Question #: 1

What is the chemical formula of chromium(III) bromide?

A. CrBr
B. CrBr₂
C. Cr₂Br
D. Cr₃Br
E. CrBr₃
F. Cr₂Br₃

Question #: 2

What is the correct chemical name for N₂O₅?

A. nitrogen(V) oxide
B. nitrogen pentoxide
C. dinitrogen oxide
D. dinitrogen pentoxide

Question #: 3

How many grams are there in 5.50 moles of propane, C₃H₈?

A. 13.0 grams
B. 71.5 grams
C. 243 grams
D. 48.6 grams
Question #: 4

How many grams of oxygen are contained in 30. grams of acetic acid, C\(_2\)H\(_4\)O\(_2\) (molar mass = 60.05 g/mol)?
Report your answer to two significant figures. Do NOT include units in your answer.

1. __________

Question #: 5

Caffeine has a percent by mass of 49.48% C, 5.19% H, 16.47% O, and 28.86% N. What is the empirical formula of caffeine?

A. CHON
B. C\(_5\)H\(_5\)O\(_5\)N\(_5\)
C. C\(_4\)H\(_3\)ON\(_2\)
D. C\(_2\)H\(_4\)O\(_2\)N
E. C\(_3\)H\(_2\)O\(_3\)N\(_2\)

Question #: 6

When iron rusts, solid iron (Fe) reacts with gaseous molecular oxygen (O\(_2\)) to form solid iron(III) oxide. In the balanced chemical equation for this reaction with the smallest integer coefficients for the reactants and products, what is the coefficient for oxygen?
Enter your answer as a whole number. Do NOT include any symbols or formulas in your answer.

1. __________
Question #: 7

When 2.00 moles of H₂O react in the following chemical reaction, how many grams of NH₃ are produced?
Report your answer to three significant figures. Do NOT include units in your answer.
Mg₃N₂(s) + 6 H₂O(l) → 3 Mg(OH)₂(s) + 2 NH₃(g)

1. ________ grams

Question #: 8

If 10.0 grams of magnesium are added to a solution containing 1.00 mole of hydrochloric acid, how many grams of hydrogen gas are produced?
Mg(s) + 2 HCl(aq) → H₂(g) + MgCl₂(aq)

A. 0.551 grams of H₂
B. 0.829 grams of H₂
C. 1.008 grams of H₂
D. 2.106 grams of H₂

Question #: 9

According to the following chemical equation, when 3.05 moles of CH₄ are mixed with 5.03 moles of O₂, the limiting reagent will be ______ [CH₄ or O₂]. The amount of unreacted excess reagent will be ______ moles.
Report your answer to three significant figures. Do NOT include units in your answer.
CH₄(g) + 2 O₂(g) → CO₂(g) + 2 H₂O(l)

1. ________
2. ________
Question #: 10

For the reaction, 
FeS(s) + 2 HCl(aq) → FeCl₂(s) + H₂S(g) ,
what is the percent yield if 0.223 moles of FeS reacts with an excess of HCl to produce 7.00 grams of H₂S?

A. 77.3 %
B. 82.1 %
C. 92.1 %
D. 96.6 %

Question #: 11

A 255.0 mL aqueous solution contains 275 grams of BaCl₂. What is the molarity (M) of the solution? 
Report your answer to **three** significant figures. Do **NOT** include units in your answer.

1. ________ molar

Question #: 12

How many grams of NaOH (molar mass = 40.00 g/mol) are in 600.0 mL of a 0.650 M NaOH solution?

A. 6.8 grams
B. 11.5 grams
C. 15.6 grams
D. 20.9 grams
**Question #**: 13

What is the molarity (M) of a KCl solution made by diluting 100. mL of a 0.250 M solution to a final volume of 750. mL?

A. 0.150 M
B. 5.00 x 10^{-3} M
C. 3.33 x 10^{-2} M
D. 1.35 M

**Question #**: 14

Which one of the following ionic compounds is **insoluble** in water?

A. NH₄OH
B. KOH
C. Ag₂SO₄
D. Pb(NO₃)₂

**Question #**: 15

Which one of the following equations best represents the reaction that occurs when KCl and Pb(NO₃)₂ solutions are mixed?

A. KCl(aq) + Pb(NO₃)₂(aq) → KNO₃(aq) + PbCl₂(s)
B. K⁺(aq) + NO₃⁻(aq) → KNO₃(aq)
C. 2 KCl(aq) + Pb(NO₃)₂(aq) → PbCl₂(s) + 2 KNO₃(aq)
D. KCl(aq) + 2 Pb(NO₃)₂(aq) → KNO₃(s) + 2 PbCl₂(aq)
**Question #**: 16

What is the net ionic equation for the reaction of ammonium chloride with silver nitrate?

A. \( \text{NH}_4^+(aq) + \text{Cl}^-(aq) + \text{Ag}^+(aq) + \text{NO}_3^-(aq) \rightarrow \text{NH}_4^+(aq) + \text{Cl}^-(aq) + \text{AgNO}_3(s) \)

B. \( \text{NH}_4^+(aq) + \text{Cl}^-(aq) \rightarrow \text{NH}_4\text{Cl}(s) \)

C. \( \text{Ag}^+(aq) + \text{Cl}^-(aq) \rightarrow \text{AgCl}(s) \)

D. \( \text{Ag}^+(aq) + \text{Cl}^-(aq) + \text{NO}_3^-(aq) \rightarrow \text{AgClNO}_3(s) \)

**Question #**: 17

A 25.00 mL sample of a \( \text{H}_3\text{PO}_4 \) solution requires titration with 22.62 mL of 0.2000 M \( \text{NaOH} \) to reach its equivalence point. According to the following chemical equation, what is the concentration of the unknown \( \text{H}_3\text{PO}_4 \) solution?

\( \text{H}_3\text{PO}_4(aq) + 3 \text{NaOH}(aq) \rightarrow 3 \text{H}_2\text{O}(l) + \text{Na}_3\text{PO}_4(aq) \)

A. 1.490 M

B. 0.06032 M

C. 0.01981 M

D. 1.023 M

**Question #**: 18

In \( \text{Na}_2\text{SO}_3 \) the oxidation numbers are \( +1 \) for Na, \( +2 \) for S, and \( +3 \) for O. You must include a number and a sign (+ or −) for each answer.

1. __________
2. __________
3. __________
Question #: 19

For the following reaction, which substance is reduced?
Mg(s) + Fe^{2+}(aq) \rightarrow Mg^{2+}(aq) + Fe(s)

A. Mg(s)  
B. Fe^{2+}(aq)  
C. Mg^{2+}(aq)  
D. Fe(s)

Question #: 20

A pressure of 630 torr:

A. is greater than one atmosphere.  
B. cannot be measured with a manometer.  
C. is due to a noble gas.  
D. is typically found at altitudes above sea level.

Question #: 21

When the amount of an ideal gas in a sample increases at constant temperature and pressure, the sample volume ________________ proportion to the number of moles of the gas.

A. increases in direct  
B. increases in inverse  
C. decreases in direct  
D. decrease in inverse
Question #: 22
What is the volume of 1.50 moles of an ideal gas at 100 \( \circ \)C and 740. torr? Report your answer with three significant figures. Do NOT include units in your answer.

1. __________

Question #: 23
A sample of an ideal gas has a volume of 650. mL at a pressure of 1.85 atm and a temperature of 37.0 \( \circ \)C. What will the new volume of the gas be if the pressure is reduced to 1.50 atm and the temperature is increased to 50.0 \( \circ \)C? Report your answer to three significant figures. Do NOT include units in your answer. Use the format 2.22E2 or 2.22E-2 for answers in scientific notation.

1. __________

Question #: 24
Which of the following gases has the greatest volume at STP?

A. 66.0 grams of \( \text{O}_2 \)
B. 1.50 moles of \( \text{CO}_2 \)
C. 10.0 grams of \( \text{He} \)
D. 2.0 moles of \( \text{Cl}_2 \)

Question #: 25
A 3.50 liter vessel contains 6.05 grams of a gas at 1.50 atm and 300. K. What is the molar mass of the gas? Report your answer with three significant digits. Do NOT include units in your answer.

1. __________
Question #: 26

A mixture of four noble gases in a 1.00 L container at 300 K exhibits a total pressure of 760 torr with three of the gases contributing a combined pressure of 600 torr. The amount of the fourth gas in the container was measured to be 0.717 grams. What is the fourth gas?

A. Xe  
B. Ne  
C. Ar  
D. Kr

Question #: 27

According to the kinetic molecular theory of gases, which one of the following statements is incorrect?

A. Gas molecules have mass, but negligible volume.  
B. Collisions among molecules result in a decrease in the average kinetic energy of the gas.  
C. Gas molecules are in constant motion.  
D. A gas is composed of molecules that are separated from each other by distances far greater than their own dimensions.

Question #: 28

According to the kinetic molecular theory of gases, the average kinetic energy of a gas particle is:

A. unrelated to the temperature.  
B. decreases as the temperature increases.  
C. proportional to the temperature in kelvins.  
D. unrelated to the identity of the gas particle.
Question #: 29

Which two of the following conditions result in non-ideal behavior of gases?

A. high temperature  
B. low temperature  
C. low pressure  
D. high pressure

Question #: 30

Choose the two phrases that correctly complete the sentence. The van der Waals equation for nonideal gases:

A. takes into account the effects of intermolecular forces between gas particles.  
B. is only applicable to monatomic gases.  
C. corrects for the volume occupied by the gas particles.  
D. cannot be applied to monatomic gases.
Question #: 1

What is the chemical formula of chromium(III) bromide?

A. CrBr
B. CrBr₂
C. Cr₂Br
D. Cr₃Br
E. CrBr₃
F. Cr₂Br₃

Question #: 2

What is the correct chemical name for N₂O₅?
A. nitrogen(V) oxide
B. nitrogen pentoxide
C. dinitrogen oxide
D. dinitrogen pentoxide

**Question #: 3**

How many grams are there in 5.50 moles of propane, \( \text{C}_3\text{H}_8 \)?

A. 13.0 grams
B. 71.5 grams
C. 243 grams
D. 48.6 grams

**Question #: 4**

How many grams of oxygen are contained in 30. grams of acetic acid, \( \text{C}_2\text{H}_4\text{O}_2 \) (molar mass = 60.05 g/mol)?

Report your answer to **two** significant figures. Do **NOT** include units in your answer.

1. 16 grams

**Question #: 5**

Caffeine has a percent by mass of 49.48% C, 5.19% H, 16.47% O, and 28.86% N. What is the empirical formula of caffeine?

A. CHON
B. \( \text{C}_5\text{H}_5\text{O}_5\text{N}_5 \)
C. \( \text{C}_4\text{H}_5\text{O}_2\text{N}_2 \)
D. \( \text{C}_2\text{H}_4\text{O}_2\text{N} \)
E. \( \text{C}_3\text{H}_2\text{O}_3\text{N}_2 \)

**Correct Answer:** Dinitrogen pentoxide
When iron rusts, solid iron (Fe) reacts with gaseous molecular oxygen (O₂) to form solid iron(III) oxide. In the balanced chemical equation for this reaction with the smallest integer coefficients for the reactants and products, what is the coefficient for oxygen? Enter your answer as a whole number. Do NOT include any symbols or formulas in your answer.

1

1.3

When 2.00 moles of H₂O react in the following chemical reaction, how many grams of NH₃ are produced? Report your answer to three significant figures. Do NOT include units in your answer.

\[ \text{Mg₃N₂(s)} + 6 \text{H₂O(l)} \rightarrow 3 \text{Mg(OH)}₂(s) + 2 \text{NH₃(g)} \]

1 grams

1. 11.4

If 10.0 grams of magnesium are added to a solution containing 1.00 mole of hydchlooric acid, how many grams of hydrogen gas are produced?

\[ \text{Mg(s)} + 2 \text{HCl(aq)} \rightarrow \text{H₂(g)} + \text{MgCl₂(aq)} \]

A. 0.551 grams of H₂

✓B. 0.829 grams of H₂

C. 1.008 grams of H₂

D. 2.106 grams of H₂

According to the following chemical equation, when 3.05 moles of CH₄ are mixed with 5.03 moles of O₂, the limiting reagent will be \[ \text{CH₄ or O₂} \]. The amount of unreacted excess
reagent will be 2 moles.
Report your answer to three significant figures. Do NOT include units in your answer.
CH\textsubscript{4}(g) + 2 O\textsubscript{2}(g) \rightarrow CO\textsubscript{2}(g) + 2 H\textsubscript{2}O(l)

1. O2|oxygen|O|
2. 0.535|535|

Question #: 10

For the reaction,
FeS(s) + 2 HCl(aq) \rightarrow FeCl\textsubscript{2}(s) + H\textsubscript{2}S(g) ,
what is the percent yield if 0.223 moles of FeS reacts with an excess of HCl to produce 7.00 grams of H\textsubscript{2}S?

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A 255.0 mL aqueous solution contains 275 grams of BaCl\textsubscript{2}. What is the molarity (M) of the solution?
Report your answer to three significant figures. Do NOT include units in your answer.

1 molar

1. 5.18

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How many grams of NaOH (molar mass = 40.00 g/mol) are in 600.0 mL of a 0.650 M NaOH solution?

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B. K⁺(aq) + NO₃⁻(aq) → KNO₃(aq)
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What is the **net ionic equation** for the reaction of ammonium chloride with silver nitrate?
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B. $\text{NH}_4^+(aq) + \text{Cl}^-(aq) \rightarrow \text{NH}_4\text{Cl}(s)$

✓ C. $\text{Ag}^+(aq) + \text{Cl}^-(aq) \rightarrow \text{AgCl}(s)$

D. $\text{Ag}^+(aq) + \text{Cl}^-(aq) + \text{NO}_3^-(aq) \rightarrow \text{AgClNO}_3(s)$

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In $\text{Na}_2\text{SO}_3$ the oxidation numbers are $\underline{1}$ for Na, $\underline{2}$ for S, and $\underline{3}$ for O. You must include a number and a sign (+ or −) for each answer.

1. $+1|1+|

2. $+4|4+|

3. $-2|-2|$

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For the following reaction, which substance is reduced?

$\text{Mg}(s) + \text{Fe}^{2+}(aq) \rightarrow \text{Mg}^{2+}(aq) + \text{Fe}(s)$

A. $\text{Mg}(s)$

✓ B. $\text{Fe}^{2+}(aq)$

C. $\text{Mg}^{2+}(aq)$

D. $\text{Fe}(s)$
**Question #**: 20

A pressure of 630 torr:

- A. is greater than one atmosphere.
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**Question #**: 22

What is the volume of 1.50 moles of an ideal gas at 100. °C and 740. torr? Report your answer with **three** significant figures. Do **NOT** include units in your answer.

1 liters

1. 47.2

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A sample of an ideal gas has a volume of 650. mL at a pressure of 1.85 atm and a temperature of 37.0 °C. What will the new volume of the gas be if the pressure is reduced to 1.50 atm and the temperature is increased to 50.0 °C? Report your answer to **three** significant figures. Do **NOT** include units in your answer. Use the format 2.22E2 or 2.22E-2 for answers in scientific notation.

1 mL
**Question #:** 24

Which of the following gases has the greatest volume at STP?

A. 66.0 grams of O₂
B. 1.50 moles of CO₂
C. 10.0 grams of He
D. 2.0 moles of Cl₂

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A 3.50 liter vessel contains 6.05 grams of a gas at 1.50 atm and 300. K. What is the molar mass of the gas?

Report your answer with three significant digits. Do **NOT** include units in your answer.

1. 28.4
2. 28.3
3. 28.5

**Question #:** 26

A mixture of four noble gases in a 1.00 L container at 300 K exhibits a total pressure of 760 torr with three of the gases contributing a combined pressure of 600 torr. The amount of the fourth gas in the container was measured to be 0.717 grams. What is the fourth gas?

A. Xe
B. Ne
C. Ar
D. Kr

**Question #:** 27

According to the kinetic molecular theory of gases, which one of the following statements is **incorrect**?
A. Gas molecules have mass, but negligible volume.
✓ B. Collisions among molecules result in a decrease in the average kinetic energy of the gas.
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