

Question #: 1

Which of the following statements is(are) **true** for ionic bonds?

Select all that apply.

- A. These bonds typically form between a metal and a nonmetal.
 - B. The formation of these bonds involves the transfer of electron(s) between atoms.
 - C. The formation of these bonds involves the sharing of electron(s) between atoms.
 - D. These bonds typically form between nonmetals.
-

Question #: 2

What is the empirical formula for $C_6H_{12}O_2$?

- A. CHO
 - B. C_3H_6O
 - C. C_2H_4O
 - D. $C_{12}H_{24}O_4$
-

Question #: 3

Select **all** of the **ionic** compound(s).

- A. N_2O_4
 - B. $BaCl_2$
 - C. NH_4Br
 - D. $FeSO_4$
 - E. SF_4
-

Question #: 4

Which of the following is the formula for calcium perchlorate?

- A. $CaClO$
 - B. $CaClO_3$
 - C. $CaClO_4$
 - D. $Ca(ClO_4)_2$
-

Question #: 5

What is the name of N_2O_5 ?

- A. dinitrogen pentoxide
 - B. nitrogen oxide
 - C. nitrogen(IV) oxide
 - D. nitrogen(II) oxide
-

Question #: 6

A 0.138 kg crystal of calcium chloride contains 1 formula units of $CaCl_2$.

Report your answer with **three significant figures** using the form 2.20E2 for exponential notation.

1. _____

Question #: 7

What is the percent composition by mass of Al in Al_2O_3 ?

1 %

Report your answer with **three significant figures** and **do not include units**.

1. _____

Question #: 8

How many moles of oxygen are present in 11.5 moles of $\text{Al}_2(\text{SO}_4)_3$?

1 moles

Report your answer to the **correct number of significant figures** and **do not include units**.

1. _____

Question #: 9

Determine the empirical formula for a compound that is 29.44% calcium, 23.55% sulfur and 47.01% oxygen by mass.

- A. Ca_2SO_2
 - B. CaSO_2
 - C. Ca_2SO_3
 - D. CaSO_4
-

Question #: 10

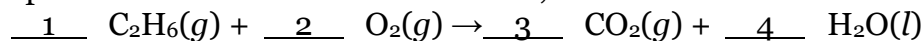
What is the molecular formula for a compound with a molar mass of 504.4 g/mol and composition 42.9% carbon, 6.39% hydrogen and 50.7% oxygen?

- A. $\text{C}_{20}\text{H}_{30}\text{O}_{18}$
 - B. $\text{C}_9\text{H}_{16}\text{O}_8$
 - C. $\text{C}_{18}\text{H}_{32}\text{O}_{16}$
 - D. CH_2O
-

Question #: 11

Balance this chemical equation showing the reaction of ethane with oxygen with the smallest possible **whole numbers**.

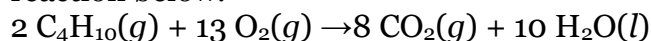
Fill in the blanks with the proper coefficients. If the coefficient is 1, fill in 1.



- 1. _____
 - 2. _____
 - 3. _____
 - 4. _____
-

Question #: 12

1 g of oxygen gas are required to completely react with 0.420 mol of C_4H_{10} according to the reaction below.

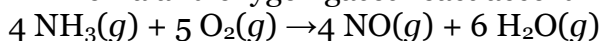


Report your answer with **three significant figures** and **do not include units**.

1. _____

Question #: 13

Ammonia and oxygen gases react according to the balanced chemical equation below.



If 2.50 grams of $\text{NH}_3(g)$ react with 2.85 grams of $\text{O}_2(g)$, how many grams of $\text{NO}(g)$ are produced? Assume 100% yield.

1 grams

Report your answer with **three significant figures** and **do not include units**.

1. _____

Question #: 14

The percent yield of a reaction is 89.9%. What is the actual yield for this reaction, if the theoretical yield is 55.0 grams?

Actual yield = 1 g

Report your answer with **three significant figures** and **do not include units**.

1. _____

Question #: 15

What is the molarity of a solution formed by dissolving 468 mg of MgI_2 (molar mass 278.1 g/mol) in enough water to yield 50.0 mL of solution?

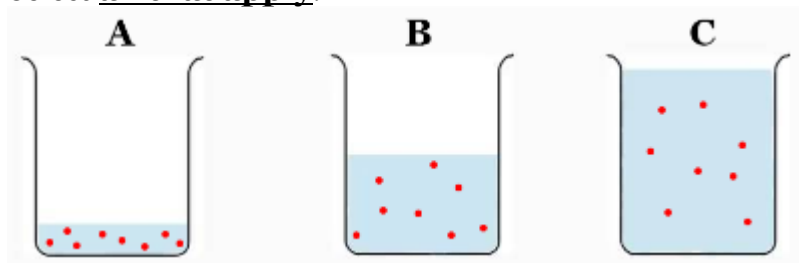
- A. 0.0297 M
 - B. 0.0337 M
 - C. 0.0936 M
 - D. 0.0107 M
-

Question #: 16

Which statement(s) is/are **true** about solutions A, B, and C?

Red dots represent solute and light blue represents solvent.

Select **all that apply**.



- A. Solution A has a higher concentration than solution B.
- B. Solution C is more dilute than solution B.
- C. Solutions B and C have the same concentration.
- D. Solution A is the most dilute.

Question #: 17

Which of the following statements is/are **true** about Na_2SO_4 added to water?

Select **all that apply**.

- A. Na_2SO_4 is soluble.
 - B. Na_2SO_4 is a nonelectrolyte.
 - C. Na_2SO_4 is a strong electrolyte.
 - D. Na_2SO_4 is a weak electrolyte
 - E. Na_2SO_4 is insoluble.
-

Question #: 18

Which of the following reactions produces a precipitate?

- A. $\text{CoCl}_2(aq) + \text{Na}_2\text{SO}_4(aq) \rightarrow \text{CoSO}_4(aq) + 2 \text{NaCl}(aq)$
 - B. $2 \text{LiBr}(aq) + \text{Hg}_2(\text{NO}_3)_2(aq) \rightarrow \text{Hg}_2\text{Br}_2(s) + 2 \text{LiNO}_3(aq)$
 - C. $\text{KCl}(aq) + \text{NaBr}(aq) \rightarrow \text{KBr}(aq) + \text{NaCl}(aq)$
 - D. $\text{HBr}(aq) + \text{KOH}(aq) \rightarrow \text{KBr}(aq) + \text{H}_2\text{O}(l)$
-

Question #: 19

What is the **net ionic** equation for the reaction that occurs when aqueous solutions of H_2SO_4 and KOH are mixed?

- A. $\text{H}^+(aq) + \text{OH}^-(aq) \rightarrow \text{H}_2\text{O}(l)$
 - B. $2 \text{K}^+(aq) + \text{SO}_4^{2-}(aq) \rightarrow \text{K}_2\text{SO}_4(s)$
 - C. $\text{H}^+(aq) + \text{OH}^-(aq) + 2 \text{K}^+(aq) + \text{SO}_4^{2-}(aq) \rightarrow \text{H}_2\text{O}(l) + \text{K}_2\text{SO}_4(s)$
 - D. $2 \text{H}^+(aq) + \text{SO}_4^{2-}(aq) + 2 \text{K}^+(aq) + 2 \text{OH}^-(aq) \rightarrow 2 \text{H}_2\text{O}(l) + 2 \text{K}^+(aq) + \text{SO}_4^{2-}(aq)$
-

Question #: 20

A 25.2 mL sample of an aqueous nitric acid (HNO_3) solution requires 16.3 mL of 0.105 M $\text{Ba}(\text{OH})_2$ to reach the equivalence point.

The concentration of the HNO_3 solution is 1 M.

Report your answer with **three significant figures** and **do not include units**.

1. _____
-

Question #: 21

Which one of the following pairs of reactants undergoes a gas-evolution reaction?

- A. $\text{HCl}(aq) + \text{NaHCO}_3(aq) \rightarrow$
- B. $\text{HCl}(aq) + \text{NaOH}(aq) \rightarrow$
- C. $2 \text{Na}(s) + \text{Cl}_2(g) \rightarrow$
- D. $4 \text{Fe}(s) + \text{O}_2(g) \rightarrow$

Question #: 22

Determine the oxidation number for each element in H_3PO_4 .

H 1

P 2

O 3

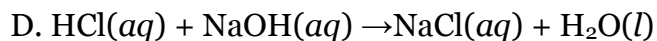
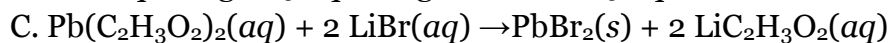
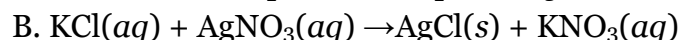
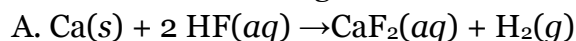
1. _____

2. _____

3. _____

Question #: 23

Which one of the following is a redox reaction?

**Question #: 24**

The atmospheric pressure supports a column of mercury 695 mm tall in a barometer.

What is this pressure in torr and in atmospheres?

The pressure is 1 torr and 2 atm.

Report your answers with **three significant figures** and **do not include units**.

1. _____

2. _____

Question #: 25

A sample of $\text{N}_2(g)$ occupies 25.0 mL at 25.0 °C. At what temperature **in °C** does the volume of the gas sample double if the pressure is held constant?

 1 °C

Report your answer with **three significant figures** and **do not include units**.

1. _____

Question #: 26

To what temperature must an ideal gas inside a rigid container be cooled in order to have a pressure of 2.00 atm, when the initial temperature and pressure are 288 K and 4.00 atm, respectively?

A. 72.0 K

B. 144 K

C. 36.0 K

D. 576 K

Question #: 27

Which of the following statements is **not** consistent with the ideal gas law?

- A. The volume of the gas is inversely proportional to pressure of the gas.
 - B. The number of moles of gas is proportional to the volume of the gas.
 - C. The ideal gas constant is independent of the identity of the gas.
 - D. The volume of the gas is inversely proportional to the temperature of the gas.
-

Question #: 28

What volume does 2.34 mol of an ideal gas occupy at a temperature of 25.0 °C and a pressure of 785 torr?

 1 L

Report your answer with **three significant figures** and **do not include units**.

1. _____

Question #: 29

A 2.524 g sample of gas in a 0.435 L vessel exerts a pressure of 2.00 atm at 388 K. What is the molar mass of the gas?

- A. 92.4 g/mol
 - B. 13.1 g/mol
 - C. 44.3 g/mol
 - D. 73.1 g/mol
-

Question #: 30

What mass of solid product will be produced when 25.0 mL of 0.300 M CaCl₂ are mixed with 35.0 mL of 0.250 M AgNO₃? Assume 100% yield.

- A. 2.15 g
- B. 1.25 g
- C. 1.44 g
- D. 2.46 g

DRAFT
Do Not Use Until Posted.

Course Name: -

Exam Psychometrics:

Mean	Median	Minimum Score	Maximum Score
20.94	21.50	-	-

Question #: 1

Which of the following statements is(are) **true** for ionic bonds?

Select all that apply.

- A. These bonds typically form between a metal and a nonmetal.
- B. The formation of these bonds involves the transfer of electron(s) between atoms.
- C. The formation of these bonds involves the sharing of electron(s) between atoms.
- D. These bonds typically form between nonmetals.

Rationale: CHE 105 Ex 2 #1

Question #: 2

What is the empirical formula for $C_6H_{12}O_2$?

- A. CHO
 - B. C_3H_6O
 - C. C_2H_4O
 - D. $C_{12}H_{24}O_4$
-

Question #: 3

Select **all** of the **ionic** compound(s).

- A. N_2O_4
- B. $BaCl_2$

- ✓C. NH_4Br
- ✓D. FeSO_4
- E. SF_4

Question #: 4

Which of the following is the formula for calcium perchlorate?

- A. CaClO
- B. CaClO_3
- C. CaClO_4
- ✓D. $\text{Ca}(\text{ClO}_4)_2$

Question #: 5

What is the name of N_2O_5 ?

- ✓A. dinitrogen pentoxide
- B. nitrogen oxide
- C. nitrogen(IV) oxide
- D. nitrogen(II) oxide

Question #: 6

A 0.138 kg crystal of calcium chloride contains 1 formula units of CaCl_2 .

Report your answer with **three significant figures** using the form 2.20E2 for exponential notation.

1. 7.49E23|7.49E+23|7.49 E23|7.49 E+23|

Rationale: Answers from 7.34E23 to 7.63E23 (+/- 2%) with 2, 3 or 4 significant figures (in a few cases, 3 decimal places) were accepted.

Question #: 7

What is the percent composition by mass of Al in Al_2O_3 ?

1 %

Report your answer with **three significant figures** and **do not include units**.

1. 52.9

Rationale: Answers from 51.8 to 54.0 (+/- 2%) with 2, 3 or 4 significant figures (in a few cases, 3 decimal places) were accepted.

Question #: 8

How many moles of oxygen are present in 11.5 moles of $\text{Al}_2(\text{SO}_4)_3$?

1 moles

Report your answer to the **correct number of significant figures** and **do not include units**.

1. 138

Rationale: Answers from 135 to 141 (+/- 2%) with 2, 3 or 4 significant figures were accepted.

Question #: 9

Determine the empirical formula for a compound that is 29.44% calcium, 23.55% sulfur and 47.01% oxygen by mass.

- A. Ca_2SO_2
 - B. CaSO_2
 - C. Ca_2SO_3
 - ✓D. CaSO_4
-

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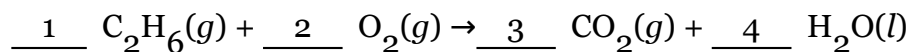
What is the molecular formula for a compound with a molar mass of 504.4 g/mol and composition 42.9% carbon, 6.39% hydrogen and 50.7% oxygen?

- A. $\text{C}_{20}\text{H}_{30}\text{O}_{18}$
- B. $\text{C}_9\text{H}_{16}\text{O}_8$
- ✓C. $\text{C}_{18}\text{H}_{32}\text{O}_{16}$
- D. CH_2O

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Balance this chemical equation showing the reaction of ethane with oxygen with the smallest possible **whole numbers**.

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1. 2

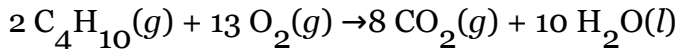
2. 7

3. 4

4. 6

Question #: 12

1 g of oxygen gas are required to completely react with 0.420 mol of C_4H_{10} according to the reaction below.



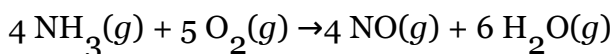
Report your answer with **three significant figures** and **do not include units**.

1. 87.4

Rationale: Answers from 85.689.2 (+/- 2%) with 2, 3 or 4 significant figures (in a few cases, 3 decimal places) were accepted.

Question #: 13

Ammonia and oxygen gases react according to the balanced chemical equation below.



If 2.50 grams of $\text{NH}_3(g)$ react with 2.85 grams of $\text{O}_2(g)$, how many grams of $\text{NO}(g)$ are produced? Assume 100% yield.

1 grams

Report your answer with **three significant figures** and **do not include units**.

1. 2.14

Rationale: Answers from 2.10 to 2.18 (+/- 2%) with 2, 3 or 4 significant figures (in a few cases, 3 decimal places) were accepted.

Question #: 14

The percent yield of a reaction is 89.9%. What is the actual yield for this reaction, if the theoretical yield is 55.0 grams?

Actual yield = 1 g

Report your answer with **three significant figures** and **do not include units**.

1. 49.4

Rationale: Answers from 48.4 to 50.4 (+/- 2%) with 2, 3 or 4 significant figures (in a few cases, 3 decimal places) were accepted.

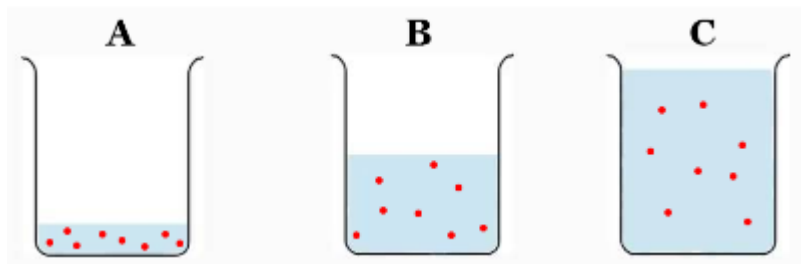
Question #: 15

What is the molarity of a solution formed by dissolving 468 mg of MgI_2 (molar mass 278.1 g/mol) in enough water to yield 50.0 mL of solution?

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- ✓B. 0.0337 M
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- D. 0.0107 M

Question #: 16

Which statement(s) is/are **true** about solutions A, B, and C?
Red dots represent solute and light blue represents solvent.
Select **all that apply**.



- ✓A. Solution A has a higher concentration than solution B.
- ✓B. Solution C is more dilute than solution B.
- C. Solutions B and C have the same concentration.
- D. Solution A is the most dilute.

Question #: 17

Which of the following statements is/are **true** about Na_2SO_4 added to water?

Select **all that apply**.

- ✓A. Na_2SO_4 is soluble.
- B. Na_2SO_4 is a nonelectrolyte.
- ✓C. Na_2SO_4 is a strong electrolyte.
- D. Na_2SO_4 is a weak electrolyte
- E. Na_2SO_4 is insoluble.

Question #: 18

Which of the following reactions produces a precipitate?

- A. $\text{CoCl}_2(aq) + \text{Na}_2\text{SO}_4(aq) \rightarrow \text{CoSO}_4(aq) + 2 \text{NaCl}(aq)$
- ✓B. $2 \text{LiBr}(aq) + \text{Hg}_2(\text{NO}_3)_2(aq) \rightarrow \text{Hg}_2\text{Br}_2(s) + 2 \text{LiNO}_3(aq)$
- C. $\text{KCl}(aq) + \text{NaBr}(aq) \rightarrow \text{KBr}(aq) + \text{NaCl}(aq)$
- D. $\text{HBr}(aq) + \text{KOH}(aq) \rightarrow \text{KBr}(aq) + \text{H}_2\text{O}(l)$

Question #: 19

What is the **net ionic** equation for the reaction that occurs when aqueous solutions of H_2SO_4 and KOH are mixed?

- ✓A. $\text{H}^+(aq) + \text{OH}^-(aq) \rightarrow \text{H}_2\text{O}(l)$
 - B. $2 \text{K}^+(aq) + \text{SO}_4^{2-}(aq) \rightarrow \text{K}_2\text{SO}_4(s)$
 - C. $\text{H}^+(aq) + \text{OH}^-(aq) + 2 \text{K}^+(aq) + \text{SO}_4^{2-}(aq) \rightarrow \text{H}_2\text{O}(l) + \text{K}_2\text{SO}_4(s)$
 - D. $2 \text{H}^+(aq) + \text{SO}_4^{2-}(aq) + 2 \text{K}^+(aq) + 2 \text{OH}^-(aq) \rightarrow 2 \text{H}_2\text{O}(l) + 2 \text{K}^+(aq) + \text{SO}_4^{2-}(aq)$
-

Question #: 20

A 25.2 mL sample of an aqueous nitric acid (HNO_3) solution requires 16.3 mL of 0.105 M $\text{Ba}(\text{OH})_2$ to reach the equivalence point.

The concentration of the HNO_3 solution is 1 M.

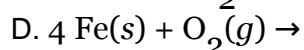
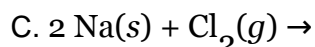
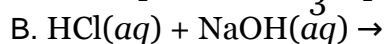
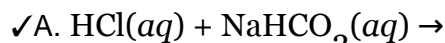
Report your answer with **three significant figures** and **do not include units**.

1. 0.136

Rationale: Answers from 0.133 to 0.139 (+/- 2%) with 2, 3 or 4 significant figures were accepted.

Question #: 21

Which one of the following pairs of reactants undergoes a gas-evolution reaction?



Rationale: CHE 105 Ex 2 F15 #21

Question #: 22

Determine the oxidation number for each element in H_3PO_4 .

H 1

P 2

O 3

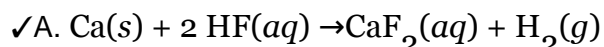
1. +1|1|1+|one|

2. five|+5|5|5+|

3. -2|2-|

Question #: 23

Which one of the following is a redox reaction?



- B. $\text{KCl}(aq) + \text{AgNO}_3(aq) \rightarrow \text{AgCl}(s) + \text{KNO}_3(aq)$
C. $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2(aq) + 2 \text{LiBr}(aq) \rightarrow \text{PbBr}_2(s) + 2 \text{LiC}_2\text{H}_3\text{O}_2(aq)$
D. $\text{HCl}(aq) + \text{NaOH}(aq) \rightarrow \text{NaCl}(aq) + \text{H}_2\text{O}(l)$
-

Question #: 24

The atmospheric pressure supports a column of mercury 695 mm tall in a barometer. What is this pressure in torr and in atmospheres?

The pressure is 1 torr and 2 atm.

Report your answers with **three significant figures** and **do not include units**.

- 695
- 0.914

Rationale: Answers from 681 to 709 and 0.896 to 0.932 (+/- 2%) with 2, 3 or 4 significant figures (in a few cases, 3 decimal places) were accepted.

Question #: 25

A sample of $\text{N}_2(g)$ occupies 25.0 mL at 25.0 °C. At what temperature in °C does the volume of the gas sample double if the pressure is held constant?

1 °C

Report your answer with **three significant figures** and **do not include units**.

- 323

Rationale: Answers from 316 to 330. (+/- 2%) with 2, 3 or 4 significant figures (in a few cases, 3 decimal places) were accepted.

Question #: 26

To what temperature must an ideal gas inside a rigid container be cooled in order to have a pressure of 2.00 atm, when the initial temperature and pressure are 288 K and 4.00 atm, respectively?

- 72.0 K
- 144 K
- 36.0 K

D. 576 K

Question #: 27

Which of the following statements is **not** consistent with the ideal gas law?

- A. The volume of the gas is inversely proportional to pressure of the gas.
 - B. The number of moles of gas is proportional to the volume of the gas.
 - C. The ideal gas constant is independent of the identity of the gas.
 - ✓D. The volume of the gas is inversely proportional to the temperature of the gas.
-

Question #: 28

What volume does 2.34 mol of an ideal gas occupy at a temperature of 25.0 °C and a pressure of 785 torr?

1 L

Report your answer with **three significant figures** and **do not include units**.

1. 55.4

Rationale: Answers from 54.3 to 56.5 (+/- 2%) with 2, 3 or 4 significant figures (in a few cases, 3 decimal places) were accepted.

Question #: 29

A 2.524 g sample of gas in a 0.435 L vessel exerts a pressure of 2.00 atm at 388 K. What is the molar mass of the gas?

- ✓A. 92.4 g/mol
 - B. 13.1 g/mol
 - C. 44.3 g/mol
 - D. 73.1 g/mol
-

Question #: 30

What mass of solid product will be produced when 25.0 mL of 0.300 M CaCl_2 are mixed with 35.0 mL of 0.250 M AgNO_3 ? Assume 100% yield.

A. 2.15 g

✓B. 1.25 g

C. 1.44 g

D. 2.46 g