Final T-042

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1  Q0 A sinusoidal wave is described by the equation
17 Q0
4  Q0         y(x, t)= 2.0 sin[5*x + 15*t]
   Q0
   Q0 in SI units. How far does this wave move in 15 seconds?
   Q0
   A1  45 m.
   A2   5 m.
   A3  90 m.
   A4  15 m.
   A5  55 m.
   Q0
2  Q0 The equation of a transverse wave on an 80 cm long stretched
17 Q0 string is given by:
6  Q0
   Q0         y(x, t)= 2.0 sin [10*x – 50*t]
   Q0
   Q0 where x and y are in meters and t is in seconds. If the mass
   Q0 of the string is 160 g, find the tension in the string.
   Q0
   A1 5.0 N.
   A2  25 N.
   A3  15 N.
   A4 3.5 N.
   A5  55 N.
   Q0
 3 Q0 Two equal waves, of wavelength 4 m and amplitude A, are
18 Q0 produced by two sources S1 and S2 as shown in figure 1.
4  Q0 S1 is at a distance of 3 m from point P and S2 is at a
   Q0 distance of 5 m from P. When the sources are operated in
   Q0 phase, what is the amplitude of oscillation at P?
   Q0
   A1 zero.
   A2 2*A.
   A3 A/2.
   A4 A.
   A5 3*A/2.
   Q0
4  Q0 A metallic bullet, of mass m and specific heat c, hits a
19 Q0 steel plate with a speed v. During the impact, 50% of the
7  Q0 bullet's initial kinetic energy is converted to thermal
   Q0 energy in the bullet. What is the rise in temperature of
   Q0 the bullet?
   Q0
   A1 v**2/(4*c).
   A2 v**2/(2*c).
   A3 v/(4*c).
   A4 v**2/(c).
   A5 v/(2*c).
   Q0
5  Q0 During one cycle, a Carnot refrigerator does 200 J of work
21 Q0 to remove 600 J from its cold compartment. How much energy
5  Q0 per cycle is exhausted to the kitchen as heat?
   Q0
   A1 800 J.
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   A2 600 J.
   A3 450 J.
   A4 225 J.
   A5 200 J.
   Q0
6  Q0 A box has a total surface area of 1.2 m**2 and a wall
19 Q0 thickness of 4.0 cm and is made of an insulating material.
11 Q0 A 10-W electric heater inside the box maintains the inside
   Q0 temperature steady at 45 degrees Celsius. If the outside
   Q0 temperature is 30 degrees Celsius, find the thermal
   Q0 conductivity of the insulating material.
   Q0
   A1 2.2*10**(-2)  W/(m*K).
   A2 1.7*10**(-3)  W/(m*K).
   A3 3.1*10**(-4)  W/(m*K).
   A4 4.5*10**(-2)  W/(m*K).
   A5 3.6*10**(-3)  W/(m*K).
   Q0
7  Q0 Two charges, q1=+2.0 micro-C and q2=-2.0 micro-C, are placed
22 Q0 as shown in figure 2. At the midpoint between the charges,
4  Q0 which one of the following statements correctly describes
   Q0 the electric field (E.F.) and the electric potential (E.P.)?
   Q0 [electric potential at infinity = 0]
   Q0
   A1  E.F. is directed toward q2 and the E.P. is zero.
   A2  E.F. is directed toward q1 and the E.P. is zero.
   A3  E.F. is directed toward q2 and the E.P. is negative.
   A4  E.F. is directed toward q1 and the E.P. is negative.
   A5  E.F. is directed toward q2 and the E.P. is positive.
   Q0
8  Q0 An electron is moving along the positive x-axis with a
23 Q0 constant speed of 1.5*10**8 m/s. When it is at a point
8  Q0 +500 m from the origin, an electric field of magnitude
   Q0 2.0*10**3 N/C and directed along the positive x-axis is
   Q0 switched on. How far will the electron reach in the field
   Q0 before stopping momentarily?
   Q0
   A1  532  m.
   A2  502  m.
   A3  551  m.
   A4  511  m.
   A5  468  m.
   Q0
9  Q0 If a rectangular area is turned in a uniform electric field
24 Q0 from a position where the maximum electric flux goes through
3  Q0 it to a position where only half the maximum flux goes through
   Q0 it, what is the turned angle?
   Q0
   A1 60 degrees
   A2 90 degrees
   A3 30 degrees
   A4 45 degrees
   A5 23 degrees
   Q0
10 Q0 A 1200-W heater is used to heat 2.0 kg of water from 30
27 Q0 degrees Celsius to 80 degrees Celsius. What is the minimum
7  Q0 time in which this can be done?
   Q0 [specific heat of water = 4.181 kJ/(kg*K)]
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A1   348 s.
A2   120 s.
A3   60 s.
A4   696 s.
A5   418 s.
Q0
11 Q0 Three resistors are connected as shown in figure 3.
28 Q0 The potential difference between points A and B is 26 V.
6 Q0 How much current flows through the 4-Ohm resistor?
Q0
A1 2.0 A
A2 6.0 A
A3 10.0 A
A4 4.0 A
A5 8.7 A
Q0
12 Q0 In the circuit shown in figure 4, I=0.65A and R=15 Ohms.
28 Q0 What is the value of the emf of the battery?
6 Q0
A1 39 V
A2 17 V
A3 25 V
A4 34 V
A5 65 V
Q0
13 Q0 A 5.0-micro-F capacitor is fully charged by connecting it
28 Q0 to a 12-V battery. After disconnecting the battery, it was
8 Q0 allowed for capacitor to discharge through a simple RC
Q0 circuit, with a time constant of 4.0 s. What is the charge
Q0 on the capacitor after one time constant has elapsed?
Q0
A1 2.2*10**(-5) C
A2 1.2*10**(-5) C
A3 7.4*10**(-5) C
A4 5.5*10**(-5) C
A5 3.8*10**(-5) C
Q0
14 Q0 In the circuit shown in figure 5, what is the current in
28 Q0 the 8.00-Ohm resistor?
6 Q0
A1 2.25 A to the left
A2 2.25 A to the right
A3 11.25 A to the left
A4 11.25 A to the right
A5 3.38 A to the left
Q0
15 Q0 A number of 240-Ohms resistors are connected in parallel
28 Q0 to a 120-V source. If the maximum current allowed in the
6 Q0 circuit is 9 A, determine the largest number of resistors,
Q0 which can be used in this circuit without exceeding the
Q0 maximum current.
Q0
A1 18.
A2 9.
A3 25.
A4 34.
A5 36.
Q0

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16 Q0 In figure 6, three identical light bulbs are connected to a
28 Q0 battery. Which one of the following statements is CORRECT?
6  Q0
   A1 The largest current passes through A.
   A2 The smallest current passes through A.
   A3 The largest current passes through B.
   A4 The largest current passes through C.
   A5 The current through all resistors is the same.
   Q0
17 Q0 An electron enters a region that contains a magnetic field
29 Q0 directed into the page as shown in figure 7. The velocity
2  Q0 of the electron makes an angle of 30 degrees with the +y
   Q0 axis. What is the direction of the magnetic force on the
   Q0 electron when it enters the field?
   Q0
   A1 at an angle of 30 degrees below the positive x axis and
   A1 in the plane of the page.
   A2 upwards and out of the page.
   A3 at an angle of 30 degrees above the positive x axis and
   A3 in the plane of the page.
   A4 at an angle of 60 degrees above the positive x axis and
   A4 in the plane of the page.
   A5 at an angle of 60 degrees below the positive x axis and
   A5 in the plane of the page.
   Q0
18 Q0 For a charged particle moving in a magnetic field, the
29 Q0 magnetic field can
2  Q0
   Q0   (1) change its velocity.
   Q0   (2) change its speed.
   Q0   (3) change its acceleration.
   Q0   (4) change its kinetic energy.
   Q0
   A1 1 and 3 only.
   A2 1 and 2 only.
   A3 1, 2, 3, and 4.
   A4 3 and 4 only.
   A5 4 only.
   Q0
19 Q0 An electron is accelerated from rest through a potential
29 Q0 difference of 500 Volts, then injected into a uniform
5  Q0 magnetic field. Once in the magnetic field, it completes
   Q0 one revolution in 4.0 nano-s. What is the radius of the
   Q0 orbit?
   Q0
   A1  8.4  mm
   A2 16.8  mm
   A3  4.2  mm
   A4  1.0  mm
   A5  13   mm
   Q0
20 Q0 A charged particle is projected with velocity v into a region
29 Q0 where there exists a uniform electric field of strength E
3  Q0 perpendicular to a uniform magnetic field of strength B. If the
   Q0 velocity of the charged particle is to remain constant, the
   Q0 minimum velocity must be
   Q0
   A1 of magnitude E/B and perpendicular to both E and B.
```

A2 of magnitude E/B and parallel to B.
A3 of magnitude E/B and parallel to E.
A4 of any magnitude but at 45 degrees to both E and B.
A5 of magnitude B/E and perpendicular to both E and B.
Q0
21 Q0 A circular coil of 160 turns has a radius of 1.90 cm and
29 Q0 carries a current I. If the maximum torque that the coil can
8 Q0 experience in a uniform 35.0 mT magnetic field is 0.08 N*m,
Q0 what is the value of I.
Q0
A1 12.6 A.
A2 14.2 A.
A3 2.3 A.
A4 9.6 A.
A5 22.0 A.
Q0
22 Q0 Five long, straight, insulated wires are closely bound
30 Q0 together to form a small cable of diameter 1.0 cm.
3 Q0 Currents carried by the wires are I1=20A, I2=-6A,
Q0 I3=12A, I4=-7A, and I5=18A (negative currents are
Q0 opposite in direction to the positive). Find the
Q0 magnitude of the magnetic field at a distance 10 cm
Q0 from the cable.
Q0
A1 74 micro-T.
A2 10 micro-T.
A3 32 micro-T.
A4 29 micro-T.
A5 zero.
Q0
23 Q0 A copper wire is of total length 1.0 m. You want to make
30 Q0 N-turn circular current loop, using the entire wire, that
1 Q0 generates a 1.0 mT magnetic field at the center of the coil
Q0 when the current is 1.0 A. What will be the diameter of your
Q0 coil?
Q0
A1 0.02 m.
A2 0.12 m.
A3 0.22 m.
A4 0.50 m.
A5 0.01 m.
Q0
24 Q0 An electron is moving along the axis of a solenoid carrying a
30 Q0 current. Which of the following is a correct statement about
4 Q0 the magnetic force acting on the electron?
Q0
A1 No force acts
A2 The force acts radially inward.
A3 The force acts radially outward.
A4 The force acts in the direction of motion
A5 The force acts opposite to the direction of motion
Q0
25 Q0 Figure 10 shows two concentric, circular wire loops, of
30 Q0 radii r1=15 cm and r2=30 cm, are located in the xy plane.
1 Q0 The inner loop carries a current of 8.0 A in the clockwise
Q0 direction, and the outer loop carries a current of 10.0 A in
Q0 the counter clockwise direction. Find the net magnetic field
Q0 at the center.

Q0
A1 12.6*10**(-6) T, directed into the page.
A2 12.6*10**(-6) T, directed out of the page.
A3 33.5*10**(-6) T, directed into the page.
A4 33.5*10**(-6) T, directed out of the page.
A5 zero.
Q0
26 Q0 How strong is the magnetic field at a distance of 10.0 cm
30 Q0 from a long straight wire, of radius 3.0 cm carrying a
1 Q0 current of 5.0 A?
Q0
A1 1.0*10**(-5) T.
A2 3.4*10**(-5) T.
A3 7.1*10**(-5) T.
A4 2.1*10**(-7) T.
A5 9.0*10**(-5) T.
Q0
27 Q0 Two long parallel wires, a distance d apart, carry currents
30 Q0 of I and 5*I in the same direction. Locate the point r,
2 Q0 from I, at which their magnetic fields cancel each other.
Q0
A1 r=d/6.
A2 r=d/2.
A3 r=2*d.
A4 r=3*d/2.
A5 r=d/4.
Q0
28 Q0 Three long parallel wires are arranged as shown in figure 8.
30 Q0 Wires 1 and 3 each carries a current of 5.0 A in the
2 Q0 directions shown. If the net magnetic force on wire 3 is zero,
Q0 what is the magnitude and direction of the current in wire 2?
Q0
A1 2.5 A, downwards.
A2 2.5 A, upwards.
A3 5.5 A, downwards.
A4 5.5 A, upwards.
A5 30 A, downwards.
Q0
29 Q0 A small circular loop of area 0.50 cm**2 is placed in the
31 Q0 plane of, and concentric with, a large circular loop of radius
3 Q0 2.0 m. The current in the large loop is changed uniformly from
Q0 +100 A to –100 A in a time of 0.50 s. Find the emf induced in
Q0 the small loop in this time interval (Assume the field is
Q0 uniform through the smaller loop).
Q0
A1 6.3*10**(-9) V.
A2 9.2*10**(-9) V.
A3 5.0*10**(-8) V.
A4 3.1*10**(-8) V.
A5 7.5*10**(-6) V.
Q0
30 Q0 A long straight wire is in the plane of a circular conducting
31 Q0 loop as shown in figure 9. The straight wire carries a
4 Q0 constant current I in the direction shown. The circular loop
Q0 starts moving to the left. The induced current in the circular
Q0 loop is:
Q0
A1 counter clockwise.

A2 clockwise.
A3 zero.
A4 2*I.
A5 4*I.

Phys 102 –Final Exam (042) Figures

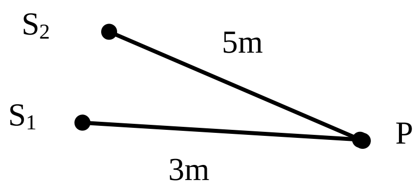

Figure 1

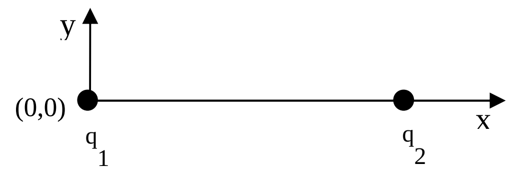

Figure 2

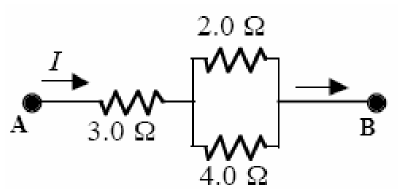

Figure 3

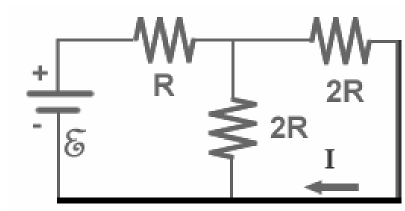

Figure 4

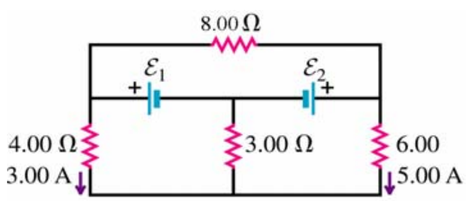

Figure 5

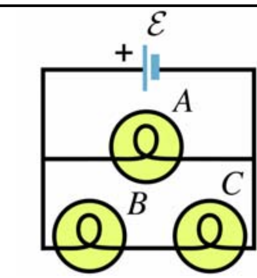

Figure 6

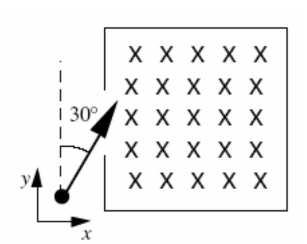

Figure 7

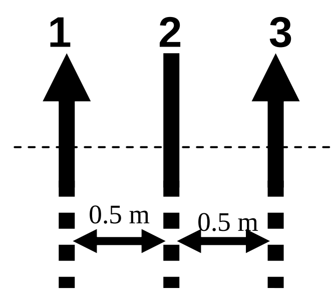

Figure 8

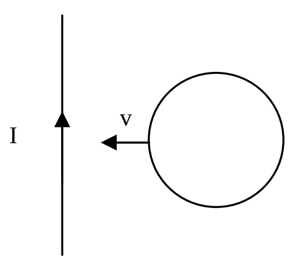

Figure 9

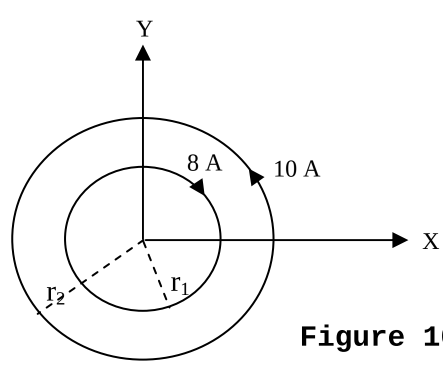

Figure 10