Exam
Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) A sample of gas (24.2 g) initially at 4.00 atm was compressed from 8.00 L to 2.00 L at constant temperature. After the compression, the gas pressure was _____ atm. 1) _____
A) 2.00 B) 4.00 C) 8.00 D) 16.0 E) 1.00

2) A gas originally at 27 °C and 1.00 atm pressure in a 3.9 L flask is cooled at constant pressure until the temperature is 11 °C. The new volume of the gas is _____ L. 2) _____
A) 3.9 B) 3.7 C) 4.1 D) 0.27 E) 0.24

3) The density of chlorine (Cl_2) gas at 25 °C and 60. kPa is _____ g/L. 3) _____
A) 20 B) 4.9 C) 0.86 D) 0.58 E) 1.7

4) The Mond process produces pure nickel metal via the thermal decomposition of nickel tetracarbonyl: 4) _____

$$Ni(CO)_4\ (l) \rightarrow Ni\ (s) + 4CO\ (g).$$

What volume (L) of CO is formed from the complete decomposition of 444 g of $Ni(CO)_4$ at 752 torr and 22.0 °C?
A) 63.7 B) 0.356 C) 20.2 D) 255 E) 11.0

5) What volume (L) of NH_3 gas at STP is produced by the complete reaction of 7.5 g of H_2O according to the following reaction? 5) _____

$$Mg_3N_2\ (s) + 6H_2O\ (l) \rightarrow 3Mg(OH)_2\ (aq) + 2NH_3\ (g)$$

A) 0.32 B) 3.1 C) 19 D) 9.3 E) 28

6) The pressure in a 12.2 L vessel that contains 2.34 g of carbon dioxide, 1.73 g of sulfur dioxide, and 3.33 g of argon, all at 42 °C is _____ mmHg. 6) _____
A) 134 B) 395 C) 116 D) 0.347 E) 263

7) Sodium hydride reacts with excess water to produce aqueous sodium hydroxide and hydrogen gas: 7) _____

$$NaH\ (s) + H_2O\ (l) \rightarrow NaOH\ (aq) + H_2\ (g)$$

A sample of NaH weighing _____ g will produce 982 mL of gas at 28.0 °C and 765 torr, when the hydrogen is collected over water. The vapor pressure of water at this temperature is 28 torr.
A) 2.93 B) 925 C) 0.960 D) 0.0388 E) 0.925

8) Of the following, _____ is a correct statement of Boyle's law. 8) _____
A) $\frac{V}{P}$ = constant
B) $\frac{V}{T}$ = constant
C) $\frac{n}{P}$ = constant
D)

$\frac{P}{V}$ = constant

E) PV = constant

9) Of the following, _____ is a valid statement of Charles' law. 9) _____

A) $\frac{V}{T}$ = constant

B) V = constant × P

C) V = constant × n

D) $\frac{P}{T}$ = constant

E) PV = constant

10) Which one of the following is a valid statement of Avogadro's law? 10) _____

A) V = constant × n

B) PV = constant

C) $\frac{V}{T}$ = constant

D) $\frac{P}{T}$ = constant

E) V = constant × P

11) Standard temperature and pressure (STP), in the context of gases, refers to _____. 11) _____

A) 273 K and 1 pascal

B) 298 K and 1 atm

C) 273 K and 1 atm

D) 298 K and 1 torr

E) 273 K and 1 torr

12) The average kinetic energy of the particles of a gas is directly proportional to _____. 12) _____

A) the square root of the rms speed

B) the rms speed

C) the square of the rms speed

D) the particle mass

E) the square of the particle mass

13) Which of the following is not part of the kinetic–molecular theory? 13) _____

A) Attractive and repulsive forces between gas molecules are negligible.

B) Atoms are neither created nor destroyed by ordinary chemical reactions.

C) Collisions between gas molecules do not result in the loss of energy.

D) Gases consist of molecules in continuous, random motion.

E) The volume occupied by all of the gas molecules in a container is negligible compared to the volume of the container.

14) Of the following gases, _____ will have the greatest rate of effusion at a given temperature. 14) _____

A) CH_4 B) HBr C) NH_3 D) HCl E) Ar

15) The van der Waals equation for real gases recognizes that _____. 15) _____

A) the non–zero volumes of gas particles effectively decrease the amount of "empty space" between them

B) the molecular attractions between particles of gas decreases the pressure exerted by the gas
C) molar volumes of gases of different types are different
D) gas particles have non–zero volumes and interact with each other
E) all of the above statements are true

Free response-

If 25 grams of potassium carbonate is reacted with 100 ml of .500 M hydrobromic acid in a 2.40 L vessel at a temperature of 20.00* Celsius and a pressure of 752 torr-

- How many liters of CO_2 will be created? Assume the vapor pressure for water at 20* Celsius is 22.34 torr.

- If the pressure was increased after the reaction had come to completion what would happen to the amount of water in the vessel?

- Give the net ionic equation for the reaction-

Cover both of the free response questions in the brown book.

1) D

2) B

3) E

4) D

5) B

6) E

7) E

8) E

9) A

10) A

11) C

12) C

13) B

14) A

15) E