

Matter and material: The periodic table

Practice test and memo

Practice test

Mark allocation: 35 marks

Time allocation: 35 minutes

Refer to the periodic table at the end of the test.

- Four options are provided as possible answers to the following questions. Each question has only one correct answer. Write only the letter (A-D) next to the question number.
 - As period 2 elements are considered in order from lithium to fluorine, there is a decrease in the: **(2)**
 - Atomic radius
 - Ionisation energy
 - The number of energy levels
 - Atomic mass
 - Group 17 elements are known as? **(2)**
 - Alkaline earth metals
 - Alkali metals
 - Halides
 - Halogens
 - Ion X^{2+} reacts with ion Y^{3-} . What compound will be formed? **(2)**
 - X_2Y_3
 - X_2Y_2
 - X_3Y_2
 - XY
- The diagram below shows the simplified periodic table of elements. The letters **A** to **L** in the periodic table represent some of the main group of elements but are NOT the chemical symbols of the elements.

	1	2		13	14	15	16	17	18
1	A								K
2	B				G			J	
3	C	E		F		H	I		L
4	D								

- How many protons does an atom of element **K** have? **(1)**
- Write down the sp notation for an element represented by the letter **K**. **(1)**
- Write down the number of valence electrons of an element represented by **F**. **(1)**
- What is the valency of element **F**? **(1)**
- Write down the letter that represents an element which:
 - Represents magnesium in the periodic table. **(1)**
 - Is in period 2 that will form an X^- ion? **(1)**
 - Has the electron configuration $1s^22s^22p^63s^23p^64s^1$. **(1)**
 - Has the same number of electrons as Ca^{2+} . **(1)**
 - Has similar chemical properties as oxygen. **(1)**
 - Is in period 3 that forms an ion with a charge of 3^- . **(1)**
- Which ONE of the letters **C**, **E** and **F** represent an element with the lowest atomic radius? Explain your answer. **(4)**
- The letter **F** represents an element that is less reactive than an element represented by letter **C**. Explain this statement by referring to the valence electrons and valency between elements represented by letter **F** and letter **C**. **(3)**
- The following table shows the first ionisation energies for the elements of periods 1 and 2.

Period	Element	First ionisation energy (kJ.mol ⁻¹)
1	H	1 312
	He	2 372
2	Li	520
	Be	899
	B	801
	C	1 086
	N	1 402
	O	1 314
	F	1 681
	Ne	2 081

- 3.1 What is the meaning of the term first ionisation energy? (2)
- 3.2 Which TWO elements exert the strongest attractive forces on their electrons? Explain using the data in the table. (2)
- 3.3 Explain why the first ionisation energy of carbon is higher than that of boron. (3)
- 3.4 Why is helium gas considered safe to use in helium balloons? Explain. (2)
- 3.5 Group 1 elements readily form positive ions with a +1 charge. Is this statement correct? Explain your answer by referring to the ionisation energies in the table. (3)

1 (I)	2 (II)	3	4	5	6	7	8	9	10	11	12	13 (III)	14 (IV)	15 (V)	16 (VI)	17 (VII)	18 (VIII)	
1 1 H																	2 4 He	
3 7 Li	4 9 Be												5 11 B	6 12 C	7 14 N	8 16 O	9 19 F	10 20 Ne
11 23 Na	12 24 Mg												13 27 Al	14 28 Si	15 31 P	16 32 S	17 35,5 Cl	18 40 Ar
19 39 K	20 40 Ca	21 45 Sc	22 48 Ti	23 51 V	24 52 Cr	25 55 Mn	26 56 Fe	27 59 Co	28 59 Ni	29 63,5 Cu	30 65 Zn	31 70 Ga	32 73 Ge	33 75 As	34 79 Se	35 80 Br	36 84 Kr	
37 86 Rb	38 88 Sr	39 89 Y	40 91 Zr	41 92 Nb	42 96 Mo	43 96 Tc	44 101 Ru	45 103 Rh	46 106 Pd	47 108 Ag	48 112 Cd	49 115 In	50 119 Sn	51 122 Sb	52 128 Te	53 127 I	54 131 Xe	
55 133 Cs	56 137 Ba	57 139 La	72 179 Hf	73 181 Ta	74 184 W	75 186 Re	76 190 Os	77 192 Ir	78 195 Pt	79 197 Au	80 201 Hg	81 204 Tl	82 207 Pb	83 209 Bi	84 209 Po	85 209 At	86 209 Rn	
87 226 Fr	88 226 Ra	89 Ac																
			58 140 Ce	59 141 Pr	60 144 Nd	61 Pm	62 150 Sm	63 152 Eu	64 157 Gd	65 159 Tb	66 163 Dy	67 165 Ho	68 167 Er	69 169 Tm	70 173 Yb	71 175 Lu		
			90 232 Th	91 Pa	92 238 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr		

KEY/SLEUTEL

Atomic number
Atoomgetal

Electronegativity
Elektronegatiwiteit

Symbol
Simbool

Approximate relative atomic mass
Benaderde relatiewe atoommassa



Practice test memo

1. Four options are provided as possible answers to the following questions. Each question has only one correct answer. Write only the letter (A-D) next to the question number.

1.1 A✓✓

1.2 D✓✓

1.3 C✓✓

2.

2.1 2✓

2.2 $1s^2$ ✓

2.3 3✓

2.4 3+✓

2.5

2.5.1 E✓

2.5.2 J✓

2.5.3 D✓

2.5.4 L✓

2.5.5 I✓

2.5.6 H✓

2.6 F has the lowest atomic radius✓

C, E and F all have their outermost electrons in $n=3$ ✓

However, atom F has more protons in its nucleus✓

This electrostatic force pulls the electrons closer to the nucleus✓ making the atomic radius of atom F smaller.

2.7 Atom C has 1 valence electron and a valency of $1+$ ✓ It needs to lose one electron to have a full outer energy level. Atom F has 3 valence electrons and a valency of $3+$ ✓ It needs to lose three electrons to have a full outer energy level.

Because atom C only need to lose 1 electron (relative to three electrons in atom F) atom C is more reactive✓

3.

3.1 The energy needed per mole to remove an electron from a neutral atom in the gas phase✓✓

3.2 Helium and neon (noble gases)✓ Noble gases have the highest ionization energies, meaning that it is most difficult to remove an outermost electron from these elements✓

3.3 Both carbon and boron have their outermost electrons in $n=2$ ✓

However, carbon has 6 protons in its nucleus and boron has 5✓

Therefore the electrostatic force of attraction towards the nucleus on carbon's outermost electron is stronger, requiring more energy to remove the electron✓

3.4 It is unreactive✓ because it has a full outer energy level✓

3.5 Correct✓ Group I elements have only one valence electron and only need to lose that one electron to have a full outer energy level and form a positive ion with a charge of $+1$ ✓ These elements have low first ionization energies (for their period)✓