

HW02 - Gases

Question 1 4 pts

Consider the following **unbalanced** reaction:

$$\text{AgNO}_3 + \text{K}_3\text{PO}_4 \rightarrow \text{Ag}_3\text{PO}_4 + \text{KNO}_3$$

What is the sum of the coefficients in the balanced reaction?

Note: If there is no coefficient, the coefficient is an understood 1.

8

5

6

3

4

10

Question 2 4 pts

Hydrogen peroxide (H_2O_2) liquid decomposes into hydrogen gas and oxygen gas. Which of the following represents this reaction?

Note: phases are omitted in the answer choices, but do remember the standard state of hydrogen and oxygen gas.

$\text{H}_2\text{O}_2 \rightarrow \text{H}_2 + \text{O}_2$

$\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}_2$

$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}_2$

$2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2 + \text{O}_2$

$\text{H}_2\text{O}_2 \rightarrow 2\text{H} + 2\text{O}$

Question 3 4 pts

In which state of matter are the molecules all spread out? This means the distance between the molecules is much larger than the size of the molecules themselves.

gas

liquid

solid

Question 4 4 pts

What are the key physical properties of solids?

the molecules are very close to each other

molecules are in static positions relative to neighboring molecules

molecules are in constant translational motion relative to each other

molecules are very far apart from each other

molecules are very close to each other but also move considerably among themselves

Question 5 4 pts

Which of the following substances listed has the smallest percentage in the make up of the typical composition of air here in Austin, TX on a humid day?

argon (Ar)

nitrogen (N_2)

oxygen (O_2)

carbon dioxide (CO_2)

water (H_2O)

Question 6 4 pts

Which of the following layers of the atmosphere is closest to the ground?

Troposphere

Ozone

Stratosphere

Mesosphere

Question 7 4 pts

Which of the following simple ratios of nitrogen to oxygen is the most accurate for describing the air on this planet.
(ratios are all written as nitrogen : oxygen)

4 : 1

1 : 2

2 : 1

3 : 2

3 : 1

Question 8 4 pts

Which of the following substances is most variable in our atmosphere?

Water vapor

Carbon dioxide

Nitrogen

Argon

Question 9 4 pts

What is the name and the approximate molar mass of C_5H_{12} ?

Heptane, 74 g/mol

Pentane, 68 g/mole

Hexane, 72 g/mol

Pentane, 72 g/mol

Pentane, 74 g/mol

Hexane, 86 g/mol

Pentonium, 72 g/mol

Question 10 4 pts

Which carbon compound contains the fewest carbon atoms?

Methane

Hexane

Propane

Chlorobutane

Question 11 4 pts

According to Boyle's Law, pressure and volume have a(n)...

indirect relationship

direct relationship

inverse relationship

none of these are correct

Question 12 4 pts

A container holding an ideal gas is compressed to half its original volume at constant temperature. According to Boyle's Law, the pressure of the gas...

halves

doubles

triples

quadruples

Question 13 4 pts

An inflated balloon has a volume equal to 2.3 L at 20°C. When the temperature is reduced to 10°C, the volume...

doubles

is halved

decreases by a small amount

increases by a small amount

Question 14 4 pts

Catalytic converters reduce the amount of _____ in car exhaust.

CO

O_3

CO_2

N_2

Question 15 4 pts

The two most abundant gases in an inhaled breath are...

Nitrogen and oxygen

Nitrogen and water vapor

Oxygen and carbon dioxide

Carbon dioxide and nitrogen

Question 16 4 pts

The air we exhale contains about 100 times more of which gas than the air we breathe from the atmosphere?

Carbon dioxide

Argon

Oxygen

Nitrogen

Question 17 4 pts

Which pollutant is present as a solid particulate in air?

Soot

Ozone

Carbon monoxide

Sulfur dioxide

Question 18 4 pts

Which of the following pollutants **cannot** be detected by odor?

CO

O_3

NO_x

SO_x

Question 19 4 pts

Refer to the graph of elevation vs pressure found [here](https://mccord.cm.utexas.edu/chembook/page.php?chnum=2§=5) (<https://mccord.cm.utexas.edu/chembook/page.php?chnum=2§=5>). What is the approximate pressure (in kPa) at 4500 m altitude?

57 kPa

50 kPa

60 kPa

63 kPa

45 kPa

Question 20 4 pts

A 34 L container holds 0.80 moles of gas at 300 K. What is the pressure (in atm)?

0.58 atm

20 atm

440 atm

1.2 atm

Question 21 4 pts

A gas is expanded from 3.60 L and 76.8 kPa to 8.10 L at constant temperature. What is the final pressure?

2240 kPa

34.1 kPa

173 kPa

68.2 kPa

9.48 kPa

86.4 kPa

Question 22 4 pts

An industrial tube used to transport methane has an internal temperature equal to 18 °C. When high quantities of methane are transported, the pressure increases to 3.6 atm in 12 L of tubing. How many moles of methane (n) are present in this 12 L tubing?

0.038 moles

29 moles

3.6 moles

1.8 moles

Question 23 4 pts

Consider the following **unbalanced** environmental reaction:

$$\text{NO}_2(\text{g}) + \text{H}_2\text{O}(\ell) \rightarrow \text{HNO}_3(\text{aq}) + \text{NO}(\text{g})$$

First balance the reaction. Then calculate the volume of NO gas produced when 0.952 moles of NO_2 are reacted to completion with excess H_2O at STP.

Reminder: STP is 0 °C and 1 atm pressure. One mole occupies 22.4 L at STP.

4.80 L

7.11 L

43.8 L

32.7 L

85.7 L

Question 24 4 pts

Your friend is using the ideal gas law to solve a question. Your friend's work is shown below:

$$PV = nRT$$
$$(3.7 \text{ atm})(4.3 \text{ L}) = (0.5 \text{ moles})(R)(387.77 \text{ K})$$

What is the proper R value to complete the equation?

0.08206 L Torr / mol K

0.08206 L atm / mol K

8.314 J / mol K

62.36 L Torr / mol K

62.36 L atm / mol K

Question 25 4 pts

Write and balance the chemical equation for the combustion of octane to the lowest whole number coefficients. What are the reactants and products of this reaction **(including coefficients of the chemical equation when balance)**?

Reactants: 2 octane, 25 oxygen
Products: 16 carbon dioxide, 18 water

Reactants: 1 octane, 1 oxygen
Products: 1 carbon dioxide, 1 water

Reactants: 2 octane, 25 carbon dioxide
Products: 16 oxygen, 18 water

Reactants: 25 octane, 2 oxygen
Products: 18 carbon dioxide, 16 water