



Atomic structure (2.3 Electron Arrangement)

Name:.....

Date:.....

1. Two particles have the following composition:

A: 37 protons; 38 neutrons, 37 electrons

B: 37 protons; 40 neutrons, 37 electrons

a. What is the relationship between these particles?

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b. These two particles have very similar chemical properties. Explain why.

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2. Explain why, in the hydrogen atom spectrum:

a. only light of certain frequencies is observed.

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b. different series are observed in different spectral regions.

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c. these series all converge at the high frequency end.

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3. Write the complete electron configurations of:

a. Mn

b. S

c. Fe³⁺

d. Cu

4. Arrange the following in order of increasing ionisation energy

Li Na Ne N O

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5.

a. Sketch a graph to show how you would expect the successive ionisation energies of silicon to vary with the number of electrons removed.

b. Explain how this provides evidence that the electrons in atoms are arranged in distinct energy levels.

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c. Explain why, within one of these levels, the amount of energy required to remove an electron varies with the number of electrons removed.

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6. Explain why

a. the first ionisation energy of lithium is greater than that of sodium.

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- b. the first ionisation energy of oxygen is less than that of nitrogen.

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- c. the first ionisation energy of beryllium is greater than that of boron.

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7. A particular metal cation M^{3+} has the electronic structure $[Ar] 3d^2$.

- a. Identify the metal concerned.....

- b. Write the electronic structure of the metal atom.

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- c. Explain why the electronic structure of the ion could not be the electronic structure of a neutral atom.

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8. The graph below shows the logarithm of the successive ionisation energies of a particular element with atomic number less than or equal to 20.

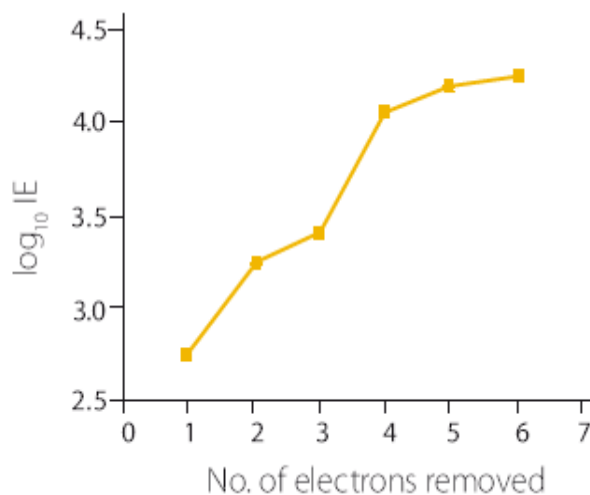
- a. Identify the element.....

- b. Predict the approximate value of the logarithm of the seventh ionisation energy.

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- c. How would you expect the equivalent successive ionisation energies of the element immediately above it in the periodic table to compare in magnitude?

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9. The table below gives successive ionisation data for a number of elements in kJmol^{-1} .

- a. Which two elements are probably in the same group of the periodic table?.....

- b. Which element is probably in group 3 of the periodic table? How can you tell?

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- c. Which two elements probably have consecutive atomic numbers?.....

- d. Which element is most probably a noble gas? Give two pieces of evidence for this.

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Element	First IE	Second IE	Third IE	Fourth IE
A	580	1800	2700	11600
B	900	1800	14800	21000
C	2080	4000	6100	9400
D	590	1100	4900	6500
E	420	3600	4400	5900