

PERIODIC TABLE 2

Q1. Read the information about the development of the periodic table and answer the questions that follow.

John Newlands was one of the first chemists to arrange the known elements in order of increasing atomic mass. In 1866, he put forward the Law of Octaves. He suggested that there was a repeating pattern of elements with similar chemical properties every eighth element, just like the eighth note of an octave of music. A version of his periodic table is shown below.

H	Li	G	Bo	C	N	O
F	Na	Mg	Al	Si	P	S
Cl	K	Ca	Cr	Ti	Mn	Fe
Co, Ni	Cu	Zn	Y	In	As	Se
Br	Rb	Sr	Ce, La	Zr	Di, Mo	Ro, Ru
Pd	Ag	Cd	U	Sn	Sb	Te
I	Cs	Ba, V	Ta	W	Nb	Au
Pt, Ir	Os	Hg	Tl	Pb	Bi	Th

However, other chemists did not accept Newlands' ideas. It was not until much later that his contribution to the development of the modern periodic table was recognised.

The modern periodic table may help you to answer these questions.

(a) What is the modern symbol for the element 'Bo'?

(1 mark)

(b) Describe one piece of evidence to support the Law of Octaves.

(2 marks)

(c) Suggest two reasons why other chemists did not accept Newlands' ideas.

(2 marks)

(d) The alkanes are a series of hydrocarbons with similar chemical properties. They have the general formula C_nH_{2n+2} .

Suggest why the alkanes do not appear in the periodic table.

(1 mark)

Q2. Complete these sentences by drawing a ring around the correct answer.

(i) Attempts to classify the elements into a periodic table were made by

Arrhenius and Dalton

Brønsted and Lowry

Mendeleev and Newlands

(1 mark)

(ii) They arranged the elements in order of their

atomic weight

melting point

reactivity

(1 mark)

(iii) They put elements in the same Group if they had similar

boiling points
chemical reactions
electrical
conductivities

(1 mark)

(iv) We now know that elements in the same Group have the same number of

electrons
neutrons
protons

in their outer shell (energy level).

(1 mark)

Q3. Read the information about the periodic table.



When the Russian chemist Dimitri Mendeleev put forward his periodic table in 1869, the atomic structure of elements was unknown. Mendeleev tried to arrange the elements in a meaningful way based on their chemical reactions. First, he put the elements in order of their increasing atomic weight. He then put elements with similar properties in the same column. However, he left gaps, and sometimes did not follow the order of increasing atomic weight – for example, he

placed iodine (atomic weight 127) after tellurium (atomic weight 128). Within a few years there was sufficient evidence to prove that Mendeleev was correct.

Our modern periodic table has evolved from Mendeleev's table.

The modern periodic table may help you to answer these questions.

(a)(i) State why Mendeleev left gaps.

(1 mark)

(ii) State why some elements were not placed in order of increasing atomic weight.

(1 mark)

(b)(i) The periodic table is now based on atomic structure.

Explain how.

(3 marks)

(ii) Suggest why it is impossible to have an undiscovered element that would fit between sodium and magnesium.

(1 mark)

Q4. The periodic table was developed over about 200 years. In 1869, a Russian scientist, Mendeleev, arranged the 60 known elements into his periodic table. Mendeleev put the elements in order of their increasing atomic weights. Then he put elements with similar chemical properties in the same columns. He left gaps in his periodic table.

The modern periodic table may help you to answer these questions.

The modern periodic table was produced with knowledge of the atomic structure of elements. The modern periodic table is an arrangement of the elements in terms of their atomic structures. Explain how.

(3 marks)

Q5. In 1869, Dmitri Mendeleev produced his periodic table of the elements.

Mendeleev placed the alkali metals in the same group.

(a) What evidence did Mendeleev use to decide that the alkali metals should be in the same group?

(1 mark)

(b) Describe how the elements in the modern periodic table are arranged:

(i) in terms of protons

(1 mark)

(ii) in terms of electrons.

(1 mark)

Q6. Use the correct word from the box to complete each sentence.

electrons	molecules	neutrons	protons
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In the modern periodic table elements are arranged in order of the number of in their nucleus. Elements in the same group have the same number of in their highest energy level (outer shell).

(2 marks)

Q7. In 1866 John Newlands produced an early version of the periodic table. Part of Newlands' periodic table is shown in the figure.

Column	1	2	3	4	5	6	7
	H	Li	Be	B	C	N	O
	F	Na	Mg	Al	Si	P	S
	Cl	K	Ca	Cr	Ti	Mn	Fe

Newlands' periodic table arranged all the known elements into columns in order of their atomic weight.

Newlands was trying to show a pattern by putting the elements into columns.

(a) Iron (Fe) does not fit the pattern in column 7. Give a reason why.

(1 mark)

(b) In 1869 Dmitri Mendeleev produced his version of the periodic table.

Why did Mendeleev leave gaps for undiscovered elements in his periodic table?

(1 mark)

(c) Newlands and Mendeleev placed the elements in order of atomic weight.

Complete the sentence.

The modern periodic table places the elements in order of

(1 mark)

(d) Lithium, sodium and potassium are all in Group 1 of the modern periodic table.

Explain why.

(2 marks)

3 They do not conduct electricity.

4 They are resistant to corrosion.

(1 mark)

(b) Fe (iron) and O (oxygen) are in the periodic table but Fe₂O₃ (iron oxide) is not. This is because iron oxide is . . .

1 an alloy.

2 a compound.

3 an ore.

4 a gas.

(1 mark)

Total marks (35)