

Name _____

Enter your answers on the answer sheet.

$R = 0.08206 \text{ L atm K}^{-1} \text{ mol}^{-1}$

$760 \text{ torr} \equiv 1 \text{ atm}$

$V_{\text{STP}} = 22.4 \text{ L mol}^{-1}$

$T/\text{K} = t/^{\circ}\text{C} + 273.15$

STP: $P \equiv 1 \text{ atm}$, $T = 273.15 \text{ K}$

$$\left(P + \frac{an^2}{V^2}\right)(V - bn) = nRT$$

$$\left(\frac{v_1}{v_2}\right) = \sqrt{\frac{m_2}{m_1}}$$

temperature	pressure	temperature	pressure	temperature	pressure	temperature	pressure
0 °C	4.6 torr	16 °C	13.6 torr	31 °C	33.7 torr	46 °C	75.7 torr
1 °C	4.9 torr	17 °C	14.5 torr	32 °C	35.7 torr	47 °C	79.6 torr
2 °C	5.3 torr	18 °C	15.5 torr	33 °C	37.7 torr	48 °C	83.7 torr
3 °C	5.7 torr	19 °C	16.5 torr	34 °C	39.9 torr	49 °C	88.0 torr
4 °C	6.1 torr	20 °C	17.6 torr	35 °C	42.2 torr	50 °C	92.5 torr
5 °C	6.5 torr	21 °C	18.7 torr	36 °C	44.6 torr	51 °C	97.2 torr
6 °C	7.0 torr	22 °C	19.8 torr	37 °C	47.1 torr	52 °C	102.1 torr
7 °C	7.5 torr	23 °C	21.1 torr	38 °C	49.7 torr	53 °C	107.2 torr
8 °C	8.0 torr	24 °C	22.4 torr	39 °C	52.4 torr	54 °C	112.5 torr
9 °C	8.6 torr	25 °C	23.8 torr	40 °C	55.3 torr	55 °C	118.0 torr
10 °C	9.2 torr	26 °C	26.2 torr	41 °C	58.3 torr	56 °C	123.8 torr
11 °C	9.8 torr	27 °C	26.7 torr	42 °C	61.5 torr	57 °C	129.8 torr
12 °C	10.5 torr	28 °C	28.3 torr	43 °C	64.8 torr	58 °C	136.0 torr
13 °C	11.2 torr	29 °C	30.0 torr	44 °C	68.3 torr	59 °C	142.6 torr
14 °C	12.0 torr	30 °C	31.8 torr	45 °C	71.9 torr	60 °C	149.4 torr
15 °C	12.8 torr						

- 1) What is the solute concentration of a solution created by mixing 33.3 mL of a 3.09 M solution of HCl with enough water to make 219 mL total. Give your answer to 3 significant figures.
- 2) In the following reaction: $2\text{HCl} + \text{Ba}(\text{OH})_2 \rightarrow \text{BaCl}_2 + 2\text{H}_2\text{O}$, $\text{Ba}(\text{OH})_2$ is used to neutralize 16.27 mL of HCl. The concentration of the HCl is 1.167 M and 92.17 mL of $\text{Ba}(\text{OH})_2$ is required. What is the concentration of the $\text{Ba}(\text{OH})_2$ solution? Give your answer to 3 significant figures.
- 3) What is the pressure of 3.00 mole of an ideal gas at 782.0 °C confined to a volume of 82.9 L? Give your answer to 3 significant figures.
- 4) How much volume does 58.3 g of N_2 require at STP? Give your answer to 3 significant figures.
- 5) Hydrogen is contained in a flexible container. The volume and pressure were initially 55.1 L and 7.85 atm. The volume is changed to 25.9 L with the temperature held constant. What is the final pressure? Give your answer to 3 significant figures.
- 6) Helium is initially at 66.7 K and 210 torr in a rigid leak-tight container. The temperature is increased to 139.8 K. What is the resultant pressure?
- 7) Oxygen at 6.26 atm and 305.1 K has an initial volume of 80.0 L is allowed to expand into a volume of 109.6 L at a temperature of 554.3 K. What is the final pressure?
- 8) What is the ratio of the velocities of SCl_6 to SBr_6 ?
The sulfur isotope is 32.0 The bromine isotope is 79.0 The chlorine isotope is 35.0

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- 9) In the following reaction, performed in a flexible container, enough N_2 is supplied as the reaction proceeds.
- $$3\text{H}_2 + \text{N}_2 \rightarrow 2\text{NH}_3$$
- 62.2 L of H_2 is reacted with an excess of N_2 . The pressure of H_2 was 6.81 atm. Before the reaction, the temperature was 286.9 K. After the reaction, the temperature was 720.2 K and the pressure of the NH_3 was 10.35 atm. What is the final volume of the NH_3 ? Give your answer to 3 significant figures.
- 10) The following are the pressures for some gasses contained in the same chamber:
- N_2 : 4.8 atm. Ar: 5.7 atm. H_2 : 4.1 atm. He: 4.5 atm.
- What is the total pressure? Give your answer to the nearest 0.1 atm.
- 11) Hydrogen is collected over water at 21.0 °C. The atmospheric pressure is 769.3 torr. What is the pressure of the dry hydrogen? Give your answer to the nearest 0.1 torr.
- 12) The mass of liquid left after a Dumas method was 1.591 g. The following is the relevant information:
Water bath temperature = 100.0°C. Atmospheric pressure = 778.3 torr volume of the flask = 564.2 mL
What is the molar mass of the liquid?
- 13) Using the Van der Waal equation, calculate the pressure of 3.41 mole of ethanol contained in a volume of 1.52 L at 512 K. $a = 12.02 \text{ atm L}^2 \text{ mol}^{-2}$ $b = 0.0841 \text{ L mol}^{-1}$ Give your answer to 3 significant figures.
- 14) How many liters does 33.5 mole of O_2 occupy at STP?
- 15) In the following reaction starting and ending at STP, how many liters of SO_2 are produced 87.40 L of SO and 43.70 L of O_2 are reacted? $2\text{SO} + \text{O}_2 \rightarrow 2\text{SO}_2$
- 16) Which of the following phases retains its volume but conforms to the shape of the container
A A solution **B** A mixture **C** A solid **D** A liquid **E** A gas
- 17) 3.40 mole of nitrogen gas is contained in a metal cylinder at 10.7 atm pressure. An additional 3.48 mole of nitrogen is pumped into this cylinder at the same temperature. What is the resultant pressure inside the cylinder? Give your answer to the nearest 0.1 atm.
- 18) A gas takes up 125 L at STP. The mass of this gas is 396 g. What is its molar mass?
- 19) A mole of an ideal gas is contained in a volume at 842.7 °C and 30.1 atm of pressure. If the pressure is lowered to 1.00 atm and the temperature to 0.0 °C, what volume would this gas occupy?
- 20) 3.36 mole of nitrogen gas is contained in a metal cylinder at STP. What is the cylinder's temperature in kelvins?

CHEM 1110 test 2 for fall 2007

Name _____

- | | number: | unit(s), if appropriate!!! |
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| 15) | _____ | _____ |
| 16) | A B C | D E |
| 17) | _____ | _____ |
| 18) | _____ | _____ |
| 19) | _____ | _____ |
| 20) | _____ | _____ |

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KEY

- 1) **0.4698 M** (but only 3 sig figs.) or mol L⁻¹
- 2) **0.103 M** or mol L⁻¹
- 3) **3.133 atm** (but only 3 sig figs.)
- 4) **46.64 L** (but only 3 sig figs.)
- 5) **16.70 atm** (but only 3 sig figs.)
- 6) **440 torr**
- 7) **8.30 atm**
- 8) **1.45** unitless since its a ratio
- 9) **68.5 L** (but only 3 sig figs.)
- 10) **19.1 atm**
- 11) **750.6 torr** (or 0.9876 atm)
- 12) **84.3 g mol⁻¹**
- 13) **55.7 atm**
- 14) **750 L**
- 15) **87.40 atm**
- 16) **D**
- 17) **21.7 atm**
- 18) **71 g mol⁻¹**
- 19) **22.4 L**
- 20) **273.15 K**