

Name _____

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Worksheet: Atoms: Chapter 5: Complete the following tables (see p. 113-117 for help)

Atomic number = big blue number = protons = electrons

Mass number = protons + neutrons (NOT the little red number. It must be given for each isotope)

Atomic number	Mass number	number of protons	number of neutrons	number of electrons	symbol of element
6	_____	_____	6	_____	_____
_____	_____	_____	12	12	_____
_____	4	_____	_____	_____	He
_____	11	5	_____	_____	_____
7	14	_____	_____	_____	_____
_____	59	27	_____	_____	_____
_____	19	_____	_____	_____	F

Atom name is Element–Mass number, (Carbon – 13), Symbol is $\overset{\text{Mass number}}{13}\underset{\text{Atomic number}}{6}\text{C}$ Symbol, $^{13}_6\text{C}$

Both mean Carbon (atomic number 6) with a mass number of 13. Subtract to get 7 neutrons.

Atom Name	Symbol of atom	Atomic number	Mass number	number of protons	number of neutrons	number of electrons
Beryllium-9	_____	4	_____	_____	_____	_____
Nitrogen-15	_____	_____	_____	_____	8	_____
_____	$^{207}_{82}\text{Pb}$	_____	207	_____	_____	_____
_____	$^{22}_{10}\text{Ne}$	10	_____	_____	_____	_____
_____	_____	8	17	_____	_____	_____
_____	$^{18}_8\text{O}$	_____	_____	_____	_____	_____
Carbon – 14	_____	_____	_____	_____	_____	_____
Potassium-40	_____	_____	_____	_____	_____	_____
_____	$^{31}_{15}\text{P}$	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	4	3

1. The Diameter of a copper atom is about 3.14×10^{-10} meters. Convert this to nanometers.

2. The mass of a Copper atom is about 1.05×10^{-22} grams. Convert this to mg.

Chemistry Worksheet (see p. 113-117, notes)

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Consider the following atoms as you answer these questions.

${}^1_1\text{H}$	${}^2_1\text{H}$	${}^3_1\text{H}$	${}^3_2\text{He}$	${}^4_2\text{He}$	${}^{12}_6\text{C}$	${}^{14}_6\text{C}$	${}^{14}_7\text{N}$	${}^{16}_8\text{O}$	${}^{18}_8\text{O}$
1	1	1	2	2	6	6	7	8	8

1. List three *groups* of atoms which have the same number of protons.
2. List three groups of atoms which are isotopes of each other.
3. List two groups of atoms which have the same mass number.
4. List two groups of atoms which have the same number of neutrons.
5. What is the difference between ${}^{12}\text{C}$ and ${}^{14}\text{C}$? What is alike about them?
6. Would ${}^{16}\text{O}$ act chemically like ${}^{18}\text{O}$? Explain.
7. Would ${}^{14}\text{C}$ act chemically like ${}^{14}\text{N}$? Explain.
8. Does ${}^{12}\text{C}$ act like ${}^{14}\text{C}$ in terms of nuclear changes? Explain.

Average Atomic mass calculations: (see p. 118-121 for help) (Check per. table for 9&10)

9. The following is the average isotopic composition for copper as it occurs in nature: copper-63 = 69.1% and copper-65 = 30.9%. Calculate the atomic weight of copper.
10. The following is the average isotopic composition for Silicon as it occurs in nature: silicon-28 = 92.2%, silicon-29 = 4.7% and silicon-30 = 3.1%. Calculate the atomic weight of silicon.
11. Check your periodic table: Which of the following elements:
A) have *no stable* isotopes (Atomic weight in parentheses),
B) are likely to have *only one stable* isotope, (Atomic wt close to a whole number)
or C) have *more than one stable* isotope (Atomic wt *not* close to a whole number).
Mercury (Hg) _____ Sodium (Na) _____ Technetium (Tc) _____ Tin (Sn) _____
Radium (Ra) _____ Aluminum (Al) _____ Palladium (Pd) _____ Radon (Rn) _____
12. Considering the Atomic weight of each element, which isotope do you think is more abundant in nature: ${}^3\text{He}$ or ${}^4\text{He}$? ${}^{16}\text{O}$ or ${}^{18}\text{O}$? ${}^{35}\text{Cl}$ or ${}^{37}\text{Cl}$?

1. Dalton's atomic theory says that all matter is made up of atoms and that

- a) atoms are _____
- b) all atoms of the same element are _____
- c) atoms combine in _____ ratios
- d) atoms are not _____, only rearranged in chemical reactions.

2. Current atomic theory does not agree with a b c d above. (circle)

3. Given: ^2H , ^3H , ^4He , ^{39}Ar , ^{40}K , ^{39}K , ^{40}Ca , ^{235}U , ^{238}Np : Which is (or has):

an isotope of potassium _____ the same number of neutrons as ^3He _____

the same number of protons as ^{238}U _____ the same mass number as ^{40}Ar _____

4. What's the difference between the nuclear reactions that take place in the sun and those in a nuclear power plant?

5. Why might radioactive isotopes of Carbon, Nitrogen and Oxygen be especially harmful to living creatures?

6. Compare the half life of a radioactive isotope to a single elimination sports tournament.

7. Name a radioisotope used in the following:

a. cancer radiation therapy _____

b. radioactive dating _____

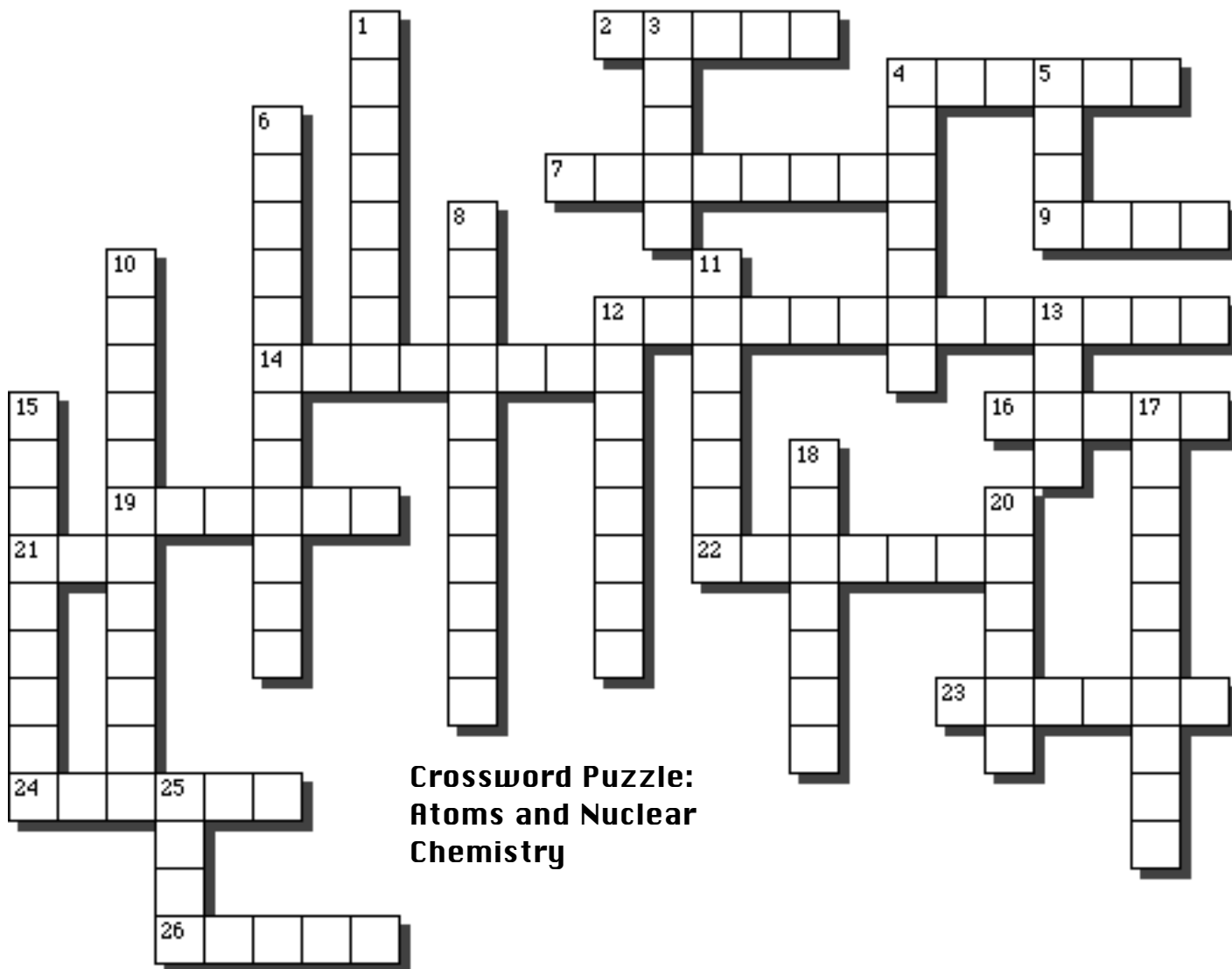
c. diagnosing disease _____

8. Complete the following table

Atomic number	Mass number	number of protons	number of neutrons	number of electrons	Name of atom	symbol of atom
_____	40	_____	22	_____	_____	_____
_____	_____	_____	16	15	_____	_____
_____	_____	_____	_____	_____	Carbon-14	_____
_____	_____	_____	_____	_____	_____	^{59}Co

9. Gallium exists in nature as two different isotopes. 36.2% is ^{71}Ga . The other isotope is ^{69}Ga . Calculate the atomic weight of Gallium. (Check answer on periodic table)

10. When Radium -226 decays, it gives off X-rays and gamma. One X-ray has a wavelength of 1.22×10^{-1} nm (nanometers). Convert this to meters.



**Crossword Puzzle:
Atoms and Nuclear
Chemistry**

ACROSS CLUES

2. The most common cause of man-made radiation exposure is medical ____.
4. The type of nuclear change in the sun.
7. Atoms of the same element with different mass numbers.
9. Mass number 22; 12 neutrons.
12. The part of the atom containing negatively charged particles. (2 wds)
14. Isotopes act alike in _____ changes.
16. The most penetrating type of radiation.
19. The element with 55 protons.
21. Element with atomic number 50.
22. Isotopes act very differently in _____ changes.
23. The electron cloud contains most of the _____ of the atom.
24. Has an isotope with mass number 14 that is used for radioactive dating.
26. A helium nucleus is a(n) _____ particle.

DOWN CLUES

1. The time for one half of a sample of radioactive atoms to decay.
3. A radioactive gas that can be dangerous in basements.
4. A nucleus is split into two large pieces.
5. The element with atomic weight 55.845 amu
6. The average mass of an element as it occurs in nature(2 wds)
8. The releases of particles and energy from an unstable nucleus is ____ decay.
10. The _____ of oxygen is 8 (2 wds).
11. A neutral subatomic particle.
12. The smallest major subatomic particle.
13. Element with 82 electrons.
15. Plutonium is a(n) _____ element.
17. In "Carbon-12," 12 is the _____. (2 wds)
18. The ____ contains most of the mass of the atom.
20. The positive particle found in the nucleus.
25. Type of decay rubidium-87 undergoes.