Unit 1 Revision Mats

1. Electrons and Periodic Table
2. Ionic and Metallic Bonding
3. Covalent Bonding and Intermolecular Forces
4. Periodic Trends
5. Reactivity and Redox
6. Calculations

Electron Configuration & Periodic Table

Keywords

Atomic number–

Mass number—

Period-

Group-

Electronic Configuration-

Groups and Periods

Elements in the same row group have _____.

Elements in the same period have _____.

Circle the element that is in Group 2:
(a) $1s^22s^22p^2$ (b) $1s^22s^1$ (c) $1s^22s^22p^63s^2$

Circle the element that is in Period 2:
(a) $1s^22s^22p^2$ (b) $1s^2$ (c) $1s^22s^22p^63s^2$

Orbitals and Energy Levels

How many electrons can the following orbitals hold?
s-orbital
p-orbital
d-orbital

Name all the orbitals present:
First shell (first energy level):
Second shell (second energy level):
Third shell (third energy level):

Arrow in a Box Notation

When orbitals are being filled, they fill singly before doubling up. Electrons have opposite spins.
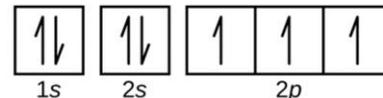
N $1s^22s^22p^3$

B
1s   2s   2p

O
1s   2s   2p

F
1s   2s   2p

Ne
1s   2s   2p

Element	Number of Electrons	Electronic Configuration
Boron	5	$1s^2\ 2s^2\ 2p^1$
Carbon	6	
Sodium		
Cl⁻		
Ca²⁺		

S, P, D-Blocks

Label the s-block, p-block and d-block and explain your answer.

Metallic & Ionic Bonding

Keywords

Ionic Bond–

Electrostatic—

Malleable-

Ductile-

Ionic Bonds - Trends

Name the two factors that determine the strength of an ionic bond:
1.
2.
What happens to the size of an ion as you go down a group? Explain why.
-
-

Which compound would have the strongest ionic bond: NaF or CaO? Explain why.
-
-
-
-

Metallic Bonding

Draw and label a diagram showing metallic bonding.

Dot and Cross Diagrams

Draw dot and cross diagrams for the following ionic compounds:

Sodium Chloride (NaCl)   Magnesium Oxide (MgO)

Sodium Oxide (Na_2O)   Calcium Chloride ($CaCl_2$)

Metals – Properties and Trends

List some properties of metals:

Explain why metals conduct electricity
-
-
Explain why metals are malleable and ductile.
-
-
Down a group, the strength of a metallic bond _____. The melting point _____. Explanation:

Across a period, the strength of a metallic bond _____. The melting point _____. Explanation:

Covalent Bonding and Intermolecular Forces

Keywords

Covalent Bond–

Dative Covalent Bond-

van der Waals force/London-

Dipole-dipole-

Hydrogen bond-

Polar v. Non-polar-

Dot and Cross Diagrams

Draw dot and cross diagrams for the following:

H_2O Cl_2

CH_4 N_2

O_2 CO_2

Draw a diagram showing the dative bond between NH_4^+ and H^+

Covalent Bonds - Trends

Which are stronger: shorter or longer bonds?

Which are stronger: single, double or triple bonds?

Which are shorter: single, double or triple bonds?

Intermolecular Forces

Fill in the table:

Electronegativity Difference	Type of Bond	Type of Intermolecular Forces
0 to 0.4		
0.4 to 1.8		
1.8+	Ionic	Electrostatic

What is the trend in electronegativity down a group?

What is the trend in electronegativity across a period?

Describe the type of intermolecular forces in:
HCl (electronegativity of H=2.20 and Cl=3.16)

H_2O (electronegativity of H=2.20 and O=3.44)

CH_4 (electronegativity of H=2.20 and C=3.16)

Draw the dipole for HF

Periodic Trends

Atomic Radius- Trends

Label the periodic table to show the trends in atomic radius down a group and across a period.
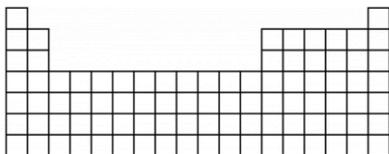
Explain why.
-
-

How does the size of a Na^+ ion compare to that of Na?
How does the size of a Cl^- ion compare to Cl?

Electronegativity Trends

Label the periodic table to show the trends in atomic radius down a group and across a period.

Explain why.
-
-

Keywords

Electronegativity—

Ionisation Energy–

Electron Affinity—

Electron Affinity-Trends

Label the periodic table to show the trends in atomic radius down a group and across a period.

Explain why.
-
-

Ionisation Energy-Trends

Label the periodic table to show the trends in atomic radius down a group and across a period.
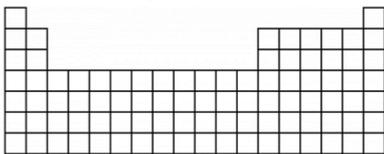
Explain why.
-
-

Type of Bonding & Melting Points

	Li	Be	B	C	N	O	F
Period 2	Li	Be	B	C	N	O	F
Period 3	Na	Mg	Al	Si	P	S	Cl
Type of Bonding							
Bonds/forces broken on melting Is mp high or low?							

What is the trend in melting points of metals down a group?

What is the trend of melting points of metals across a period?

Reactivity and Redox

Keywords

Oxidation—
Reduction-
Displacement-
Which of the following reactions will take place:
1. Iron + Copper Sulfate $\rightarrow$
2. Zinc + Potassium Chloride $\rightarrow$
3. Copper + Silver Nitrate $\rightarrow$
4. Potassium + Iron Oxide $\rightarrow$

Reactivity of Metals

Label this periodic table to show the trends of reactivity of metals.

Indicate the charge formed by metals in Groups 1-3
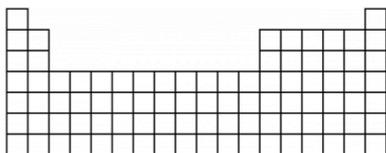
Explain these trends in reactivity.
-
-
-

Write a balanced equation for the products of the following:

$Na + O_2 \rightarrow$

$Mg + O_2 \rightarrow$

$Al + O_2 \rightarrow$

$Mg + H_2O \rightarrow$

$Ca + HCl \rightarrow$

$Ca + H_2SO_4 \rightarrow$
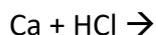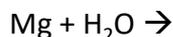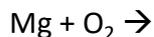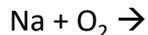
Oxidation States: Complete this table of oxidation states.

Element	Oxidation State	Exceptions
Group 1 (e.g. Na)		
Group 2 (e.g. Mg)		
Group 3 (e.g. Al)		
O		-1 in peroxides, +2 when bonded to F
F		
Cl, Br, I		when bonded to non-metals
H		

1. What is the oxidation number of each atom in:
(a) F_2 (b) $NaClO_3$ (c) H_2S (d) $KMnO_4$
2. Work out the oxidation number of Cl in the following: (a) HCl (b) HClO (c) $NaClO_2$ (d) $KClO_3$ (e) Cl_2O_7
3. Iron reacts with chlorine to form iron chloride. The equation is
$2Fe(s) + 3Cl_2(g) \rightarrow 2FeCl_3(s)$
What is oxidised and what is reduced?

Reactions with Oxygen

What is the difference between complete and incomplete combustion?

Carbon undergoes complete combustion to form CO_2 and incomplete combustion to form CO. Write a balanced symbol equation both reactions.

Calculations

Relative Formula Mass/Molar Mass

Atomic number is the number of protons in the atom's nucleus

32

Ge

Germanium

74

Symbol is used as a short-hand and in chemical equations

Mass number is the number of protons and neutrons in the nucleus
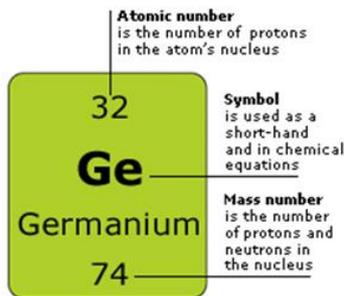
Using the <u>mass number</u> from the periodic table.
1. Calculate the relative formula mass of $CaCO_3$.

2. Calculate the relative formula mass of $Mg(OH)_2$

Reacting Masses $= \frac{\text{Mass of the known}}{\text{RFM of known}} \text{xRFM of unknown}$

Example: Calculate the mass of magnesium Chloride ($MgCl_2$) formed from 480g of Magnesium (Mg) when it is reacted with excess Hydrochloric acid (HCl). $Mg + HCl \longrightarrow MgCl_2 + H_2$

Step 1: Calculate the RFM of the $MgCl_2$. $= 24 + (35.5 \times 2) = 95$

Step 2: equation: $= \frac{480}{24} \text{x95} = 1900g$

1. In electrolysis, molten sodium bromide is decomposed.
$PbBr_2 \rightarrow Pb + Br_2$
Calculate the mass of lead that could be formed from 205g of lead bromide.

Moles

1. Calculate the number of moles in 5g of NaCl.

mass (g)

moles | RAM/RFM

2. Calculate the number of grams 2.5 moles of CO_2.

Concentration

moles

conc | vol dm³
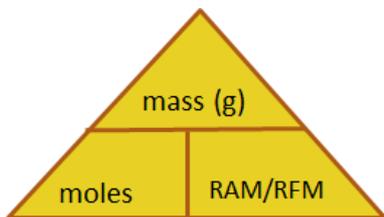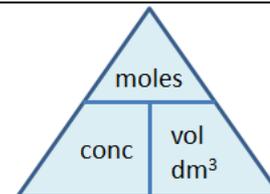
1. What is the relative formula mass/molar mass of $CaCl_2$?

2. A standard solution of $CaCl_2$ was made by dissolving 17g into 250 cm³ of water. What is the volume in dm³?

3. How many moles are there in 17g of $CaCl_2$?

4. Calculate the concentration of the $CaCl_2$ solution using your answers from 2 and 3 above.

5. Calculate the concentration in mol dm⁻³ of a solution made by dissolving 55g of NaOH into 500 cm³ of water.

Percent Yield

$percent\ yield = \frac{actual\ yield}{theoretical\ yield} \times 100\%$

1. What is the percentage yield of a reaction where the theoretical yield was 75 kg but the actual yield was 68 kg?