1. An unbreakable meteorological balloon is released from the ground.Ground level pressure is 98.5 KPa and the temperature is 18.0 Celsius. The balloon contains 74.0 liters of Hydrogen gas. As the balloon soars up, the pressure drops to 27.0 KPa. What is the new volume of the balloon, assuming no temperature change?
2. Re-read question 1, but considering in the real world when you go up in altitude the temperature does change. what is the actual volume of the meteorological balloon if the temp also drops 79.0 celsius from its original temperature?

Answer:

$1. pV = vRT$
The only parameter, which was not changed, is the amount of Hydrogen.

$$v = \frac{pV}{RT} \qquad\qquad V = \frac{vRT}{p}$$

R=$8314.472\ kPa{*}cm^3/(mol{*}K)$

$$v = \frac{98.5 \cdot 74000}{8314.3 \cdot (18 + 273)} = 3\ moles$$

$$V = \frac{3 \cdot 8314.3 \cdot (18 + 273)}{27} = 269962\ cm^3 = 270\ l$$

2   T$_2$ = 18-79 = -61 C
$$V = \frac{3 \cdot 8314.3 \cdot (-61 + 273)}{27} = 195848\ cm^3 = 196\ l$$