Elemental Measures (a.k.a., Stoikheion-metry)

Apprentice Difficulty Level
Question Group 1
Question 1
Atomic Scale Analysis:
Consider the reaction $2\ H_2 + O_2 \rightarrow 2\ H_2O$. Count the number of atoms of the elements **H** and **O** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of H: _____	# atoms of H: _____
# atoms of O: _____	# atoms of O: _____

Which statement is an accurate summary of this analysis?
a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.
b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.
c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:
For the reaction $2\ H_2 + O_2 \rightarrow 2\ H_2O$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **H** and **O** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of H: _____	Mass (g) of H: _____
Mass (g) of O: _____	Mass (g) of O: _____

Which statement is an accurate summary of this analysis?
a. The mass of one or more of the elements changes; but the total mass remains constant.
b. The mass of one or more of the elements changes; the total mass also changes.
c. The mass of each element is conserved (does not change) during this reaction.

Question 2

Atomic Scale Analysis:

Consider the reaction $N_2 + 3\ H_2 \rightarrow 2\ NH_3$. Count the number of atoms of the elements **N** and **H** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of N: _____	# atoms of N: _____
# atoms of H: _____	# atoms of H: _____

Which statement is an accurate summary of this analysis?

a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.

b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.

c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:

For the reaction $N_2 + 3\ H_2 \rightarrow 2\ NH_3$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **N** and **H** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of N: _____	Mass (g) of N: _____
Mass (g) of H: _____	Mass (g) of H: _____

Which statement is an accurate summary of this analysis?

a. The mass of one or more of the elements changes; but the total mass remains constant.

b. The mass of one or more of the elements changes; the total mass also changes.

c. The mass of each element is conserved (does not change) during this reaction.

Question 3

Atomic Scale Analysis:

Consider the reaction $3\ Ti + 2\ N_2 \rightarrow Ti_3N_4$. Count the number of atoms of the elements **Ti** and **N** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of Ti: _____	# atoms of HTi _____
# atoms of N: _____	# atoms of N: _____

Which statement is an accurate summary of this analysis?

a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.

b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.

c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:

For the reaction $3\ Ti + 2\ N_2 \rightarrow Ti_3N_4$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **Ti** and **N** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of Ti: _____	Mass (g) of Ti: _____
Mass (g) of N: _____	Mass (g) of N: _____

Which statement is an accurate summary of this analysis?

a. The mass of one or more of the elements changes; but the total mass remains constant.

b. The mass of one or more of the elements changes; the total mass also changes.

c. The mass of each element is conserved (does not change) during this reaction.

Question Group 2
Question 4
Atomic Scale Analysis:
Consider the reaction $2\ Al + 3\ Cl_2 \rightarrow 2\ AlCl_3$. Count the number of atoms of the elements **Al** and **Cl** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of Al: _____	# atoms of Al: _____
# atoms of Cl: _____	# atoms of Cl: _____

Which statement is an accurate summary of this analysis?
a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.
b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.
c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:
For the reaction $2\ Al + 3\ Cl_2 \rightarrow 2\ AlCl_3$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **Al** and **Cl** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of Al: _____	Mass (g) of Al: _____
Mass (g) of Cl: _____	Mass (g) of Cl: _____

Which statement is an accurate summary of this analysis?
a. The mass of one or more of the elements changes; but the total mass remains constant.
b. The mass of one or more of the elements changes; the total mass also changes.
c. The mass of each element is conserved (does not change) during this reaction.

Question 5

Atomic Scale Analysis:

Consider the reaction $2\ Al + 3\ Br_2 \rightarrow 2\ AlBr_3$. Count the number of atoms of the elements **Al** and **Br** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of Al: _____	# atoms of Al: _____
# atoms of Br: _____	# atoms of Br: _____

Which statement is an accurate summary of this analysis?

a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.

b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.

c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:

For the reaction $2\ Al + 3\ Br_2 \rightarrow 2\ AlBr_3$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **Al** and **Br** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of Al: _____	Mass (g) of Al: _____
Mass (g) of Br: _____	Mass (g) of Br: _____

Which statement is an accurate summary of this analysis?

a. The mass of one or more of the elements changes; but the total mass remains constant.

b. The mass of one or more of the elements changes; the total mass also changes.

c. The mass of each element is conserved (does not change) during this reaction.

Question 6

Atomic Scale Analysis:

Consider the reaction $2\ Al + 3\ I_2 \rightarrow 2\ AlI_3$. Count the number of atoms of the elements **Al** and **I** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of Al: _____	# atoms of Al: _____
# atoms of I: _____	# atoms of I: _____

Which statement is an accurate summary of this analysis?

a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.

b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.

c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:

For the reaction $2\ Al + 3\ I_2 \rightarrow 2\ AlI_3$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **Al** and **I** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of Al: _____	Mass (g) of Al: _____
Mass (g) of I: _____	Mass (g) of I: _____

Which statement is an accurate summary of this analysis?

a. The mass of one or more of the elements changes; but the total mass remains constant.

b. The mass of one or more of the elements changes; the total mass also changes.

c. The mass of each element is conserved (does not change) during this reaction.

Question Group 3
Question 7
Atomic Scale Analysis:
Consider the reaction $4\ Li + O_2 \rightarrow 2\ Li_2O$. Count the number of atoms of the elements **Li** and **O** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of Li: _____	# atoms of Li: _____
# atoms of O: _____	# atoms of O: _____

Which statement is an accurate summary of this analysis?
a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.
b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.
c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:
For the reaction $4\ Li + O_2 \rightarrow 2\ Li_2O$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **Li** and **O** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of Li: _____	Mass (g) of Li: _____
Mass (g) of O: _____	Mass (g) of O: _____

Which statement is an accurate summary of this analysis?
a. The mass of one or more of the elements changes; but the total mass remains constant.
b. The mass of one or more of the elements changes; the total mass also changes.
c. The mass of each element is conserved (does not change) during this reaction.

Question 8

Atomic Scale Analysis:

Consider the reaction $4\ K + O_2 \rightarrow 2\ K_2O$. Count the number of atoms of the elements **K** and **O** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of K: _____	# atoms of K: _____
# atoms of O: _____	# atoms of O: _____

Which statement is an accurate summary of this analysis?

a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.

b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.

c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:

For the reaction $4\ K + O_2 \rightarrow 2\ K_2O$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **K** and **O** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of K: _____	Mass (g) of K: _____
Mass (g) of O: _____	Mass (g) of O: _____

Which statement is an accurate summary of this analysis?

a. The mass of one or more of the elements changes; but the total mass remains constant.

b. The mass of one or more of the elements changes; the total mass also changes.

c. The mass of each element is conserved (does not change) during this reaction.

Question 9

Atomic Scale Analysis:

Consider the reaction $4\ Na + O_2 \rightarrow 2\ Na_2O$. Count the number of atoms of the elements **Na** and **O** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of Na: _____	# atoms of Na: _____
# atoms of O: _____	# atoms of O: _____

Which statement is an accurate summary of this analysis?

a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.

b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.

c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:

For the reaction $4\ Na + O_2 \rightarrow 2\ Na_2O$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **Na** and **O** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of Na: _____	Mass (g) of Na: _____
Mass (g) of O: _____	Mass (g) of O: _____

Which statement is an accurate summary of this analysis?

a. The mass of one or more of the elements changes; but the total mass remains constant.

b. The mass of one or more of the elements changes; the total mass also changes.

c. The mass of each element is conserved (does not change) during this reaction.

Master Difficulty Level
Question Group 4
Question 10

Atomic Scale Analysis:
Consider the reaction $Li_2O + H_2O \rightarrow 2\ LiOH$. Count the number of atoms of the elements **Li**, **O**, and **H** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of Li: _____	# atoms of Li: _____
# atoms of O: _____	# atoms of O: _____
# atoms of H: _____	# atoms of H: _____

Which statement is an accurate summary of this analysis?
a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.
b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.
c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:
For the reaction $Li_2O + H_2O \rightarrow 2\ LiOH$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **Li**, **O**, and **H** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of Li: _____	Mass (g) of Li: _____
Mass (g) of O: _____	Mass (g) of O: _____
Mass (g) of H: _____	Mass (g) of H: _____

Which statement is an accurate summary of this analysis?
a. The mass of one or more of the elements changes; but the total mass remains constant.
b. The mass of one or more of the elements changes; the total mass also changes.
c. The mass of each element is conserved (does not change) during this reaction.

Question 11

Atomic Scale Analysis:
Consider the reaction $Na_2O + H_2O \rightarrow 2\ NaOH$. Count the number of atoms of the elements **Na**, **O**, and **H** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of Na: _____	# atoms of Na: _____
# atoms of O: _____	# atoms of O: _____
# atoms of H: _____	# atoms of H: _____

Which statement is an accurate summary of this analysis?
a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.
b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.
c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:
For the reaction $Na_2O + H_2O \rightarrow 2\ NaOH$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **Na**, **O**, and **H** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of Na: _____	Mass (g) of Na: _____
Mass (g) of O: _____	Mass (g) of O: _____
Mass (g) of H: _____	Mass (g) of H: _____

Which statement is an accurate summary of this analysis?
a. The mass of one or more of the elements changes; but the total mass remains constant.
b. The mass of one or more of the elements changes; the total mass also changes.
c. The mass of each element is conserved (does not change) during this reaction.

Question 12

Atomic Scale Analysis:
Consider the reaction $K_2O + H_2O \rightarrow 2\ KOH$. Count the number of atoms of the elements **K**, **O**, and **H** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of K: _____	# atoms of K: _____
# atoms of O: _____	# atoms of O: _____
# atoms of H: _____	# atoms of H: _____

Which statement is an accurate summary of this analysis?
a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.
b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.
c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:
For the reaction $K_2O + H_2O \rightarrow 2\ KOH$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **K**, **O**, and **H** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of K: _____	Mass (g) of K: _____
Mass (g) of O: _____	Mass (g) of O: _____
Mass (g) of H: _____	Mass (g) of H: _____

Which statement is an accurate summary of this analysis?
a. The mass of one or more of the elements changes; but the total mass remains constant.
b. The mass of one or more of the elements changes; the total mass also changes.
c. The mass of each element is conserved (does not change) during this reaction.

Question Group 5
Question 13
Atomic Scale Analysis:
Consider the reaction $CH_4 + 2\,O_2 \rightarrow CO_2 + 2\,H_2O$. Count the number of atoms of the elements **C**, **H**, and **O** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of C: _____	# atoms of C: _____
# atoms of H: _____	# atoms of H: _____
# atoms of O: _____	# atoms of O: _____

Which statement is an accurate summary of this analysis?
a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.
b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.
c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:
For the reaction $CH_4 + 2\,O_2 \rightarrow CO_2 + 2\,H_2O$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **C**, **H**, and **O** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of C: _____	Mass (g) of C: _____
Mass (g) of H: _____	Mass (g) of H: _____
Mass (g) of O: _____	Mass (g) of O: _____

Which statement is an accurate summary of this analysis?
a. The mass of one or more of the elements changes; but the total mass remains constant.
b. The mass of one or more of the elements changes; the total mass also changes.
c. The mass of each element is conserved (does not change) during this reaction.

Question 14

Atomic Scale Analysis:

Consider the reaction $2\ C_2H_6\ +\ 7\ O_2\ \rightarrow\ 4\ CO_2\ +\ 6\ H_2O$. Count the number of atoms of the elements **C**, **H**, and **O** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of C: _____	# atoms of C: _____
# atoms of H: _____	# atoms of H: _____
# atoms of O: _____	# atoms of O: _____

Which statement is an accurate summary of this analysis?

a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.

b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.

c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:

For the reaction $2\ C_2H_6\ +\ 7\ O_2\ \rightarrow\ 4\ CO_2\ +\ 6\ H_2O$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **C**, **H**, and **O** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of C: _____	Mass (g) of C: _____
Mass (g) of H: _____	Mass (g) of H: _____
Mass (g) of O: _____	Mass (g) of O: _____

Which statement is an accurate summary of this analysis?

a. The mass of one or more of the elements changes; but the total mass remains constant.

b. The mass of one or more of the elements changes; the total mass also changes.

c. The mass of each element is conserved (does not change) during this reaction.

Question 15

Atomic Scale Analysis:

Consider the reaction $2\ CH_3OH\ +\ 3\ O_2\ \rightarrow\ 2\ CO_2\ +\ 4\ H_2O$. Count the number of atoms of the elements **C**, **H**, and **O** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of C: _____	# atoms of C: _____
# atoms of H: _____	# atoms of H: _____
# atoms of O: _____	# atoms of O: _____

Which statement is an accurate summary of this analysis?

a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.

b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.

c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:

For the reaction $2\ CH_3OH\ +\ 3\ O_2\ \rightarrow\ 2\ CO_2\ +\ 4\ H_2O$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **C**, **H**, and **O** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of C: _____	Mass (g) of C: _____
Mass (g) of H: _____	Mass (g) of H: _____
Mass (g) of O: _____	Mass (g) of O: _____

Which statement is an accurate summary of this analysis?

a. The mass of one or more of the elements changes; but the total mass remains constant.

b. The mass of one or more of the elements changes; the total mass also changes.

c. The mass of each element is conserved (does not change) during this reaction.

Question Group 6
Question 16
Atomic Scale Analysis:
Consider the reaction $2\ KClO_3 \rightarrow 2\ KCl + 3\ O_2$. Count the number of atoms of the elements **K**, **Cl**, and **O** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of K: _____	# atoms of K: _____
# atoms of Cl: _____	# atoms of Cl: _____
# atoms of O: _____	# atoms of O: _____

Which statement is an accurate summary of this analysis?
a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.
b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.
c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:
For the reaction $2\ KClO_3 \rightarrow 2\ KCl + 3\ O_2$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **K**, **Cl**, and **O** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of K: _____	Mass (g) of K: _____
Mass (g) of Cl: _____	Mass (g) of Cl: _____
Mass (g) of O: _____	Mass (g) of O: _____

Which statement is an accurate summary of this analysis?
a. The mass of one or more of the elements changes; but the total mass remains constant.
b. The mass of one or more of the elements changes; the total mass also changes.
c. The mass of each element is conserved (does not change) during this reaction.

Question 17

Atomic Scale Analysis:

Consider the reaction $2\ Al(OH)_3 \rightarrow Al_2O_3 + 3\ H_2O$. Count the number of atoms of the elements **Al**, **O**, and **H** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of Al: _____	# atoms of Al: _____
# atoms of O: _____	# atoms of O: _____
# atoms of H: _____	# atoms of H: _____

Which statement is an accurate summary of this analysis?

a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.

b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.

c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:

For the reaction $2\ Al(OH)_3 \rightarrow Al_2O_3 + 3\ H_2O$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **Al**, **O**, and **H** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of Al: _____	Mass (g) of Al: _____
Mass (g) of O: _____	Mass (g) of O: _____
Mass (g) of H: _____	Mass (g) of H: _____

Which statement is an accurate summary of this analysis?

a. The mass of one or more of the elements changes; but the total mass remains constant.

b. The mass of one or more of the elements changes; the total mass also changes.

c. The mass of each element is conserved (does not change) during this reaction.

Question 18

Atomic Scale Analysis:

Consider the reaction $2\ Fe(OH)_3 \rightarrow Fe_2O_3 + 3\ H_2O$. Count the number of atoms of the elements **Fe**, **O**, and **H** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of Fe: _____	# atoms of Fe: _____
# atoms of O: _____	# atoms of O: _____
# atoms of H: _____	# atoms of H: _____

Which statement is an accurate summary of this analysis?

a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.

b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.

c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:

For the reaction $2\ Fe(OH)_3 \rightarrow Fe_2O_3 + 3\ H_2O$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **Fe**, **O**, and **H** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of Fe: _____	Mass (g) of Fe: _____
Mass (g) of O: _____	Mass (g) of O: _____
Mass (g) of H: _____	Mass (g) of H: _____

Which statement is an accurate summary of this analysis?

a. The mass of one or more of the elements changes; but the total mass remains constant.

b. The mass of one or more of the elements changes; the total mass also changes.

c. The mass of each element is conserved (does not change) during this reaction.

Wizard Difficulty Level
Question Group 7
Question 19

Consider the reaction $Al(OH)_3 + 3\ HCl \rightarrow AlCl_3 + 3\ H_2O$. Count the number of atoms of the elements **Al**, **O**, **H**, and **Cl** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of Al: _____	# atoms of Al: _____
# atoms of O: _____	# atoms of O: _____
# atoms of H: _____	# atoms of H: _____
# atoms of Cl: _____	# atoms of Cl: _____

Which statement is an accurate summary of this analysis?
a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.
b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.
c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:

For the reaction $Al(OH)_3 + 3\ HCl \rightarrow AlCl_3 + 3\ H_2O$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **Al**, **O**, **H**, and **Cl** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of Al: _____	Mass (g) of Al: _____
Mass (g) of O: _____	Mass (g) of O: _____
Mass (g) of H: _____	Mass (g) of H: _____
Mass (g) of Cl: _____	Mass (g) of Cl: _____

Which statement is an accurate summary of this analysis?
a. The mass of one or more of the elements changes; but the total mass remains constant.
b. The mass of one or more of the elements changes; the total mass also changes.
c. The mass of each element is conserved (does not change) during this reaction.

Question 20

Consider the reaction $Fe(OH)_3 + 3\ HCl \rightarrow FeCl_3 + 3\ H_2O$. Count the number of atoms of the elements **Fe**, **O**, **H**, and **Cl** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of Fe: _____	# atoms of Fe: _____
# atoms of O: _____	# atoms of O: _____
# atoms of H: _____	# atoms of H: _____
# atoms of Cl: _____	# atoms of Cl: _____

Which statement is an accurate summary of this analysis?

a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.

b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.

c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:

For the reaction $Fe(OH)_3 + 3\ HCl \rightarrow FeCl_3 + 3\ H_2O$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **Fe**, **O**, **H**, and **Cl** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of Fe: _____	Mass (g) of Fe: _____
Mass (g) of O: _____	Mass (g) of O: _____
Mass (g) of H: _____	Mass (g) of H: _____
Mass (g) of Cl: _____	Mass (g) of Cl: _____

Which statement is an accurate summary of this analysis?

a. The mass of one or more of the elements changes; but the total mass remains constant.

b. The mass of one or more of the elements changes; the total mass also changes.

c. The mass of each element is conserved (does not change) during this reaction.

Question 21

Consider the reaction $Cr(OH)_3 + 3\ HCl \rightarrow CrCl_3 + 3\ H_2O$. Count the number of atoms of the elements **Cr**, **O**, **H**, and **Cl** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of Cr: _____	# atoms of Cr: _____
# atoms of O: _____	# atoms of O: _____
# atoms of H: _____	# atoms of H: _____
# atoms of Cl: _____	# atoms of Cl: _____

Which statement is an accurate summary of this analysis?

a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.

b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.

c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:

For the reaction $Cr(OH)_3 + 3\ HCl \rightarrow CrCl_3 + 3\ H_2O$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **Cr**, **O**, **H**, and **Cl** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of Cr: _____	Mass (g) of Cr: _____
Mass (g) of O: _____	Mass (g) of O: _____
Mass (g) of H: _____	Mass (g) of H: _____
Mass (g) of Cl: _____	Mass (g) of Cl: _____

Which statement is an accurate summary of this analysis?

a. The mass of one or more of the elements changes; but the total mass remains constant.

b. The mass of one or more of the elements changes; the total mass also changes.

c. The mass of each element is conserved (does not change) during this reaction.

Question Group 8
Question 22
Consider the reaction $Mg(OH)_2 + CO_2 \rightarrow MgCO_3 + H_2O$. Count the number of atoms of the elements **Mg**, **O**, **H**, and **C** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of Mg: _____	# atoms of Mg: _____
# atoms of O: _____	# atoms of O: _____
# atoms of H: _____	# atoms of H: _____
# atoms of C: _____	# atoms of C: _____

Which statement is an accurate summary of this analysis?
a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.
b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.
c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:
For the reaction $Mg(OH)_2 + CO_2 \rightarrow MgCO_3 + H_2O$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **Mg**, **O**, **H**, and **C** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of Mg: _____	Mass (g) of Mg: _____
Mass (g) of O: _____	Mass (g) of O: _____
Mass (g) of H: _____	Mass (g) of H: _____
Mass (g) of C: _____	Mass (g) of C: _____

Which statement is an accurate summary of this analysis?
a. The mass of one or more of the elements changes; but the total mass remains constant.
b. The mass of one or more of the elements changes; the total mass also changes.
c. The mass of each element is conserved (does not change) during this reaction.

Question 23

Consider the reaction $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$. Count the number of atoms of the elements **Ca**, **O**, **H**, and **C** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of Ca: _____	# atoms of Ca: _____
# atoms of O: _____	# atoms of O: _____
# atoms of H: _____	# atoms of H: _____
# atoms of C: _____	# atoms of C: _____

Which statement is an accurate summary of this analysis?

a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.

b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.

c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:

For the reaction $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **Ca**, **O**, **H**, and **C** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of Ca: _____	Mass (g) of Ca: _____
Mass (g) of O: _____	Mass (g) of O: _____
Mass (g) of H: _____	Mass (g) of H: _____
Mass (g) of C: _____	Mass (g) of C: _____

Which statement is an accurate summary of this analysis?

a. The mass of one or more of the elements changes; but the total mass remains constant.

b. The mass of one or more of the elements changes; the total mass also changes.

c. The mass of each element is conserved (does not change) during this reaction.

Question 24

Consider the reaction $Ba(OH)_2 + CO_2 \rightarrow BaCO_3 + H_2O$. Count the number of atoms of the elements **Ba**, **O**, **H**, and **C** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of Ba: _____	# atoms of Ba: _____
# atoms of O: _____	# atoms of O: _____
# atoms of H: _____	# atoms of H: _____
# atoms of C: _____	# atoms of C: _____

Which statement is an accurate summary of this analysis?

a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.

b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.

c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:

For the reaction $Ba(OH)_2 + CO_2 \rightarrow BaCO_3 + H_2O$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **Ba**, **O**, **H**, and **C** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of Ba: _____	Mass (g) of Ba: _____
Mass (g) of O: _____	Mass (g) of O: _____
Mass (g) of H: _____	Mass (g) of H: _____
Mass (g) of C: _____	Mass (g) of C: _____

Which statement is an accurate summary of this analysis?

a. The mass of one or more of the elements changes; but the total mass remains constant.

b. The mass of one or more of the elements changes; the total mass also changes.

c. The mass of each element is conserved (does not change) during this reaction.

Question Group 9
Question 25
Consider the reaction $2\ HCl + Mg(OH)_2 \rightarrow MgCl_2 + 2\ H_2O$. Count the number of atoms of the elements **H**, **Cl**, **Mg**, and **O** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of H: _____	# atoms of H: _____
# atoms of Cl: _____	# atoms of Cl: _____
# atoms of Mg: _____	# atoms of Mg: _____
# atoms of O: _____	# atoms of O: _____

Which statement is an accurate summary of this analysis?
a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.
b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.
c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:
For the reaction $2\ HCl + Mg(OH)_2 \rightarrow MgCl_2 + 2\ H_2O$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **H**, **Cl**, **Mg**, and **O** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of H: _____	Mass (g) of H: _____
Mass (g) of Cl: _____	Mass (g) of Cl: _____
Mass (g) of Mg: _____	Mass (g) of Mg: _____
Mass (g) of O: _____	Mass (g) of O: _____

Which statement is an accurate summary of this analysis?
a. The mass of one or more of the elements changes; but the total mass remains constant.
b. The mass of one or more of the elements changes; the total mass also changes.
c. The mass of each element is conserved (does not change) during this reaction.

Question 26

Consider the reaction $H_2SO_4 + 2\ NaOH \rightarrow Na_2SO_4 + 2\ H_2O$. Count the number of atoms of the elements **H**, **S**, **O**, and **Na** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of H: _____	# atoms of H: _____
# atoms of S: _____	# atoms of S: _____
# atoms of O: _____	# atoms of O: _____
# atoms of Na: _____	# atoms of Na: _____

Which statement is an accurate summary of this analysis?

a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.

b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.

c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:

For the reaction $H_2SO_4 + 2\ NaOH \rightarrow Na_2SO_4 + 2\ H_2O$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **H**, **S**, **O**, and **Na** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of H: _____	Mass (g) of H: _____
Mass (g) of S: _____	Mass (g) of S: _____
Mass (g) of O: _____	Mass (g) of O: _____
Mass (g) of Na: _____	Mass (g) of Na: _____

Which statement is an accurate summary of this analysis?

a. The mass of one or more of the elements changes; but the total mass remains constant.

b. The mass of one or more of the elements changes; the total mass also changes.

c. The mass of each element is conserved (does not change) during this reaction.

Question 27

Consider the reaction $H_3PO_4 + 3\ NaOH \rightarrow Na_3PO_4 + 3\ H_2O$. Count the number of atoms of the elements **H**, **P**, **O**, and **Na** on both sides of the equation.

Reactant Side:	**Product Side:**
# atoms of H: _____	# atoms of H: _____
# atoms of P: _____	# atoms of P: _____
# atoms of O: _____	# atoms of O: _____
# atoms of Na: _____	# atoms of Na: _____

Which statement is an accurate summary of this analysis?

a. Atoms of one element are changed into atoms of another element but the total number of atoms does not change.

b. Atoms of one element are changed into atoms of another element; the total number of atoms changes during the reaction.

c. The number of atoms of each of the elements is conserved (does not change) during this reaction.

Macroscopic Scale Analysis:

For the reaction $H_3PO_4 + 3\ NaOH \rightarrow Na_3PO_4 + 3\ H_2O$, the coefficients indicate the number of moles of each reactant and product involved in the reaction. Calculate the grams of the elements **H**, **P**, **O**, and **Na** on both sides of the equation.

Reactant Side:	**Product Side:**
Mass (g) of H: _____	Mass (g) of H: _____
Mass (g) of P: _____	Mass (g) of P: _____
Mass (g) of O: _____	Mass (g) of O: _____
Mass (g) of Na: _____	Mass (g) of Na: _____

Which statement is an accurate summary of this analysis?

a. The mass of one or more of the elements changes; but the total mass remains constant.

b. The mass of one or more of the elements changes; the total mass also changes.

c. The mass of each element is conserved (does not change) during this reaction.