electric field is measured on opposite sides of a thin conducting surface just outside the surface. On one side the electric field is measured to be 4000 N/C, and is directed into the surface. On the other side it is measured to be 2000 V/m and is also pointed into the surface (anti-parallel to the field on the other side). What is the surface charge density? (charge per unit area).

    (a) 1.77×10^{-8} C/m^2
    (b) -1.77×10^{-8} C/m^2
    (c) 5.31×10^{-8} C/m^2
    (d) -5.31×10^{-8} C/m^2
    (e) 3.54×10^{-8} C/m^2