Second Major (T031)

```
(1)Q0 Five moles of an ideal gas undergo a reversible isothermal
 21Q0 compression from volume V to volume V/2 at temperature
   Q0 30 degrees C. What is the change in the entropy of the gas?
   Q0
   A1  -29 J/K.
   A2   29 J/K.
   A3   18 J/K.
   A4  -81 J/K.
   A5  -18 J/K.
   Q0
(2)Q0 An automobile engine operates with an overall efficiency
 21Q0 of 20%. How many gallons of gasoline is wasted for each
   Q0 10 gallons burned?
   Q0
   A1    8.
   A2   12.
   A3    6.
   A4   10.
   A5    2.
   Q0
(3)Q0 A heat engine operates between 600 K and 300 K. In each cycle
 21Q0 it takes 100 J from the hot reservoir, loses 25 J to the cold
   Q0 reservoir, and does 75 J of work.  This heat engine violates:
   Q0
   A1   The second law but not the first law of thermodynamics.
   A2   Both, the first law and the second law of thermodynamics.
   A3   The first law but not the second law of the thermodynamics.
   A4   Neither the first law nor the second law.
   A5   Conservation of energy.
   Q0
(4)Q0 As in figure (1), a charge Q is fixed at each of two opposite
 22Q0 corners of a square. A charge q is fixed at each of the other
   Q0 two corners. If the resultant electrical force on Q is zero,
   Q0 then Q and q are related as:`
   Q0
   A1 Q = - 2 Sqrt(2) q
   A2 Q = - 4 q
   A3 Q =   q
   A4 Q =   q**2
   A5 Q = - 2 Sqrt(2) q**2
   Q0
(5)Q0 Consider two identical conductor spheres, A and B.
22 Q0 Initially, sphere A has a charge of -80 Q and Sphere B
   Q0 has a charge of +20 Q. If the spheres touched and then
   Q0 are separated by a distance of 0.3 m, what is the
   Q0 resultant force between them? [Take Q = 5.7*10**(-8) C]
   Q0
   A1   0.3  N.
   A2   0.2  N.
   A3   0.4  N.
   A4   0.6  N.
   A5   0.9  N.
   Q0
(6)Q0 A particle, of mass m and charge q, is released from rest
23 Q0 at point A in a uniform electric field, see figure (2).
   Q0 The kinetic energy, due to the electric field, it attains
   Q0 after moving a distance y is:
   Q0
```

```
   A1   q*E*y.
   A2   m*q*E*y.
   A3   q*E*y/2.
   A4   q*E*y**2.
   A5   E*y.
   Q0
7  Q0 Which of the following statements are CORRECT:
   Q0
23 Q0  1. Electric charge is quantized.
   Q0  2. The potential at the center of a charged conductor is zero.
   Q0        ->
   Q0  3. If E  = 0 at a point P then V must be zero at P.
   Q0  4. The electric field inside a charged conductor is zero.
   Q0                                ->
   Q0  5. If V = 0 at a point P then E  must be zero at P.
   Q0
   A1  1 and 4.
   A2  2 and 4.
   A3  1, 2 and 3.
   A4  1, 2, and 5.
   A5  3 and 5.
   Q0
(8)Q0 A long noncoducting cylinder (radius 12.0 cm) has a charge
23 Q0 of uniform density 5.0 nano-C/m**3 distributed through
   Q0 its column. Determin the magnitude of the electric field
   Q0 5.0 cm from the axis of the cylinder. [See figure (3)].
   Q0
   A1   14 N/C.
   A2   22 N/C.
   A3   31 N/C.
   A4   34 N/C.
   A5    4 N/C.
   Q0
(9)Q0 In figure (4), what is the magnitude of the electric field
23 Q0 at point P, center of the equilateral triangle?
   Q0 [take d = 2 m, q = 10**(-9) C]
   Q0
   A1   Zero.
   A2   11 N/C.
   A3    9 N/C.
   A4   22 N/C.
   A5   18 N/C.
   Q0
10 Q0 For the two infinite dielectric sheets, see figure (5), find
24 Q0 the magnitude of the electric field at a point P. Consider
   Q0 that each sheet has a positive surface charge density of
   Q0 10**2 C/m**2.
   Q0
   A1   1.1*10**13 N/C.
   A2   2.2*10**13 N/C.
   A3   0.5*10**13 N/C.
   A4   1.7*10**13 N/C.
   A5   Zero.
   Q0
11 Q0 A point charge of +4.0 micro-C lies at the center of a hollow
24 Q0 spherical conducting shell that has a net charge of -13.0
   Q0 micro-C. If the inner radius of the shell is 2.0 cm and the
   Q0 outer radius is 3.0 cm, then the ratio between the charge
   Q0 density on the inner surface to the charge density on the
   Q0 outer surface is:
   Q0
```

```
   A1   1  : 1.
   A2  -1  : 1.
   A3   1  : 2.
   A4  -1  : 2.
   A5   4  : 1.
   Q0
12 Q0 A cube, as in figure (6), has an edge length of 3.00 m in a
24 Q0 region of a uniform electric field given by the equation:
   Q0
   Q0           ->          ^        ^
   Q0           E = (- 5.00 j + 6.00 k)  N/C,
   Q0
   Q0       ^  ^      ^
   Q0 where i, j, and k are the unit vectors in the directions of
   Q0 x, y, and z respectively.
   Q0 Find the electric flux through the top face (shaded).
   Q0
   A1   - 45 N*m**2/C.
   A2     45 N*m**2/C.
   A3   - 30 N*m**2/C.
   A4     30 N*m**2/C.
   A5     Zero.
   Q0
13 Q0 The electric potential at points in the xy–plane is given by:
25 Q0       V = (x**3 - 2*x*y) Volts,
   Q0 where x and y are in meters. The magnitude of the electric
   Q0 field at the point with the coordinates x = 1 m and y = 2 m is:
   Q0
   A1    Sqrt(5) V/m.
   A2    Sqrt(8) V/m.
   A3    Sqrt(2) V/m.
   A4    Sqrt(3) V/m.
   A5    Zero.
   Q0
14 Q0 In figure (7), what is the net potential at point P due to the
25 Q0 four point charges if V = 0 at infinity ? [take d = 2 cm,
   Q0 q = 1.0 micro-C].
   Q0
   A1    9.0*10**5  V.
   A2  - 9.0*10**5  V.
   A3    4.6*10**7  V.
   A4  - 4.6*10**7  V.
   A5    Zero.
   Q0
15 Q0 Which one of the following statements is true?
  25Q0
   Q0
   A1 The electric field lines are perpendicular to the equipotential
   A1 surfaces.
   A2 We have to do work to move a charged particle along an
   A2 equipotential surface.
   A3 The electric field is a scalar quantity.
   A4 The electric potential is a vector quantity.
   A5 Any two equipotential surfaces are always parallel.
   Q0
16 Q0 Two balls with charges 5.0 micro-C and 10 micro-C are at a
  25Q0 distance of 1.0 m from each other. In order to reduce the
   Q0 distance between them to 0.5 m the amount of work to be
   Q0 performed is:
   Q0
   A1    0.45 J.
```

A2 45.0 J.
A3 1.2*10**(-4) J.
A4 4.5*10**(-4) J.
A5 0.23 J.
Q0
17 Q0 Find the equivalent capacitance of three capacitors
Q0 connected in series. Assume the three capacitors are:
26 Q0 C1 = 2.00 micro-F, C2 = 4.00 micro-F and
Q0 C3 = 8.00 micro-F.
Q0
A1 1.14 micro-F.
A2 0.88 micro-F.
A3 3.01 micro-F.
A4 26.1 micro-F.
A5 15.4 micro-F.
Q0
18 Q0 In figure (8), find the total charge stored by the three
Q0 capacitors if the potential difference “V” is 10.0 volts.
26 Q0 Assume C1 = 10.0 micro-F, C2 = 5.00 micro-F and
Q0 C3 = 4.00 micro-F.
Q0
A1 31.6 micro-C.
A2 22.1 micro-C.
A3 61.3 micro-C.
A4 26.1 micro-C.
A5 63.4 micro-C.
Q0
19 Q0 An air filled parallel-plate capacitor has a capacitance of
26 Q0 1.00*10**(-12) F. The plate separation is then doubled and a
Q0 wax dielectric is inserted, completely filling the space
Q0 between the plates. As a result the, capacitance becomes
Q0 2.00*10**(-12) F. The dielectric constant of the wax is:
Q0
A1 4.00.
A2 0.25.
A3 2.00.
A4 0.50.
A5 8.00.
Q0
20 Q0 Two capacitors, C1 and C2, are connected in series and a
26Q0 potential difference is applied to the combination. If the
Q0 capacitor that is equivalent to the combination has the same
Q0 potential difference, then the charge on the equivalent
Q0 capacitors is the same as:
Q0
A1 The charge on C1 or C2.
A2 The sum of the charges on C1 and C2.
A3 The difference of the charges on C1 and C2.
A4 The product of the charges on C1 and C2.
A5 The ratio of the charges on C1 and C2.

{ SHAPE * MERGEFORMAT }

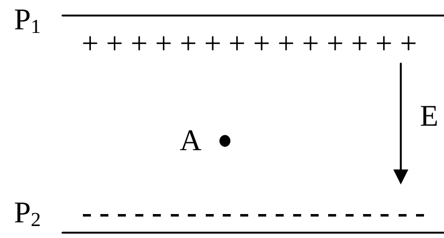

Figure (2)

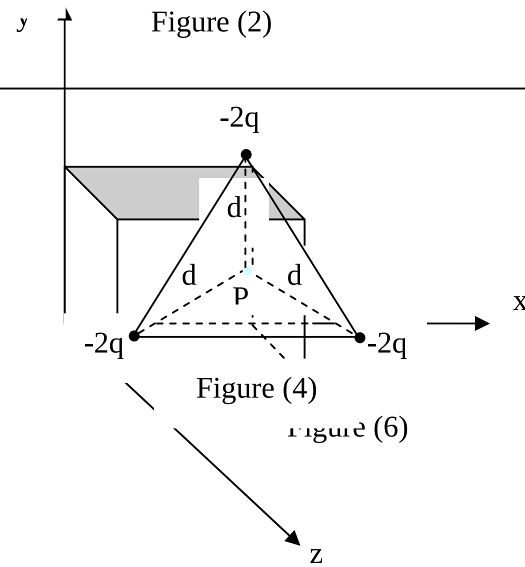

Figure (4)

Figure (6)

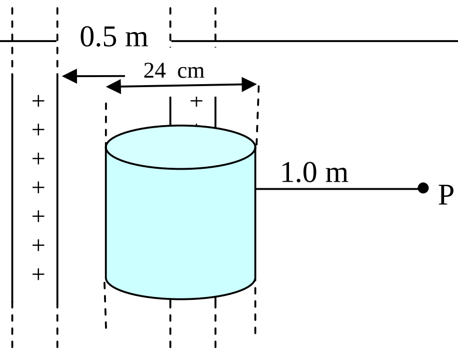

Figure (3)

Figure (5)

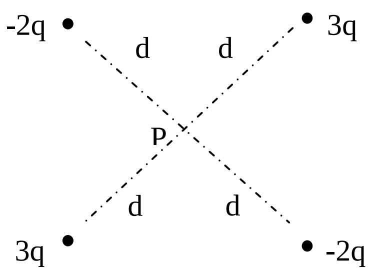

Figure (7)

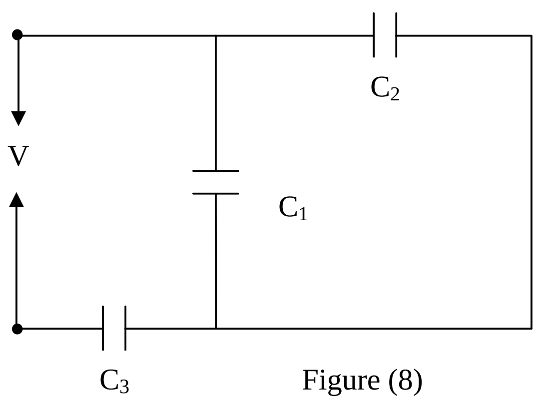

Figure (8)