

1. A neutron has a relative charge of +1 and a proton has no charge.
☐ True ☐ False
2. A positive ion (cation) is larger than its parent atom.
☐ True ☐ False
3. Isotopes of an element have:
☐ the same number of protons but a different number of neutrons
☐ a different number of protons
☐ the same number of neutrons
☐ a different number of electrons
4. The electron configuration of sodium (11 electrons) is $1s^2 2s^2 2p^6$ _____.

5. Each orbital can hold up to two electrons, which must have the same spin.
☐ True ☐ False
6. Why are gaseous atoms specified in the definition of ionisation energy?
☐ to make them heavier
☐ because gases are cheaper
☐ so the process starts with separate gaseous atoms, without including energy to break a solid or molecule into atoms
☐ so the atoms can react
7. Which particle has a relative charge of 0 and a relative mass of 1?
☐ the electron
☐ the proton
☐ the neutron
☐ the nucleus
8. Across a period, the atomic radius decreases because:
☐ the atom loses electrons
☐ a new shell is added each time
☐ shielding increases sharply

9. Isotopes of an element have the same number of protons but different numbers of _____.

10. How many electrons can a p sub-shell hold?

- ☐ 6 (three orbitals of 2)
- ☐ 8
- ☐ 2
- ☐ 10

1. **False**

False. It is the other way round: a proton has a relative charge of $+1$ and a neutron has no charge. Electrons carry -1 .

2. **False**

False. A cation is smaller: losing the outer-shell electrons removes a shell or reduces repulsion, so the remaining electrons are pulled closer.

3. **the same number of protons but a different number of neutrons**

Isotopes share the proton number Z but differ in neutron number, so they have different nucleon numbers A .

4. **3s1**

Sodium has one electron in the 3s sub-shell.

5. **False**

False. Two electrons in one orbital must have opposite spins, which is why ‘electrons in boxes’ show two arrows pointing opposite ways.

6. **so the process starts with separate gaseous atoms, without including energy to break a solid or molecule into atoms**

The definition isolates electron removal from gaseous atoms. Starting with a solid or molecule would also involve other energy changes.

7. **the neutron**

A neutron is neutral (charge 0) with relative mass 1; the proton is $+1$ mass 1; the electron is -1 and almost massless.

8. **the nuclear charge rises while shielding stays about the same, pulling the outer shell in**

Electrons go into the same outer shell, so rising nuclear charge with similar shielding pulls them closer.

9. **neutrons**

Same protons (so same element), different mass.

10. **6 (three orbitals of 2)**

A p sub-shell has 3 orbitals, each holding 2 electrons, so 6 in total ($s = 2$, $d = 10$).