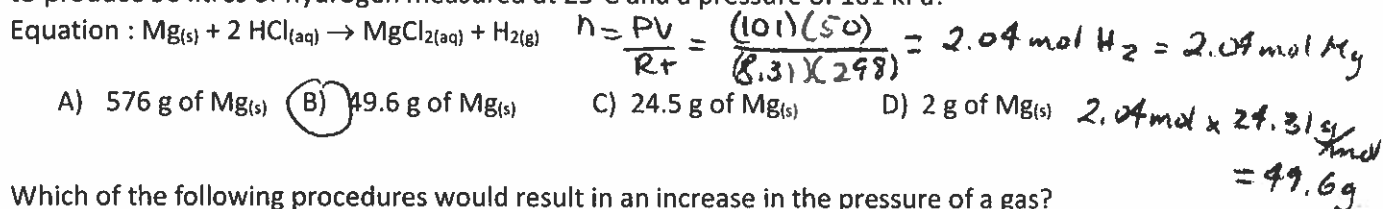


1. Which of the following gases has the greatest rate of diffusion? **(A)** H₂ B) CH₄ C) O₂ D) He
2. Hydrogen can be prepared by the action of hydrochloric acid on magnesium. What mass of magnesium is required to produce 50 litres of hydrogen measured at 25°C and a pressure of 101 kPa?



3. Which of the following procedures would result in an increase in the pressure of a gas?
- Reduce the number of moles without changing the volume or the temperature.
 - Use the same number of moles of a more dense gas without changing the volume or the temperature.
 - Increase the volume of the gas without changing the number of moles or the temperature of the gas.
 - (D)** Increase the temperature of the gas without changing the number of moles or the volume of the gas.
4. You are given two unknown liquids. You mix 100 mL of liquid A at 80°C with 100 mL of liquid B at 20°C. The resulting mixture has a final temperature of 60°C. **What can you conclude from these results?**
- The specific heat capacity of liquid A is **less than** the specific heat capacity of liquid B.
 - The specific heat capacity of liquid A is **equal** to the specific heat capacity of liquid B.
 - (C)** The specific heat capacity of liquid A is **more than** the specific heat capacity of liquid B.
 - Liquid A and liquid B are **identical** in both nature and concentration.

5. A syringe contains 500mL of a gas at a pressure of 105kPa and at a temperature of 38°C. After the gas was heated, the pressure reached 220kPa for a volume of 275mL. What was the change in temperature in degrees Celsius?
- A) 43.8°C B) 79.6°C **(C)** 85.4°C D) 358°C
- $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$ $\frac{(105)(500)}{311} = \frac{(220)(275)}{x}$
- $x = 358 - 273 = 85^\circ\text{C}$
6. A block of solid carbon dioxide (dry ice) is heated from -90°C to -70°C. What **new** molecular motion is produced? (Carbon dioxide sublimates at -78.5°C at standard atmospheric pressure.)
- Translational motion
 - (B)** Translation and rotation motion
 - Translation, rotation and vibration motion
 - No new motion

7. Which of the following statements would be considered to be part of the **Kinetic Molecular Theory of Gases**?
- Gases consist of extremely small particles.
 - The distances between gas molecules are very large compared to the size of the molecules themselves.
 - All gas molecules move at the same speed, depending on the temperature.
 - Gas molecules are in constant motion; they move in straight lines in all directions.
 - Gas molecules collide among themselves and with the walls of their container.

A) 1, 2 and 3 **(B)** 1, 2, 4 and 5 C) 2, 4 and 5 D) 1, 2, 3, 4 and 5

8. The height on an open ended manometer is 50 mmHg higher on the side closest to the atmosphere. What is the pressure of the gas if the atmospheric pressure is 750 mmHg?

A) 700 mm Hg B) 750 mmHg **(C)** 800 mmHg D) 50 mmHg

9. Which of the following phenomena are considered to be *exothermic*?
1. Alcohol evaporates very rapidly from a warm surface.
 2. Gasoline burns in internal combustion engines.
 3. When sodium hydroxide is dissolved in water, the temperature of the water rises.
 4. In winter, ice crystals often form on of window panes (inside the home).
 5. Magnesium metal, after ignition, gives off an intense white light.
 6. When ammonium chloride is dissolved in water, the temperature of the water drops.
- A) 1, 2, 5 and 6 B) 1, 3, 4 and 5 **C) 2, 3, 4 and 5** D) 2, 3, 4 and 6

10. A 4.00×10^2 g piece of iron at 22.0°C is heated in a bomb calorimeter until the temperature is 250.0°C . If the iron absorbs 41.04 kJ of heat, what is the specific heat capacity of the iron? $Q = mc\Delta T$
- $$41040 = 400(c)(250 - 22)$$
- A) 4.5×10^{-4} J/(g \cdot $^\circ\text{C}$) B) 4.5×10^{-1} J/(g \cdot $^\circ\text{C}$) **C) 4.5 J/(g \cdot $^\circ\text{C}$)** D) 4.5×10^1 J/(g \cdot $^\circ\text{C}$)

11. The following two equations show the molar heats of formation of liquid carbon tetrachloride, $\text{CCl}_4(\text{l})$, and gaseous carbon tetrachloride, $\text{CCl}_4(\text{g})$.
- $$\begin{array}{l} \text{C}(\text{s}) + 2 \text{Cl}_2(\text{g}) \rightarrow \text{CCl}_4(\text{l}) \quad \Delta H = -139.5 \text{ kJ/mol} \\ \text{C}(\text{s}) + 2 \text{Cl}_2(\text{g}) \rightarrow \text{CCl}_4(\text{g}) \quad \Delta H = -103.2 \text{ kJ/mol} \end{array}$$
- liquid \rightarrow gas
flip $\rightarrow +139.5$
 $\rightarrow -103.2$

36.3

Using these heats of formation, the molar heat of vaporization of carbon tetrachloride can be determined. Which of the following is the correct molar heat of vaporization of CCl_4 ?

- A) -242.7 kJ/mol B) -36.3 kJ/mol C) 242.7 kJ/mol **D) 36.3 kJ/mol**

12. Helium and an unknown gas (X) effuse through a hole pierced in the side of a container. What is the molar mass of the unknown gas with an effusion rate of 0.077 m/s and that of helium's is 0.256 m/s? What is this gas?

A) CO_2 B) O_2 C) Ne D) F_2

$$\frac{V_1}{V_2} = \frac{\sqrt{M_2}}{\sqrt{M_1}} \quad \frac{0.077}{0.256} = \frac{\sqrt{4}}{\sqrt{M_1}} \quad M_1 = 44 \rightarrow \text{CO}_2$$

13. Determine the enthalpy of the reaction using the information given in the table.



- A) 424 kJ/mol
B) 577 kJ/mol
C) 1298 kJ/mol
D) -1298 kJ/mol

Table of Average Bond Enthalpies	
Bond	Average Enthalpy (kJ/mol)
H-N	389
O=O	498
H-O	464
N=N	946

$$[4(3 \cdot 389) + (3 \cdot 498)] - [(2 \cdot 946) + 6(2 \cdot 464)]$$

$$6162 - 7460$$

$$\Delta H = -1298$$

Question	Ans
1	A
2	B
3	D
4	C
5	C
6	B
7	B
8	C
9	C
10	B
11	D
12	A
13	D