

Welcome!

This is a Review Quiz, covering the topics of atoms, protons, neutrons, electrons, atomic number, mass number, isotopes, and atomic mass.

I will be asking you many questions in this Quiz.

Each time I ask a question, **you should attempt to answer the question on your own** before you scroll down to view my answer.

This Quiz is part of the chapter “Atoms, Molecules, and Compounds”, which is the second chapter of the series, “Chemistry, Explained Step by Step”.

This Review Quiz tests the material we covered in the following lessons:

[Atoms, Protons, Neutrons, and Electrons](#)

[Atomic Number and Mass Number](#)

[Isotopes](#)

[Atomic Mass](#)

You should complete those lessons before taking this Quiz.

In some textbooks, the concept of *atomic mass* is covered in the chapter on Stoichiometry, rather than in the chapter on Atoms, Molecules, and Compounds.

So, if your class hasn't covered atomic mass yet, you may want to skip the questions in the Quiz that deal with atomic mass.

This Review Quiz was written by Freelance-Teacher.

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REVIEW QUIZ

1. Define the term *atomic mass*.

What are the units for atomic mass?

(Some courses may not cover atomic mass until the chapter on Stoichiometry. If your course hasn't covered atomic mass yet, you can skip this question, and the other questions about atomic mass in this quiz.)

Naturally occurring elements are usually a *mixture* of different isotopes.

The *atomic mass* of an element is defined as a *weighted average* of the masses of the individual isotopes in that mixture.

The units for atomic mass are amu.

2. What is the atomic symbol for carbon?

The atomic symbol for carbon is C.

3. What element does the atomic symbol H represent?

The atomic symbol H represents hydrogen.

4. Tell me as much as possible about fluorine-20.

Answer:

Fluorine-20 is *an isotope of fluorine*.

Fluorine-20 has *a mass number of 20*.

The mass of a single atom of fluorine-20, when rounded to the nearest whole number, is *20 amu*.

The symbol for fluorine-20 is ^{20}F .

Atomic numbers are listed in the periodic table,
so we know that fluorine-20 has *an atomic number of 9*.

So another possible symbol for fluorine-20 is $^{20}_{9}\text{F}$.

atomic number = number of protons

So we know that one atom of fluorine-20 contains *9 protons*.

mass number = number of protons + number of neutrons

So an atom of fluorine-20 contains *11 neutrons*.

(If we make the assumption that we are considering a neutral atom of fluorine-20,
then we also know that the atom has 9 electrons.)

5. What is the atomic number for iodine?

What information does this number give you about iodine?

From the periodic table, we know that
the atomic number of iodine (I) is 53.

This tells us that every atom of iodine
contain 53 protons.

6. True or False: All atoms of the same element have the same number of protons.

True. All atoms of the same element have the same number of protons.

The number of protons is the fundamental thing that determines the identity of the element.

7. What is the atomic symbol for potassium?

The atomic symbol for potassium is K.

8. Consider a phosphorus atom that contains 16 neutrons. How would you write the symbol for this particular phosphorus atom? Include a subscript and superscript.

Answer: $^{31}_{15}\text{P}$

Analysis:

From the periodic table, we know that the atomic number for phosphorus is 15.

atomic number = number of protons

So we know that a phosphorus atom contains 15 protons.

mass number = number of protons + number of neutrons

So we know that this particular phosphorus atom has a mass number of 31.

In the atomic symbol, the subscript represents the atomic number, and the superscript represents the mass number: $^{31}_{15}\text{P}$

**9. True or False: If true, how would you rewrite the statement so it's true.
All silicon atoms have the same number of electrons.**

False.

All silicon atoms have the same number of *protons*.

(But if we adopted the convention used in some textbooks that the word "atom" refers only to neutral atoms, while the word "ions" refers to charged atoms, then the statement would be true.)

10. What are the components of an atom?**What is the electric charge on each component?****Where in the atom is each component located?****Rounded to the nearest whole number, what is the mass of each component, in amu?**

The components of an atom are
protons,
neutrons, and
electrons.

Each proton:
has an electric charge of +1;
is located in the nucleus (the center of the atom); and
has a mass of approximately 1 amu.

Each neutron:
has an electric charge of 0 (neutral);
is located in the nucleus; and
has a mass of approximately 1 amu.

Each electron:
has an electric charge of -1;
is located outside the nucleus; and
has a mass of approximately 0
(i.e., compared to a proton or neutron, the mass of an electron is negligible).

11. What is the definition of mass number?**What is the symbol for mass number?****What are the units for mass number?****What is an alternative interpretation for the mass number of an atom?**

mass number = number of protons + number of neutrons.

The symbol for mass number is A .

Mass number is a unitless concept.

The mass number of an atom can also be interpreted as
the numerical value of the mass of the atom, expressed in amu,
rounded to the nearest whole number.

12. What is the atomic symbol for chlorine?

The atomic symbol for chlorine is Cl.

**13. True or False. If false, rewrite the statement so it's true.
All chlorine atoms have the same number of neutrons.**

False. All chlorine atoms have the same number of *protons* (17).
But chlorine atoms can have different numbers of neutrons if they are isotopes.

14. What element does the atomic symbol Na represent?

The atomic symbol Na represents sodium.

15. You are told that a particular lithium atom has a mass number of 7. Figure out as much as you can from this information.

From the periodic table, we know that the lithium atom contains *3 protons*.

The problem tells us that this particular lithium atom has a mass number of 7.

mass number = number of protons + number of neutrons

So this particular lithium atom must have *4 neutrons*.

Also, we can say that the mass of this particular lithium atom, rounded to the nearest whole number, is *7 amu*.

This lithium atom represents the isotope *lithium-7*.

This isotope is represented by the symbol ${}^7\text{Li}$, or by the symbol ${}^7_3\text{Li}$.

16. Define the term *mass*.

What are the units for mass?

Arrange the units from biggest to smallest.

Give names and abbreviations.

**Which units are most appropriate for ordinary sized objects,
and which units are most appropriate for atomic-scale objects?**

The *mass* of an object is defined as
the *quantity of matter* contained in that object.

We have discussed the following units for mass, arranged from biggest to smallest:

kilograms = kg

grams = g

milligrams = mg

atomic mass units = amu

Kilograms, grams, and milligrams are most convenient for ordinary-sized objects, and
amu are most appropriate for atomic-scale objects.

**17. In the periodic table, what do the whole numbers and the decimal numbers represent?
Give both the *name* and the *meaning* of each concept.**

The whole numbers in the periodic table represent the *atomic number* for each element.
atomic number = number of protons

The decimal numbers in the periodic table represent the *atomic mass* for each element.
The atomic mass for an element is weighted average
of the masses of the individual isotopes in a naturally occurring sample of the element.

(In the next chapter on Stoichiometry,
we will learn an alternative way to interpret the decimal numbers in the periodic table.)

18. Consider the symbol ${}^6\text{He}$.

Figure out as much as possible about the atoms represented by this symbol.

${}^6\text{He}$ is an *isotope of helium*.

The name for this isotope is *helium-6*.

We can look up He in the periodic table and find that *the atomic number is 2*.

atomic number = number of protons

So a single atom of this isotope contains *2 protons*.

This particular isotope of helium has *a mass number of 6*.

So we can say that the mass of a single atom of this particular isotope of helium, rounded to the nearest whole number, is *6 amu*.

mass number = number of protons + number of neutrons

So a single atom of this isotope contains *4 neutrons*.

(If we assume the atoms are neutral, then we can also say that each atom contains 2 electrons.)

19. Silver has two naturally occurring isotopes, ^{107}Ag (mass = 106.9051 amu, abundance = 51.84%) and ^{109}Ag (mass = 108.9048 amu, abundance = 48.16%). Use this data to calculate the atomic mass of silver.

Answer:

The atomic mass of silver is 107.8682 amu.

Solution:

? = atomic mass of silver

We have the masses and natural abundances of each isotope:

Silver-107: mass = 106.9051 amu, abundance = 51.84%

Silver-109: mass = 108.9048 amu, abundance = 48.16%

We calculate the atomic mass,

which is a weighted average of the isotopic masses:

atomic mass = $.5184(106.9051) + .4816(108.9048)$

So, atomic mass = 107.8682 amu

So, the atomic mass of silver is 107.8682 amu.

The two isotopes have nearly equal abundances (51.84% and 48.16%), with slightly greater abundance for silver-107;

so we should have expected the atomic mass to be approximately half-way between 107 amu and 109 amu, but slightly closer to 107 amu than to 109 amu;

our result (107.8682 amu) matches that expectation.

You should find that the periodic table reports an atomic mass for silver of 107.9 amu;

we calculated an atomic mass for silver of 107.8682 amu, which, when rounded to one decimal place, matches the value reported in the periodic table.

20. A particular atom has 6 neutrons and 5 protons. Another atom has 7 neutrons and 5 protons. Are these two atoms isotopes of each other?

Isotopes have the same number of protons but different numbers of neutrons.

The two atoms match this definition, so,
yes, they are isotopes of boron.

21. True or False? Explain why the statement is true or false.
All atoms of the same element have the same mass number.

False.

mass number = number of protons + number of neutrons

Different atoms of the same element can have different mass numbers, because they can have different numbers of neutrons.

Different atoms of the same element with different mass numbers are called *isotopes*.

22. What is the atomic symbol for calcium?

The atomic symbol for calcium is Ca.

23. What element does the atomic symbol Br represent?

The atomic symbol Br represents bromine.

24. True or False? Explain why the statement is true or false.
All sulfur atoms have the same number of protons.

True. All sulfur atoms have 16 protons.

Having 16 protons is the fundamental thing that makes an atom represent the element sulfur.

25. How many protons are there in a potassium atom?

From the periodic table, we know that a potassium atom has *19 protons*.

26. A particular atom has 6 neutrons and 6 protons. Another atom has 6 neutrons and 7 protons. Are these two atoms isotopes of each other?

Isotopes have the same number of protons but different numbers of neutrons.

The two atoms in this problem have different numbers of protons, so no, they are not isotopes of each other.

Instead, the two atoms represent two different elements (carbon and nitrogen).

27. What is the definition of atomic number?

What is the symbol for atomic number?

What are the units for atomic number?

How can you determine the atomic number for an element?

atomic number = number of protons

The symbol for atomic number is Z .

Atomic number is a unitless concept.

You can determine the atomic number for any element, by looking the element up in the periodic table; the whole numbers in the periodic table represent the atomic numbers for the elements.

28. What are isotopes?

Isotopes are atoms with the same number of protons but different numbers of neutrons.

29. Determine the mass number of carbon from the periodic table.

Answer:

Trick question, mass numbers are not listed in the periodic table.

Analysis:

The periodic table tells you atomic number (6) and atomic mass (12.01 amu) of carbon, but it does not tell you mass number.

mass number = number of protons + number of neutrons

One isotope of carbon might have 6 protons and 6 neutrons, giving a mass number of 12.

Another isotope of carbon atom might have 6 protons and 8 neutrons, giving a mass number of 14.

These two examples demonstrate that *different isotopes of carbon will have different mass numbers*. Therefore, without further information, there's no way to determine the mass number of any particular carbon atom from the periodic table.

You have completed the Review Quiz.

You're ready now to proceed to the next lesson for this chapter:

[Ions](#)