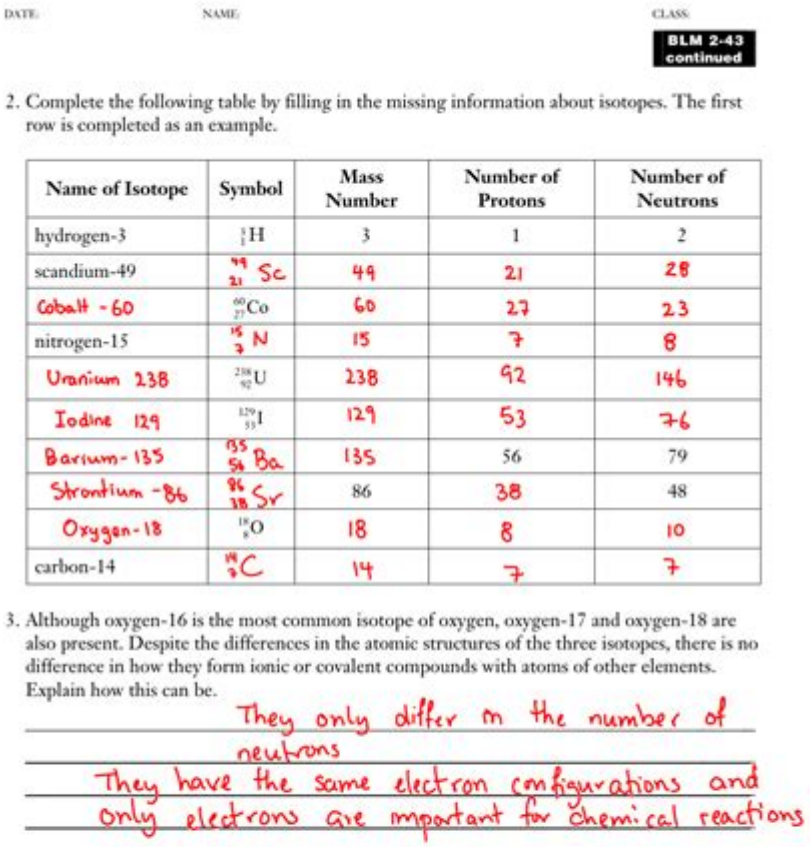
Isotope Practice Worksheet Answers With Work



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BLM 2-43 continued

2. Complete the following table by filling in the missing information about isotopes. The first row is completed as an example.

Name of Isotope	Symbol	Mass Number	Number of Protons	Number of Neutrons
hydrogen-3	$^{3}_{1}H$	3	1	2
scandium-49	$^{49}_{21}Sc$	49	21	28
Cobalt - 60	$^{60}_{27}Co$	60	27	23
nitrogen-15	$^{15}_{7}N$	15	7	8
Uranium 238	$^{238}_{92}U$	238	92	146
Iodine 129	$^{129}_{53}I$	129	53	76
Barium-135	$^{135}_{56}Ba$	135	56	79
Strontium -86	$^{86}_{38}Sr$	86	38	48
Oxygen-18	$^{18}_{8}O$	18	8	10
carbon-14	$^{14}_{6}C$	14	7	7

3. Although oxygen-16 is the most common isotope of oxygen, oxygen-17 and oxygen-18 are also present. Despite the differences in the atomic structures of the three isotopes, there is no difference in how they form ionic or covalent compounds with atoms of other elements. Explain how this can be.

They only differ in the number of neutrons

They have the same electron configurations and only electrons are important for chemical reactions

Isotope practice worksheet answers with work can be a crucial resource for students and educators alike, helping to reinforce the understanding of isotopes and their various applications in chemistry and nuclear physics. Isotopes are variants of a chemical element that differ in neutron number, and consequently, in atomic mass. This article will delve into the concept of isotopes, how to work through typical problems found in isotope practice worksheets, and provide detailed answers with step-by-step explanations.

Understanding Isotopes

Definition and Importance

Isotopes are atoms of the same element that contain the same number of protons but differ in the number of neutrons. This difference leads to variations in atomic mass but does not change the chemical properties of the element. Isotopes are crucial in various fields, including:

1. Medicine: Radioisotopes are used in diagnostic imaging and treatment.
2. Archaeology: Carbon-14 dating helps determine the age of ancient artifacts.
3. Nuclear Power: Certain isotopes are used as fuel in nuclear reactors.

Notation of Isotopes

Isotopes are often denoted by their element symbol along with their mass number. For example, Carbon-12 is represented as ^{12}C, where 12 is the mass number (protons + neutrons).

- Mass Number (A): Total number of protons and neutrons.
- Atomic Number (Z): Number of protons (unique to each element).

The number of neutrons can be calculated using the formula:

$$
\text{Number of Neutrons} = A - Z
$$

Typical Problems in Isotope Practice Worksheets

Example Problem 1: Identifying Isotopes

Problem Statement: Given the element Oxygen (O) with atomic number 8, identify the number of neutrons in its isotopes ^{16}O and ^{18}O.

Solution:

1. For ^{16}O:
- Mass Number (A) = 16
- Atomic Number (Z) = 8
- Number of Neutrons = A - Z = 16 - 8 = 8 neutrons

2. For ^{18}O:
- Mass Number (A) = 18
- Atomic Number (Z) = 8
- Number of Neutrons = A - Z = 18 - 8 = 10 neutrons

Answer:
- ^{16}O has 8 neutrons.
- ^{18}O has 10 neutrons.

Example Problem 2: Calculating Average Atomic Mass

Problem Statement: An element has two stable isotopes: ^{35}Cl (with an abundance of 75%) and ^{37}Cl (with an abundance of 25%). Calculate the average atomic mass of chlorine.

Solution:

1. Convert percentages to decimal form:

- ^{35}Cl: 0.75

- ^{37}Cl: 0.25

2. Calculate the weighted average:

$$
\text{Average Atomic Mass} = (0.75 \times 35) + (0.25 \times 37)
$$

$$
= 26.25 + 9.25 = 35.50 \, \text{amu}
$$

Answer: The average atomic mass of chlorine is 35.50 amu.

Example Problem 3: Radioactive Decay

Problem Statement: A sample of ^{60}Co has a half-life of 5.27 years. If you start with 100 grams of ^{60}Co, how much will remain after 15.81 years?

Solution:

1. Determine the number of half-lives:

$$
\text{Total Time} = 15.81 \, \text{years} \quad \text{and} \quad \text{Half-life} = 5.27 \, \text{years}
$$

$$
\text{Number of Half-lives} = \frac{15.81}{5.27} \approx 3
$$

2. Calculate the remaining mass:

$$
\text{Remaining Mass} = \frac{\text{Initial Mass}}{2^{\text{Number of Half-lives}}}
$$

$$
= \frac{100 \, \text{g}}{2^3} = \frac{100}{8} = 12.5 \, \text{g}
$$

Answer: After 15.81 years, 12.5 grams of ^{60}Co will remain.

Practice Worksheet Answers with Work

To facilitate learning, here's a compilation of problems along with thorough explanations of their solutions.

Worksheet Problem 1

Question: How many protons, neutrons, and electrons are in ^{40}K?

Solution:

- Protons = Atomic Number (Z) = 19
- Neutrons = Mass Number (A) - Atomic Number (Z) = 40 - 19 = 21
- Electrons = Protons (in a neutral atom) = 19

Answer: 19 protons, 21 neutrons, 19 electrons.

Worksheet Problem 2

Question: Element X has isotopes ^{14}X (70% abundance) and ^{15}X (30% abundance). Calculate the average atomic mass.

Solution:

- Average atomic mass = (0.70 × 14) + (0.30 × 15)
- = 9.8 + 4.5 = 14.3 amu

Answer: The average atomic mass of element X is 14.3 amu.

Worksheet Problem 3

Question: If a sample of ^{238}U has a half-life of 4.5 billion years, how much of a 1000g sample remains after 9 billion years?

Solution:

- Number of half-lives = 9 billion / 4.5 billion = 2
- Remaining mass = 1000g / 2^2 = 1000g / 4 = 250g

Answer: After 9 billion years, 250g of ^{238}U remains.

Conclusion

Understanding isotopes is fundamental in many scientific disciplines. The above examples illustrate how to approach isotope-related problems, ensuring a solid grasp of the concepts involved. Through practice worksheets, students can develop proficiency in calculating isotopic compositions, average atomic masses, and applying knowledge of radioactive decay. By consistently working through

problems and understanding the underlying principles, students will enhance their skills and confidence in handling isotopes in chemistry.

Frequently Asked Questions

What is an isotope and how is it different from regular atoms?

An isotope is a variant of a chemical element that has the same number of protons but a different number of neutrons, resulting in a different atomic mass. While regular atoms of an element have the same mass number, isotopes can have varying mass numbers.

How can I calculate the number of neutrons in an isotope?

To calculate the number of neutrons in an isotope, subtract the atomic number (number of protons) from the mass number. For example, for Carbon-14 (mass number 14, atomic number 6), the number of neutrons is 14 - 6 = 8.

What is the significance of isotopes in scientific research and applications?

Isotopes are significant in various fields, including medicine for diagnostic imaging and cancer treatment (e.g., radioactive isotopes), in archaeology for dating artifacts (e.g., carbon dating), and in environmental studies to trace chemical pathways.

Where can I find reliable answers for isotope practice worksheets?

Reliable answers for isotope practice worksheets can typically be found in educational textbooks, online academic resources, or educational websites that specialize in chemistry or nuclear physics. Additionally, teachers and tutors can provide assistance.

What are some common isotopes that students often study in chemistry?

Common isotopes studied in chemistry include Carbon-12 and Carbon-14, Oxygen-16 and Oxygen-18, and Uranium-235 and Uranium-238. These isotopes are frequently used in various applications and experiments.

Isotope Practice Worksheet Answers With Work

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How to play the Bing Trends Quiz? - Trybotics
Start the Bing quiz by clicking on the banner that says 'Trends Quiz' on the Bing homepage. You will be asked a series of questions about the most recent trends. Select the correct answers to …

Query - Wikipedia
Met een query (Engels voor vraagstelling) wordt in de informatica een opdracht bedoeld die aan een database wordt gegeven om een bepaalde actie uit te voeren, die ook potentieel …

Wat is een query? Simpele uitleg + Leer zelf queries maken!
Sep 3, 2022 · Vraag jij je af wat een query is? Dan zit je hier goed! Een query is simpel gezegd een opdracht aan een database. Lees lekker verder om nog meer te weten te komen over een …

Een query maken, laden of bewerken in Excel (Power Query)
Power Query biedt verschillende manieren om Power-query's in uw werkmap te maken en te laden. U kunt ook standaardinstellingen voor het laden van query's instellen in het venster …

Query Betekenis: Wat is het en Hoe Gebruik Je het Effectief?
Feb 19, 2025 · In de wereld van computers en databases is een query een precieze instructie. Het vertelt de computer precies welke informatie je wilt hebben en hoe het die moet vinden.

Query - 9 definities - Encyclo
Een query op een database levert een selectie van gevonden records op die voldoen aan de zoekcriteria. Deze selectie, het resultaat van de query, wordt eveneens aangeduid met query.

query: query’s / queries* | Vlaanderen.be
query: query’s / queries* Het meervoud van query is query’s. De betekenis van query is ‘zoekopdracht, informatieverzoek aan een databank’. Query komt uit het Engels.

query | SeniorWeb
query Spreek uit als: kwe-rie Uitspraak beluisteren Engelse term voor 'vraag'. Het gaat om een zoekopdracht in een softwareprogramma of op internet. Een query kan bijvoorbeeld worden …

Betekenis Query
Betekenis query Wat betekent query? Hieronder vind je 12 betekenissen van het woord query. Je kunt ook zelf een definitie van query toevoegen. ... Betekenis van toevoegen.

QUERY in het Nederlands - Cambridge Dictionary
Jul 24, 2024 · In answer to your query about hotel reservations, I am sorry to tell you that we have no vacancies.

query - Vertaling Engels-Nederlands - Mijnwoordenboek
EN: You may enter your query verbally or by entering it manually on the console before you. - NL: U kunt uw vraag mondeling stellen... of hem met de hand invoeren.

Unlock your understanding of isotopes with our detailed practice worksheet answers with work. Get clear explanations and step-by-step solutions. Learn more!

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