Gas Laws Practice Problems

1. Convert 3.6×10^2 atm to torr.

   [A] 13,000 torr [B] 25 torr [C] 270,000 torr [D] 0.47 torr [E] 53,000 torr

Perform the following conversions of pressure units:

2. 1.13 atm = _____ torr

   [A] 798 [B] 430. [C] 937 [D] 859 [E] 653

3. 168 torr = _____ atm

   [A] 0.442 [B] 0.221 [C] 0.802 [D] 243 [E] 136

4. 5.0×10^9 Pa = _____ atm

   [A] 9.8×10^4 [B] 1.7×10^5 [C] 4.9×10^4 [D] 4.3×10^4 [E] 2.5×10^4

5. 263 kPa = _____ Pa

   [A] 2.63×10^4 [B] 2.63 [C] 0.263 [D] 2.63×10^5 [E] 5.26×10^5

6. A gas occupies a volume of 202 mL at a pressure of 505 torr. To what pressure must the gas be subjected in order to change the volume to 65.0 mL? Assume constant temperature.

7. A balloon has a volume of 1.20 L at 24.0°C. The balloon is heated to 48.0°C. Calculate the new volume of the balloon.

   [A] 1.70 L [B] 2.40 L [C] 2.10 L [D] 1.20 L [E] 1.30 L

8. A helium balloon has a volume of 2.30 L at 23.5°C and a pressure of 1.00 atm at sea level. The balloon is released and floats upward. At a certain height the atmospheric pressure is 0.810 atm and the temperature is 12.0°C. Calculate the volume of the balloon.

   [A] 1.45 L [B] 2.84 L [C] 2.21 L [D] 2.73 L [E] none of these

9. Which of the following will give a graph with a straight line and a *y*-intercept of 0?

   [A] volume vs. temperature (°C) [B] volume vs. temperature (K)

   [C] volume vs. 1/temperature (°C) [D] volume vs. 1/temperature (K)

   [E] none of these

10. You transfer a sample of a gas at 17°C from a volume of 5.67 L and 1.10 atm to a container at 37°C that has a pressure of 1.13 atm. What is the new volume of the gas?

    [A] 2.61 L [B] 5.90 L [C] 5.30 L [D] 12.34 L [E] none of these

Gas Laws Practice Problems

[1] [C]

[2] [D]

[3] [B]

[4] [C]

[5] [D]

[6] 1570 torr; 2.07 atm

[7] [E]

[8] [D]

[9] [B]

[10] [B]

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(1) $3.6 \times 10^2 \text{ atm} \times \frac{760 \text{ torr}}{1 \text{ atm}} = 273600 \text{ torr}$

2 sig figs

270,000 or 2.7×10^5 torr

(2) $1.13 \text{ atm} \times \frac{760 \text{ torr}}{1 \text{ atm}} = 859 \text{ torr}$

(3) $168 \text{ torr} \times \frac{1 \text{ atm}}{760.0 \text{ torr}} = 0.221 \text{ atm}$

(4) $5.0 \times 10^9 \text{ Pa} \times \frac{1 \text{ kPa}}{10^3 \text{ Pa}} \times \frac{1 \text{ atm}}{101.3 \text{ kPa}} = \frac{49358.34156}{49000} \text{ atm}$

$= 4.9 \times 10^4 \text{ atm}$

(5) $263 \text{ kPa} \times \frac{1000 \text{ Pa}}{1 \text{ kPa}} = 263000 \text{ Pa}$

$2.63 \times 10^5 \text{ Pa}$

(6) $V_1 = 202 \text{ mL}$ $V_2 = 65.0 \text{ mL}$

$P_1 = 505 \text{ torr}$ $P_2 = ?$

$\frac{P_1 V_1}{V_2} = \frac{P_2 V_2}{V_2} = \frac{(505 \text{ torr})(202 \text{ mL})}{65.0 \text{ mL}} = 1569 = 1570 \text{ torr}$

$= 1.57 \times 10^3 \text{ torr}$

(7) $V_1 = 1.20 \text{ L}$ $V_2 = ?$

$T_1 = 24.0°C + 273 = 297 \text{ K}$ $T_2 = 321 \text{ K}$

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$\frac{T_2 V_1}{T_1} = V_2 = \frac{(321 \text{ K})(1.20 \text{ L})}{297 \text{ K}} = 1.30 \text{ L}$

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(8) $V_1 = 2.30\,L$ $\quad V_2 = ?$

$T_1 = 23.5°C$ $\quad T_2 = 12.0°C$

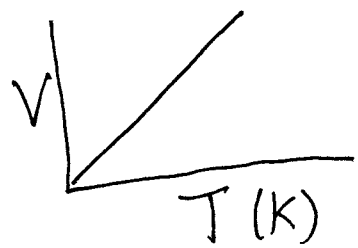
$P_1 = 1.00\,atm$ $\quad P_2 = 0.810\,atm$

$T_1 = 23.5°C + 273 = 296.5K$ $\quad T_2 = 12 + 273 = 285.0\,K$

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \xrightarrow{\text{cross multiply}} \frac{P_1V_1T_2}{T_1P_2} = \frac{\cancel{T_1}\cancel{P_2}V_2}{\cancel{T_1}\cancel{P_2}} = \frac{(1\,atm)(2.3\,L)(285K)}{(296.5K)(0.810\,atm)}$$

$$= 2.73\,L$$

(9)



(10) $P_1 = 1.10\,atm$ $\quad P_2 = 1.13\,atm$

$V_1 = 5.67\,L$ $\quad V_2 = ?$

$T_1 = 17°C + 273 = 290\,K$ $\quad T_2 = 37 + 273 = 310\,K$

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \Rightarrow \frac{(1.10\,atm)(5.67\,L)}{290\,K} = \frac{(1.13\,atm)(V_2)}{310\,K}$$

$V_2 = 5.90\,L$ (B)