NAME:

PHYS 2326 University Physics II – Class number -44402

12:15-3:30 PM

EXAM – 2, JULY 24, 2013

CHAPTERS: 27,28,29,30,31

Chapter-27

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1. A conductor of radius r, length ℓ and resistivity ρ has resistance R. It is melted down and formed into a new conductor, also cylindrical, with one fourth the length of the original conductor. The resistance of the new conductor is

   a. $\frac{1}{16}R$
   b. $\frac{1}{4}R$
   c. R
   d. $4R$
   e. $16R$

2. If 5.0×10^{21} electrons pass through a 20-Ω resistor in 10 min, what is the potential difference across the resistor?

   a. 21 V
   b. 32 V
   c. 27 V
   d. 37 V
   e. 54 V

3. Most telephone cables are made of copper wire of either 24 or 26 gauge. If the resistance of 24-gauge wire is 137 Ω/mile and the resistance of 26-gauge wire is 220 Ω/mile, what is the ratio of the diameter of 24-gauge wire to that of 26-gauge wire?

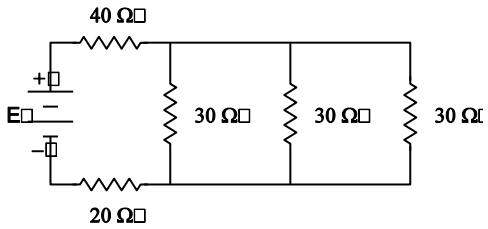
a. 1.6
b. 1.3
c. 0.62
d. 0.79
e. 0.88

4. What is the resistance of a wire made of a material with a resistivity of $3.2 \times 10^{-8}\ \Omega \cdot m$ if its length is 2.5 m and its diameter is 0.50 mm?

a. 0.16 Ω
b. 0.10 Ω
c. 1.28 Ω
d. 0.41 Ω
e. 0.81 Ω

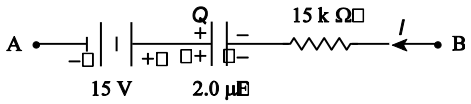
---------- Chapter 28----------

5. At what rate is thermal energy generated in the 20-Ω resistor when E = 20 V?



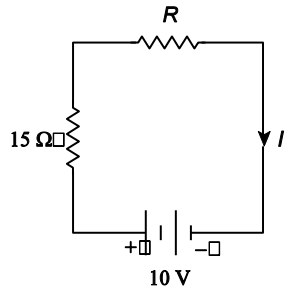
a. 6.5 W
b. 1.6 W
c. 15 W
d. 26 W
e. 5.7 W

6. Determine the potential difference, $V_A - V_B$ in the circuit segment shown below when I = 2.0 mA and Q = 50 μC.



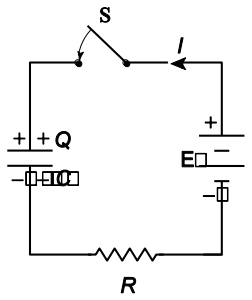
a. –40 V
b. +40 V
c. +20 V
d. –20 V
e. –10 V

7. A 10-V battery is connected to a 15-Ω resistor and an unknown resistor R, as shown. The current in the circuit is 0.40 A. How much heat is produced in the 15-Ω resistor in 2.0 min?



a. 0.40 kJ
b. 0.19 kJ
c. 0.29 kJ
d. 0.72 kJ
e. 0.80 kJ

8. At $t = 0$ the switch S is closed with the capacitor uncharged. If $C = 30\ \mu$F, E = 50 V, and $R = 10\ \text{k}\Omega$, what is the potential difference across the capacitor when $I = 2.0$ mA?



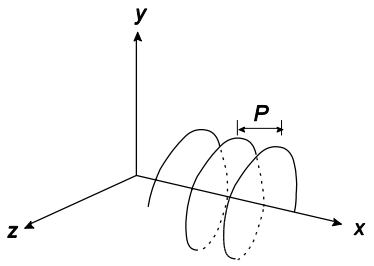
a. 20 V
b. 15 V
c. 25 V
d. 30 V
e. 45 V

---------- Chapter-29----------

9. A 2.0-C charge moves with a velocity of (2.0**i** + 4.0**j** + 6.0**k**) m/s and experiences a magnetic force of (4.0**i** – 20**j** + 12**k**) N. The x component of the magnetic field is equal to zero. Determine the z component of the magnetic field.

a. –3.0 T
b. +3.0 T
c. +5.0 T
d. –5.0 T
e. +6.0 T

10. A charged particle (m = 2.0 g, q = –50 μC) moves in a region of uniform field along a helical path (radius = 4.0 cm, pitch = 8.0 cm) as shown. What is the angle between the velocity of the particle and the magnetic field?



a. 27°
b. 72°
c. 63°
d. 18°
e. 58°

BONUS: A proton is accelerated from rest through a potential difference of 150 V. It then enters a region of uniform magnetic field and moves in a circular path (radius = 12 cm). What is the magnitude of the magnetic field in this region?

a. 18 mT
b. 12 mT
c. 15 mT
d. 22 mT
e. 10 mT

11. What is the kinetic energy of an electron that passes undeviated through perpendicular electric and magnetic fields if E = 4.0 kV/m and B = 8.0 mT?

a. 0.65 eV
b. 0.71 eV
c. 0.84 eV
d. 0.54 eV
e. 1.4 eV

12. Two very long parallel wires carry currents in the positive x direction. One wire (current = 15 A) is coincident with the x axis. The other wire (current = 50 A) passes through the point (0,4.0 mm,0). What is the magnitude of the magnetic field at the point (0,0,3.0 mm)?

a. 3.8 mT
b. 2.7 mT
c. 2.9 mT
d. 3.0 mT
e. 0.6 mT

13. Two long parallel wires are separated by 4.0 cm. One of the wires carries a current of 20 A and the other carries a 30-A current. Determine the magnitude of the magnetic force on a 2.0-m length of the wire carrying the greater current.

a. 7.0 mN
b. 6.0 mN
c. 8.0 mN
d. 9.0 mN
e. 4.0 mN

14. A long straight wire (diameter = 2.0 mm) carries a current of 30 A. What is the magnitude of the magnetic field 2.5 mm from the axis of the wire?

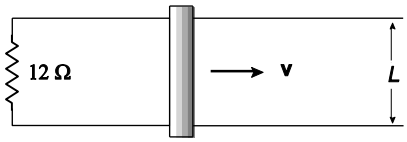
a. 3.2 mT
b. 2.8 mT
c. 2.4 mT
d. 3.6 mT
e. 3.0 mT

---------- Chapter. 31----------

15. A planar loop consisting of four turns of wire, each of which encloses 200 cm^2, is oriented perpendicularly to a magnetic field that increases uniformly in magnitude from 10 mT to 25 mT in a time of 5.0 ms. What is the resulting induced current in the coil if the resistance of the coil is 5.0 Ω?

a. 60 mA
b. 12 mA
c. 0.24 mA
d. 48 mA
e. 6.0 mA

BONUS: A rod (length = 10 cm) moves on two horizontal frictionless conducting rails, as shown. The magnetic field in the region is directed perpendicularly to the plane of the rails and is uniform and constant. If a constant force of 0.60 N moves the bar at a constant velocity of 2.0 m/s, what is the current through the 12-Ω load resistor?



a. 0.32 A
b. 0.34 A
c. 0.37 A
d. 0.39 A
e. 0.43 A