Matter and material: Chemical bonding

Practice test and memo

Practice test

Mark allocation: 40 marks
Time allocation: 40 minutes
Refer to the periodic table at the end of the test.

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 Which compound has covalent bonds between the atoms? **(2)**

A. Fe_2O_3
B. NH_3
C. K_2O
D. Na_2O

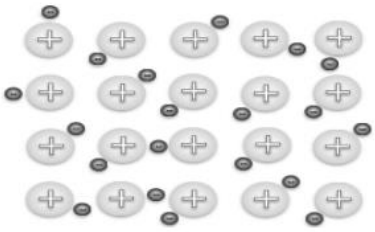
1.2 The correct chemical formula for ammonium nitrate is: **(2)**

A. NH_4NO
B. $NH_4(NO_3)_2$
C. NH_4NO_3
D. NH_4NO_2

1.3 In which one of the following compounds do ionic bond occur between the atoms? **(2)**

A. Dihydrogen monoxide
B. Silicon dioxide
C. Mercury
D. Sodium chloride

1.4 What does the diagram below represent? **(2)**



A. Ionic crystal lattice
B. Positive ions surrounded by a sea of electrons
C. Covalent bonds
D. Electrostatic forces of repulsion

1.5 Consider the following statements: **(2)**

(i) A bond is formed by the sharing of electrons between nonmetals
(ii) A bond is formed by the transfer of electrons from a metal to a nonmetal
(iii) Ions are held together by electrostatic forces of attraction
(iv) Arranged in a network structure known as a crystal lattice

Which of the above statements are true of ionic bonds?

A. (i), (iii) and (iv)
B. (ii) and (iv)
C. (ii) and (iii)
D. (ii), (iii) and (iv)

2. Use the information from the periodic table to complete the table below. Write the answer next to each of question numbers (2.1)–(2.10). **(10)**

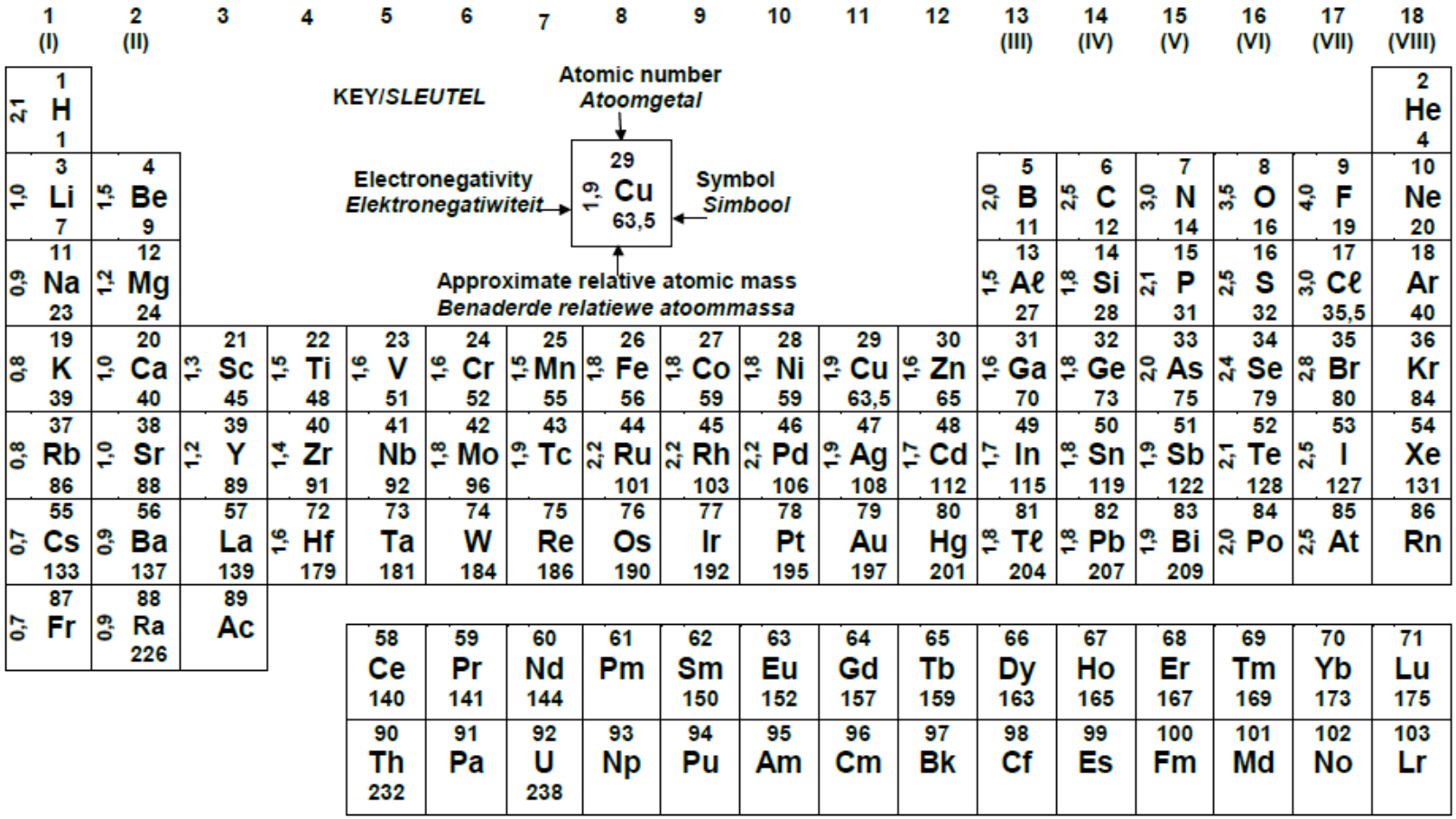
Name of element or ion	**Symbol**	**Number of protons**	**Number of electrons**	**Charge or valency**
Aluminium	Al	13	(2.1)	(2.2)
Magnesium ion	(2.3)	12	(2.4)	(2.5)
Bromide	Br^-	(2.6)	(2.7)	1–
Oxide	(2.8)	8	(2.9)	(2.10)

3. Write the names of the following substances:
3.1 $CaCO_3$ **(1)**
3.2 NH_4Cl **(1)**

4. Write the chemical formulas of the following substances:
4.1 Zinc sulphate **(1)**
4.2 Potassium permanganate **(1)**

5. Consider a carbon dioxide molecule.
5.1 What is the chemical formula of carbon dioxide? **(1)**
5.2 Name the type of bond formed between these elements. **(1)**
5.3 Use a Lewis diagram to represent carbon dioxide. **(2)**

6. Calcium and chlorine readily react to form calcium chloride.
6.1 Provide the electron configuration of the **ion** of calcium. **(2)**
6.2 Draw the Aufbau diagram of the **ion** of chlorine. **(3)**
6.3 Name the type of bond formed between these elements. **(1)**
6.4 Use Lewis diagrams to show the two half reactions, full reaction and final product formed when calcium and chlorine chemically react. **(6)**


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)
KEY/SLEUTEL
Atomic number
Atoomgetal
Electronegativity
Elektronegatiwiteit
Symbol
Simbool
Approximate relative atomic mass
Benaderde relatiewe atoommassa
2,1 H 1
2 He 4
1,0 Li 7
1,5 Be 9
2,0 B 11
2,5 C 12
3,0 N 14
3,5 O 16
4,0 F 19
10 Ne 20
0,9 Na 23
1,2 Mg 24
1,5 Aℓ 27
1,8 Si 28
2,1 P 31
2,5 S 32
3,0 Cℓ 35,5
18 Ar 40
0,8 K 39
1,0 Ca 40
1,3 Sc 45
1,5 Ti 48
1,6 V 51
1,6 Cr 52
1,5 Mn 55
1,8 Fe 56
1,8 Co 59
1,8 Ni 59
1,9 Cu 63,5
1,6 Zn 65
1,6 Ga 70
1,8 Ge 73
2,0 As 75
2,4 Se 79
2,8 Br 80
36 Kr 84
0,8 Rb 86
1,0 Sr 88
1,2 Y 89
1,4 Zr 91
41 Nb 92
1,8 Mo 96
1,9 Tc
2,2 Ru 101
2,2 Rh 103
2,2 Pd 106
1,9 Ag 108
1,7 Cd 112
1,7 In 115
1,8 Sn 119
1,9 Sb 122
2,1 Te 128
2,5 I 127
54 Xe 131
0,7 Cs 133
0,9 Ba 137
57 La 139
1,6 Hf 179
73 Ta 181
74 W 184
75 Re 186
76 Os 190
77 Ir 192
78 Pt 195
79 Au 197
80 Hg 201
1,8 Tℓ 204
1,8 Pb 207
1,9 Bi 209
2,0 Po
2,5 At
86 Rn
0,7 Fr
0,9 Ra 226
89 Ac
58 Ce 140
59 Pr 141
60 Nd 144
61 Pm
62 Sm 150
63 Eu 152
64 Gd 157
65 Tb 159
66 Dy 163
67 Ho 165
68 Er 167
69 Tm 169
70 Yb 173
71 Lu 175
90 Th 232
91 Pa
92 U 238
93 Np
94 Pu
95 Am
96 Cm
97 Bk
98 Cf
99 Es
100 Fm
101 Md
102 No
103 Lr

Practice test memo

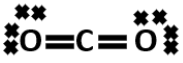
1. Four options are provided as possible answers to the following questions. Each question has only one correct answer. Write only the letter (A-D) next to the question number.

1.1 B✓✓
1.2 C✓✓
1.3 D✓✓
1.4 B✓✓
1.5 D✓✓

2.
2.1 13✓
2.2 0✓
2.3 Mg^{2+}✓
2.4 10✓
2.5 2+✓
2.6 35✓
2.7 36✓
2.8 O^{2-}✓
2.9 10✓
2.10 2–✓

3.
3.1 Calcium carbonate✓
3.2 Ammonium chloride✓

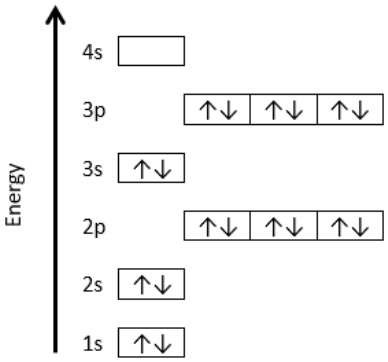
4.
4.1 $ZnSO_4$✓
4.2 $KMNO_4$✓

5.
5.1 CO_2✓
5.2 Covalent✓
5.3 
or
 ✓✓

6.

6.1 $1s^2 2s^2 2p^6 3s^2 3p^6$ ✓✓ (Same electron configuration as argon, since all ions have the electron configuration of a noble gas)

6.2 Aufbau diagram of chloride: ✓ for correct layout including energy layout, ✓for arrows in opposite directions, ✓for correct number of arrows to represent chloride.

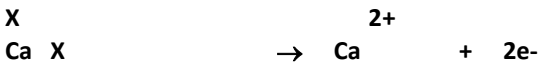


(Same electron configuration as argon, since all ions have the electron configuration of a noble gas)

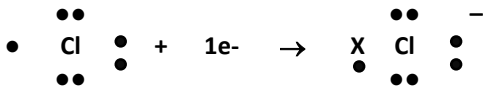
6.3 Ionic bond ✓

6.4

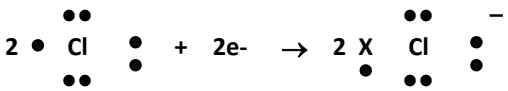
Half reaction 1: ✓



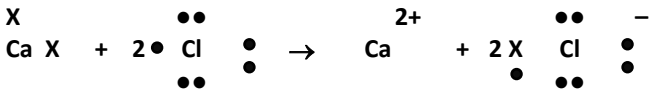
Half reaction 2:



Balance the number of electrons in half reaction 2: ✓✓



Full reaction: ✓



Final product: ✓✓