Last Name _____ **Do Date** _____

First Name _____ **Section** **M** **T** **W** **R**

Exam 2 Review Practice 1
Atomic Mass

General Information

- This assignment is not due. This assignment is to provide you the opportunity to practice the material.
- Refer to Class Notes-034 for this material.
- Textbook: Chapter 4, Section 5
  - Note: In class, I provided you with the mass number that are whole numbers. The textbook gives you more accurate mass values for each isotope. Don't let that throw you.
- You can check your answers against the periodic table. The values should be close to each other (± 1 amu). If the atomic masses don't agree within ±1 amu, go back and check your work.
- You must show your work.
- Max Time: Remember that if you answer all questions at exactly Max Time, you will not finish the Exam.
- The last two pages include the solutions. I *highly* suggest that you work from your notes first.
  - Don't work backwards from the answer key. It didn't work for you last time.

Problems

1) Magnesium has three naturally-occurring isotopes: Magnesium-24 (78.99%), Magnesium-25 (10.00%), and Magnesium-26 (11.01%). Calculate the atomic mass (in amu) of magnesium. **Max Time: 4 min**

2) Silicon has three naturally-occurring isotopes: Silicon-28, Silicon-29, and Silicon-30. Their natural abundances are 92.23%, 4.68%, and 3.09%, respectively. Calculate the atomic mass (in amu) of silicon. **Max Time: 4 min**

3) Chromium has four naturally-occurring isotopes: Chromium-50 (4.345%), Chromium-52 (83.789%), Chromium-53 (9.501%), and Chromium-54 (2.365%). Calculate the atomic mass (in amu) of chromium. **Max Time: 5 min**

4) This question is conceptual; no calculations are involved. Rubidium has two naturally occurring isotopes: Rubidium-85 and Rubidium-87. The atomic mass of rubidium is 85.47 amu. Which isotope has a higher natural abundance (%-abundance)? Explain your answer in three or less sentences. **Max Time: 4 min**

Question 5 – Extra Credit

Bromine has two naturally occurring isotopes. Bromine-79 has a %-abundance of 50.69%.

5a) Calculate the %-abundance of the second isotope. (Don't over-think it, and – yes – show your work.)

5b) From the periodic table, obtain the atomic mass of bromine. You will use this in your calculation.

5c) Given the initial information – and your answer to Questions 5a and 5b – set up an equation that will allow you to determine the atomic mass of the second isotope. I only want the equation for this question. Do not solve.

5d) Solve the equation written in Question 5c to determine the atomic mass (in amu) of the second isotope.

5e) Round the value in 5c to a whole number. State the identity of the second isotope.

SOLUTIONS

1) Magnesium has three naturally-occurring isotopes: Magnesium-**24** (**78.99%**), Magnesium-**25** (**10.00%**), and Magnesium-**26** (**11.01%**). Calculate the atomic mass (in amu) of magnesium. **Max Time: 4 min**

atomic mass	=	(78.99%) (24 amu)	+	(10.00%) (25 amu)	+	(11.01%) (26 amu)		**Required**
		(2 points) (2 points)		(2 points) (2 points)		(2 points) (2 points)		
	=	$\left(\frac{78.99}{100}\right)$ (24 amu)	+	$\left(\frac{10.00}{100}\right)$ (25 amu)	+	$\left(\frac{11.01}{100}\right)$ (26 amu)		Recommended
	=	18.9576 amu	+	2.5 amu	+	2.862 amu		**Required**
		(2 points)		(2 points)		(2 points)		
	=	24.3196 amu	→	**24.32 amu**	←			

Final answer must have exactly <u>two</u> digits after the decimal point, regardless of sigfigs rules.

Periodic Table: 24.31 amu. Answer agrees within ± 1 amu. ✓

- 1 pt numerically correct
- 1 pt sigdigs
- 1 pt units must match work

Problem is worth 21 points.

2) Silicon has three naturally-occurring isotopes: Silicon-**28**, Silicon-**29**, and Silicon-**30**. Their natural abundances are **92.23%**, **4.68%**, and **3.09%**, respectively. Calculate the atomic mass (in amu) of silicon. **Max Time: 4 min**

atomic mass	=	(92.23%) (28 amu)	+	(4.68%) (29 amu)	+	(3.09%) (30 amu)		Required
		(2 points) (2 points)		(2 points) (2 points)		(2 points) (2 points)		
	=	$\left(\frac{92.23}{100}\right)$ (28 amu)	+	$\left(\frac{4.68}{100}\right)$ (29 amu)	+	$\left(\frac{3.09}{100}\right)$ (30 amu)		Recommended
	=	25.8244 amu	+	1.3572 amu	+	0.927 amu		Required
		(2 points)		(2 points)		(2 points)		
	=	28.1086 amu	→	**28.11 amu**	←		Final answer must have exactly <u>two</u> digits after the decimal point, regardless of sigfigs rules.	

- 1 pt numerically correct
- 1 pt sigdigs
- 1 pt units must match work

Periodic Table: 28.09 amu. Answer agrees within ± 1 amu. ✓

Problem is worth 21 points.

3) Chromium has four naturally-occurring isotopes: Chromium-**50** (4.345%), Chromium-**52** (83.789%), Chromium-**53** (9.501%), and Chromium-**54** (2.365%). Calculate the atomic mass (in amu) of chromium. **Max Time: 5 min**

atomic mass = (4.345%) (50 amu) + (83.789%) (52 amu) + (9.501%) (53 amu) + (2.365%) (54 amu) **Required**

(2 points) (2 points) (2 points) (2 points) (2 points) (2 points) (2 points) (2 points)

$= \left(\frac{4.345}{100}\right)(50\text{ amu}) + \left(\frac{83.789}{100}\right)(52\text{ amu}) + \left(\frac{9.501}{100}\right)(53\text{ amu}) + \left(\frac{2.365}{100}\right)(54\text{ amu})$ Recommended

= 2.1725 amu + 43.57028 amu + 5.03553 amu + 1.2771 amu **Required**

(2 points) (2 points) (2 points) (2 points)

= 52.05541 amu → **52.06 amu** ←

Final answer must have exactly <u>two</u> digits after the decimal point, regardless of sigfigs rules.

Periodic Table: 52.00 amu. Answer agrees within ± 1 amu. ✓

- 1 pt numerically correct
- 1 pt sigdigs
- 1 pt units must match work

Problem is worth 27 points.

4) This question is <u>conceptual</u>; <u>no calculations are involved</u>. Rubidium has two naturally occurring isotopes: Rubidium-85 and Rubidium-87. The atomic mass of rubidium is 85.47 amu. Which isotope has a higher natural abundance (%-abundance)? Explain your answer in three or less sentences. **Max Time: 4 min**

Sorry. No answer here. This question is completely <u>conceptual</u>, and you should be able to reason it out for yourselves based upon your knowledge of how percentages work.

Question 5 – Extra Credit. **Max Time: 9 min**

Bromine has two naturally occurring isotopes. Bromine-79 has a %-abundance of 50.69%.

5a) Calculate the %-abundance of the second isotope. (Don't over-think it, and – yes – show your work.)

Hint: The total percent abundance values must add up to 100%.

5b) From the periodic table, obtain the atomic mass of bromine. You will use this in your calculation.

You are on your own.

5c) Given the initial information – and your answer to Questions 5a and 5b – set up an equation that will allow you to determine the atomic mass of the 2nd isotope. I only want the equation for this question. Do not solve.

Answer to 5b = (50.69%) (79 amu) + (Answer to 5a) (x)

5d) Solve the equation written in Question 5c to determine the atomic mass (in amu) of the second isotope. Your answer should have exactly two sigdigs after the decimal point.

Solve the equation from 5c. You are on your own.

5e) Round the value in 5c to a whole number. State the identity of the second isotope.

Bromine-A, where "A" is the numerical answer to Question 5d.