

6 This question is about the Periodic Table.

(a) State the name given to Group I elements.

..... [1]

(b) State which Group I element is least reactive.

..... [1]

(c) Lithium is in Group I of the Periodic Table.

When lithium is added to water a chemical reaction occurs.

(i) Give **two** observations when lithium is added to water.

- 1
- 2

[2]

(ii) Write a symbol equation for this reaction.

..... [2]

(d) Group I elements have lower melting points and lower boiling points than transition elements.

Describe **two other** physical properties of Group I elements that are different from transition elements.

- 1
- 2

[2]

(e) The Group VII elements are known as the halogens.

(i) Give the physical state and colour of chlorine at room temperature and pressure.

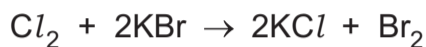
state

colour

[2]

(ii) When chlorine is passed through aqueous potassium bromide, a displacement reaction occurs.

The equation for the reaction is shown.

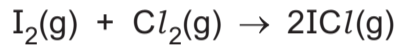


Write an ionic equation for the reaction.

..... [2]

(iii) Iodine and chlorine react at high temperatures to form iodine monochloride, ICl .

The equation for the reaction is shown.



The structures of the molecules involved in the reaction are $I-I$, $Cl-Cl$ and $I-Cl$.

Table 6.1

| bond | bond energy in kJ/mol |
|---------|-----------------------|
| $I-I$ | 150 |
| $Cl-Cl$ | 242 |
| $I-Cl$ | 218 |

Calculate the enthalpy change, ΔH , for the reaction using the bond energies in Table 6.1.

Use the following steps.

- Calculate the **total** amount of energy required to break the bonds in 1 mol of $I_2(g)$ and 1 mol of $Cl_2(g)$.

..... kJ

- Calculate the total amount of energy released when the bonds in 2 mol of $ICl(g)$ are formed.

..... kJ

- Calculate the enthalpy change, ΔH , for the reaction. Your answer should include a sign.

..... kJ/mol [3]

[Total: 15]

The Periodic Table of Elements

| Group | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| I | II | III | | | | | | | | | | IV | V | VI | VII | VIII | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 Li lithium | 4 Be beryllium | 1 H hydrogen | 5 B boron | 6 C carbon | 7 N nitrogen | 8 O oxygen | 9 F fluorine | 10 Ne neon | 11 Al aluminium | 12 Si silicon | 13 P phosphorus | 14 S sulfur | 15 Cl chlorine | 16 Ar argon | 17 K potassium | 18 Ca calcium | 19 Sc scandium | 20 Ti titanium | 21 V vanadium | 22 Cr chromium | 23 Mn manganese | 24 Fe iron | 25 Co cobalt | 26 Ni nickel | 27 Cu copper | 28 Zn zinc | 29 Ga gallium | 30 Ge germanium | 31 As arsenic | 32 Se selenium | 33 Br bromine | 34 Kr krypton | 35 Rb rubidium | 36 Sr strontium | 37 Y yttrium | 38 Zr zirconium | 39 Nb niobium | 40 Mo molybdenum | 41 Tc technetium | 42 Ru ruthenium | 43 Rh rhodium | 44 Pd palladium | 45 Ag silver | 46 Cd cadmium | 47 In indium | 48 Sn tin | 49 Sb antimony | 50 Te tellurium | 51 I iodine | 52 Xe xenon | 53 Cs caesium | 54 Ba barium | 55 La lanthanoids | 56 Ce cerium | 57 Pr praseodymium | 58 Nd neodymium | 59 Pm promethium | 60 Sm samarium | 61 Eu europium | 62 Gd gadolinium | 63 Tb terbium | 64 Dy dysprosium | 65 Ho holmium | 66 Er erbium | 67 Tm thulium | 68 Yb ytterbium | 69 Lu lutetium | 70 Hf hafnium | 71 Ta tantalum | 72 W tungsten | 73 Re rhenium | 74 Os osmium | 75 Ir iridium | 76 Pt platinum | 77 Au gold | 78 Hg mercury | 79 Tl thallium | 80 Pb lead | 81 Bi bismuth | 82 Po polonium | 83 At astatine | 84 Rn radon | 85 Fr francium | 86 Ra radium | 87 Ac actinoids | 88 Th thorium | 89 Pa protactinium | 90 U uranium | 91 Np neptunium | 92 Pu plutonium | 93 Am americium | 94 Cm curium | 95 Bk berkelium | 96 Cf californium | 97 Es einsteinium | 98 Fm fermium | 99 Md mendelevium | 100 No nobelium | 101 Lr lawrencium | 102 Og oganesson |

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).