

## Final Exam

### T-031

- 1 Q0 A tuning fork, of frequency of 512 Hz, is used to generate  
Q0 the fundamental resonance in an open, at both ends, air tube  
Q0 of length 30 cm. The frequency of the fork that used to  
Q0 generate the fundamental resonance in the same air column  
Q0 when one of its ends is closed is:  
Q0  
A1 256 Hz.  
A2 512 HZ.  
A3 128 HZ.  
A4 1024 HZ.  
A5 64 Hz.  
Q0
- 2 Q0 The volume of an oxygen container is 50.0 L. As oxygen leaks  
Q0 from the container, the pressure inside the container drops  
Q0 from 21.0 to 9.00 atm, and its temperature drops from  
Q0 303 to 283 K. The number of moles that leaks from the  
Q0 container is:  
Q0  
A1 22.8 mol.  
A2 42.2 mol.  
A3 19.4 mol.  
A4 11.1 mol.  
A5 65.3 mol.  
Q0
- 3 Q0 A sound wave travels from air to water, then  
Q0  
A1 its speed increases.  
A2 its frequency increases.  
A3 its speed decreases.  
A4 its frequency decreases.  
A5 its wavelength will remain unchanged.  
Q0
- 4 Q0 The whistle on a train generates a tone of 440 Hz as the train  
Q0 approaches a station at 30.0 m/s. Find the frequency that a  
Q0 stationary observer standing at the station will hear.  
Q0 (assume the speed of sound = 330 m/s.)  
Q0  
A1 484 Hz.  
A2 493 Hz.  
A3 472 Hz.  
A4 440 Hz.  
A5 528 Hz.  
Q0
- 5 Q0 The ratio of the intensities of two sound waves is 5.  
Q0 Find the difference in their intensity levels.  
Q0  
A1 7 dB.  
A2 4 dB.  
A3 2 dB.  
A4 1 dB.  
A5 6 dB.  
Q0
- 6 Q0 The average translation kinetic energy of an ideal gas  
Q0 of helium atoms at room temperature (300 Kelvin) is  
Q0  $5.54 \times 10^{-21}$  J. The average translation kinetic energy  
Q0 of the ideal argon gas at room temperature is:

- Q0 [Atomic mass of helium = 2.0 Kg/Kmole,  
Q0 Atomic mass of argon = 8.0 Kg/Kmole]  
Q0  
A1  $5.54 \times 10^{(-21)}$  J.  
A2  $1.11 \times 10^{(-20)}$  J.  
A3  $2.21 \times 10^{(-20)}$  J.  
A4  $2.77 \times 10^{(-21)}$  J.  
A5  $1.40 \times 10^{(-21)}$  J.  
Q0  
Q0
- 7 Q0 A bar of copper is heated from 280 K to 300 K. Which of the  
Q0 following statements is NOT TRUE?  
Q0  
A1 Its density will increase slightly.  
A2 Its length will increase slightly.  
A3 Its electrical resistance will increase slightly.  
A4 Its mass will remain unchanged.  
A5 Its weight will remain unchanged.  
Q0
- 8 Q0 In a vibrating string waves travel a distance of 45 cm in  
Q0 3.0 s. If the distance between two successive crests is  
Q0 3.0 cm, what is the frequency of the vibrator causing  
Q0 the waves?  
Q0  
A1 5.0 Hz.  
A2 7.5 Hz.  
A3 11.5 Hz.  
A4 20.0 Hz.  
A5 15.0 Hz.  
Q0
- 9 Q0 5.00 kg of water is to be cooled from 100 to 0 degrees-C.  
Q0 The quantity of ice needed is:  
Q0 [For water: the specific heat = 4.19 kJ/(kg.K)  
Q0 and the latent heat of fusion = 333 kJ/kg.]  
Q0  
A1 6.29 kg.  
A2 0.89 kg.  
A3 4.25 kg.  
A4 12.5 kg.  
A5 9.22 kg.  
Q0
- 10 Q0 An ideal heat engine has a power output of 200 W. The engine  
Q0 operates between two reservoirs at 300 K and 600 K.  
Q0 How much energy is absorbed per hour?  
Q0  
A1  $1.44 \times 10^{**6}$  J.  
A2  $1.92 \times 10^{**6}$  J.  
A3  $6.31 \times 10^{**3}$  J.  
A4  $5.46 \times 10^{**6}$  J.  
A5  $1.93 \times 10^{**5}$  J.  
Q0
- 11 Q0 Two moles of helium gas (monatomic) are initially at  
Q0 a temperature of 27.0 degrees-C and occupy a volume  
Q0 of 20.0 liters. The helium gas is expanded at constant  
Q0 pressure until its volume is doubled. Find the change  
Q0 in the internal energy.  
Q0  
A1  $7.5 \times 10^{**3}$  J.  
A2  $9.2 \times 10^{**3}$  J.  
A3  $1.3 \times 10^{**3}$  J.  
A4  $5.4 \times 10^{**6}$  J.

- A5  $1.9 \times 10^{**5}$  J.  
Q0
- 12 Q0 A nonconducting shell has a uniform negative charge of  
Q0 magnitude  $5.0 \times 10^{**(-5)}$  C. Its inner and outer radii  
Q0 are 5.0 cm and 6.0 cm, respectively. The electric  
Q0 field at  $r = 3.0$  cm, from the center, is:  
Q0
- A1 zero.  
A2  $1.5 \times 10^{**9}$  N/C, inward.  
A3  $1.5 \times 10^{**9}$  N/C, outward.  
A4  $4.5 \times 10^{**9}$  N/C, inward.  
A5  $4.5 \times 10^{**9}$  N/C, inward.  
Q0  
Q0
- 13 Q0 An isolated conducting sphere whose radius R is 2.00 cm has  
26 Q0 a charge  $q = 16.0 \times 10^{*(-9)}$  C. What is the energy density at  
Q0 the surface of the sphere?  
Q0
- A1  $0.57$  J/m<sup>3</sup>.  
A2  $1.22$  J/m<sup>3</sup>.  
A3  $3.66$  J/m<sup>3</sup>.  
A4  $0.01$  J/m<sup>3</sup>.  
A5  $2.22$  J/m<sup>3</sup>.  
Q0
- 14 Q0 A cylindrical wire of radius R = 2.0 mm has a uniform current  
27 Q0 density  $J = 2.0 \times 10^{**(5)}$  A/m<sup>2</sup>. What is the current through  
Q0 the portion of the wire between radial distances R/3 and R/2?  
Q0 (see figure 1)  
Q0
- A1 0.35 A.  
A2 3.73 A.  
A3 1.95 A.  
A4 5.31 A.  
A5 9.11 A.  
Q0
- 15 Q0 A heater element of resistance  $10^{**3}$  Ohm is constructed  
27 Q0 to operate at 110 V. How much thermal energy is produced  
Q0 in one hour by the heater?  
Q0
- A1  $4.4 \times 10^{**4}$  J.  
A2  $1.9 \times 10^{**5}$  J.  
A3  $6.2 \times 10^{**5}$  J.  
A4  $5.1 \times 10^{**2}$  J.  
A5  $2.2 \times 10^{**7}$  J.  
Q0
- 16 Q0 In figure 2, a battery of emf of 12-Volt and internal  
28 Q0 resistance of  $r = 3.0$  Ohm is connected to a bulb of  
Q0 resistance R. If the bulb will light at a steady current  
Q0 of 0.1 A, what should the value of R be?  
Q0
- A1 117 Ohm.  
A2 40 Ohm.  
A3 130 Ohm.  
A4 35 Ohm.  
A5 200 Ohm.  
Q0
- 17 Q0 A resistor  $R = 30 \times 10^{**6}$  Ohm is connected in series with  
28 Q0 a capacitor  $C = 3.0$  micro-F and a 21-Volt battery for  
Q0 long time. The battery was removed, then R and C are  
Q0 connected in a loop. What is the energy stored in the  
Q0 capacitor C after one minute?

Q0  
A1 174 micro-J.  
A2 47 micro-J.  
A3 204 micro-J.  
A4 24 micro-J.  
A5 11 micro-J.  
Q0  
18 Q0 In figure 3, if R = 10 Ohm find the current in R.  
28 Q0  
Q0  
A1 - 0.2 A.  
A2 0.2 A.  
A3 - 0.4 A.  
A4 0.4 A.  
A5 - 1.1 A.  
Q0  
19Q0 What is the power dissipated in 4.0 Ohm resistor in Figure 4.  
28Q0  
A1 9.0 W.  
A2 3.0 W.  
A3 1.2 W.  
A4 6.0 W.  
A5 4.3 W.  
Q0  
20 Q0 An electron that has velocity  
29 Q0  
Q0  $\vec{v} = 3.2 \times 10^7 \hat{i} \text{ m/s}$   
Q0  
Q0 traveling parallel to a uniform magnetic field of strength  
Q0  $2.60 \times 10^{-3}$  Tesla. The force on the electron is:  
Q0  $\hat{i}$   
Q0 [ $\hat{i}$  is the unit vectors in the directions of x]  
Q0  
A1 zero.  
A2  $6.1 \times 10^{-15}$  N.  
A3  $2.3 \times 10^{-15}$  N.  
A4  $1.4 \times 10^{-15}$  N.  
A5  $5.0 \times 10^{-15}$  N.  
Q0  
21 Q0 A straight horizontal length of copper wire is located in a  
29 Q0 place where the magnetic field of the earth  $B = 0.5 \times 10^{-4}$  T  
Q0 (see figure 5). What minimum current in the wire is needed  
Q0 to balance the gravitational force on the wire?  
Q0 [The linear density of the wire is 60.0 gram/m]  
Q0  
A1  $1.2 \times 10^4$  A into the page.  
A2  $1.2 \times 10^4$  A out of the page.  
A3  $4.3 \times 10^4$  A into the page.  
A4  $4.3 \times 10^4$  A out of the page.  
A5  $3.2 \times 10^4$  A into the page.  
Q0  
22 Q0 The path of a charged particle in a magnetic field, when  
29 Q0 its direction of motion is not at right angle to the  
Q0 magnetic field, will be a:  
Q0  
A1 helix.  
A2 circle.  
A3 parabola.  
A4 straight line.  
A5 hyperbola.

- Q0
- 23 Q0 An electron moving at right angle to a uniform magnetic  
 29 Q0 field completes a circular orbit in  $10^{**}(-8)$  s. What  
 Q0 is the magnitude of the magnetic field.  
 Q0
- A1  $3.6 \cdot 10^{**}(-3)$  T.  
 A2  $2.5 \cdot 10^{**}(-3)$  T.  
 A3  $1.0 \cdot 10^{**}(-3)$  T.  
 A4  $4.2 \cdot 10^{**}(-3)$  T.  
 A5  $6.3 \cdot 10^{**}(-3)$  T.  
 Q0
- 24 Q0 Two parallel wires, carrying equal currents of 10 A, attract  
 30 Q0 each other with a force F. If both currents are doubled,  
 Q0 and the distance between them reduced by 50%, the new force  
 Q0 will be:  
 Q0
- A1  $8 \cdot F$ .  
 A2  $16 \cdot F$ .  
 A3  $4 \cdot F$ .  
 A4  $F$ .  
 A5  $F/4$ .  
 Q0
- 25Q0 Four long straight wires carry equal currents into page  
 30Q0 as shown in Figure 6. The magnetic force exerted on wire  
 Q0 "A" is:  
 Q0
- A1 East.  
 A2 West.  
 A3 North.  
 A4 South.  
 A5 Zero.  
 Q0
- 26 Q0 Consider two solenoids, A and B, having the same current.  
 30 Q0 Solenoid B has twice the radius and six times the number  
 Q0 of turns per unit length as solenoid A. The ratio of  
 Q0 the magnetic field in the interior of solenoid B to that  
 Q0 in the interior of solenoid A is:  
 Q0
- A1 6.  
 A2 4.  
 A3 3.  
 A4 2 .  
 A5 1.  
 Q0
- 27 Q0 The segment of wire is formed into the shape as shown in  
 30 Q0 Figure 7 and carries a current  $I = 6$  A. When  $R = 6.28$  cm,  
 Q0 what is the magnetic field at the point P?  
 Q0
- A1  $3.0 \cdot 10^{**}(-5)$  T into the page.  
 A2  $6.1 \cdot 10^{**}(-5)$  T out of the page.  
 A3  $6.1 \cdot 10^{**}(-5)$  T into the page.  
 A4  $3.0 \cdot 10^{**}(-5)$  T out of the page.  
 A5 Zero.  
 Q0
- 28 Q0 A long straight wire is in the plane of a rectangular  
 31 Q0 conducting loop as shown in Figure 8. The straight  
 Q0 wire carries an increasing current "i" in the direction  
 Q0 shown. The current in the rectangular is:  
 Q0
- A1 counter clockwise.

- A2 clockwise.  
A3 zero.  
A4 clockwise in the left side and counter clockwise in  
A4 the right side.  
A5 counter clockwise in the left side and clockwise  
A5 in the right side.  
Q0
- 29 Q0 The circuit shown in figure 9 is in a uniform magnetic field  
31 Q0 that is into the page and is decreasing in the magnitude  
Q0 at the rate of 150 T/s. The current in the circuit is:  
Q0  
A1 0.22 A.  
A2 0.15 A.  
A3 0.40 A.  
A4 0.18 A.  
A5 0.62 A.  
Q0
- 30 Q0 Figure 10 shows a bar moving to the right on two conducting  
31 Q0 rails. To make an induced current in the direction  
Q0 indicated, a constant magnetic field in region "A" should  
Q0 be in what direction?  
Q0  
A1 Into the page.  
A2 Out of the page.  
A3 Left.  
A4 Right.  
A5 Impossible; this cannot be done with a constant  
A5 magnetic field.

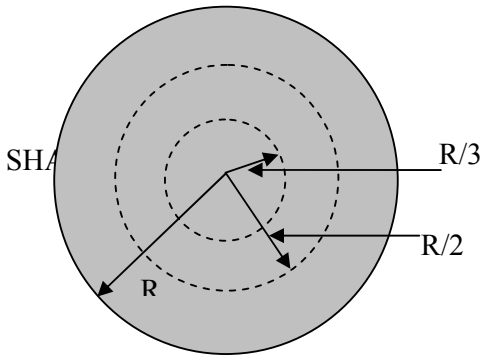


Figure 1

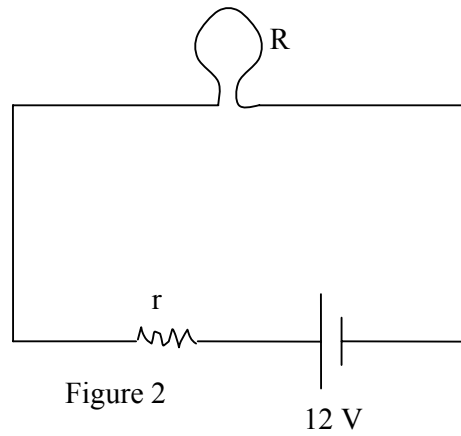


Figure 2

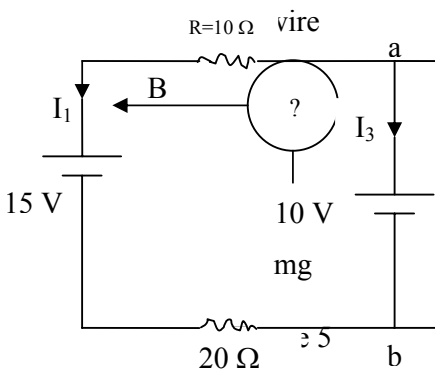


Figure 3

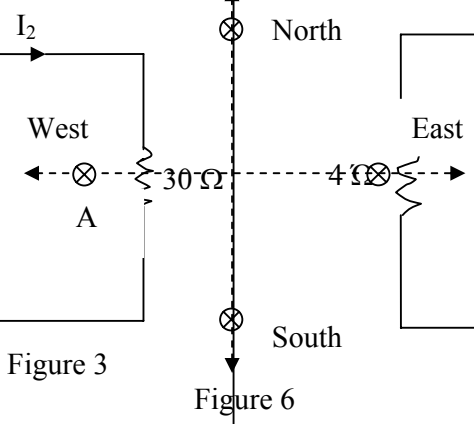


Figure 6

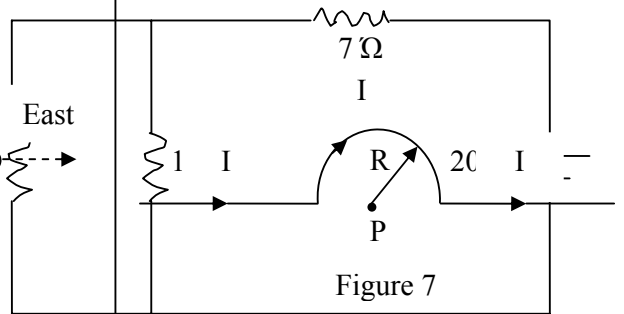


Figure 7

Figure 4

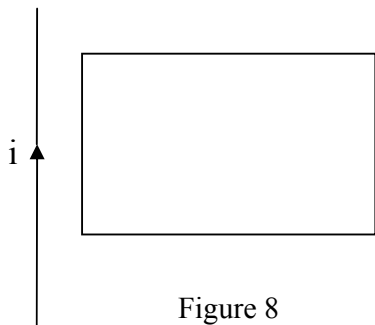


Figure 8

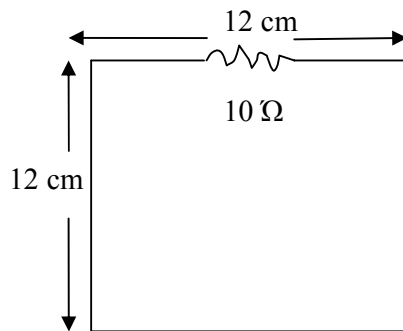


Figure 9

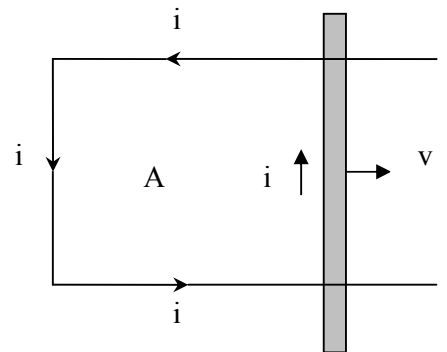


Figure 10