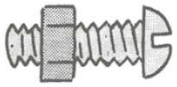
PHY1122A DISCUSSION GROUP#2 JANUARY 27, 30 2017

1. Which one of the following statements is true?

   A) Temperature differing by 25º on the Fahrenheit scale must differ by 45º on the Celsius scale.
   B) 40 K corresponds to –40ºC.
   C) Temperatures which differ by 10º on the Celsius scale must differ by 18º on the Fahrenheit scale.
   D) Water at 90ºC is warmer than water at 202ºF.
   E) 0ºF corresponds to –32ºC.

Answers: A) false, B) false, C) true, D) false, E) false

2.



A nut is very tight on a screw. Which of the following is most likely to free it?

   A) Cooling them.
   B) Heating them.
   C) Either.
   D) Neither.

Answer: B)

3. A rectangular metallic sheet expands isotropically with temperature. It was noticed that its area increases by 0.115% when temperature is raised from 25ºC to 50ºC. The coefficient of linear expansion [in $(ºC)^{-1}$] of this metal is

   A) 46×10^{-6}.
   B) 69×10^{-6}.
   C) 92×10^{-6}.
   D) 23×10^{-6}.
   E) None of the above.

Answer: D)

4. Fifty grams of ice at 0ºC is placed in a thermos bottle containing one hundred grams of water of 6ºC. How many grams of ice will melt?

   A) 7.5
   B) 2.0
   C) 8.3
   D) 17
   E) 50

Answer: A)

5. How much heat (in kcal) needs to be extracted from 2 kg of water at 20ºC to make ice at −10ºC (the specific heats of water and ice are, respectively, 1.0 cal/g·Cº and 0.5 cal/g·Cº, and the heat of fusion of water is 80 cal/g)?

A) 280
B) 200
C) 240
D) 210
E) 160

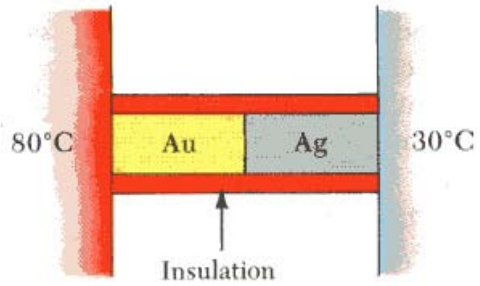
Answer: D)

6. An aluminum window frame has a total cross-sectional area of 200 cm^2 surrounding a single pane of glass whose cross-sectional area is 1 m^2. Find the ratio of heat through the aluminum vs. the window pane, assuming the thickness of the two is the same, and the thermal conductivities of Al and glass are 0.57 and 2×10^{-3} cal/s·cm·Cº, respectively.

A) 600
B) 0.6
C) 60
D) 6
E) None of the above.

Answer: D)

7.



A bar of gold is in thermal contact with a bar of silver of the same length and area, as shown in the figure above. One end of the compound bar is maintained at 80ºC while the opposite end is at 30ºC. When the heat flow reaches a steady state, find the temperature (in ºC) of the junction. The thermal conductivities of gold and silver are, respectively, 314 and 427 W/m·K.

Answer: 51ºC

8. A pond of water at 0ºC is covered with a layer of ice 4.00 cm thick. If the air temperature stays constant at −10.0ºC, how long does it take the ice's thickness to increase to 8.00 cm?

Answer: 12.8 h

9. Coffee is in an insulated cup 0.5 cm thick in the shape of a cube 10 cm on a side. The cup has a very small opening (its area is much smaller than the area of a square wall) through which coffee can be drunk. The temperature of the coffee is 95ºC and the surrounding temperature is 21ºC. Find the ratio of the heat loss due to conduction to the heat loss due to the radiation. Assume the emissivity of 1.0 and the thermal conductivity of cup of 2×10^{-4} cal/s·cm·Cº.

A) 17
B) 9
C) 2
D) 26
E) 1

Answer: C)