

## Topic 2- Isotopes

### Multiple Choice

1. What is the mass number of an element?
- A) It is the number of neutrons only.                      C) It is the sum of the protons and neutrons.  
B) It is the number of electrons only.                      D) It is the sum of the protons and electrons.

Answer: C

2. For a neutral atom the atomic number, Z, is equal to which of the following?
- A) The sum of the number of protons and neutrons  
B) The number of neutrons or the number of electrons  
C) The number of protons or the number of electrons  
D) The number of protons or the number of neutrons

Answer: C

3. In the Periodic Table, what is the relationship between the atomic mass of an element and its atomic number, Z ?
- A) In general, the atomic mass of an element decreases as the atomic number, Z, increases.  
B) In general, the atomic mass of an element increases as the atomic number, Z, increases.  
C) In general, there is no relationship between the atomic mass of an element and the atomic number, Z.  
D) In general, the atomic mass of an element increases by the same amount as the atomic number, Z.

Answer: B

4. The element hydrogen has three isotopes :  ${}^1_1\text{H}$ ,  ${}^2_1\text{H}$  and  ${}^3_1\text{H}$ .

Which of the following statements is **false** ?

- A) The three atoms have the same number of protons.  
B) The three atoms have the same number of electrons.  
C) The three atoms have the same number of neutrons.  
D) The three atoms have the same chemical properties.

Answer: C

5. Given the isotope of oxygen,  ${}^{18}_8\text{O}$ . How many neutrons, electrons and protons does this atom have?
- A) 8 neutrons, 10 electrons and 10 protons.                      C) 10 neutrons, 8 electrons and 8 protons.  
B) 8 neutrons, 18 electrons and 8 protons.                      D) 18 neutrons, 8 electrons and 8 protons.

Answer: C

6. Two isotopes of chlorine are found in nature. What is the difference between these two isotopes?

- A) The number of electrons
- B) The number of protons
- C) The number of neutrons
- D) The number of electron orbits (energy levels)

Answer: C

7. An oxygen atom has 8 protons, 8 neutrons and 8 electrons. Which of the following describes an isotope of an oxygen atom?

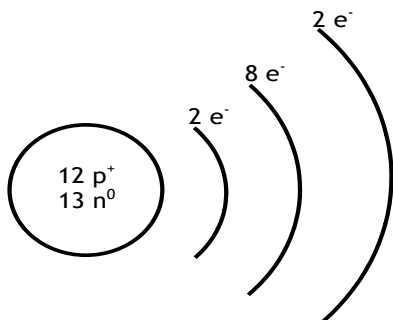
- A) It has 8 protons, 8 neutrons and 10 electrons.
- B) It has 10 protons, 8 neutrons and 8 electrons.
- C) It has 8 protons, 10 neutrons and 8 electrons.
- D) It has 10 protons, 10 neutrons and 8 electrons.

Answer: C

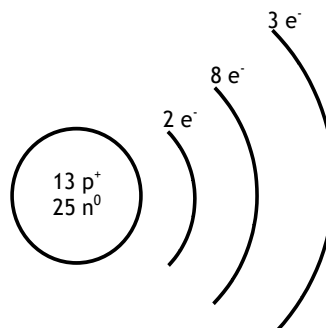
8. An isotope of the element magnesium (Mg) has an atomic mass of 25 atomic mass units.

Which of the illustrations below represents the simplified atomic model for this isotope of magnesium?

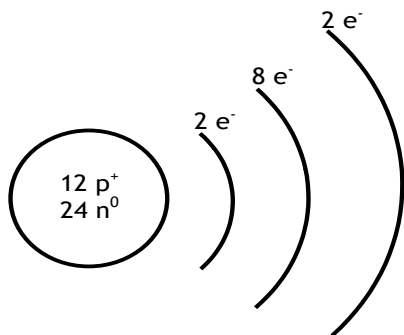
A)



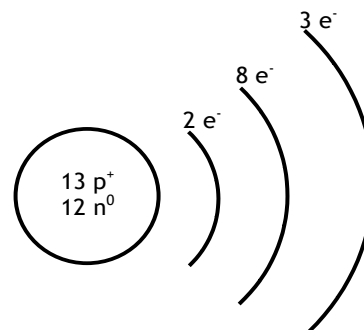
B)



C)

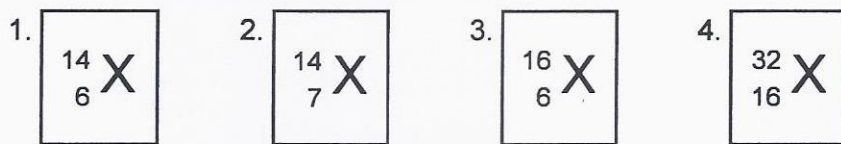


D)



Answer: A

9. Shown below are isotopes of unknown elements.



Which diagrams, illustrated above, represent isotopes of the same element?

- A) 1 and 2      B) 1 and 3      C) 2 and 4      D) 3 and 4

Answer: B

10. An element can have different isotopes.

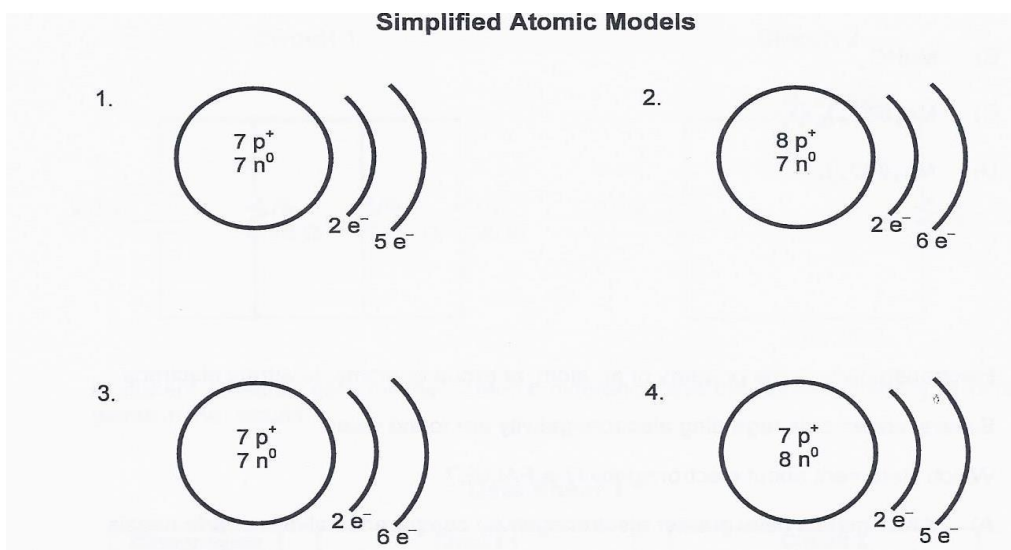
| Element | Atomic number | Neutron number | Atomic mass |
|---------|---------------|----------------|-------------|
| 1       | 5             | 8              | 13          |
| 2       | 6             | 7              | 13          |
| 3       | 6             | 8              | 14          |
| 4       | 7             | 7              | 14          |

Which of the elements in the table above are isotopes of the same element?

- A) 1 and 2      B) 1 and 3      C) 2 and 3      D) 2 and 4

Answer: C

11. Nitrogen isotopes are used to study the intake of nitrogen in plants and the metabolism of proteins in the human body. Which two of the simplified atomic models below represent isotopes of nitrogen?

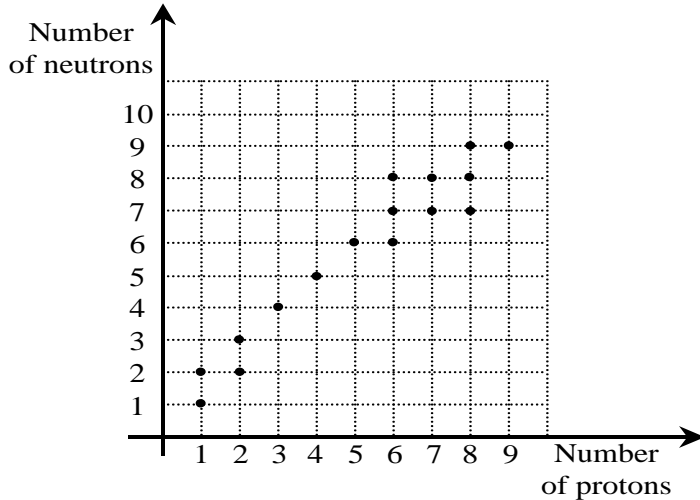


- A) Models 1 and 2      B) Models 1 and 4      C) Models 2 and 3      D) Models 3 and 4

Answer: B

## Short Answer

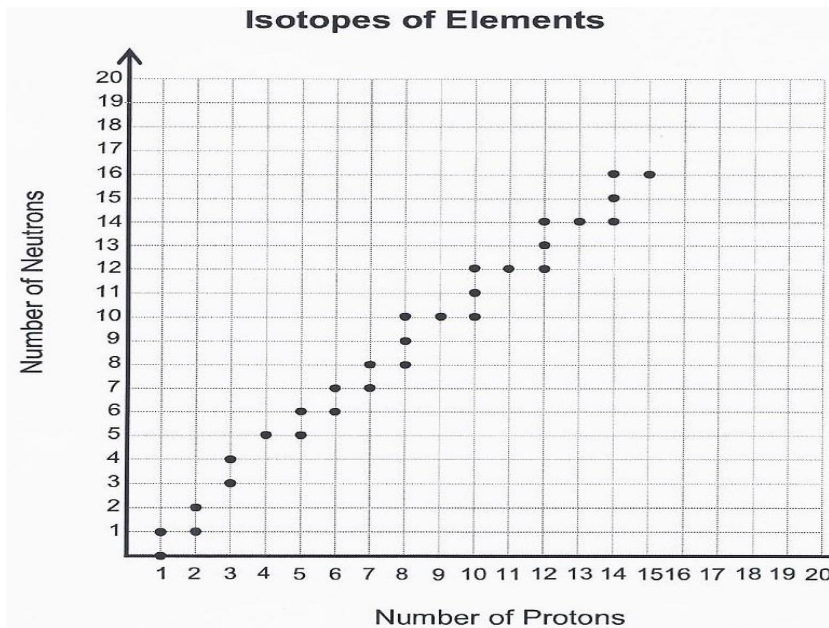
12. The following graph shows the number of neutrons and the number of protons in the isotopes of different elements.



Using this graph, determine the mass number for each of the three different isotopes of carbon, C.

Answer: 12, 13 and 14

13. Atoms of the same element with different number of neutrons are called isotopes. The graph below represents some of these isotopes.



What are the mass numbers for boron's two isotopes?

Answer: 10 and 11