Atomic structure – 2022 Nov AS Chemistry 9701

1. Nov/2022/Paper_11/No.3

Which statement about the electrons in a ground state carbon atom is correct?

A Electrons are present in four different energy levels.

B There are more electrons in p orbitals than there are in s orbitals.

C The occupied orbital of highest energy is spherical.

D The occupied orbital of lowest energy is spherical.

2. Nov/2022/Paper_11/No.4

For the element sulfur, which pair of ionisation energies has the largest difference between them?

A third and fourth ionisation energies

B fourth and fifth ionisation energies

C fifth and sixth ionisation energies

D sixth and seventh ionisation energies

3. Nov/2022/Paper_12/No.1

Why is the first ionisation energy of phosphorus greater than the first ionisation energy of silicon?

A A phosphorus atom has one more proton in its nucleus.

B The atomic radius of a phosphorus atom is greater.

C The outer electron in a phosphorus atom is more shielded.

D The outer electron in a phosphorus atom is paired.

4. Nov/2022/Paper_21/No.1

Atoms with nuclei containing an odd number of protons tend to have fewer isotopes than those with an even number of protons.

(a) Gallium has two stable isotopes, ^{69}Ga and ^{71}Ga.

(i) Complete Table 1.1 to show the numbers of protons, neutrons and electrons in the two stable isotopes of gallium.

Table 1.1

isotope	number of protons	number of neutrons	number of electrons
^{69}Ga			
^{71}Ga			

[2]

(ii) Define relative atomic mass.

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..... [2]

(iii) The relative atomic mass of gallium, A_r, is 69.723.
The relative isotopic masses of ^{69}Ga and ^{71}Ga are:

^{69}Ga, 68.926; ^{71}Ga, 70.925.

Use this information to calculate the percentage abundance of ^{69}Ga in elemental gallium.
Show your working.
Assume that the element contains only the ^{69}Ga and ^{71}Ga isotopes.
Give your answer to four significant figures.

percentage abundance of ^{69}Ga = ... %
[2]

(b) Potassium also has two stable isotopes. Both isotopes have the same chemical properties.

(i) Explain why both isotopes of potassium have the same chemical properties.

.....

..... [1]

(ii) State the full electronic configuration of an atom of potassium.

..... [1]

(iii) The first, second and third ionisation energies of potassium are 418, 3070 and 4600 kJ mol^{-1}, respectively.

Use this information to explain why potassium is in Group 1.

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..... [2]

[Total: 10]