Chemistry Worksheet: Atomic Structure and Isotopes

Give the chemical symbol for the following isotopes, including the atomic number and mass number. List the number of protons and neutrons for each.

Reference: p. 88 – 94 (chapter 3) in your chemistry book (Click on the link to go directly to the web version of chapter 3.)

mass number = number of protons + number of neutrons

Example: hydrogen – 2

answer: \( ^2_1 \text{H} \) 1 proton 1 neutron

1. hydrogen – 3 (3 is the mass number)

2. sulfur – 36

3. chlorine - 37

4. uranium – 235

Complete the table below:

<table>
<thead>
<tr>
<th>element name</th>
<th>atomic number</th>
<th>mass number</th>
<th>number of neutrons</th>
<th>number of electrons (neutral atom)</th>
<th>element symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td></td>
<td>10</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>16</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td>24</td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td></td>
<td>254</td>
<td></td>
<td></td>
<td>Es</td>
</tr>
<tr>
<td>9.</td>
<td>5</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td></td>
<td>10</td>
<td></td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>11.</td>
<td>99</td>
<td>252</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

More Questions on the Back -------->
12. Numbers 5. and 9. (on the front of this page) are atoms of the same element. The same is true for numbers 8. and 11. Explain the relationship that these atoms have and why it is possible for an element to have atoms that are not all identical.

13. Write the name and symbol for the elements that are described below:

a. 78 protons in the nucleus of each atom.

b. 42 electrons in each uncharged atom.

c. 18 electrons in each +2 cation.

d. 10 electrons in each -1 anion.

Identify the isotope in each of the following. Give the appropriate symbol and name. Use the mass number in the name of the isotope as was done in 1 - 4.

e. 52 neutrons in each nucleus and a mass number of 92.

f. A mass number of 112 and 48 electrons in each uncharged atom.

g. A mass number of 75 and 36 electrons in each -3 anion.

h. A mass number of 262 and 159 neutrons in the nucleus.

i. A mass number of 103 and 41 electrons in each +3 cation.

j. A mass number of 79 and 36 electrons in each -1 anion.
Chemistry Worksheet: Atomic Structure and Isotopes Answers

Give the chemical symbol for the following isotopes, including the atomic number and mass number. List the number of protons and neutrons for each.

Reference: p. 88 – 94 (chapter 3) in your chemistry book (Click on the link to go directly to the web version of chapter 3.)

mass number = number of protons + number of neutrons

Example: hydrogen – 2

answer: \( ^1_1\text{H} \) 1 proton 1 neutron

1. hydrogen – 3 (3 is the mass number)
2. sulfur – 36

\( ^3_1\text{H} \) 1 proton 2 neutrons
\( ^{36}_{16}\text{S} \) 16 protons 24 neutrons

3. chlorine - 37
4. uranium – 235

\( ^{37}_{17}\text{Cl} \) 17 protons 20 neutrons
\( ^{235}_{92}\text{U} \) 92 protons 143 neutrons

Complete the table below:

<table>
<thead>
<tr>
<th>element name</th>
<th>atomic number</th>
<th>mass number</th>
<th>number of neutrons</th>
<th>number of electrons (neutral atom)</th>
<th>element symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. boron</td>
<td>5</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>B</td>
</tr>
<tr>
<td>6. sulfur</td>
<td>16</td>
<td>32</td>
<td>16</td>
<td>16</td>
<td>S</td>
</tr>
<tr>
<td>7. scandium</td>
<td>21</td>
<td>45</td>
<td>24</td>
<td>21</td>
<td>Sc</td>
</tr>
<tr>
<td>8. einsteinium</td>
<td>99</td>
<td>254</td>
<td>155</td>
<td>99</td>
<td>Es</td>
</tr>
<tr>
<td>9. boron</td>
<td>5</td>
<td>11</td>
<td>6</td>
<td>5</td>
<td>B</td>
</tr>
<tr>
<td>10. oxygen</td>
<td>8</td>
<td>18</td>
<td>10</td>
<td>8</td>
<td>O</td>
</tr>
<tr>
<td>11. einsteinium</td>
<td>99</td>
<td>252</td>
<td>153</td>
<td>99</td>
<td>Es</td>
</tr>
</tbody>
</table>

More Questions on the Back --------->
12. Numbers 5. and 9. (on the front of this page) are atoms of the same element. The same is true for numbers 8. and 11. Explain the relationship that these atoms have and why it is possible for an element to have atoms that are not all identical.

Boron – 10 and Boron – 11 are isotopes. They are the same element because they both have 5 protons. Atoms with the same number of protons are atoms of the same element.

13. Write the name and symbol for the elements that are described below:

a. 78 protons in the nucleus of each atom. Platinum, Pt

b. 42 electrons in each uncharged atom. molybdenum, Mo

c. 18 electrons in each +2 cation. calcium, Ca

d. 10 electrons in each -1 anion. fluorine, F

Identify the isotope in each of the following. Give the appropriate symbol and name. Use the mass number in the name of the isotope as was done in 1 - 4.

e. 52 neutrons in each nucleus and a mass number of 92.
   zirconium – 92 $^{92}$Zr

f. A mass number of 112 and 48 electrons in each uncharged atom.
   cadmium – 112 $^{112}$Cd

g. A mass number of 75 and 36 electrons in each -3 anion.
   arsenic – 75 $^{75}$As

h. A mass number of 262 and 159 neutrons in the nucleus.
   lawrencium - 262 $^{262}$Lr

i. A mass number of 103 and 41 electrons in each +3 cation.
   ruthenium - 103 $^{103}$Ru

j. A mass number of 79 and 36 electrons in each -1 anion.
   bromine – 79 $^{79}$Br