Name ——————————————

$T(°F) = \frac{9}{5}T(°C) + 32°F$

$T(°C) = \frac{5}{9}(T(°F) - 32°F)$

$T(K) = T(°C) + 273.15K$

Ideal Gas Law: $PV = NkT$: P=Pressure in N/m^2, V=Volume in m^3, N = Number of atoms/molecules, $k = 1.38 \times 10^{-23} J/K$, T (Boltzmann's constant) = Temperature in Kelvin

Or: $PV = nRT$: n = number of moles, $R = 8.31 J/(mol K)$

Avogadro's number: $N_A = 6.02 \times 10^{23} mol^{-1}$: atoms or molecules per mol

1. What is Absolute zero (0K) in Celcius?
   What is 20°C in Kelvin?

2. A spray can has a gas at a relatively high pressure. Why do labels on the cans often have the warning, "Do not store at high temperatures?"

3. Helium balloons are used to bring objects high up into earth's atmosphere for monitoring weather, for astronomical observing, and in 2012 to bring a person (Felix Baumgartner) to the record highest jump at almost 39km (127,851ft). Why do helium balloons appear hardly inflated near the ground, but become very large in diameter as they rise in altitude?

4. When beer bubbles rise in a glass their volume nearly doubles. The temperature of the beer is constant throughout the glass. We know pressure decreases as the bubbles rise in the liquid, but why can this not fully account for the increase in volume of the bubbles?

   What must be the cause of the increase in volume, according to the ideal gas law?

5. A room is 6m x 5m x 4m, the pressure is 1 atm and the temperature is 30°C. How many molecules of air are in the room?

   If the room is sealed and the temperature rises when a heater is turned on, what happens to the pressure in the room?

   A:Increases, **B**: Stays Same, **C**: Decreases

6. Sometimes when the temperature drops suddenly, the tire pressure warning light in a car can go off. It usually goes off when the pressure drops by 25% of its recommended value, but can warn you when it drops by as low as 10% of its ideal value. Suppose the ideal tire pressure is $2.81 \times 10^5 Pa$ at a temperature of 75°F=23.9°C. At what temperature would the warning light come on, assuming the volume of the air in the tires does not change much, and the light comes on when the pressure drops by 10%?

   What happens to the pressure in your tires after driving on the highway for a long time? **A**:Increases, **B**:Stays Same, **C**: Decreases