

## **Atomic Structure**

Extra Practice Problems

## What the Numbers Mean

Numbers, numbers everywhere! The numbers associated with atoms and atomic structure are: atomic number, mass number, and atomic mass. This worksheet gives practice in using these numbers.

## Example A

What is the atomic number of an element that contains 19 protons, 19 electrons, and 20 neutrons?

4.4

**Solution** Since the atomic number is the number of protons in the nucleus of the atom of that element, the atomic number of the element must be 19 (the number of protons).

### You Try It

1. What is the atomic number of an element that contains 12 protons, 12 electrons, and 13 neutrons?

4.4

### **Your Solution**



### Example B

Calculate the mass number of the potassium atom discussed in Example A.

4.

**Solution** The mass number is the total number of protons and neutrons in the nucleus. These two types of particles contribute to the bulk of the mass in any atom. Thus this atom has a mass number of 39 (19 protons and 20 neutrons).

### You Try It

2. Calculate the mass number of the carbon atom containing 6 protons and 6 neutrons.

4.5

### **Your Solution**

### Example C

Use the following information to determine the atomic mass of chlorine. Two isotopes are known: chlorine-35 (mass = 35.0 amu) and chlorine-37 (mass = 37.0 amu). The relative abundances are 75.4% and 24.6%, respectively.

4.7



**Solution** Recall that the text defines atomic mass as the weighted average of the masses of the isotopes of that element. To solve the problem:

Contribution of masses

relative abundance (expressed

by each isotope

= mass of isotope  $\times$  as a decimal fraction)

= 35.0 amu

 $\times$  0.754 = 26.4 amu

= 37.0 amu

 $\times$  0.246 = 9.10 amu

The sum of the individual isotope mass contributions will equal the atomic mass.

26.4 amu + 9.10 amu = 35.5 amu

### You Try It

3. Use the following information to determine the atomic mass of carbon. Two isotopes are known: carbon-12 (mass = 12.00 amu) and carbon-13 (mass = 13.00 amu). Their relative abundances are 98.9% and 1.10%, respectively.

4.7

### Your Solution

## **Problems For You To Try**

4. How many protons are found in an atom of each of the following?

boron \_\_\_\_\_ b. sulfur \_\_\_\_ c. strontium \_\_\_\_ d. gold \_\_

Number of

4.4

- 5. Name the element which has:
  - **a.** 1 proton  $(p^+)$  \_\_\_\_\_

Element

- **c.** 4 n<sup>0</sup>, 3 p<sup>+</sup>, 3e<sup>-</sup>\_\_\_\_\_
- **b.** 30  $n^0$ , 26  $e^-$ , 26  $p^+$  \_\_\_\_\_\_ **d.** 18  $e^-$ , 22  $n^0$ , 18  $p^+$  \_\_\_\_\_\_

Number of

Number of

6. Complete the following table:

4.5

Name	Symbol	Number of Protons	Number of Electrons	Number of Neutrons	Atomic Number	Mass Number
	· · . · . · . · . · . · . · . · . ·	<u>25</u>		30		
		*	11	· · · · · · · · · · · · · · · · · · ·		23
14		35	1000	45		
	<del></del>				39	89
	747612	·	33			75
	Ac					227

7. Determine the atomic mass of an element which has 2 isotopes with mass numbers of 6 (mass = 6.02) and 7 (mass = 7.02). The relative abundances are 7.42% and 92.6%, respectively.



# Atomic Structure

KET

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## Example A

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**Solution** Since the atomic number is the number of protons in the nucleus of the atom of that element, the atomic number of the element must be 19 (the number of protons).

### You Try It

1. What is the atomic number of an element that contains 12 protons, 12 electrons, and 13 neutrons?

4.4

Your Solution

ATOMIC # = PROTONS = (12)



## Example B

Calculate the mass number of the potassium atom discussed in Example A.

4.5

**Solution** The mass number is the total number of protons and neutrons in the nucleus. These two types of particles contribute to the bulk of the mass in any atom. Thus this atom has a mass number of 39 (19 protons and 20 neutrons).

### You Try It

2. Calculate the mass number of the carbon atom containing 6 protons and 6 neutrons.

4.5

#### Your Solution

MAGS # = PROTORS + NEUTRONS = 6 + 6 = (2)

### Example C

Use the following information to determine the atomic mass of chlorine. Two isotopes are known: chlorine-35 (mass = 35.0 amu) and chlorine-37 (mass = 37.0 amu). The relative abundances are 75.4% and 24.6%, respectively.

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**Solution** Recall that the text defines atomic mass as the weighted average of the masses of the isotopes of that element. To solve the problem:

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= mass of isotope  $\times$  as a decimal fraction)

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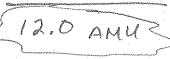
$$26.4 \text{ amu} + 9.10 \text{ amu} = 35.5 \text{ amu}$$

### You Try It

Use the following information to determine the atomic mass of carbon. Two isotopes are known: carbon-12 (mass = 12.00 amu) and carbon-13 (mass = 13.00 amu). Their relative abundances are 98.9% and 1.10%, respectively.

4.7

### Your Solution



## **Problems For You To Try**

4. How many protons are found in an atom of each of the following?

4.4

- **b.** sulfur <u>16</u> **c.** strontium <u>38</u> **d.** gold <u>79</u>

- 5. Name the element which has:
  - 1 proton  $(p^4)$ 
    - HYDROGEN C. 4 no, 8 pt 3e LITHIUM +) IRON d. 18 e-, 22 no, (8 pt ARGON)
  - **b.** 30  $n^0$ , 26  $e^-$ , 26  $p^+$
- **6.** Complete the following table:

4.5

Element Name	Symbol	Number of Protons	Number of Electrons	Number of Neutrons	Atomic Number	Mass Number
Manganese	Mn	25	25	30		Boundary Apolicy.
Sodium	Na		11	12	one of the same of	23
Bromine	Br	35	35	45		80
Yttrium		39	39	50	39	89
Arsenic	As	33	33	42	33.	75
Activium	Ac	89	89	138	29	227

7. Determine the atomic mass of an element which has 2 isotopes with mass numbers of 6 (mass = 6.02) and 7 (mass = 7.02). The relative abundances are

, 7,42% and, 92,6%, respectively.

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