Name: _____

(handwritten, right margin)
$373K \ H_2O(l) \rightleftharpoons H_2O(g)$
$273K \ H_2O \rightleftharpoons$ (s)
H_2O (l)

---

1 The chart below lists water temperatures and types of molecular motion.

Water temperature		Molecular Motion	
1.	500 K *gas*	a.	rotation
2.	358 K *liquid*	b.	vibration
3.	225 K *solid*	c.	translation

Which combination below correctly matches each water temperature with the predominant type of molecular motion that characterizes water at that temperature?

A) 1a, 2c and 3b   C) 1c, 2b and 3a

B) 1b, 2a and 3c   (D) 1c, 2a and 3b

(handwritten, right)
$G = R + V + \underline{\underline{T}}$
$L = \underline{\underline{R}} + \underline{V} + T$
$S = \underline{\underline{V}}$

---

2 Peter has a purple balloon. On the ground, the balloon has a volume of exactly 2.0 L when it is filled to a pressure P_1. The air temperature is 23°C. Peter lets go of the balloon and it rises up into the air. Eventually it reaches an altitude where its volume has increased to 2.4 L, the air temperature is only 3.0°C, and the pressure in the balloon is P_2.

Which of the following shows the correct relationship between pressures P_2 and P_1?

A) $P_2 = 1.3 \ P_1$ (C) $P_2 = 0.78 \ P_1$

B) $P_2 = 1.1 \ P_1$ D) $P_2 = 0.11 \ P_1$

3 A used propane cylinder, containing only air, is accidentally thrown onto a camp bonfire. The initial conditions inside the cylinder are 25°C and 101.3 kPa. The cylinder can withstand an internal pressure of 341 kPa.

cylinder   camp fire
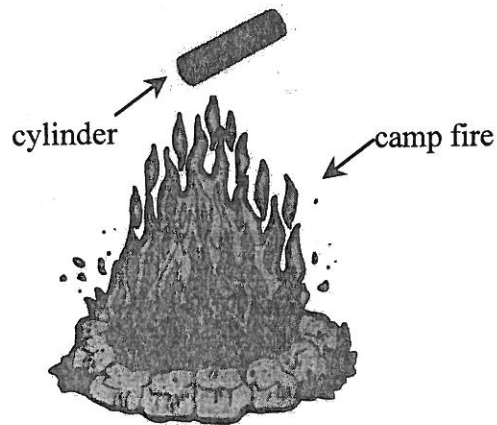
Above what temperature will an explosion occur?

Answer: _____ $T = 1003\ K$ _____

4 There are n molecules in 250 cm³ of hydrogen gas (H_2), at a certain temperature and pressure.

How many molecules are in 1.0 L of oxygen gas (O_2) under the same conditions of temperature and pressure?

A) n

B) $2n$

C) $4n$

D) $8n$

5 Which group correctly pairs three of the gases with their uses or hazards?

A) Nitrogen gas - explosion

   Chlorofluorocarbons - refrigeration

   Carbon Dioxide - plant respiration

B) Chlorofluorocarbons - ozone depletion

   Hydrogen gas - fuel

   Carbon Dioxide - global warming

C) Sulphur Dioxide - acid rain

   Carbon monoxide - poisoning

   Methane Gas - refrigeration

D) Neon Gas - lights

   Propane gas - fuel

   Nitrogen gas - global warming

P_1

V_1

$T_1 + 273$
$= 307$

6 On a hot summer day a weather balloon was filled with 5.0 L of air. The temperature was 34°C and the pressure was 90.0 kPa. The following day, the balloon had shrunk to 4.0 L. A barometer read 110 kPa, but there was no thermometer available.

P_2

What was the temperature on the second day?

V_2

A) 27°C

C) 35°C

B) 31°C

D) 41°C

$$\frac{P_1}{P_1} \cdot \frac{T_2}{T_1} \cdot \frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \cdot \frac{T_2 \cdot T_1}{P_1 V_1}$$
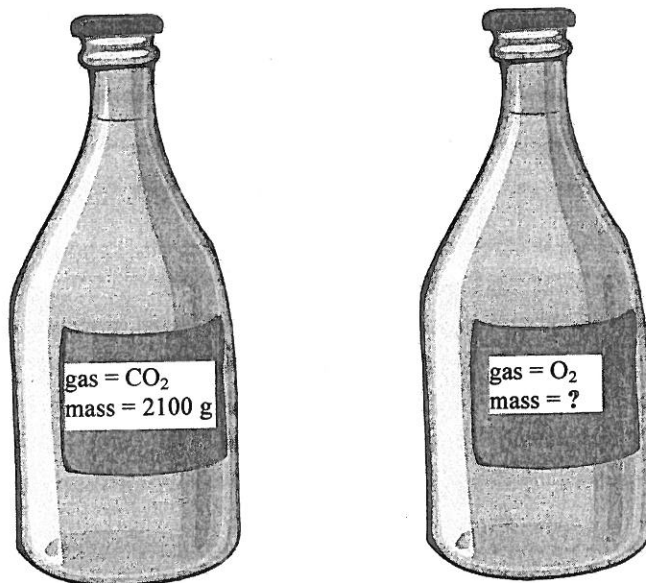
$$T_2 = \frac{P_2 V_2 \cdot T_1}{P_1 V_1}$$

$$= \frac{(110 kPa)(4.0L)(307K)}{(90.0 kPa)(5.0L)}$$

$$= 300K - 273$$

$$= 27°C$$

7 Two identical tanks contain different gases at the same temperature and pressure. One tank contains $CO_{2(g)}$, the other contains $O_{2(g)}$. The tank containing $CO_{2(g)}$ has a label indicating the mass of its contents.

gas = CO_2
mass = 2100 g

gas = O_2
mass = ?

What is the mass of $O_{2(g)}$ indicated on the other label?

Answer: _____1536g O_2_____
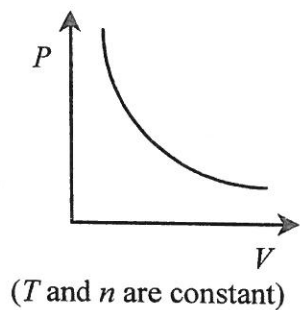
8 │ A 300.0 mL container holds 5.00 g of oxygen gas at a temperature of -25.0°C.

What pressure is exerted by the oxygen gas?

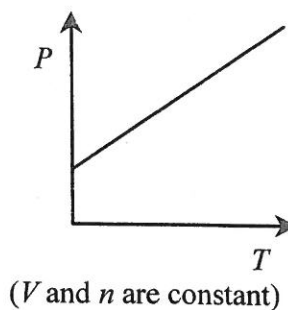1.07 kPa   3of.

Answer: _____

Which of the following graphs does NOT represent a gas relationship?

A)

P

V

(*T* and *n* are constant)

C)

P

T

(*V* and *n* are constant)

B)

V

n

(*P* and *T* are constant)

D)

V

T

(*P* and *n* are constant)
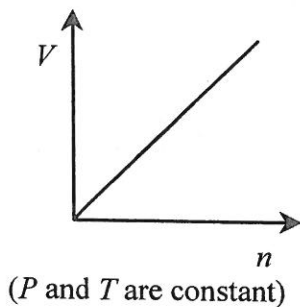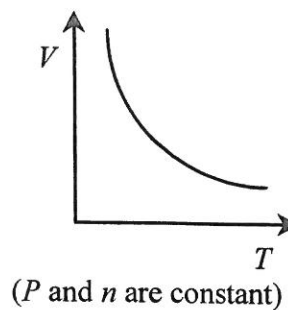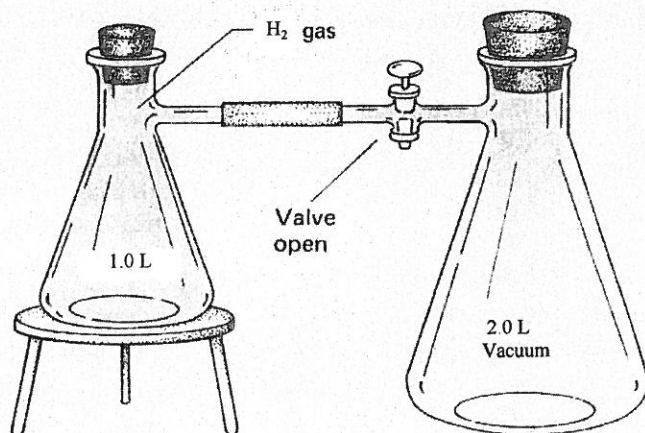
10 The diagram below represents two closed containers of different volumes connected by a tube with a valve. The 1.0 L bulb on the left contains hydrogen gas, H_2, at a pressure of 75 kPa. The 2.0 L bulb on the right is a vacuum.

If the valve is opened, what will be the total pressure of hydrogen throughout the system?

Answer: _____ $P_2 = 25.0\ kPa$ _____

11 Which of the following statements would be considered to be part of the **Kinetic Molecular Theory of Gases**?

1. Gases consist of extremely small particles.

2. The distances between gas molecules are very large compared to the size of the molecules themselves.

3. All gas molecules move at the same speed, depending on the temperature.

4. Gas molecules are in constant motion; they move in straight lines in all directions.

5. Gas molecules collide among themselves and with the walls of their container.

A)   1, 2 and 3   C)   1, 2, 4 and 5

B)   2, 4 and 5   D)   1, 2, 3, 4 and 5