MODEL ANSWERS!!!

IE

Predicting electron configuration

How to find out which group:

- The largest difference is between the (a) and the (b) ionization energies.
- The (b) electron must have been removed from the inner electron shell.
- Therefore, there are (a) electrons in the valence shell.
- Element is in Group (a).

Down a group

- DECREASING
- As number of protons increase, nuclear charge increases
- However, as successive member of group has additional shell of electrons,
    - Screening effect increases
    - Atomic radius increases
- Increase in screening effect and atomic radius outweighs the increase in nuclear charge
- Forces of attraction between nucleus and valence electrons decrease
- Lesser amount of energy required to remove the electron

Across a period

- GENERALLY INCREASING
- Nuclear charge increases, while screening effect remains almost constant
- Effective nuclear charge increases
- Atomic radius decreases as electrons are pulled closer to the nucleus
- Force of attraction between nucleus and valence electrons increase
- Greater amount of energy is required to remove the electron

But there are exceptions where instead of increasing, ionization energy dips

Exception I (Mg to Al)

Electronic configuration of Mg: $1s^2 2s^2 2p^6 3s^2$

Electronic configuration of Al: $1s^2 2s^2 2p^6 3s^2 3p^1$

- It's easier to remove the electron from 3p than 3s

Exception II (P to S)

Electronic configuration of P: $1s^2 2s^2 2p^6 3s^2 3p^3$

Electronic configuration of S: $1s^2 2s^2 2p^6 3s^2 3p^4$

- The 4^{th} electron is added to the 1^{st} 3p orbital so there is now inter-electronic repulsion between the 1^{st} and 4^{th} 3p orbital electron. When there is repulsion, it is easier to remove.

Salts
Soluble→ Grp 1, ammonium, NSC (nitrate, sulfate, chloride), SPAN (sodium, potassium, amm, nitrate)
Insoluble→ COH (carbonate, oxide, hydroxide)

Precipitation:

1. Mix aqueous solutions of (solution) and (solution). A (insert colour) precipitate of (precipitate name) is produced
2. Filter the mixture. The residue is (whatever insoluble salt you want) and the filtrate is ____.
3. Wash the precipitate with a small amount of distilled water to remove any impurities
4. Dry the precipitate with filter paper

Reaction with insoluble substance (excess method)

1. Pour 25cm^3 of acid into a beaker. Add the (insoluble stuff) slowly, stirring constantly until no more solid dissolves.
2. Filter to remove the excess unreacted (insoluble stuff). Collect the filtrate that contains the aqueous solution of the salt
3. Heat the filtrate to evaporate some of the water and obtain a saturated solution of the salt.
4. Allow the filtrate to cool and crystallise
5. Filter to obtain the crystals as residue.
6. Rinse the crystals with a little cold distilled water to remove impurities.
7. Dry the crystals between filter papers

Titration (works best for Grp I and ammonium salts)

1. Fill up a burette with the acid. Note the initial burette reading (V1 cm^3). Pipette 25 cm^3 of the alkali or carbonate solution into a conical flask. Add 2 drops of indicator to the solution in the flask.
2. Add (acid) from the burette slowly until the indicator just changes colour (end-point). Record the final burette reading (V2 cm^3), and calculate the volume of (acid) required for neutralization (V2-V1 cm^3).
3. Repeat the whole procedure, adding the calculated volume of acid required for neutralization. However, do not add the indicator this time.
4. Heat the resulting solution to evaporate off some of the water.
5. Allow the saturated solution to cool and crystallize. Rinse the crystals with cold distilled water and dry between filter papers.

List of oxides
Basic oxides - CuO, MgO, NaOH, KOH
Amphoteric oxides - ZnO, Al_2O_3, PbO

Acidic oxides - SO_2, CO_2, SO_3
Neutral oxides - CO, NO, N_2O
Don't bother reacting oxides with hydroxides

ALKALI METALS

	Li	Na	K
Appearance	Dull outside, shiny inside	Dull outside, shiny inside	Dull outside, shiny inside
Hardness	Soft	Softer	Softest
Floats/sink in: Water Paraffin	Float Float	Float Sink	Float Sink
Observations	- Effervescence - No flame - Reacts quickly	- Effervescence - Yellow flame - Melts to form white globule - Darts around water surface - Reacts v quickly	- Effervescence - Purple flame - Melts - Reacts violently
Effect of burning splinter	Extinguishes flame with pop sound	Extinguishes flame with pop sound	Extinguishes flame with pop sound
Colour of universal indicator	Turn from green to purple	Turn from green to purple	Turn from green to purple

DISPLACEMENT

	KCl	KBr	KI
Cl liquid: pale yellow	Solution turns from colourless to pale yellow	Solution turn from colourless to orange	Solution turn from colourless to brown
Br liquid: orange	Solution turns from colourless to orange	Solution turns from colourless to orange	Solution turn from colourless to brown
I liquid: brown	Solution turns from colourless to brown	Solution turns from colourless to brown	Solution turns from colourless to brown

% Mass of element in compound = $\frac{Ar\ of\ element\ x\ No.\ of\ atoms}{Mr\ of\ compound}$ x100%

No. of moles = $\frac{Mass\ of\ chemical}{Mr}$

No. of particles = No. of moles x (6.02×10^{23})

Empirical Formula

Element	Element X	Element Y
Mass/g		
No. of moles		
Mole Ratio		
Simplest whole no. ratio		

Volume:

1 mole → $24dm^3$ at rtp → $22.4dm^3$ at stp

% Purity = % Yield = $\frac{Actual/g}{Theoretical/g}$ x100%

Acids and Bases

Acid + Base or Metal Oxide/Hydroxide → Salt + Water

Acid + Carbonate → Salt + Water + Carbon Dioxide

Acid + Metal → Salt + Water + Hydroxide

Alkali + Ammonium Salt → Salt + Water + Ammonia