

Gas Laws: $PV = nRT$

1. Numerical response question

Left justify your answer in the boxes provided below

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Under identical conditions of temperature and pressure, a 75.0 g sample of $\text{Cl}_2(\text{g})$ will occupy the same volume as _____ g of $\text{Xe}(\text{g})$

2. Numerical response question

Left justify your answer in the boxes provided below

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$$PV = \frac{nR}{t}$$

The ideal gas law, $PV = \frac{nR}{t}$, is based on interrelationship among pressure, volume, temperature, and chemical amounts of matter. These variables are either **directly** or **inversely** proportional to each other.

Using 1 for directly proportional and 2 for inversely proportional, complete each of the laws given below:

- Charles' law states that volume is _____ to absolute temperature of a gas
- Avogadro's law states that volume is _____ to chemical amount of matter
- Boyle's law states that volume is _____ to pressure of a gas.

3. A 23.0 g sample of $\text{N}_2(\text{g})$ has a volume of 0.315 L at 36.0°C . Under ideal conditions, the pressure of the gas will be ____ MPa.

a	0.780
b	7.80×10^2
c	13.4
d	6.70

4. Numerical response question

Left justify your answer in the boxes provided below

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John is filling 999 giant balloons with helium for his grandparents' 60th wedding anniversary at SATP. After filling the balloons, John noticed that the tank only contained 7.50 kg of helium. The tank originally contained 9.10 kg. There will be _____ L of helium in each balloon.

5. Stephen is filling up his hot air balloon for a morning ride. The balloon has a maximum volume capacity of 2.08×10^3 L. The weather report states that the morning high will be 5.00°C and at an air pressure of 1.00 atm. The mass of propane Stephen must use to fill the balloon is ____ kg.

- a) 5.40 kg
- b) 4.02 kg
- c) 3.79 kg
- d) 1.49 kg

6. Numerical response question

Left justify your answer in the boxes provided below

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The volume at STP of a 49.6 g sample of acetylene gas, $C_2H_2(g)$, is ____ L.

7. **Long Answer**

Laurel and Braeden run a lab that does experimentation on four hydrocarbon fuels

Fuel	Molar mass (g/mol)
Methane	16.05
Ethane	30.08
Propane	44.11
Butane	58.14

The lab stores each gas in an identical 85.0 L canister at a constant temperature of 18°C. Braeden has labeled 4 identical canisters A, B, C, and D. When full each canister has a mass of 3.60 kg.

But Braeden has forgotten which container contains which gas. Luckily for him the canisters have pressure gauges. Braeden has recorded the pressure for each canister.

Canister	Pressure (kPa)	Gas
A	3408	?
B	6388	?
C	1763	?
D	2324	?

Match each gas to the canister that contains it. (4 marks)

8. Numerical response question

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Left justify your answer in the boxes provided.

Cole and Jared wear their gas masks to perform a lab with $Cl_{2(g)}$. They collect the following data

Temperature	300 K
Pressure	110 kPa
Amount of chlorine gas	0.500 mol
Volume of chlorine gas	12.0 L

Based on their observations, the gas constant R will have a value of _____ $\frac{LkPa}{Kmol}$

9. Numerical Response question

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Left justify your answer in the boxes

The average person inhales and exhales about 0.50 L of air per breath. Alana exhales 0.50 L of air at 37 °C with a pressure of 107 kPa. The volume this gas will occupy at SATP will be _____ L

10. Numerical response question

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Left justify your answer in the boxes provided.

Shelby and Logan are scuba diving off the coast of Victoria, BC. Logan's tank has a volume of 8.60 L and a pressure of 2.80 MPa. There are 10.5 mol of oxygen gas in the tank. The temperature inside the tank will be _____ °C

11. Some Kr(g) in a 18.5 L cylinder exerts a pressure of 11.2 atm at 28.2 °C. The mass of krypton present is _____ g.

- a. 0.742 g
- b. 8.38 g
- c. 74.1 g
- d. 702 g

12. Numerical response question

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Left justify your answer in the boxes provided.

How many grams of SO₃(g) will fill a 0.650 L balloon at 25.0°C and 115 kPa?

13. Numerical response question

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Left justify your answer in the boxes provided.

What volume will be occupied by 45.0 g of CO₂(g) at 290K and 1.50 atm of pressure? Express the answer in Litres.

14. Numerical response question

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Left justify your answer in the boxes provided.

What is the temperature if 75 g of CO(g) occupies 4.6 L at 0.95 atm of pressure? Express the answer in Kelvins.

15. Numerical response question

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Left justify your answer in the boxes provided.

A 70.5 g sample of CO(g) occupies 46.0 L at 2.95 atm of pressure? The temperature of the sample will be ____ °C. Round the answer to the **nearest degree**.

Answers:

1. 120
2. 112
3. D
4. 9.93
5. B
6. 42.7
- 7.

Canister	Pressure (kPa)	Gas
A	3408	Ethane
B	6388	Methane
C	1763	Butane
D	2324	propane

8. 8.80
9. 0.51
10. 2.69
11. d
12. 2.41
13. 16.2
14. 20
15. 384