MAJOR 2 (002)

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   Q0
(1)Q0 What is the change in entropy of 200-g of water as its
002Q0 temperature increases from 0 degrees Celsius to
 21Q0 50 degrees Celsius. [For water: the specific heat =
   Q0 4.19 kJ/(kg.K) and the latent heat of fusion = 333 kJ/kg.]
   Q0
   A1 1.41*10**2 J/K.
   A2 0.35*10**3 J/K.
   A3 4.19*10**3 J/K.
   A4 3.35*10**3 J/K.
   A5 2.55*10**3 J/K.
   Q0
(2)Q0 An ideal engine absorbs heat at 527 degrees Celsius
002Q0 and rejects heat at 127 degrees Celsius. If it has to
 21Q0 produce useful mechanical work at the rate of 750 Watts,
   Q0 it must absorb heat at the rate of:
   Q0
   A1 1500 Watts.
   A2  750 Watts.
   A3 2250 Watts.
   A4  527 Watts.
   A5  375 Watts.
   Q0
(3)Q0 A heat engine has a monatomic gas as the working substance and
21 Q0 its operating cycle is shown by the P-V diagram in Figure 1.
992Q0 In one cycle, 18.2 kJ of heat energy is absorbed by the
002Q0 engine. Find the efficiency of the heat engine.
   Q0
   A1 0.44
   A2 0.55
   A3 0.31
   A4 0.25
   A5 0.22
   Q0
(4)Q0 A negative charge is placed at the center of a square. Each
002Q0 corner of the square has a fixed charge of 1.00*10**(-6) C.
22 Q0 If the resulting force acting on each charge is zero,
   Q0 the magnitude of the negative charge is:
   Q0
   A1   0.96*10**(-6) C.
   A2   9.60*10**(-6) C.
   A3   6.92*10**(-6) C.
   A4   0.69*10**(-6) C.
   A5   0.77*10**(-6) C.
   Q0
(5)Q0 Two neutral metal sphere are separated by 0.3 km. How much
002Q0 electric charge must be transferred from one sphere to the
22 Q0 other so that their electrical attraction is 10**3 N?
   Q0
   A1   0.1  C.
   A2   0.2  C.
   A3   0.4  C.
   A4   0.6  C.
   A5   0.9  C.
   Q0
(6)Q0 A point charge of 4.0 nano-C is located at a point having
23 Q0 coordinates (30.0 cm, 40.0 cm). At what point will the
992Q0 electric field be 72 N/C and pointing in the negative
002Q0 y-direction?
   Q0
   A1 (30.0, -30.7) cm
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   A2 (30.0,  49.9) cm
   A3 (30.0,  70.7) cm
   A4 (30.0, -49.9) cm
   A5 (10.0, -89.9) cm
   Q0
 (7)Q0 An electric dipole consists of a positive charge of magnitude
002Q0 6.0*10**(-6) C at the origin and a negative charge of magnitude
002Q0 6.0*10**(-6) C on the x-axis at x = 3.0*10**(-3) m.
23 Q0 Its dipole moment is:
   Q0
   A1   1.8*10**(-8) C.m, in the negative x direction.
   A2   1.8*10**(-8) C.m, in the positive x direction.
   A3   Zero because the net charge is Zero.
   A4   1.8*10**(-8) C.m, perpendicular to the x-axis.
   A5   3.6*10**(-8) C.m, in the negative x direction.
   Q0
(8)Q0 A charged particle has a mass of 2.0*10**(-4) kg. If it is
002Q0 held stationary by a downward 300 N/C electric field, the
23 Q0 charge of the particle is:
   Q0
   A1  - 6.5*10**(-6) C.
   A2    6.5*10**(-6) C.
   A3  - 1.5*10**(-6) C.
   A4    1.5*10**(-6) C.
   A5  - 3.0*10**(-6) C.
   Q0
09 Q0 Two uniformly charged, concentric and hollow, spheres have
24 Q0 radii r and 1.5*r. The charge of the inner sphere is q/2 and
002Q0 that on the outer sphere is 3*q/2. Find the electric field at
   Q0 a distance 2.0*r from the center of the spheres.
   Q0
   A1  0.5*k*q/(r**2).
   A2  0.13*k*q/(r**2).
   A3  0.25*k*q/(r**2).
   A4  0.35*k*q/(r**2).
   A5  Zero.
   Q0
10 Q0 An infinitely long line has a charge density of 7.6 nano-C/m.
24 Q0 Calculate the electric flux through a spherical surface of
992Q0 radius R = 7.7 cm whose center, C, lies on the line charge as
002Q0 shown in Figure 3.
   Q0
   A1  132   (N*m**2)/C.
   A2  415   (N*m**2)/C.
   A3  610   (N*m**2)/C.
   A4  92.0  (N*m**2)/C.
   A5  Zero.
   Q0
11 Q0 Fig. 7 shows two parallel plates, infinite and non-conducting,
24 Q0 with surface charge densities of 8.9*10**(-4)C/m**2 and
002Q0 -8.9*10**(-4)C/m**2. B, a ball with negligible mass, carries
   Q0 a positive charge of 6.0*10**(-8) C and is attached to point A
   Q0 with a non-conducting string of length 10 cm. At equilibrium,
   Q0 the tension in the string is:
   Q0
   A1  6.0 N.
   A2  1.5 N.
   A3  3.0 N.
   A4  0.3 N.
   A5  Zero.
   Q0
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002Q0
   A1 257 degrees Celsius.
   A2 531 degrees Celsius.
   A3 340 degrees Celsius.
   A4 321 degrees Celsius.
   A5 132 degrees Celsius.
   Q0
 12Q0 A 100 g of water at 100 degrees Celsius is added to a 20-g
19 Q0 aluminum cup containing 50 g of water at 20 degrees Celsius.
002Q0 What is the equilibrium temperature of the system?
   Q0 The specific heat of aluminum is 900 J/(kg*K) and the specific
   Q0 heat of water is 4186 J/(kg*K).
   Q0
   A1 72 degrees Celsius.
   A2 63 degrees Celsius.
   A3 14 degrees Celsius.
   A4 55 degrees Celsius.
   A5 95 degrees Celsius.
   Q0
13 Q0 A solid aluminum rod, of length 1.60 m and cross-sectional area
19 Q0 of 3.14*10**(-4) m**2, has one end in boiling water and the
002Q0 other end in ice. How much ice melts in one minute?
   Q0 [The thermal conductivity of aluminum is 205 Watts/(m*K)
   Q0 and the heat of fusion of water is 3.35*10**5 J/kg.]
   Q0 (neglect any heat loss, by the system, to the surrounding)
   Q0
   A1 7.2*10**(-4) kg.
   A2 7.9*10**(-2) kg.
   A3 6.3*10**(-4) kg.
   A4 5.8*10**(-4) kg.
   A5 3.2*10**(-3) kg.
   Q0
 14Q0 An iron ball has a diameter of 6.0 cm and is 0.01 mm too large
19 Q0 to pass through a hole in a brass ring when both are at a
002Q0 temperature of 30 degrees Celsius. To what temperature should
   Q0 the brass ring be heated so that the ball just passes through
   Q0 the hole? [The coefficient of volume expansion of
   Q0 iron = 3.6*10**(-5) K**-1 and of brass = 5.7*10**(-5) K**-1]
   Q0
   A1 39 degrees Celsius.
   A2 59 degrees Celsius.
   A3 47 degrees Celsius.
   A4 52 degrees Celsius.
   A5 32 degrees Celsius.
   Q0
 15Q0 5 moles of hydrogen gas occupy a balloon that is inflated to a
20 Q0 volume of 0.3 m**3 and at 1.0 atmospheric pressure. What is the
002Q0 root-mean square velocity of the molecules inside the balloon?
   Q0 [The mass of hydrogen atom is 1.66*10**(-27) kg].
   Q0
   A1 4.3*10**3 m/s.
   A2 3.4*10**2 m/s.
   A3 3.0*10**9 m/s.
   A4 2.2*10**3 m/s.
   A5 1.3*10**3 m/s.
   Q0
16 Q0 For an ideal gas, which of the following statements is FALSE:
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002Q0 is charged by a battery to a potential difference of 12.0 volts.
26 Q0 The charging battery is then disconnected and oil with
   Q0 dielectric constant = 4.0 fills the inside space between the
   Q0 plates. The resulting potential difference, in volts, between
   Q0 the plates is:
   Q0
   A1   3.
   A2  12.
   A3  48.
   A4  1.0*10**(-9).
   A5  3.0*10**(-9).
   Q0
18 Q0 If Vab is equal to 50 V, find the charge stored and the
26 Q0 potential difference across the 25 micro-F capacitor shown
991Q0 in Figure 5.
002Q0
   A1 250 micro-C and 10 V.
   A2 300 micro-C and 20 V.
   A3 600 micro-C and 10 V.
   A4 600 micro-C and 20 V.
   A5 250 micro-C and 40 V.
   Q0
19 Q0 If 110 Volts is applied to a wire, the current density is
27 Q0 1.5*10**6 A/m**2. If the resitivity of the wire is
002Q0 48.2*10**(-8) Ohm.m, the length of the wire is:
   Q0
   A1 152 m.
   A2  76 m.
   A3 254 m.
   A4  38 m.
   A5  19 m.
   Q0
20 Q0 At what temperature would the resistance of a conductor be
27 Q0 double its resistance at 30 degrees Celsius?
002Q0 [The temperature coefficient of resistivity of the conductor
   Q0 is 2.0*10**(-2) K**-1]
   Q0
   A1   80 degrees Celsius.
   A2  -20 degrees Celsius.
   A3   20 degrees Celsius.
   A4   50 degrees Celsius.
   A5   60 degrees Celsius.
```

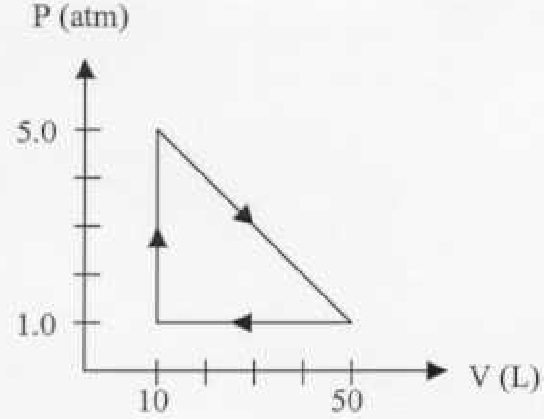


FIGURE 1

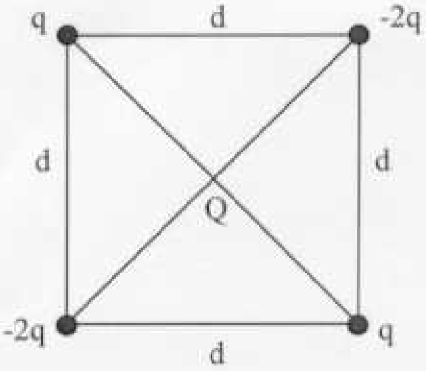
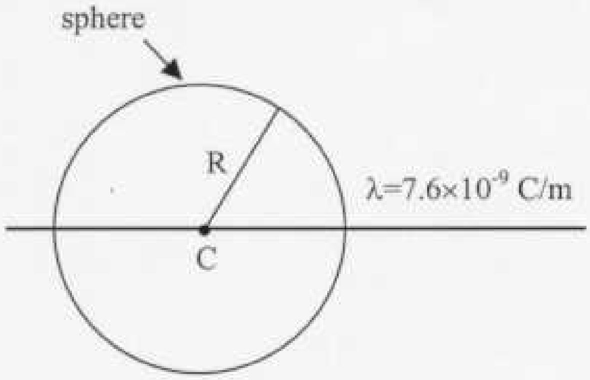


FIGURE 2



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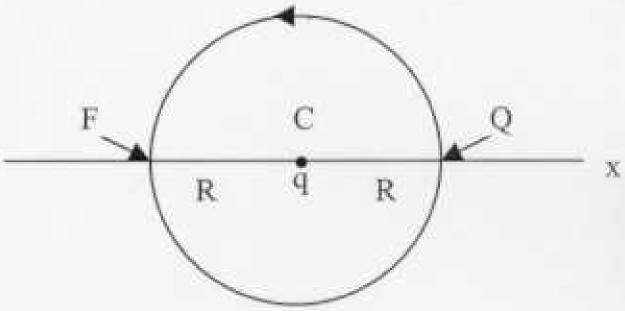

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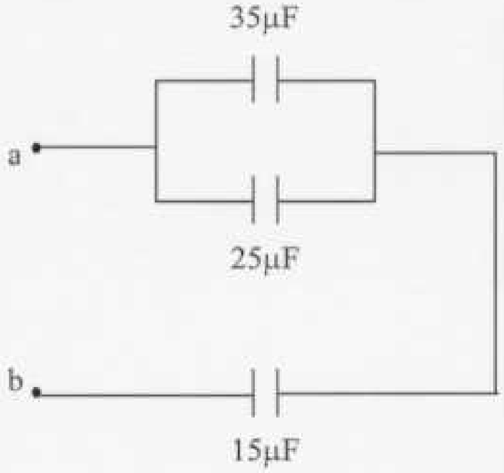

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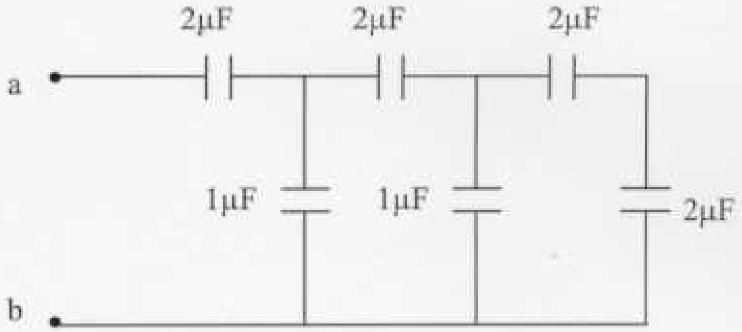

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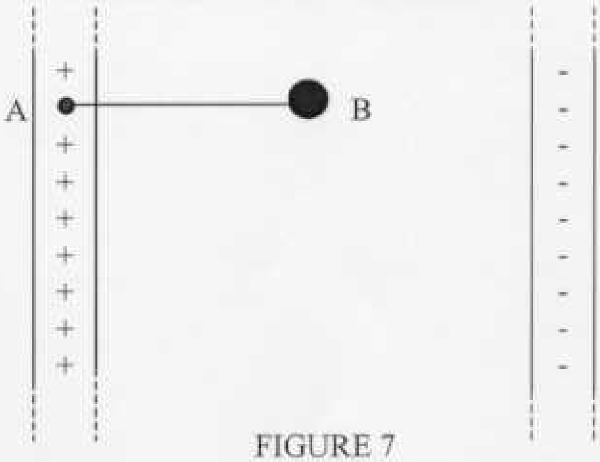

FIGURE 7