Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_\_\_ Teacher \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Phases of Matter and Gas Law Practice Problems**Show all of your work for the following problems. Include appropriate units and the proper number of sig figs in all answers.

1. Make the following temperature conversions:

|  |
| --- |
| **Temperature** |
| Degrees Celcius(˚C) | Kelvin(K) |
| 0 |  |
|  | 373 |
| -25 |  |
|  | 200 |
| 378 |  |
|  | 36 |

1. Make the following pressure conversions.
2. Convert atmospheric pressure in Denver, 620 mm Hg, to kPa.
3. Convert 0.75 atm to mmHg.
4. Convert 25.0 kPa to atm.
5. Convert 811 mmHg to atm.
6. Define STP and give the T and P values.
7. Go to PhET simulations at University of Colorado and choose the chemistry simulation: Gas Properties.

Use the pump to add gas to the chamber and slide the cover to remove gas. Use the heat control to heat or cool the gas

|  |  |
| --- | --- |
| Pressure (atm) | Temp (Kelvin) |
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|  |  |
|  |  |
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Add a “light” gas so that the pressure is approximately 1.00 atm and the

temp is approximately 300K. Record the starting pressure and temp as

shown on the gauges. Increase the temp by 300K and record the new

temp and pressure. Continue to record pressure and temp in 300K

increments until the temp is 1800K.

a. Describe the behavior of the gas particles as temp is increased.

b. How does pressure change as temp in increased?

c. Make a graph of pressure (Y) vs. temperature (X) and make a best fit line.

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|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | d. Is the slope constant?e. Calculate the slope.f. Use the slope to determine the pressure of the gas at 2200K. |
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**Using Gas Laws**

1. A high altitude balloon contains 30.0 L of helium gas at 103 kPa. What is the volume when the balloon rises to an altitude where the pressure is only 25.0 kPa? (Assume constant temperature.)

Variables Mentioned in Problem:

V1 =

P1 =

V 2 =

P 2 =

1. A balloon inflated in a room at 24 ºC has a volume of 4.00 L. The balloon is then heated to a temperature of 58 ºC. What is the new volume if the pressure remains constant?

Variables Mentioned in Problem:

1. A gas has a pressure of 6.58 kPa at 539 K. What will be the pressure at 211 K if the volume does not change?

Variables Mentioned in Problem:

1. Exactly 5.00 L of air at -50.0 ºC is warmed to 100.0 ºC. What is the new volume if the pressure remains constant?

Variables Mentioned in Problem:

1. A gas with a volume of 4.00 L at a pressure of 205 kPa is allowed to expand to a volume of 12.0L. What is the pressure in the container if the temperature remains constant?

Variables Mentioned in Problem:

1. The gas left in a used aerosol can is at a pressure of 103 kPa at 25 ºC. If this can is thrown into a fire, what is the pressure of the gas when its temperature reaches 928 ºC?

Variables Mentioned in Problem:

1. A gas-filled balloon takes up 30.0 L of space at 153 kPa and 25 ºC. What volume will the balloon have at standard pressure and temperature (STP)?

Variables Mentioned in Problem:

1. A gas is kept in a sealed container with a volume of 1.0 L. The pressure of the gas is increased from 1.00 atm to 1.13 atm by changing the temperature. If the initial gas temperature was 0.00 °C, what is the final temperature of the gas (in °C)?

Variables Mentioned in Problem:

1. A 5.00 L air sample at a temperature of -50.0 ºC has a pressure of 84 kPa. What will the new pressure be if the temperature is raised to 102 ºC and the volume expands to 7.00 L?
2. **Identify which gas law is being demonstrated**.
3. A ball is left out sided on a snowy day and it shrinks. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. A deep sea fish swims to the surface to eat a swimmer but explodes on the way. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. When a gas is released from an aerosol can, it feels cool. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. A sealed bottle explodes as it’s heated. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. A weather balloon expands as it gets higher in the atmosphere. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Analyzing Data**

The graph at the left shows the variation in three variables for a gas:
P = pressure V = volume K = temp in Kelvin

1. Use the graph below to answer the following questions.



1. Identify the variables graphed and describe their relationship.
2. Determine the volume of a gas at 4 atm and 250 K.

c. How does the volume of a gas change when temperature is increased at constant pressure? Support with numbers.

d. Which temperature shows the smallest change in volume when pressure is increased? Support with numbers.

1. Comparing Boiling Points

a. Explain how and why the atmospheric pressure in Denver is different than the pressure on the coast of California?

b. Explain why the boiling point of a liquid (such as water) is different in Denver than it is on the coast of California. What would the boiling point of water be like on top of Mount Evans?

c. Make a diagram that shows the difference in water boiling in Denver compared to water boiling on the coast of California.