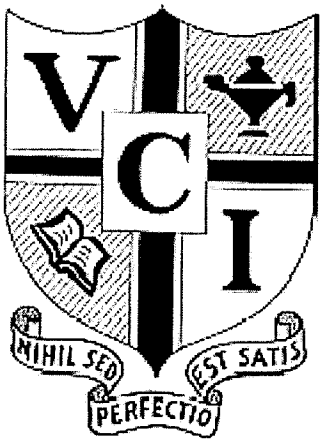
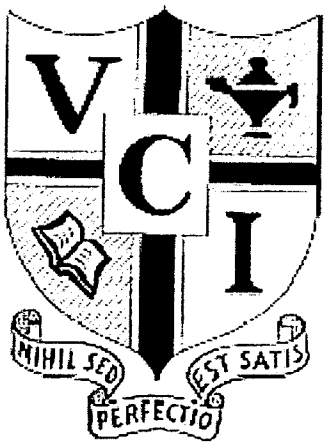
Science Notebook



40S Chemistry

Gases and the Atmosphere

Science Notebook



30S Chemistry

Gases and the Atmosphere

Student Name: _____ Date: _____

Chemistry 30S

Behavior of Gases
Pressure and Temperature

Complete these conversions in your Chemistry notebook. Show your work.

1. Convert the following into kilopascals:
   a). 720 mm Hg
   b). 452 mm Hg
   c). 1271 mm Hg
   d). 3 atm
   e). $6.09X\ 10^{-2}$ atm
2. Convert the following into mm of Hg
   a). 72 kPa
   b). 154 kPa
   c). 0.34 atm
   d). 1.1 atm
3. Convert the following into atmospheres:
   a). 755 mm Hg
   b). 1311 mm Hg
   c). 17 kPa
   d). 102 kPa
4. Convert the following into Kelvins:
   a). 32°C
   b). 0°C
   c). -104°C
   d). 87°C
   e). -26°C
5). Convert the following into Celsius:
   a). 40 K
   b). 450 K
   c). 97 K
   d). 363 K
   e). 149 K

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Chemistry 30S

Behavior of Gases
Boyle's Law Problems

Answer these questions in your Chemistry notebook. Use Boyles' Law . Show your work.

1) 1.00 L of a gas at standard temperature and pressure is compressed to 473 mL. What is the new pressure of the gas?

2) In a thermonuclear device, the pressure of 0.050 liters of gas within the bomb casing reaches 4.0×10^6 atm. When the bomb casing is destroyed by the explosion, the gas is released into the atmosphere where it reaches a pressure of 1.00 atm. What is the volume of the gas after the explosion?

3) Synthetic diamonds can be manufactured at pressures of 6.00×10^4 atm. If we took 2.00 liters of gas at 1.00 atm and compressed it to a pressure of 6.00×10^4 atm, what would the volume of that gas be?

4) The highest pressure ever produced in a laboratory setting was about 2.0×10^6 atm. If we have a 1.0×10^{-5} liter sample of a gas at that pressure, then release the pressure until it is equal to 0.275 atm, what would the new volume of that gas be?

5) Atmospheric pressure on the peak of Mt. Everest can be as low as 150 mm Hg, which is why climbers need to bring oxygen tanks for the last part of the climb. If the climbers carry 10.0 liter tanks with an internal gas pressure of 3.04×10^4 mm Hg, what will be the volume of the gas when it is released from the tanks?

6) Part of the reason that conventional explosives cause so much damage is that their detonation produces a strong shock wave that can knock things down. While using explosives to knock down a building, the shock wave can be so strong that 12 liters of gas will reach a pressure of 3.8×10^4 mm Hg. When the shock wave passes and the gas returns to a pressure of 760 mm Hg, what will the volume of that gas be?

7) Submarines need to be extremely strong to withstand the extremely high pressure of water pushing down on them. An experimental research submarine with a volume of 15,000 liters has an internal pressure of 1.2 atm. If the pressure of the ocean breaks the submarine forming a bubble with a pressure of 250 atm pushing on it, how big will that bubble be?

8) Divers get "the bends" if they come up too fast because gas in their blood expands, forming bubbles in their blood. If a diver has 0.05 L of gas in his blood under a pressure of 250 atm, then rises instantaneously to a depth where his blood has a pressure of 50.0 atm, what will the volume of gas in his blood be? Do you think this will harm the diver?

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Chemistry 30S

Behavior of Gases
Charles Law Worksheet

Answer these questions in your Chemistry notebook. Show your work.

1. Calculate the decrease in temperature when 2.00 L at 20.0 °C is compressed to 1.00 L.
2. A gas occupies 900.0 mL at a temperature of 27.0 °C. What is the volume at 132.0 °C.
3. The temperature of a 4.00 L sample of gas is changed from 10.0 °C to 20.0 °C. What will the volume of this gas be at the new temperature if the pressure is held constant?
4. 3.50 liters of a gas at 72.7 .0 K will occupy how many liters at 153.0 K?
5. If 15.0 liters of neon at 25.0 °C is allowed to expand to 45.0 liters, what must the new temperature be to maintain constant pressure?
6. When 50.0 liters of oxygen at 20.0 °C is compressed to 5.00 liters, what must the new temperature be to maintain constant pressure?
7. What volume change occurs to a 400.0 mL gas sample as the temperature increases from 22.0 °C to 30.0 °C?
8. A 600.0 mL sample of nitrogen is warmed from 77.0 ° to 86.0 °C. Find its new volume if the pressure remains constant.
9. 600.0 mL of air is at 20.0 °C. What is the volume at 60.0 °C?
10. At 225.0 °C a gas has a volume of 400.0 mL. What is the volume of this gas at 127.0 °C?
11. A gas syringe contains 56.05 milliliters of a gas at 315.1 K. Determine the volume that the gas will occupy if the temperature is increased to 380.5 K.
12. If 540.0 mL of nitrogen at 0.00 °C is heated to a temperature of 100.0 °C what will be the new volume of the gas?
13. If the Kelvin temperature of a gas is doubled, the volume of the gas will increase by how much?
14. Carbon dioxide is usually formed when gasoline is burned. If 30.0 L of CO_2 is produced at a temperature of 1.00×10^3 °C and allowed to reach room temperature (25.0 °) without any pressure changes, what is the new volume of the carbon dioxide?

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Chemistry 30S

Behavior of Gases

Gay-Lussac's Law Worksheet

Answer these questions in your Chemistry notebook. Show your work.

1. Determine the pressure change when a constant volume of gas at 1.00 atm is heated from 20.0 °C to 30.0 °C.
2. A container of gas is initially at 0.500 atm and 25 °C. What will the pressure be at 125 °C?
3. A gas container is initially at 47 mm Hg and 77 K (liquid nitrogen temperature.) What will the pressure be when the container warms up to room temperature of 25 °C?
4. A gas thermometer measures temperature by measuring the pressure of a gas inside the fixed volume container. A thermometer reads a pressure of 248 Torr at 0 °C. What is the temperature when the thermometer reads a pressure of 345 Torr?
5. A gas is collected at 22.0 °C and 745.0 mm Hg. When the temperature is changed to 0 °C, what is the resulting pressure?
6. A gas has a pressure of 699.0 mm Hg at 40.0 °C. What is the temperature at standard pressure?
7. If a gas is cooled from 323.0 K to 273.15 K and volume is kept constant what final pressure would result if the original pressure was 750.0 mm Hg?
8. The temperature of a sample of gas in a steel tank at 30.0 kPa is increased from –100.0 °C to 25.0 °. What is the final pressure inside the tank?
9. Calculate the final pressure inside a scuba tank after it cools from 1.00×10^3 °C to 25.0 °C. The initial pressure in the tank is 130.0 atm.
10. A 30.0 L sample of nitrogen inside a rigid, metal container at 20.0 °C is placed inside an oven whose temperature is 50.0 °C. The pressure inside the container at 20.0 °C was at 3.00 atm. What is the pressure of the nitrogen after its temperature is increased?

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Chemistry 30S

Behavior of Gases
Avagadro's Law Worksheet

Answer these questions in your Chemistry notebook. Show your work.

1. Determine the volume of a container that holds 2.4 mol of gas at STP.
2. What size container will you need to hold 0.0459 mol N_2 gas at STP?
3. How many moles of nitrogen gas will be contained in a 2.00 L flask at STP?
4. If a balloon will rise off the ground when it contains 0.0226 mol of helium in a volume of 0.460 L, how many moles of helium are needed to make the balloon rise when its volume is 0.865 L? Assume pressure and temperature remain constant.
5. How many grams of carbon dioxide gas are in a 1.0 L balloon at STP?
6. What volume will 0.416 g of krypton gas occupy at STP?
7. A flexible plastic container contains 0.860 g of helium gas in a volume of 19.2 L. If 0.205 g of helium is removed without changing the pressure or temperature, what will be the new volume?

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Chemistry 30S

Behavior of Gases

Combined Gas Law Worksheet

Answer these questions in your Chemistry notebook. Show your work.

1. A gas has a volume of 800.0 mL at minus 23.00 °C and 300.0 torr. What would the volume of the gas be at 227.0 °C and 600.0 torr of pressure.

2. 500.0 liters of a gas are prepared at 700.0 mm Hg and 200.0 °C. The gas is placed into a tank under high pressure. When the tank cools to 20.0 °C, the pressure of the gas is 30.0 atm. What is the volume of the gas?

3. What is the final volume of a 400.0 mL gas sample that is subjected to a temperature change from 22.0 °C to 30.0 °C and a pressure change from 101.3 kPa to 55.5 kPa?

4. What is the volume of gas at 2.00 atm and 200.0 K if its original volume was 300.0 L at 0.250 atm and 400.0 K.

5. AT conditions of 785.0 torr of pressure and 15.0 °C temperature, a gas occupies a volume of 45.5 mL. What will be the volume of the same gas at 745.0 torr and 30.0 °C?

6. The volume of gas originally at standard temperature and pressure was recorded as 488.8 mL. What volume would the same gas occupy when subjected to a pressure of 100.0 atm and temperature of minus 245.0 °C?

7. At a pressure of 780.0 mm Hg and 24.2 °C, a certain gas has a volume of 350.0 mL. What will be the volume of this gas under STP?

8. A gas sample occupies 3.25 liters at 24.5 °C and 1825 mm Hg. Determine the temperature at which the gas will occupy 4250 mL at 1.50 atm.

9. A gas balloon has a volume of 106.0 liters when the temperature is 45.0 °C and the pressure is 97.3 kPa. What will its volume be at 20.0 °C and 109.4 kPa pressure?

10. A gas is heated from 263.0 K and the volume is increased from 24.0 liters to 35.0 litres by moving a large piston within a cylinder. If the original pressure was 1.00 atm, what would the final pressure be?

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Chemistry 30S

Behavior of Gases
Ideal Gas Law Problems

Answer these questions in your Chemistry notebook. Show your work.

1. If I have 4.0 moles of a gas at a pressure of 5.6 atm and a volume of 12 liters, what is the temperature?
2. If I have an unknown quantity of gas at a pressure of 1.2 atm, a volume of 31 liters, and a temperature of 87°C, how many moles of gas do I have?
3. If I contain 3.0 moles of gas in a container with a volume of 60 liters and at a temperature of 4.0×10^2 K, what is the pressure inside the container?
4. If I have 7.7 moles of gas at a pressure of 0.090 atm and at a temperature of 56°C, what is the volume of the container that the gas is in?
5. If I have 17 moles of gas at a temperature of 67°C, and a volume of 88.89 liters, what is the pressure of the gas?
6. If I have an unknown quantity of gas at a pressure of 0.50 atm, a volume of 25 liters, and a temperature of 3.0×10^2 K, how many moles of gas do I have?
7. If I have 21 moles of gas held at a pressure of 78 atm and a temperature of 900 K, what is the volume of the gas?
8. If I have 1.9 moles of gas held at a pressure of 5.0 atm and in a container with a volume of 50.0 liters, what is the temperature of the gas?
9. If I have 2.4 moles of gas held at a temperature of 97°C and in a container with a volume of 45 liters, what is the pressure of the gas?
10. If I have an unknown quantity of gas held at a temperature of 1195 K in a container with a volume of 25 liters and a pressure of 560 atm, how many moles of gas do I have?
11. If I have 0.275 moles of gas at a temperature of 75 K and a pressure of 1.75 atmospheres, what is the volume of the gas?
12. If I have 72 liters of gas held at a pressure of 3.4 atm and a temperature of 225 K, how many moles of gas do I have?

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Chemistry 30S

Dalton's Law of Partial Pressure Problems

Answer these questions in the space provided. Show your work.

1. A mixture of oxygen, O_2, carbon dioxide, CO_2, and nitrogen, N_2 has a total pressure of 0.97 atm. What is the partial pressure of O_2, if the partial pressure of CO_2 is 0.70 atm and the partial pressure of N_2, is 0.12 atm?

2. What is the partial pressure of hydrogen gas in a mixture of hydrogen and helium if the total pressure is 6.00×10^2 mm Hg and the partial pressure of helium is 439 mm Hg?

3. Find the total pressure for a mixture of four gases with partial pressures of 5.00 kPa, 4.56 kPa, 3.02 kPa, and 1.20 kPa.

4. Find the partial pressure of carbon dioxide in a gas mixture with a total pressure of 30.4 kPa if the partial pressures of the other two gases in the mixture are 16.5 kPa and 3.7 kPa.