

## CHE 105 Exam 1 Spring 2016

Your Name: \_\_\_\_\_ Your ID: \_\_\_\_\_

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### Question #: 1

Which one of the following states of matter does **not** take on the shape of its container?

- A. solid
  - B. liquid
  - C. gas
- 

### Question #: 2

Which statement is **not** true about the gaseous state?

- A. Gases are compressible.
  - B. Gases have about the same density as liquids of the same composition.
  - C. The distances between gas molecules are much larger than the size of the molecules.
  - D. Gases can form mixtures with variable proportions of their components.
- 

### Question #: 3

Which pair lists a compound first, then an element?

- A. Na and NO
  - B. calcium and chromium
  - C. CO and water
  - D. CO and Co
- 

### Question #: 4

Which one of the following is a **chemical** property of water?

- A. Water decomposes to form hydrogen and oxygen.
  - B. Water boils at 100 °C.
  - C. Boiling 25 g of water requires more energy than melting 25 g of ice.
  - D. The density of ice is less than the density of liquid water.
- 

### Question #: 5

When an apple falls from a tree and accelerates toward the ground, the potential energy of the apple   1   [increases, decreases, stays the same] while the kinetic energy of the apple   2   [increases, decreases, stays the same].

1. \_\_\_\_\_

2. \_\_\_\_\_

---

**Question #: 6**

The usual adult dose of ampicillin for respiratory tract infections is 250. mg. Convert this mass to kg and report the answer in scientific notation with the correct number of significant figures.

1 × 10<sup>-2</sup> kg

1. \_\_\_\_\_

2. \_\_\_\_\_

---

**Question #: 7**

What is the value of 0.000329 in scientific notation? Fill in the blanks with the correct numbers.

1 × 10<sup>-2</sup>

1. \_\_\_\_\_

2. \_\_\_\_\_

---

**Question #: 8**

An empty beaker weighs 23.9 grams. When the beaker is filled with mercury, the total mass of the beaker and its contents is 1.5 kilograms. The beaker contains 1 mL of mercury. The density of mercury is 13.5 g/cm<sup>3</sup>.

Report your answer with the correct number of significant figures, without units, using the format 2.2E2 or 2.2E-2 if you use scientific notation.

1. \_\_\_\_\_

---

**Question #: 9**

Which of these properties is **dependent** on the amount of a pure substance in a sample?

- A. temperature
- B. volume
- C. density
- D. molar mass

---

**Question #: 10**

10.915 - (1.035 + 0.28) = 1

Report your answer with the **correct** number of significant figures and do **not** use scientific notation.

1. \_\_\_\_\_

---

**Question #: 11**

What is the result of the following calculation with the correct number of significant figures?

$$\frac{(6.626 \times 10^{-34})(2.9979 \times 10^8)}{4.170 \times 10^{-7}} =$$

- A.  $4.217 \times 10^{-19}$
- B.  $4.2174 \times 10^{-19}$
- C.  $4.764 \times 10^{-19}$
- D.  $8.28 \times 10^{-32}$

---

**Question #: 12**

A cyclist rides at an average speed of 18 miles per hour. What is this speed in kilometers per second (km/s)?

  1   km/s

Report your answer with **two** significant figures, without units, and in the form 2.2E2 or 2.2E-2 if you use scientific notation.

1. \_\_\_\_\_

---

**Question #: 13**

A container has a volume of 3.4 ft<sup>3</sup>. What is the equivalent volume in liters?

  1   L

Report your answer to **two** significant figures and without units.

1. \_\_\_\_\_

---

**Question #: 14**

Dalton's atomic theory is built on four postulates. Which postulate was modified by the discovery of isotopes?

- A. Each element is composed of tiny, indestructible particles called atoms.
- B. All atoms of a given element are identical.
- C. Compounds are composed of atoms of more than one element.
- D. Atoms are neither created or destroyed in chemical reactions.

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**Question #: 15**

Two samples of sodium chloride (NaCl) were decomposed into their constituent elements.

A 406 g sample produced 161 g of sodium and 245 g of chlorine.

A 174 g sample produced 69 g of sodium and 105 g of chlorine.

This experiment demonstrates the law(s) of \_\_\_\_\_.

Choose **all** correct answers.

- A. conservation of mass
- B. definite proportions
- C. multiple proportions
- D. mass action

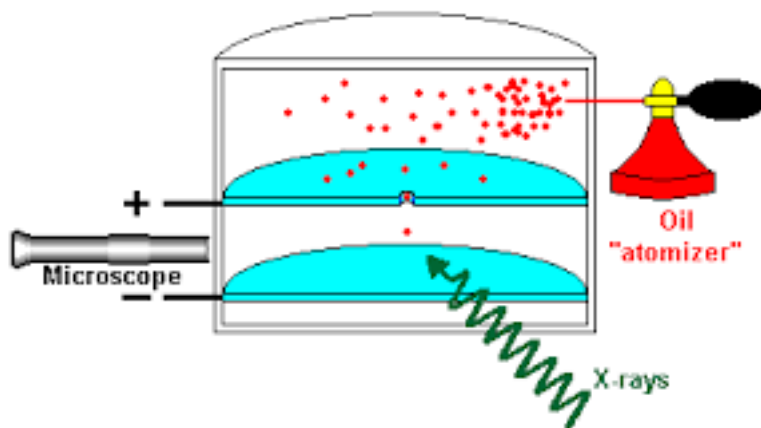
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**Question #: 16**

In the apparatus shown, oil drops acquire extra electrons. Their free fall and size can be observed through the microscope.

Millikan compared the masses of many oil drops with the strength of the electric field required to halt each one's free fall.

This experiment allowed the determination of the   1   of the electron. Combined with Thomson's earlier measurement of the deflection of an electron beam by electric and magnetic fields, the   2   of the electron was deduced.



1. \_\_\_\_\_

2. \_\_\_\_\_

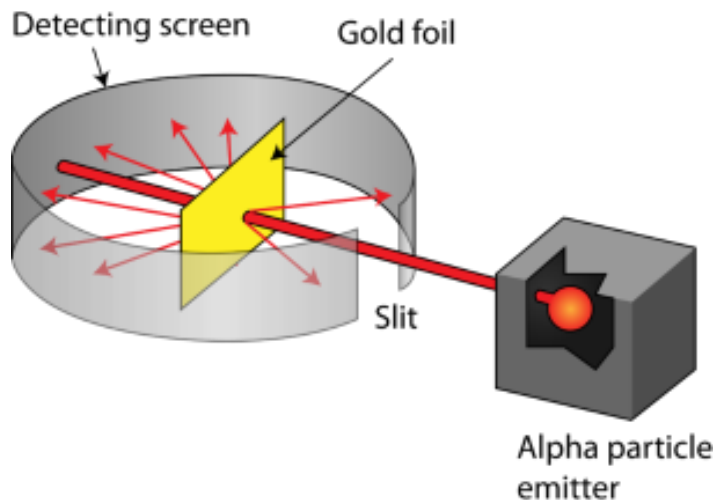
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**Question #: 17**

Rutherford observed that although most particles pass through thin gold foil with little or no deflection, a few particles are deflected by large angles. This experiment demonstrated that

Choose **all** that apply.

- A. there are neutrons present in the nucleus of a gold atom.
- B. the positive charge and the negative charge of a gold atom are both dispersed throughout the volume of the atom.
- C. most of a gold atom's mass and all of its positive charge are concentrated in a small nucleus.
- D. most of the volume of a gold atom consists of empty space throughout which electrons are dispersed.



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**Question #: 18**

Which particle(s) account(s) for the fact that the mass of a helium atom is about four times the mass of a hydrogen atom even though a helium atom contains only one more proton than a hydrogen atom?

- A. proton
- B. neutron
- C. electron
- D. proton and electron

---

**Question #: 19**

Complete each sentence with "**larger**," "**smaller**" or "**about equal**."

An electron is   1   in mass compared to a neutron.

An electron is   2   in mass compared to a proton.

A proton is   3   in mass compared to a neutron.

1. \_\_\_\_\_

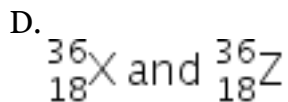
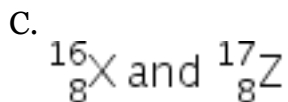
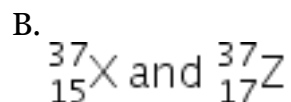
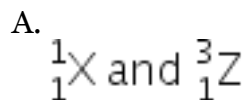
2. \_\_\_\_\_

3. \_\_\_\_\_

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**Question #: 20**

Select **all** of the following that are pairs of isotopes. Atomic symbols X and Z may be the same or different element in a pair.



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**Question #: 21**

How many protons, neutrons, and electrons are in the most common ion formed from magnesium-26?

  1   protons

  2   neutrons

  3   electrons

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

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**Question #: 22**

Classify each description below as typical of a **metal** or a **nonmetal**.

tendency to lose electrons in chemical reactions:   1  

tendency to gain electrons in chemical reactions:   2  

found at the upper right of the periodic table:   3  

majority of elements:   4  

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

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**Question #: 23**

Choose the atom or ion below that does **not** have the same number of electrons as the other three.

- A.  $\text{Ca}^{2+}$
- B. Ar
- C.  $\text{S}^{2-}$
- D.  $\text{Cl}^+$

---

**Question #: 24**

An imaginary element, E, exists as three naturally occurring isotopes:

$^{13}\text{E}$  (exact mass 13.15, 10% abundance),  $^{14}\text{E}$  (exact mass 14.10, 60% abundance), and  $^{15}\text{E}$  (exact mass 15.20, 30% abundance).

What is the average atomic mass of this imaginary element?

- A. 14.23 amu
- B. 15.20 amu
- C. 14.02 amu
- D. 14.34 amu

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**Question #: 25**

Which of the following samples has the largest number of atoms?

- A. 14.0 g C
- B. 54.0 g Cr
- C. 151 g Ag
- D. 202 g Pb

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**Question #: 26**

How many Sc atoms are in  $4.5 \times 10^4$  mg of Sc?

1  $\times 10^{-2}$  atoms

Report your answer with **two** significant digits.

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_

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**Question #: 27**

A pure copper wire made of 5.2 moles of Cu has a mass of 1 kilograms.

Report your answer with **two** significant figures, using the format 2.2E2 or 2.2E-2 for scientific notation.

- 1. \_\_\_\_\_

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**Question #: 28**

How many moles of potassium are present in a sample with a mass of 29 g?

1 moles

Report your answer with two significant figures and without units. Do **not** use scientific notation.

1. \_\_\_\_\_

---

**Question #: 29**

How many moles are in a sample with  $4.39 \times 10^{24}$  atoms of Na?

1 moles

Report your answer with **three** significant digits.

1. \_\_\_\_\_

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**Question #: 30**

Manufacturers of recycled paper carefully monitor the content of heavy metals, especially lead, in their products. The results of three different methods of lead removal are shown below.

Considering the error associated with each method in the table, answer the following questions.

The **range** of residual lead using **Method B** is from a low of 1 mg/kg to a high of 2 mg/kg.

The **most precise** method for removing lead from recycled paper is **Method** 3 [A, B or C].

Method	Residual Lead in Recycled Paper (mg/kg)
A	$3.5 \pm 0.4$
B	$2.8 \pm 0.5$
C	$2.4 \pm 0.6$

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_



CHE 105 Exam 1 Spring 2016 - key

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**Question #: 1**

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- A. solid
- B. liquid
- C. gas

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Which statement is **not** true about the gaseous state?

- A. Gases are compressible.
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When an apple falls from a tree and accelerates toward the ground, the potential energy of the apple 1 [increases, decreases, stays the same] while the kinetic energy of the apple 2 [increases, decreases, stays the same].

- 1. decreases|decrease|
- 2. increases|increase|

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1 × 10<sup>-2</sup> kg

- 1. 2.50
- 2. .4

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What is the value of 0.000329 in scientific notation? Fill in the blanks with the correct numbers.

1 × 10<sup>-2</sup>

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- 

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1. 1.1E2|1.1 e 2|1.1E2|1.1 E 2|110|
- 

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**Question #: 10**

10.915 - (1.035 + 0.28) = 1

Report your answer with the **correct** number of significant figures and do **not** use scientific notation.

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1 km/s

Report your answer with **two** significant figures, without units, and in the form 2.2E2 or 2.2E-2 if you use scientific notation.

1. 0.0080|0.0081|0.0079|8.0E-3|8.1E-3|7.9E-3|8.0 E -3|8.1 E -3|7.9 E

-3|8.0e-3|8.1e-3|7.9e-3|8.0 e -3|8.1 e -3|7.9 e -3|

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A container has a volume of 3.4 ft<sup>3</sup>. What is the equivalent volume in liters?

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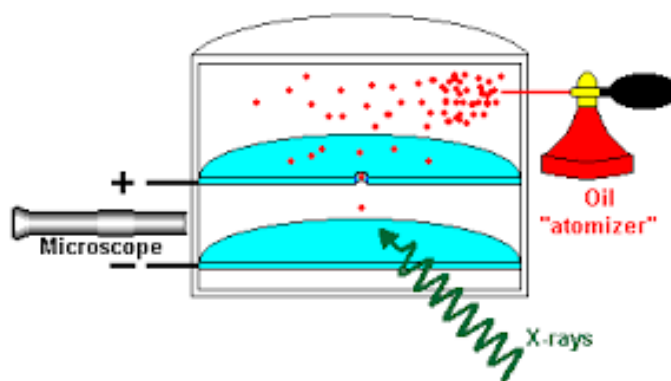
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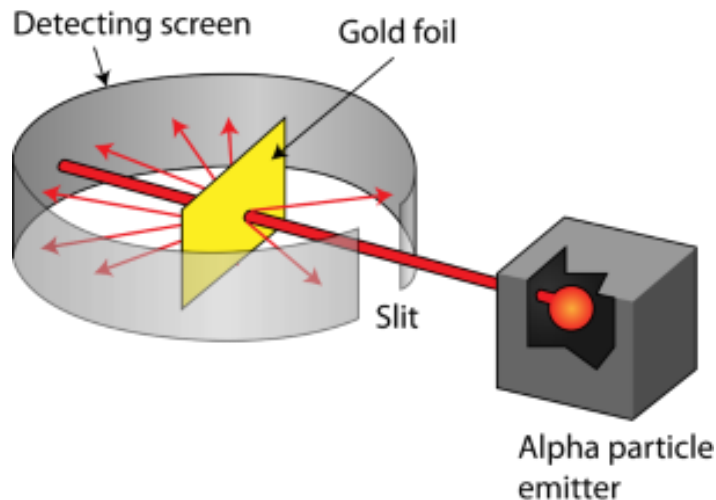
1. charge|fundamental charge|negative charge|unit charge|
2. mass

---

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Rutherford observed that although most particles pass through thin gold foil with little or no deflection, a few particles are deflected by large angles. This experiment demonstrated that \_\_\_\_\_

Choose **all** that apply.



- A. there are neutrons present in the nucleus of a gold atom.
- B. the positive charge and the negative charge of a gold atom are both dispersed throughout the volume of the atom.
- ✓ C. most of a gold atom's mass and all of its positive charge are concentrated in a small nucleus.
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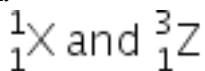
1. smaller|small|
2. smaller|small|
3. about equal|aboutequal|equal|

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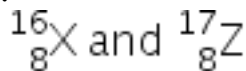
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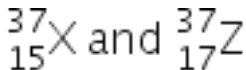
✓ A.



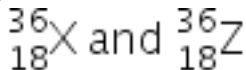
✓ C.



B.



D.

**Question #: 21**

How many protons, neutrons, and electrons are in the most common ion formed from magnesium-26?

1 protons

2 neutrons

3 electrons

1. 12|twelve|

2. 14|fourteen|

3. 10|ten|

---

**Question #: 22**

Classify each description below as typical of a **metal** or a **nonmetal**.

tendency to lose electrons in chemical reactions: 1

tendency to gain electrons in chemical reactions: 2

found at the upper right of the periodic table: 3

majority of elements: 4

1. metals|metal|

2. nonmetal|nonmetals|non-metal|non-metals|

3. nonmetal|nonmetals|non-metal|non-metals|

4. metals|metal|

---

**Question #: 23**

Choose the atom or ion below that does **not** have the same number of electrons as the other three.

A.  $\text{Ca}^{2+}$

B. Ar

C.  $\text{S}^{2-}$

✓ D.  $\text{Cl}^+$

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**Question #: 24**

An imaginary element, E, exists as three naturally occurring isotopes:

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- B. 15.20 amu
- C. 14.02 amu
- ✓ D. 14.34 amu

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How many Sc atoms are in  $4.5 \times 10^4$  mg of Sc?

1  $\times 10^{-2}$  atoms

Report your answer with **two** significant digits.

- 1. 6.0|6.1|5.9|
- 2. 23

---

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A pure copper wire made of 5.2 moles of Cu has a mass of 1 kilograms.

Report your answer with **two** significant figures, using the format 2.2E2 or 2.2E-2 for scientific notation.

- 1. 3.3E-1|3.2E-1|3.4E-1|0.33|0.32|0.34|3.3 E -1|3.2 E -1|3.4 E -1|3.3e-1|3.2e-1|3.4e-1|3.3 e -1|3.2 e -1|3.4 e -1|

---

**Question #: 28**

How many moles of potassium are present in a sample with a mass of 29 g?

1 moles

Report your answer with two significant figures and without units. Do **not** use scientific notation.

- 1. 0.74|0.73|0.75|.74|.75|.73|7.4E-1|7.3E-1|7.5E-1|7.4 E -1|7.3 E -1|7.5 E -1|

---

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How many moles are in a sample with  $4.39 \times 10^{24}$  atoms of Na?

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Report your answer with **three** significant digits.

- 1. 7.29|7.28|7.30|

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The **most precise** method for removing lead from recycled paper is **Method**   3   [A, B or C].

Method	Residual Lead in Recycled Paper (mg/kg)
A	3.5 ±0.4
B	2.8 ±0.5
C	2.4 ±0.6

1. 2.3
2. 3.3
3. A|a|