

Module 1: Fundamentals in Chemistry

1.1.1: Atomic Structure and the Periodic Table

1 The atomic theory published in 1808 by John Dalton has been modified because

- (A) after 1808 other scientists discovered new information that disproved some of the principle in his theory (A)
- (B) his theory was not accepted by most members of the scientific community in 1808 (B)
- (C) his theory could not be proven (C)
- (D) his theory was based on experimental data generated by other scientists. (D)

2 Identify the type of radioactive emission in the equation below.



- (A) Beta particle emission that lead to an increase in the n/p ratio. (A)
- (B) Beta particle emission that lead to a decrease in the n/p ratio. (B)
- (C) Alpha particle emission that lead to an increase in the n/p ratio. (C)
- (D) Alpha particle emission that lead to a decrease in the n/p ratio. (D)

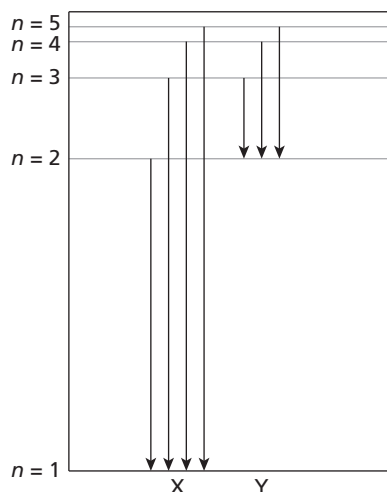
3 Which of the following atomic orbitals has the lowest relative orbital energy?

- (A) 1p (A)
- (B) 1s (B)
- (C) 2p (C)
- (D) 2s (D)

4 Which of the radioisotopes below is used as a medical tracer to monitor the activity of the thyroid gland?

- (A) Sodium-24 (A)
- (B) Potassium-40 (B)
- (C) Yttrium-90 (C)
- (D) Iodine-131 (D)

Item 5 refers to the diagram of electronic transitions in the hydrogen atom.



5 Which statements correctly describe the energy changes for the electronic transitions?

I X occurs in the Balmer series.

II Y is invisible to the human eye.

III All the energy changes are quantised.

IV The energy changes at X have higher frequencies than those at Y.

(A) I only

(B) III and IV

(C) II, III and IV

(D) IV only

(A)

(B)

(C)

(D)

6 Which statements below are CORRECT?

I The 3p sub-shell can hold a maximum of six electrons.

II For elements with an atomic number less than 20, the energy of the 4s orbital is lower than the energy of the 3d orbital.

III The neutrons in a nucleus help to reduce the repulsion between the protons.

IV As the nuclear charge of an atom increases, the ionisation energy decreases.

(A) I only

(B) I and II

(C) I, II and III

(D) III and IV

(A)

(B)

(C)

(D)

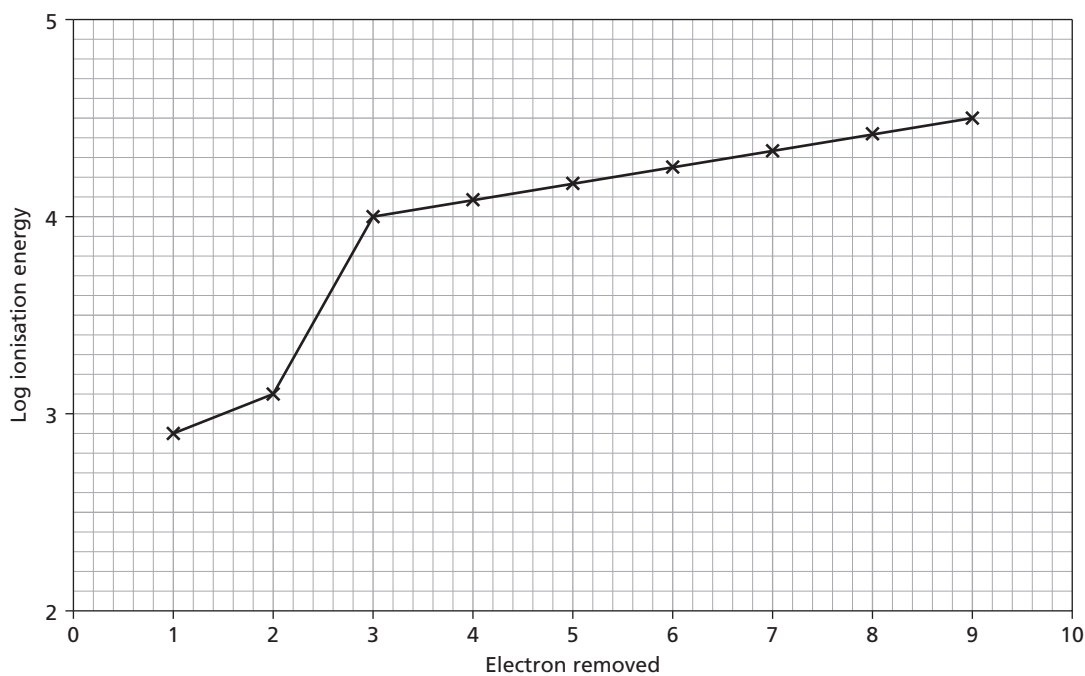
1.1.1: Atomic Structure and the Periodic Table (cont.)

Item 7 refers to the table of first ionisation energies for lithium, sodium, oxygen and sulfur.

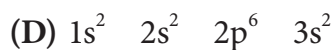
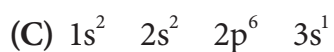
Element	Li	Na	O	S
Group	I	I	VI	VI
Period	2	3	2	3
First ionisation energy, kJ/mol	519	494	1310	1000

- 7 Which of the statements below is supported by the data in the table?
- I First ionisation energy increases across a period as the atomic number increases.
 - II A change in atomic radius does not lead to a change in first ionisation energy.
 - III First ionisation energy decreases down a group as the quantum number increases.
 - IV Down a group the effect of the attractive force of the nucleus on the outer electrons is offset by the shielding effect from the inner electrons.
- (A) I, II and IV Ⓐ
- (B) I, III and IV Ⓑ
- (C) I, II and III Ⓒ
- (D) I, II, III and IV Ⓓ

Item 8 refers to the graph of log of successive ionisation energies for nine electrons removed from an element, R.



8 The electronic configuration of element R is MOST LIKELY:



(A)

(B)

(C)

(D)