

1 atm = 101.3 kPa = 101,325 Pa = 760 mm Hg = 760 torr = 14.7 lb/in<sup>2</sup> (psi)

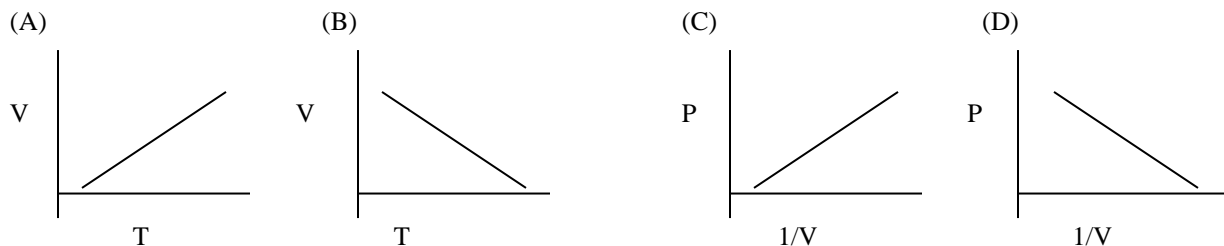
**Practice Test: Weather Units III&IV**

Name \_\_\_\_\_

Date \_\_\_\_\_ Period \_\_\_\_\_

1. A mole is equal to  
(A) 12 (B) 22.4 (C) 0.08206 (D)  $6.02 \times 10^{23}$

2. Which is the correct graph for the relationship between volume and temperature?



3. Which weighs more, 100 atoms of He or 100 moles of He?  
(A) both weigh the same (B) 100 atoms of He  
(C) 100 moles of He (D) cannot determine which weighs more
4. Which is the correct answer when you convert 298K to °C?  
(A) 0°C (B) 10° C (C) 20°C (D) 25°C
5. You have 3 L of H<sub>2</sub> gas in a balloon and 3 L of O<sub>2</sub> gas in another balloon. The balloon with H<sub>2</sub> gas floats, while the balloon with O<sub>2</sub> gas falls to the ground. Which of the following is NOT true?  
(A) Both have the same volume.  
(B) Both have the same number of moles.  
(C) The O<sub>2</sub> balloon has more molecules.  
(D) Oxygen gas is more dense than hydrogen gas.
6. How many moles are in 50 L of O<sub>2</sub> gas at STP?  
(A) 0.448 mol (B) 1120 mol (C) 2.2 mol (D) 1.56 mol
7. Metals have a \_\_\_\_\_ heat capacity. Evidence for this is that metals tend to heat up quickly, indicating that they require a \_\_\_\_\_ amount of heat increase to increase its temperature.  
(A) high, small (B) low, large (C) high, large (D) low, small
8. The weather news gives the atmospheric pressure as 1.07 atm. What is this atmospheric pressure in torr?  
(A) 760 torr (B) 4.81 torr (C) 813 torr (D) 515 torr
9. 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?  
(A) 3.34 L (B) 334 L (C) 0.520 L (D) 520 L
10. When you go up in altitude,  
(A) pressure increases.  
(B) temperature decreases.  
(C) there are more molecules of oxygen.  
(D) you breathe more slowly.
11. Assuming that the pressure of gas stays constant, what happens to temperature when the volume decreases?  
(A) It decreases. (B) It increases.  
(C) It remains constant. (D) It is always 0.08205 L\*atm/K\*mol.
12. Which gas law would you use to solve the following problem? At 28°C, the volume of a beach ball is 2.3 L. Assuming that the pressure is constant, at what temperature will the volume of the balloon be 1.7 L?  
(A)  $P_1V_1 = P_2V_2$  (B)  $P_1V_1/T_1 = P_2V_2/T_2$   
(C)  $V_1/T_1 = V_2/T_2$  (D)  $PV = nRT$
13. A mixture of three gases has a pressure of 5 atm. If one of the gases has a partial pressure of 2 atm, and the other has a partial pressure of 1 atm, what must the partial pressure of the third gas be?  
(A) 8 atm (B) 2 atm (C) 3 atm (D) 1 atm
14. The force caused by molecules of a gas striking the walls of a container is called  
(A) volume (B) temperature (C) heat (D) pressure
15. Assuming that the temperature of a gas stays constant, what happens to pressure when the volume decreases?  
(A) It decreases. (B) It increases.  
(C) It remains constant. (D) It is always 0.08205 L\*atm/K\*mol.
16. Absolute zero is defined as the temperate at which all motion ceases and volume is decreased to zero.  
(A) True (B) False

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17. The Standard Temperature and Pressure (STP) are:

- (A) 0 K and 1 atm      (B) 0 K and 760 mm Hg      (C) 273 K and 760 mm Hg      (D) 0 °C and 670 mm Hg

18. When dry ice sublimates, the process is \_\_\_\_\_ because energy is \_\_\_\_\_ in the process.

- (A) endothermic, absorbed      (B) exothermic, released      (C) endothermic, released      (D) exothermic, absorbed

### Calculations

For the following problems, you must show your work (do the algebra, include units, cancel units) and report your answer with the correct unit or you will get NO CREDIT!!

19. At 300 K, the pressure inside a rigid can is 2.2 atm. If the temperature increases to 315K, what is the pressure inside the can?

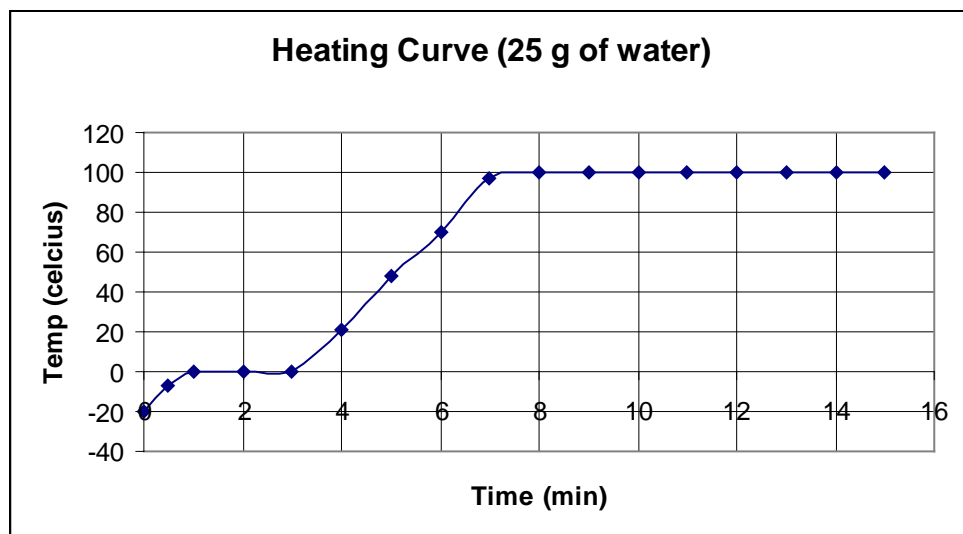
20. A 5.0 L balloon at 1.1 atm and 310 K floats up into the sky. What is the volume of the balloon when the pressure is 0.95 atm and temperature is 290 K?

21. How many millimeters are in 0.5 mile?

22. A 25 g sample of solid water is heated. Use the heating curve to answer the following questions.

Useful information:

$$c_{\text{ice}} = 0.5 \text{ cal/g}^{\circ}\text{C} \quad c_{\text{water}} = 1 \text{ cal/g}^{\circ}\text{C} \quad L_f = 80 \text{ cal/g} \quad L_v = 540 \text{ cal/g}$$



(a) Label each of the four regions with the appropriate phase(s)

(b) Label where melting and boiling take place.

(c) What is the freezing point of this substance?

(d) What is the boiling point of this substance?

(e) Calculate the amount of heat (in calories) absorbed in region 1.

(f) Calculate the amount of heat (in calories) absorbed in region 2.

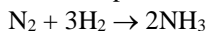
(g) Calculate the amount of heat (in calories) absorbed in region 3.

(h) Calculate the amount of heat (in calories) absorbed in region 4.

(i) Calculate the total amount of heat (in calories) absorbed in this process.

(j) Convert to joules (1 calorie = 4.184 J)

23. What volume of NH<sub>3</sub> is produced when 28 g of nitrogen is reacted with excess hydrogen at STP?



24. How many molecules are in 46 liters of O<sub>2</sub> at STP?

25. Calculate the percent composition of NH<sub>3</sub>.

26.

Equilibrium Reaction	Change/Stress	Direction of shift to restore equilibrium
$\text{CoCl}_2(\text{g}) \leftrightarrow \text{CO}(\text{g}) + \text{Cl}_2(\text{g})$	Decrease V	
$\text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g}) \leftrightarrow \text{PCl}_5(\text{g})$	Add Cl <sub>2</sub>	
$2\text{NO}_2(\text{g}) \leftrightarrow \text{N}_2\text{O}_4(\text{g})$ (exothermic reaction)	Raise T	

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Answers:

1.D 2.A 3.C 4.D 5.C 6.C 7.D 8.C 9.C 10.B 11.A 12.C 13.B 14.D 15.B 16.A 17.C 18.A

19. 2.3 atm 20. 5.4 L 21. 804,672 mm 22a. region 1: solid, region 2: solid/liquid, region 3: liquid, region 4: liquid/gas

22b. region 2 is melting; region 4 is boiling 22c. 0°C 22d. 100°C 22e. 250 cal 22f. 2000 cal 22g. 2500 cal

22h. 13,500 cal 22i. 18,250 cal 22j. 76,358 J 23. 44.8 L 24.  $1.24 \times 10^{24}$  molecules 25. 82% N and 18% H

26.

Equilibrium Reaction	Change/Stress	Direction of shift to restore equilibrium
$\text{CoCl}_2(\text{g}) \leftrightarrow \text{CO}(\text{g}) + \text{Cl}_2(\text{g})$	Decrease V	<b>Right</b>
$\text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g}) \leftrightarrow \text{PCl}_5(\text{g})$	Add $\text{Cl}_2$	<b>Right</b>
$2\text{NO}_2(\text{g}) \leftrightarrow \text{N}_2\text{O}_4(\text{g})$ (exothermic reaction)	Raise T	<b>Left</b>

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