Spot the difference

What are the differences and similarities between the elements below?

- 12
  - C
  - 6

- 13
  - C
  - 6

- 14
  - C
  - 6

Task

1. Use this to describe the differences and similarities between isotopes of the same element in terms of their sub-atomic particles. (3 marks)

Think about what the information above represents.

2. How is the relative atomic mass of an element in the periodic table calculated? (1 mark)

3. For each element, use the percentage abundance and mass number of its isotopes to calculate the relative atomic mass \(A_r\). Remember to show your working and give your answers to 2 decimal places.

   a. Isotope \(^{35}\text{Cl}\) has an abundance of 75.77%
      Isotope \(^{37}\text{Cl}\) has an abundance of 24.23%

   \[ A_r \text{ of chlorine} = \]
b. Isotope $^{79}$Br has an abundance of 50.69%
   Isotope $^{81}$Br has an abundance of 49.31%

   $A_r$ of bromine = .................................................................

C. Isotope $^{20}$Ne has an abundance of 90.60%
   Isotope $^{21}$Ne has an abundance of 0.20%
   Isotope $^{22}$Ne has an abundance of 9.20%

   $A_r$ of neon = .............................................................................

D. Isotope $^{24}$Mg has an abundance of 78.90%
   Isotope $^{25}$Mg has an abundance of 10.00%
   Isotope $^{26}$Mg has an abundance of 11.10%

   $A_r$ of magnesium = .................................................................

E. Isotope $^{32}$S has an abundance of 95.02%
   Isotope $^{33}$S has an abundance of 0.75%
   Isotope $^{34}$S has an abundance of 4.21%
   Isotope $^{36}$S has an abundance of 0.02%

   $A_r$ of sulfur = .............................................................................

Challenge

The relative atomic mass of a sample of boron is 10.80. There are 2 isotopes of boron, $^{10}$B and $^{11}$B. What would be the % abundance of each isotope?
Isotopes and relative abundance

Answers

Spot the difference

- Same symbol, so all carbon atoms
- Same atomic number
- Different mass numbers

1. All have the same number of protons (1) and electrons (1), but different numbers of neutrons (1)

2. 

\[ A_r = \frac{(mass\ 1 \times abundance\ 1) + (mass\ 2 \times abundance\ 2) + \ldots}{100} \]

3. 

a. \(((35 \times 75.77) + (37 \times 24.23)) \div 100 = 35.48\)

b. \(((79 \times 50.69) + (81 \times 49.31)) \div 100 = 79.99\)

c. \(((20 \times 90.60) + (21 \times 0.20) + (22 \times 9.20)) \div 100 = 20.19\)

d. \(((24 \times 78.90) + (25 \times 10.00) + (26 \times 11.10)) \div 100 = 24.32\)

e. \(((32 \times 95.02) + (33 \times 0.75) + (34 \times 4.21) + (36 \times 0.02)) \div 100 = 32.09\)

Challenge:

\(^{10}\text{B}\) abundance = 20%

\(^{11}\text{B}\) abundance = 80%

The following video is useful to use as an explanation of how to calculate atomic mass; www.youtube.com/watch?v=SdhLTfma_Eg