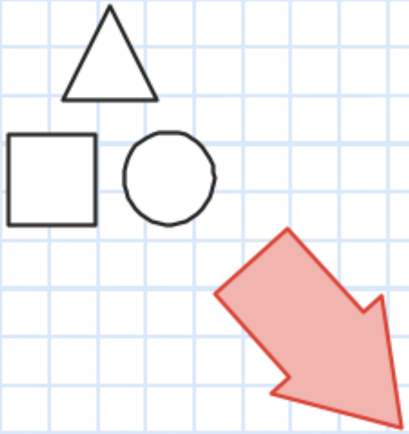
Welcome!

RA Session
28/03/2022

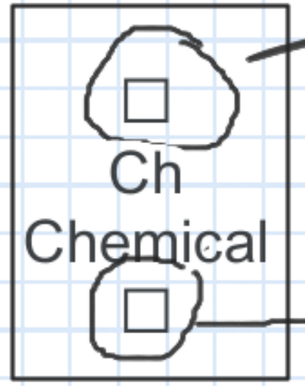
Chemistry



Recap

Periodic Table

First invented/discovered by Dimitri Mendeleev in 1869



Mass number

number of p + n

Proton/Atomic number

number of p OR e

Abbreviated to PT

18 groups and 7 periods

Potassium
Sodium
Calcium
Magnesium
Aluminium
Carbon
Zinc
Iron
Tin
Lead
Hydrogen
Copper
Silver
Gold

More Reactive

Periods

1. Alkali Metals
2. Alkaline Earth Metals
7. Halogens
0. Noble Gases

GCSE Groups

AQA

The Periodic Table of Elements

Groups = 18

Increasing mass

Increasing mass + electrons (electron shells increase in size)

BrINCIHOF

Diatomic elements (H_2)

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

	1	2										3	4	5	6	7	0
1	1+	2+										3+		3−	2−	1−	
2	7 **Li** lithium 3	9 **Be** beryllium 4										11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
3	23 **Na** sodium 11	24 **Mg** magnesium 12										27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
4	39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
5	85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
6	133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
7	[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	[285] **Cn** copernicium 112	[286] **Nh** nihonium 113	[289] **Fl** flerovium 114	[289] **Mc** moscovium 115	[293] **Lv** livermorium 116	[294] **Ts** tennessine 117	[294] **Og** oganesson 118

	F	Cl
1	2	2
2	8	10
3	8	18
4	18	36
5	18	54
6	32	86
7	36	118

* The Lanthanides (atomic numbers 58 – 71) and the Actinides (atomic numbers 90 – 103) have been omitted.

Relative atomic masses for **Cu** and **Cl** have not been rounded to the nearest whole number.

Bonding

- Ionic
  - metal + non-metal
  - Involves ions
  - Electrolysis when molten or aqueous
  - High melting and boiling points due to strong electrostatic forces of attraction
- Covalent
  - non-metal + non-metal
  - Electrons are shared
  - Small molecules
  - Weak intermolecular forces - low m + b ps
  - Cannot conduct
  - Giant
    - Diamond and graphite
- Metallic
  - in metals
  - High m + b ps
  - delocalised electrons
    - strong
  - can conduct

m + b ps = melting and boiling points

EQUATION
BOND
ENERGY

Overall

energy change = reactants energy - products energy

Worked Examples

ACRONYM
VESRAU

Values

Equation

Substitute

Rearrange

Answer

Units

ACRONYM
FIFA

Formula
Insert Values
Fine Tune
Answer

Hydrogen and chlorine react to form hydrogen chloride gas:

436+243 = 679

2 × 432 = 864

$$H{-}H + Cl{-}Cl \rightarrow 2 \times (H{-}Cl)$$

Calculate the energy change.

VESRAU

Bond	Bond Energy (kJ/mol)
H−H	436
Cl−Cl	243
H−Cl	432

energy change = reactants - products

energy change = 679 - 864

-185 = 679 - 864

-185 kJ/mol

Exothermic reaction

Hydrogen bromide decomposes to form hydrogen and bromine:

2 × 366 = 732 436 + 193 = 629

$$2 \times (H{-}Br) \rightarrow H{-}H + Br{-}Br$$

Calculate the energy change.

VESRAU

Bond	Bond Energy (kJ/mol)
H–Br	366
H–H	436
Br–Br	193

energy change = reactants - products

energy change = 732 - 629

103 = 732 - 629

+103 kJ/mol

Endothermic reaction

GENERAL OUTLINE

How to answer bond energy questions

1. Write the bond energy equation
2. Calculate bond energy of reactants
3. Calculate bond energy of products

REMEMBER: Include both large and small numbers in calculations

4. Take reactants from products

REMEMBER: Write units and positive or negative symbol

REMEMBER: You may have to work in reverse!

Practice Questions

INFO
QUESTIONS

Practice questions are available on the Online Quizzing System (OQS) under the title: Online RA Session #02 - Chemistry