**Study of gas laws**

**Boyle’s law**

Q. How many cylinders of 1500 ml capac ity at 1 atm. pressure can be filled from

a cylinder of 150 litres capacity under a pressure of 100 atm. at the same temperature? [3]

Q. At constant temperature a gas occupies a volume of 2000 cm3 at a pressure of 740 mm of mercury. Find at what pressure its volume will be 500 cm3 . [2]

Q. A gas was allowed to expand from a volume of 400 ml to 2000 ml at a constant temp. If the initial pressure of the gas was 3 atmosphere , calculate the final pressure of the gas?

 [Ans-: 0.6 atm]

Q The volume of a certain gas at constant temp. was found to be 800 ml. when the pressure was 950 mm (Hg). If the volume is decreased to 50% of the original volume, what is the change in pressure of the gas?

[Ans-: 1900 mm]

Q. A balloon with a volume of 2.0 L is filled with a gas at 3 atmospheres. If the pressure is reduced to 0.5 atmospheres without a change in temperature, what would be the volume of the balloon?

[Ans-: 12 L]

Q. Bacteria produce methane gas in sewage treatment plants. This gas is often captured or burned. If a bacterial culture produces 60.0 mL of methane gas at 700.0 mm Hg, what volume would be produced at 760.0 mm Hg?

[Ans-: 55.3ML]

Q. A gas has a pres sure of 1.26 atm and occupies a volume of 7.40 L. If the gas is compressed to a volume of 2.93 L, what will its pressure?

[Ans-:3.18 ML]

Q. Hospitals buy 400 L cylinders of oxygen gas compressed at 150 atm. They administer oxygen to patients at 3.0 atm in a hyperbaric oxygen chamber. What volume of oxygen can a cylinder supply at this pressure?

[Ans-:20,000 l]

Q. A gas occupies 12.3 liters at a pressure of 40.0 mm Hg. What is the volume when the pressure is increased to 60.0 mm Hg?

[ (40.0 mm Hg) (12.3 liters) = (60.0 mm Hg) (x); x = 8.20 L, ]

Q. If a gas at 25.0 °C occupies 3.60 liters at a pressure of 1.00 atm, what will be its volume at a pressure of 2.50 atm? [ (1.00 atm) ( 3.60 liters) = (2.50 atm) (x); x = 1.44 L ]

Q. To what pressure must a gas be compressed in order to get into a 3.00 cubic foot tank the entire weight of a gas that occupies 400.0 cu. ft. at standard pressure?

[ ( 400.0 cu. ft) (1.00 atm) = (x) (3.00 cubic foot); x = 133 atm ]

Q. A gas occupies 1.56 L at 1.00 atm. What will be the volume of this gas if the pressure becomes 3.00 atm?

[ (1.56 L) (1.00 atm) = (3.00 atm) (x); 0.520 L ]

Q. A gas occupies 11.2 liters at 0.860 atm. What is the pressure if the volume becomes 15.0 L? [ (11.2 liters) (0.860 atm) = (x) (15.0 L); x = 0.642 atm ]

Q. 500.0 mL of a gas is collected at 745.0 mm Hg. What will the volume be at standard pressure? ( 745.0 mm Hg) (500.0 mL) = (760.0 mm Hg) (x)

Q. Convert 350.0 mL at 740.0 mm of Hg to its new volume at standard pressure. (740.0 mm Hg) (350.0 mL) = (760.0 mm Hg) (x)

Q. Convert 338 L at 63.0 atm to its new volume at standard pressure. (63.0 atm) (338 L) = (1.00 atm) (x)

Q. Convert 273.15 mL at 166.0 mm of Hg to its new volume at standard pressure. (166.0 mm Hg) (273.15 mL) = (760.0 mm Hg) (x)

Q. Convert 77.0 L at 18.0 mm of Hg to its new volume at standard pressure. (18.0 mm Hg) (77.0 L) = (760.0 mm Hg) (x)

Q. When the pressure on a gas increases, will the volume increase or decrease? Volume will decrease.

Q. If the pressure on a gas is decreased by one-half, how large will the volume change be? It will double in size.

Q. A gas occupies 4.31 liters at a pressure of 0.755 atm. Determine the volume if the pressure is increased to 1.25 atm. (0.755 atm) (4.31 liters) = (1.25 atm) (x)

Q. 600.0 mL of a gas is at a pressure of 8.00 atm. What is the volume of the gas at 2.00 atm? (8.00 atm) (600.0 mL) = (2.00 atm) (x)

Q. 400.0 mL of a gas are under a pressure of 800.0 torr. What would the volume of the gas be at a pressure of 1000.0 torr? (800.0 torr) (400.0 mL) = (1000.0 torr) (x)

Q. 4.00 L of a gas are under a pressure of 6.00 atm. What is the volume of the gas at 2.00 atm? (6.00 atm) (4.00 L) = (2.00 atm) (x)

Q. A gas occupies 25.3 mL at a pressure of 790.5 mm Hg. Determine the volume if the pressure is reduced to 0.804 atm. (790.5 mm Hg) (25.3 mL) = ( 0.804 atm) (x)

This is wrong!! You MUST change one of the pressures units so both are the same. Here, change the mm Hg to atm:

(790.5 mm Hg / 760.0 mm Hg/atm) (25.3 mL) = ( 0.804 atm) (x)

Q. A sample of gas has a volume of 12.0 L and a pressure of 1.00 atm. If the pressure of gas is increased to 2.00 atm, what is the new volume of the gas? (1.00 atm) (12.0 L) = (2.00 atm) (x)

Q. A container of oxygen has a volume of 30.0 mL and a pressure of 4.00 atm. If the pressure of the oxygen gas is reduced to 2.00 atm and the temperature is kept constant, what is the new volume of the oxygen gas? (4.00 atm) (30.0 mL) = (2.00 atm) (x)

Q. A tank of nitrogen has a volume of 14.0 L and a pressure of 760.0 mm Hg. Find the volume of the nitrogen when its pressure is changed to 400.0 mm Hg while the temperature is held constant. (760.0 mm Hg) (14.0 L) = (400.0 mm Hg) (x)

Q. A 40.0 L tank of ammonia has a pressure of 8.00 atm. Calculate the volume of the ammonia if its pressure is changed to 12.0 atm while its temperature remains constant. (8.00 atm) (40.0 L ) = (12.0 atm) (x)

Q. Two hundred liters of helium at 2.00 atm and 28.0 °C is placed into a tank with an internal pressure of 600.0 kPa. Find the volume of the helium after it is compressed into the tank when the temperature of the tank remains 28.0 °C. (2.00 atm) (200.0 L) = (600.0 kPa) (x)

This is wrong. The pressure units must be the same. I'll change the atm to kPa. You could go the other way if you want, the answer would be the same.

(2.00 atm x 101.325 kPa/atm) (200.0 L) = (600.0 kPa) (x)

In fact, here's the problem with the kPa changed to atm: (2.00 atm) (200.0 L) = (600.0 kPa / 101.325 kPa/atm) (x)

Q. You are now wearing scuba gear and swimming under water at a depth of 66.0 ft. You are breathing air at 3.00 atm and your lung volume is 10.0 L. Your scuba gauge indicates that your air supply is low so, to conserve air, you make a terrible and fatal mistake: you hold your breath while you surface. What happens to your lungs? Why? Your lungs will "explode." As you go up towards the surface, the pressure on your body and lungs becomes less. The air in your lungs expands. What would happen is the alveoli and small capallaries would rupture, causing massive bleeding in the lungs. You'd die. No, your body would not swell up and burst, like a balloon.

Q. Solve Boyle's Law equation for V2. V2 = (P1V1) / P2

Q. Boyle's Law deals what quantities?

a. pressure/temperature
b. pressure/volume
c. volume/temperature
d. volume temperature/pressure

Ans. B

Q. A 1.5 liter flask is filled with nitrogen at a pressure of 12 atmospheres. What size flask would be required to hold this gas at a pressure of 2.0 atmospheres? (12 atmospheres) (1.5 liter) = (2.0 atmospheres) (x)

Q. 300 mL of O2 are collected at a pressure of 645 mm of mercury. What volume will this gas have at one atmosphere pressure? (645 mm Hg) (300 mL) = (one atmosphere) (x) This is wrong. I will change atm to mm Hg. (645 mm Hg) (300 mL) = (760 mm Hg) (x)

Q. How many cubic feet of air at standard conditions (1.00 atm.) are required to inflate a bicycle tire of 0.50 cu. ft. to a pressure of 3.00 atmospheres? (1.00 atm.) (x) = (3.00 atmospheres) (0.50 cu. ft.)

Q. How much will the volume of 75.0 mL of neon change if the pressure is lowered from 50.0 torr to 8.00 torr? (50.0 torr) ( 75.0 mL) = (8.00 torr) (x)

Q. A tank of helium has a volume of 50.0 liters and is under a pressure of 2000.0 p.s.i.. This gas is allowed to flow into a blimp until the pressure in the tank drops to 40.00 p.s.i. and the pressure in the blimp is 30.00 p.s.i.. What will be the volume of the blimp? (1960.0 p.s.i.) (50.0 liters) = (30.00 p.s.i.) (x) Important point: 2000 psi - 40 psi = 1960 psi flowed out of tank. 2000 is not used in calculation.

Q. What pressure is required to compress 196.0 liters of air at 1.00 atmosphere into a cylinder whose volume is 26.0 liters? (1.00 atmosphere) (196.0) = (x) (26.0 liters)

**Charles law**

Q. A gas is enclosed in a vessel at standard temperature. At what temperature **( In degree Celsius)**, the volume of enclosed gas will be 1/6 of its initial volume, given that the pressure remains constant. [3]

[Ans- -227.5 C]

Q. A 600 mL sample of nitrogen is heated from 27 °C to 77 °C at constant pressure. What is the final volume?

[Ans-: 700 ml]

Q. A balloon is filled with 3.0 L of helium at 310 K. The balloon is placed in an oven where the temperature reaches 340 K. What is the new volume of the balloon?

.[ 3.3 L ]

Q. A gas at 65 C occupies 4.22 L. At what Celsius temperature will the volume be 3.87 L?

[5. 37 C]

Q. A 4 L sample of methane gas is collected at 30.0 C. Predict the volume of the sample at 0 C

[6. 3.6 L ]

Q. Calculate the decrease in temperature when 2.00 L at 20.0 °C is compressed to 1.L.

Q. 600.0 mL of air is at 20.0 °C. What is the volume at 60.0 °C?

Q. A gas occupies 900.0 mL at a temperature of 27.0 °C.What is the volume at 132°C?

Q. What change in volume results if 60.0 mL of gas is cooled from 33.0 °C to 5.00 °C?

Q. Given 300.0 mL of a gas at 17.0 °C. What is its volume at 10.0 °C?

Q. A gas occupies 1.00 L at standard temperature. What is the volume at 333.0 °C?

Q. At 27.00 °C a gas has a volume of 6.00 L. What will the volume be at 150.0 °C?

Q. At 225 °C a gas has a volume of 400.0 mL.What is the volume of this gas at 127°C?

Q. At 210.0 °C a gas has a volume of 8.00 L. What is the volume of this gas at –23.0 °C?

Q. 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?

Q. Carbon dioxide is usually formed when gasoline is burned. If 30.0 L of CO2 is produced at a temperature of 1.00 x103 °C and allowed to reach room temperature (25.0 °C) without any pressure changes, what is the new volume of the carbon dioxide?

Q. A 600.0 mL sample of nitrogen is warmed from 77.0 °C to 86.0 °C. Find its new volume if the pressure remains constant.

Q. What volume change occurs to a 400.0 mL gas sample as the temperature increases from 22.0 °C to 30.0 °C?

Q. 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

Q. A gas syringe contains 42.3 milliliters of a gas at 98.15 °C. Determine the volume that the gas will occupy if the temperature is decreased to -18.50 °C.

Q. When the temperature of a gas decreases, does the volume increase or decrease?

Q. If the Kelvin temperature of a gas is doubled, the volume of the gas will increase by \_\_\_.

Q. Solve the Charles' Law equation for V2.

Q. Charles' Law deals with what quantities?

a. pressure/temperature b. pressure/volume

c. volume/temperature d. volume/temperature/pressure

Q. 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?

Q. A balloon has a volume of 2500.0 mL on a day when the temperature is 30.0 °C. If the temperature at night falls to 10.0 °C, what will be the volume of the balloon if the pressure remains constant?

Q. When 50.0 liters of oxygen at 20.0 °C is compressed to 5.00 liters, what is the new

temperature?

Q. If 15.0 liters of neon at 25.0 °C is allowed to expand to 45.0 liters, what is the new

temperature?

Q. 3.50 liters of a gas at 727.0 °C will occupy how many liters at 153.0 °C?

**Combined Gas Law**

Q. 6 dm3 of dry gas at temperature of 27 C and pressure of 700 mm Hg. Find the volume of gas at S.T.P.?

[Ans- 5.02 dm3]

Q. A gas has a volume of 800.0 mL at –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?

Q. 500.0 liters of a gas are prepared at 700.0 mmHg 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?

Q. 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 760.0 mmHg to 360.0 mmHg?

Q. 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.

Q. 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?

Q. A gas occupies a volume of 34.2 mL at a temperature of 15.0 °C and a pressure of 800.0 torr. What will be the volume of this gas at standard conditions?

Q. The volume of a 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 -245.0 °C?

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

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

Q. If 10.0 liters of oxygen at STP are heated to 512 °C, what will be the new volume of gas if the pressure is also increased to 1520.0 mm of mercury?

Q. What is the volume at STP of 720.0 mL of a gas collected at 20.0 °C and 3.00 atm pressure?

Q. 2.00 liters of hydrogen, originally at 25.0 °C and 750.0 mm of mercury, are heated until a volume of 20.0 liters and a pressure of 3.50 atmospheres is reached. What is the new temperature?

Q. A gas balloon has a volume of 106.0 liters when the temperature is 45.0 °C and the

pressure is 740.0 mm of mercury. What will its volume be at 20.0 °C and 780 .0 mm of mercury pressure?

Q. If the absolute temperature of a given quantity of gas is doubled and the pressure tripled, what happens to the volume of the gas?

Q. 73.0 mL of nitrogen at STP is heated to 80.0 °C and the volume increase to 4.53 L. What is the new pressure?

Q. 500.0 mL of a gas was collected at 20.0 °C and 720.0 mmHg. What is its volume at STP?

Q. A sample of gas occupies 50.0 L at 15.0 °C and 640.0 mmHg pressure. What is the volume at STP?

Q. A gas is heated from 263.0 K to 298.0 K and the volume is increased from 24.0 liters to 35.0 liters by moving a large piston within a cylinder. If the original pressure was 1.00 atm, what would the final pressure be?

Q. The pressure of a gas is reduced from 1200.0 mmHg to 850.0 mmHg as the volume of its container is increased by moving a piston from 85.0 mL to 350.0 mL. What would the final temperature be if the original temperature was 90.0 °C?

Q. If a gas is heated from 298.0 K to 398.0 K and the pressure is increased from 2.230 x 103 mmHg to 4.560 x 103 mmHg what final volume would result if the volume is allowed to change from an initial volume of 60.0 liters?

**Mixed Review**

Q. The volume of a scuba tank is 10.0 L. It contains a mixture of nitrogen and oxygen at 290. atm. What volume of this mixture could the tank supply to a diver at 2.40 atm?

[ 1210 L ]

Q A helium filled balloon has a volume of 2.75 L at 20. oC. The volume of the balloon decreases to 2.46 L after it is placed outside on a cold day. What is the outside temperature in oC?

[11 oC ]

Q A 25 L sample of nitrogen is heated from 110 oC to 260 Oc What volume will the sample occupy at the higher temperature?

[35 L ]

Q. A 1.00 L balloon is filled with helium at 1.20 atm. If the balloon is squeezed into a 0.500 L beaker and doesn’t burst, what is the pressure of the helium?

[2.40 atm ]