# Ch.11-Q2W5- H.W-Behavior of gases

## **True/False**

Indicate whether the statement is true or false.

- \_\_\_\_\_ 1. According to Charles's law, the volume of a gas is inversely proportional to its pressure at constant temperature.
- 2. A weather balloon functions on the principle of Gay-Lussac's law.

### **Multiple Choice**

Identify the choice that best completes the statement or answers the question.

 3.	Four liters of gas at atmospheric pressure is compressed into a 0.85 L gas cylinder. What is the pressure of the compressed gas if its temperature remains constant?				
	a. 0.15 atm	c.	4.7 atm		
	b. 3.4 atm	d.	0.21 atm		
 4.	A 40.0-L sample of fluorine is heated from 90.0 higher temperature?	0°C	to 186.0°C. What volume will the sample occupy at the		
	a. 82.6 L	c.	19.3 L		
	b. 31.6 L	d.	50.5 L		
 5.	In a hospital, oxygen is administered to patients measuring 600.0 L, is compressed in a cylinder the given pressure?	s at ' at 1	3.0 atm in a hyperbaric oxygen chamber. Oxygen gas, 160.0 atm. What volume of oxygen can a cylinder supply at		
	a. $11 \times 10^3 L$	c.	32 L		
	b. 11 L	d.	$32 \times 10^3 \mathrm{L}$		
6.	How many moles of helium gas are contained i	n a	4.0-L flask at STP?		
	a. 89 mol	c.	0.17 mol		
	b. 0.089 mol	d.	0.045 mol		
 7.	The volume of a sample of helium is 4.50 mL a 203.0 kPa?	nt 20	0.0°C and 203.0 kPa. What will its volume be at 10.0°C and		
	a. 6.85 mL	c.	3.78 mL		
	b. 2.25 mL	d.	4.34 mL		
 8.	When a milkshake is taken in through a straw a How much liquid is consumed at 0.092 atm?	it a j	pressure of 0.071 atm, the straw contains 5.0 mL of liquid.		
	a. 0.10 mL	c.	6.3 mL		
	b. 3.9 mL	d.	7.8 mL		
 9.	When a bicycle reaches the top of a hill with a What is the maximum volume of air that can be	tire e fill	volume of 0.80 L, the atmospheric pressure is 9.0 atm. led in the tire just before it bursts?		
	a. 0.088 L	с.	1.2 L		
	b. 8.9 L	d.			
 10.	A welding torch requires 3200 L of ethylene ga is supplied by a 250.0-L tank?	is at	3.00 atm. What will be the pressure of the gas if ethylene		
	a. 38.4 atm	c.	45.4 atm		
	b. 2.34 atm	d.	0.231 atm		
 11.	A 2.50 L balloon is filled with water at 2.27 atr NOT burst, what is the pressure of water in the	n. If ball	f the balloon is squeezed into a 0.80 L beaker and does loon?		
	a. 8.8 atm	c.	0.72 atm		
	b. 7.1 atm	d.	0.88 atm		

 12.	The volume of a gas is 1.50 L at 30.0°C and 1.00 atm. What volume will the gas occupy if the temperatu				
	raised to 134.0°C at constant pressure?				
	a. 1.11 L	c.	0.331 L		
	b. 2.01 L	d.	6.70 L		
 13.	A balloon is filled with 3.50 L of water at 24.0	°C a	nd 2.27 atm. If the balloon is placed outdoors on a hot day		
	at a temperature of 34.0°C, what is the volume	of t	he balloon at constant pressure?		
	a. 2.47 L	c.	3.61 L		
	b. 8.19 L	d.	3.38 L		
 14.	A steel tank with a volume of 9.583 L contains	$N_2$	gas under a pressure of 4.972 atm at 31.8 °C. Calculate the		
	number of moles of $N_2$ in the tank.				
	a. 0.525 mol	c.	0.002 mol		
	b. 1.90 mol	d.	0.018 mol		
 15.	The volume of a 24.0-g sample of methane gas	is 2	2.8 L at 40.0°C and 4.00 atm. What will its volume be at		
	68.0°C and 4.00 atm?				
	a. 40.8 L	c.	24.8 L		
	b. 38.7 L	d.	20.9 L		

#### Completion

Complete each statement.

16. A mixture consists of three gases, A, B, and C. The partial pressure of A is 5.1 Pa, of B is 1.5 Pa, and of C is 1.2 Pa. The total pressure of the mixture is \_\_\_\_\_\_ Pa.

A. 7.8	B. 8.8	C. 9.8	D. 10.8

A. Charles's law	B. Avogadro's principle	C. pascal
D. kilopascal	E. standard	F. factor
G. atm	H. barometer	I. direct
J. inverse		

- 17. The pressure needed to support a 760 mm column of mercury is known as one \_\_\_\_\_\_.
- 18. The statement defining the relationship between the temperature and volume of a gas at constant pressure is known as \_\_\_\_\_.

19. An instrument used to measure atmospheric pressure is the \_\_\_\_\_\_.

20. The SI unit for measuring pressure is the \_\_\_\_\_

- 22. The \_\_\_\_\_\_ is equivalent to 1000 pascals .
- 23. The term \_\_\_\_\_\_temperature and pressure refers to a temperature of 0°C and a pressure of 1 atm.
- 24. The relationship between the pressure and volume of a sample of gas at constant temperature is a(n) \_\_\_\_\_ proportion.
- 25. \_\_\_\_\_\_ states that equal volumes of gases at the same pressure and temperature contain equal numbers of particles.

#### Matching

Match each item with the correct statement below.

- a. barometer
- b. Robert Boyle
- c. kilopascal
- d. 14.7 psi
- e. 101.3 kPa
- f. Jacques Charles
- g. inverse

- h. Blaise Pascal
- i. sphygmomanometer
- j. atmospheric pressure
- k. pound per square inch
- l. small whole number ratios
- m. Evangelista Torricelli

- \_\_\_\_\_ 26. Invented the barometer.
- \_\_\_\_\_ 27. The device used to measure atmospheric pressure.
- \_\_\_\_\_ 28. The unit of pressure in the old system of measurement in the United States.
- \_\_\_\_\_ 29. Normal air pressure measured in kilopascals.
- \_\_\_\_\_ 30. A commonly used multiple of the unit pascal.
- \_\_\_\_\_ 31. The device used to measure blood pressure.
- \_\_\_\_\_ 32. Normal air pressure.
- \_\_\_\_\_ 33. Less at the top of a mountain than at the bottom of the mountain.
- \_\_\_\_\_ 34. Gas volume and gas pressure have this relationship.
- \_\_\_\_\_ 35. Discovered the relationship between gas volume and temperature.

#### Problems

36.	A mixture of helium and krypton are formed at room temperature. If the total pressure of the mixture is 1.7 atm and the partial pressure of helium is 1.6 atm, what is the pressure of krypton?						
	A. 0.1 atm	B. 0.2 atm	C.	0.3 atm	D.	0.4 atm	
37.	7. A 6.32-L football is filled with air at 1.90 atm at 25.1°C. At the same temperature, the volume of the football is reduced to 3.49 L. What is the pressure of air in the ball?						
	A. 1.45 atm	B. 2.45 atm	C. 3.4	5 atm	D. 4.4	5 atm	
38.	. Carbon dioxide gas is stored in a steel container with a volume of 12.5 L under a pressure of 50.0 atm. What volume will the gas occupy when it is released from the container into a pressure of 1.00 atm?						
	The volume will be						
	A. 525 L.	B. 625 L.	C. 725	L.	D. 825	L.	

39. The volume of a 28.70-g sample of carbon dioxide gas is 26.42 L at 73.0°C and 12.00 atm. What will its volume be at 92.0°C and 12.00 atm?

A. 21.9 L B. 23.9 L C. 25.9 L D. 27.9 L

40. Hydrogen chloride and argon form a mixture at room temperature. The partial pressure of hydrogen chloride is 1.2 atm and that of argon is 2.7 atm. What is the total pressure of the mixture of the two gases?

A. 2.9 atm B. 3.9 atm C. 4.9 atm D. 5.9 atm

- 41. The reading on a barometer is 764 mm Hg. If the barometer contained water instead of mercury, would you expect the reading to be more than, less than, or equal to 764 mm? Explain. Consider the densities of mercury and water.
  - A. Because the density of water is much less than the density of mercury, the atmosphere will support a column of water much lower than 764 mm
  - B. Because the density of water is much less than the density of mercury, the atmosphere will support a column of water much higher than 764 mm
  - C. Because the density of water is much more than the density of mercury, the atmosphere will support a column of water much higher than 764 mm
  - D. Because the density of water is much more than the density of mercury, the atmosphere will support a column of water much lwoer than 764 mm
- 42. How many grams of gas are present in a sample that has a molar mass of 75.0 g/mol and occupies a 3.00-L container at 100.0 kPa and 35.0°C?

A. 5.79 g B. 6.79 g C. 7.79 g D. 8.79 g

43. Calculate the temperature of 2.0 moles of a gas occupying a volume of 5.0 L at 2.46 atm.

A. 45 K, –198°C	B. 55 K, −198°C
C. 65 K, –198°C	D. 75 K, –198°C

44. A pair of chemistry students worked together in the laboratory to collect data on the volumes, pressures, and temperatures of several samples of gases. One student worked on Tuesday and the other on Wednesday. Each student neglected to collect certain data from time to time. From the data reported in the table, calculate the missing information indicated by the numbers (1) through (5).

	Tuesday Data			Wednesday Data			
Trial	Volume	Pressure	Temp.	Volume	Pressure	Temp.	
101	125 mL	1.00 atm	25°C	1	1.00 atm	0.0°C	
102	25.0 mL	650 mm Hg	22.5°C	30.0 mL	2	22.5℃	
103	39.0 mL	1.025 atm	0.0°C	35.0 mL	1.025 atm	3	
104	250.0 mL	750 mm Hg	32°C	4	780 mm Hg	47°C	
105	5	25 mm Hg	-45°C	0.079 L	760 mm Hg	0.0°C	

- A. 106 mL, 532 mm Hg, -28°C, 252 mL, 2.0 L
- B. 116 mL, 542 mm Hg, -28°C, 252 mL, 2.0 L
- C. 126 mL, 552 mm Hg, -28°C, 252 mL, 2.0 L
- D. 136 mL, 562 mm Hg, -28°C, 252 mL, 2.0 L

- 45. A gas is confined in a cylinder fitted with a movable piston. At 20.5°C, the gas occupies a volume of 7.90 L under a pressure of 3.36 atm. The gas is isothermally compressed until its pressure reaches 6.24 atm. What volume does the compressed gas occupy?
  - A. 2.25 L B. 3.25 L C. 4.25 L D. 5.25 L
- 46. At 20°C, a sample of nitrogen gas occupies 25.0 L. What volume will the nitrogen occupy at 225°C?
  - A. 42.5 L B. 52.5 L C. 62.5 L D. 72.5 L
- 47. Calculate the volume of the vessel that holds 0.30 moles of a gas at STP.
  - A. 4.7 L B. 5.7 L C. 6.7 L D. 7.7 L
- 48. A refrigeration system contains 575 mL of a gas at 22°C and 1.25 atm. The gas is compressed until it has a pressure of 2.00 atm and a temperature of -6°C. What is the new volume of the gas in the system?

The new volume is 325 mL.

- A. 325 mL B. 425 mL C. 525 mL D. 625 mL
- 49. If the pressure exerted by a gas at 27.0°C in a vessel of volume 0.050 L is 4.00 atm, how many moles of the gas are present?
  - A. 10 mol B. 11 mol C. 13 mol D. 15 mol
- 50. Natural gas is often stored in large tanks kept under constant pressure by a dome that rides up and down on vertical tracks. Suppose the volume of gas in a municipal tank measures  $2.50 \times 10^6$  m<sup>3</sup> during the evening when the temperature is 15°C. What will be the volume of the gas in the tank during the day when the temperature rises to 27°C?

The volume of the gas will be A.  $1.60 \times 10^6$  m<sup>3</sup>. C.  $3.60 \times 10^6$  m<sup>3</sup>.

B.  $2.60 \times 10^{6} \text{ m}^{3}$ . D.  $4.60 \times 10^{6} \text{ m}^{3}$ .