

Chapter L - Problems

Blinn College - Physics 2425 - Terry Honan

Problem L.1

A constant volume gas thermometer is calibrated using dry ice (at $T = -80.0\text{ }^\circ\text{C}$) and boiling water (at $T = 100\text{ }^\circ\text{C}$). The pressure with dry ice is 1.81 atm and with boiling water is 3.49 atm.

- With this calibration, what is the value of absolute zero given by the thermometer?
- What is the pressure at $0\text{ }^\circ\text{C}$?

Problem L.2

At what temperature are the numerical values of the Fahrenheit and Celcius scales the same?

Problem L.3

Liquid nitrogen is at 77 K. What is this in Celcius and in Fahrenheit?

Problem L.4

An aluminum hole has a diameter of 5 cm. An aluminum rod is slightly too big to fit in the hole; it has a 5.01 cm diameter. By how much must the temperature of the rod be lowered to fit in the hole? (For aluminum $\alpha = 24 \times 10^{-6}/\text{C}^\circ$)

Problem L.5

Gasoline has a coefficient of volume expansion of $\beta = 960 \times 10^{-6}/\text{C}^\circ$ and steel has a linear expansion coefficient of $\alpha = 11 \times 10^{-6}/\text{C}^\circ$. Suppose a steel tank is 98% filled with gasoline at $20\text{ }^\circ\text{C}$. If the temperature is increased, at what temperature will the gasoline start to spill?

Problem L.6

The total vertical fall of Naigara Falls is about 55 m. If the water temperature at the top of the Falls is $15\text{ }^\circ\text{C}$ then what is the temperature at the bottom? Assume all of the potential energy goes into heat in the water and also assume there is no evaporation, which would tend to decrease the temperature.

Problem L.7

The temperature of a 2 kg mass of an unknown substance increases by 15°C when 8400 J of heat is added to it. What is the specific heat of the unknown?

Problem L.8

A 4 kg chunk of iron at 500°C is dropped into a bucket with 25 kg of water that is initially at 20°C . Assuming no heat loss to the environment or bucket then what is the equilibrium temperature of the water and iron?

Problem L.9

How much heat must be added to completely melt 2 kg of lead at 20°C ?

Problem L.10

A quantity of mass m of water at 20°C is added to 2 kg of ice at -10°C . There are three possible final states: all ice at a temperature less than 0°C , ice-water at 0°C or all water at some temperature greater than 0°C . What values of m will give each of the three possibilities?