Homework 02 - Ideal Gases

Question 1
1 pts

A gas is enclosed in a 10.0 L tank at 1200 mmHg pressure. Which of the following is a reasonable value for the pressure when the gas is pumped into a 5.00 L vessel?

○ 24 mmHg
○ 600 mmHg
○ 0.042 mmHg
○ 2400 mmHg

Question 2
1 pts

A sample of gas in a closed container at a temperature of 76°C and a pressure of 5.0 atm is heated to 399°C. What pressure does the gas exert at the higher temperature?

○ 26 atm
○ 2.6 atm
○ 9.6 atm
○ 0.95 atm

Question 3
1 pts

A flask containing 163 cm^3 of hydrogen was collected under a pressure of 26.7 kPa. What pressure would have been required for the volume of the gas to have been 68 cm^3, assuming the temperature is held constant?

○ 64.0 kPa
○ 11.1 kPa
○ 78.2 kPa
○ 32.0 kPa

Question 4
1 pts

A sample of nitrogen gas is contained in a piston with a freely moving cylinder. At 0°C, the volume of the gas is 371 mL. To what temperature must the gas be heated to occupy a volume of 557 mL?

○ 137°C
○ 484°C
○ 212°C
○ -91.2°C

Question 5
1 pts

A 5.00 L sample of a gas exerts a pressure of 1040 torr at 50.0°C. In what volume would the same sample exert a pressure of 1.00 atm at 50.0°C?

○ 6.84 L
○ 0.581 L
○ 3.33 L
○ 10.5 L

Question 6
2 pts

What mass of O_2 is required to produce 14.5 g of CO_2 if the reaction has a 65.0% yield?

$CH_4(g) + 2O_2(g) \longrightarrow CO_2(g) + 2H_2O(g)$

○ 13.7 g
○ 21.1 g
○ 32.4 g
○ 16.2 g

Question 7
2 pts

Consider the following reaction:

$2Al + 6HCl \longrightarrow 2AlCl_3 + 3H_2$

This reaction has a yield of 82.5%. How many moles of HCl are needed to produce 14.0 L of H_2 at 351 K and 1.11 atm?

○ 0.540 mol
○ 0.890 mol
○ 1.08 mol
○ 1.31 mol

Question 8
2 pts

The reaction below has a percent yield of 45.0%.

$H_2(g) + Cl_2(g) \longrightarrow 2HCl(g)$

How many moles of HCl gas are produced if 15.5 L of Cl_2 at STP and excess H_2 are reacted?

○ 0.156 mol
○ 0.769 mol
○ 0.346 mol
○ 0.623 mol

Question 9
1 pts

If you have 44.8 L of nitrogen gas at standard temperature and pressure, how much will it weigh?

○ 56 g
○ 28 g
○ 44.8 g
○ 28 kg

Question 10
2 pts

At 80.0°C and 12.0 torr, the density of camphor vapor is 0.0829 g/L. What is the molar mass of camphor?

○ 152 g/mol
○ 34.5 g/mol
○ 243 g/mol
○ 3490 g/mol

Question 11
1 pts

What is the density of nitrogen gas at STP?

○ 0.625 g/L
○ 4.00 g/L
○ 2.50 g/L
○ 1.25 g/L

Question 12
1 pts

A chemist has synthesized a greenish-yellow gaseous compound that contains only chlorine and oxygen and has a density of 7.71 g/L at 36.0°C and 2188.8 mmHg. What is the molar mass of the compound?

○ 67.9 g/mol
○ 51.5 g/mol
○ 86.9 g/mol
○ 25.8 g/mol

Question 13
1 pts

How many moles of gaseous carbon dioxide are there in 15 L at STP?

○ 3.0 moles
○ 0.67 moles
○ 0.52 moles
○ 1.0 moles

Question 14
1 pts

Consider the following reaction:

$CH_4(g) + 2O_2(g) \longrightarrow CO_2(g) + 2H_2O(l)$

What is the final volume if 10 L of methane (CH_4) reacts completely with 20 L of oxygen?

○ 20 L
○ 10 L
○ 30 L
○ 15 L
○ It cannot be determined without knowing the temperature at which this reaction takes place.

Question 15
1 pts

Calculate the volume of methane (CH_4) produced by the bacterial breakdown of 3.87 kg of sugar ($C_6H_{12}O_6$) at 258 K and 726 torr.

$C_6H_{12}O_6(aq) \rightarrow 3CH_4(g) + 3CO_2(g)$

○ 2610 L
○ 1450 L
○ 1430 L
○ 858 L

Question 16
1 pts

Consider the following reaction:

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

If the reaction is carried out at constant temperature and pressure, how much H_2 is required to react with 9.8 L of N_2?

○ 14.7 L
○ 19.6 L
○ 29.4 L
○ 39.2 L

Question 17
1 pts

What volume of pure oxygen gas (O_2) measured at 546 K and 1.00 atm is formed by complete dissociation of 0.5 mol of Ag_2O?

$2Ag_2O(s) \longrightarrow 4Ag(s) + O_2(g)$

○ 16.8 L
○ 5.60 L
○ 33.6 L
○ 11.2 L

Question 18
1 pts

If the volume of a gaseous system is increased by a factor of 3 and the temperature is raised by a factor of 6, then the pressure of the system will __________ by a factor of __________.

○ decrease, 0.5
○ increase, 2
○ decrease, 2
○ decrease, 18
○ increase, 0.5
○ increase, 18

Question 19
1 pts

You have a sample of H_2 gas and Ar gas at the same temperature and pressure, but the H_2 gas has twice the volume of the Ar gas. Assuming the gases behave ideally, which gas has the larger NUMBER DENSITY (gas particles per volume)?

○ It depends on the value of the temperature and the pressure.
○ the Ar gas
○ the H_2 gas
○ they are the same

Question 20
1 pts

Which has the higher mass density (g/L): a sample of O_2 with a volume of 10 L, or a sample of Cl_2 with a volume of 3 L? Both samples are at the same temperature and pressure.

○ It depends on the value of the temperature and pressure.
○ they are the same
○ the O_2
○ the Cl_2

Question 21
1 pts

What is the mass of oxygen gas in a 16.6 L container at 34.0°C and 6.22 atm?

○ 4.10 g
○ 131 g
○ 432 g
○ 1180 g

Question 22
2 pts

One method of estimating the temperature of the center of the sun is based on the assumption that the center consists of gases that have an average molar mass of 2.00 g/mol. If the density of the center of the sun is 1.40 g/cm^3 at a pressure of 1.30×10^9 atm, calculate the temperature.

○ 700°C
○ 2.26×10^{10} °C
○ 2.26×10^7 °C
○ 2.26×10^{13} °C

Question 23
1 pts

What is the molar mass of a gas if 0.473 g of the gas occupies a volume of 376 mL at 23.0°C and 1.90 atm?

○ 16.1 g/mol
○ 13.2 g/mol
○ 0.0161 g/mol
○ 1.25 g/mol

Question 24
1 pts

Consider the following reaction:

$2HCl + Na_2CO_3 \longrightarrow 2NaCl + H_2O + CO_2$

For this reaction, 179.2 L of CO_2 is collected at STP. How many moles of NaCl are also formed?

○ 32.0 moles
○ 12.5 moles
○ 8.00 moles
○ 16.0 moles

Question 25
1 pts

The analysis of a hydrocarbon revealed that it was 85.6281% C and 14.3719% H by mass. When 3.22 g of the gas was stored in a 1.2 L flask at -190.842°C, it exerted a pressure of 491 torr. What is the molecular formula of the hydrocarbon?

○ C_4H_6
○ C_4H_{10}
○ C_2H_4
○ C_3H_8