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CAIE A LEVEL Chemistry Topic Questions / 9701

1.3.1-Shells-Subshells-Orbitals-and-Principle-Quantum-set-2

Total Questions: 10

Note:

- For questions with answer choices as statements 1, 2 and 3, follow these instructions for selecting options A/B/C/D:
- A= 1, 2 and 3 are correct
- B=1 and 2 only are correct
- C=2 and 3 only are correct
- D=1 only is correct

Questions

Question 1:

Scientists are trying to synthesise a new element with proton number 119. The element is predicted to be a Group 1 element in Period 8 of the Periodic Table.

Which predictions are likely to be correct about this element?

1 The outermost occupied orbital of one atom of this element will be an s orbital.

2 The atomic radius will be the largest of the seven elements in Group 1.

3 It will have a greater first ionisation energy than element 118.

Question 2:

Carbon and nitrogen are adjacent in the Periodic Table.

Which properties do they both have?

1 There is an empty 2p orbital in each atom of the element.

2 The principal quantum number of the highest occupied orbital is 2.

3 They can form compounds in which their atoms form four bonds.

Question 3:

X is an element that has

- its outer electrons in the 4th principal quantum shell,
- a higher 1st ionisation energy than calcium.

What could be the identity of **X**?

1 bromine

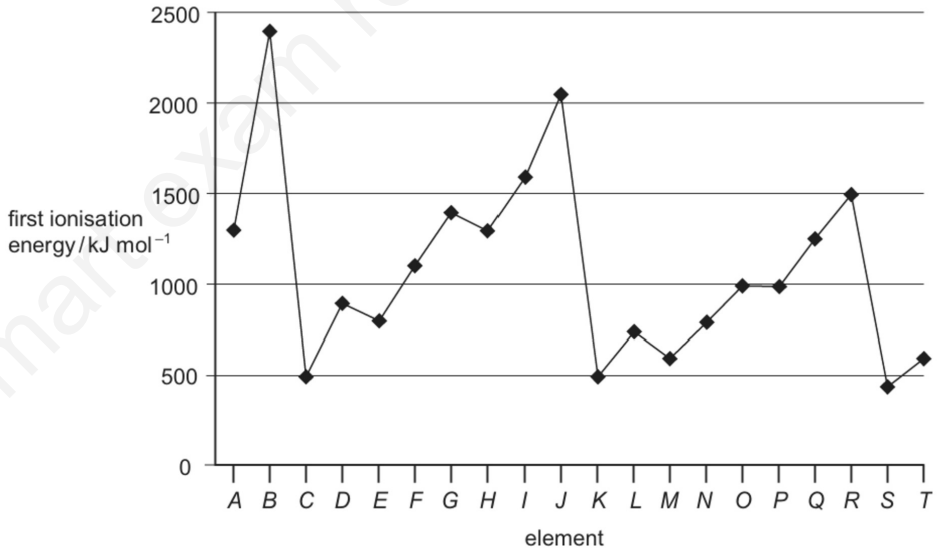
2 krypton

3 xenon

Questions (Continued)

Question 4:

4 The first ionisation energies of successive elements in the Periodic Table are represented in the graph.



Which of these statements about this graph are correct?

1 Elements *B*, *J* and *R* are in Group 0 of the Periodic Table.

2 Atoms of elements *D* and *L* contain 2 electrons in their outer shells.

3 Atoms of elements *G* and *O* contain half-filled p orbitals.

Question 5:

What is the order of increasing energy of the listed orbitals in the atom of titanium?

A 3s 3p 3d 4s

B 3s 3p 4s 3d

C 3s 4s 3p 3d

D 4s 3s 3p 3d

Question 6:

Which of the following particles would, on losing an electron, have a half-filled set of p orbitals?

A C^- **B** N **C** N^- **D** O^+

Questions (Continued)

Question 7:

Gallium nitride, GaN, could revolutionise the design of electric light bulbs because only a small length used as a filament gives excellent light at low cost.

Gallium nitride is an ionic compound containing the Ga^{3+} ion.

What is the electron arrangement of the nitrogen ion in gallium nitride?

A $1s^2\ 2s^2$

B $1s^2\ 2s^2\ 2p^3$

C $1s^2\ 2s^2\ 2p^4$

D $1s^2\ 2s^2\ 2p^6$

Question 8:

In which pair do both atoms have one electron only in an s orbital in their ground states?

A Ca, Sc **B** Cu, Be **C** H, He **D** Li, Cr

Question 9:

The first seven ionisation energies of an element between lithium and neon in the Periodic Table are as follows.

1310 3390 5320 7450 11 000 13 300 71 000 $kJmol^{-1}$

What is the outer electronic configuration of the element?

A $2s^2$ **B** $2s^2 2p^1$ **C** $2s^2 2p^4$ **D** $2s^2 2p^6$

Questions (Continued)

Question 10:

The electronic configuration of an atom of sulfur is $1s^2 2s^2 2p^6 3s^2 3p^4$.

How many valence shell and unpaired electrons are present in one sulfur atom?

	valence shell electrons	unpaired electrons
A	2	1
B	4	2
C	6	0
D	6	2