Grade 12 Meeting 23 July 2018 Final Push

#45

Analysis of results

SUBJECT	NCS 2017	GRADE 11 2017	TERM 1 2018	TARGET	VARIANCE
Physical Science	63,4	69,15	76,07	80	-3,93
Technical Science	-	86,73	96,43	95	+1,43

PHYSICS -Paper 1

	QUESTION	MARKS
1	QUESTION 1: MULTIPLE CHOICE (10 ITEMS) – ALL TOPICS	20 (2 x 10)
2	QUESTION 2: NEWTONS LAWS	$\pm$15
3	QUESTION 3: VERTICAL PROJECTILE MOTION	$\pm$14
4	QUESTION 4: MOMENTUM	$\pm$13
5	QUESTION 5: WORK, POWER AND ENERGY	$\pm$13
6	QUESTION 6: DOPPLER EFFECT	$\pm$10
7	QUESTION 7: ELECTROSTATICS- Coulumbs law	$\pm$9
8	QUESTION 8:ELECTROSTATICS- Electric fields	$\pm$9
9	QUESTION 9: ELECRIC CIRCUITS	$\pm$20
10	QUESTION 10: ELECTRODYNAMICS-Motors, generators and alternating current	$\pm$13
11	QUESTION 11: PHOTO ELECTRIC EFFECT	$\pm$ 14

Chemistry-Paper 2

	QUESTION	MARKS
1	QUESTION 1: MULTIPLE CHOICE (10 ITEMS) – ALL TOPICS	20 (2 x 10)
2	QUESTION 2: ORGANIC CHEMISTRY-NOMENCLATURE	$\pm$20
3	QUESTION 3: ORGANIC CHEMISTRY: REACTIONS	$\pm$15
4	QUESTION 4: ORGANIC CHEMISTRY- PROPERTIES	$\pm$15
5	QUESTION 5: RATES OF REACTIONS	$\pm$20
6	QUESTION 6: CHEMICAL EQUILIBRIUM	$\pm$20
7	QUESTION 7: ACIDS AND BASES	$\pm$15
8	QUESTION 8: REDOX REACTIONS – Galvanic cells	$\pm$20
9	QUESTION 9: REDOX REACTIONS – Electrolytic cells	$\pm$20
10	QUESTION 10: FERTILIZERS	$\pm$10

Sections to concentrate on in Exam

KNOWLEDGE AREA	Paper	MARKS	%	TOPICS
CHEMICAL CHANGE	2	84	56	• Definitions • Kc Expression and calculations • Galvanic cells and electrolytic cells • Acids and Bases
MATTER AND MATERIAL	2	48	32	• IUPAC • Organic Molecules • Organic Reactions • Physical Properties

Sections to concentrate on in Exam

KNOWLEDGE AREA	Paper	MARKS	%	TOPICS
Electricity and Magnetism	1	55	36	• Electrostatics • Current Electricity- Circuits • Electrodynamics
Mechanics	1	63	42	• VPM • Momentum

ACTION VERBS COMMONLY USED IN NSC PAPERS

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- It is important that teachers write a diagnostic analysis of learners’ performance after marking the preliminary exam.
- The diagnostic analysis must be done per question and sub question, refer to the above 2015 national diagnostic report on learner performance.
- This will enable teachers to identify specific topics that posed a challenge and develop tailored intervention strategies.
- Learners must be given immediate feedback on their performance and corrections must be done based on the identified challenging topics.

VERBS THAT REQUIRE SPLITTING OF TICKS	VERBS THAT DO NOT REQUIRE SPLITTING OF TICKS
Explain, discuss, describe, justify, analyse, apply, elaborate, evaluate, differentiate, distinguish and compare.	**Name, give, mention, recommend, suggest, advise, outline, propose, provide, quote and motivate.**
NOTE: The mark allocation for verbs that do not require splitting of ticks will depend on the nature of the question. This means that 2 marks will not always be awarded for each fact. If for an example the question requires one word answer, then ONE mark will be awarded. However, if the question requires candidates to apply knowledge, TWO marks will be awarded even if it is a one word answer e.g. “identify the Act that is relevant to the scenario above”.	

Dynamics of investigations and experiments

- The difference between an independent and dependent variable
  - Independent variable is the one you can control / change.
  - Dependent variable is the one that is influenced by the changes made on the other variable.
- A hypothesis and an investigative question involve the relationship between Dependent and Independent variables

QUESTION 1: MCQ

- Three rules to remember when taking multiple choice questions.
  - Budget Time Wisely
  - Relax and Don’t Panic!
  - Always answer a MCQ question, don’t leave it blank.

How to answer MCQ Questions

- **Step 1:** Read the question at least twice (Without looking at the options).
- **Step 2**: Underline or highlight all the key words or phrases.
- **Step 3:** See if you know the answer the before looking at the options. If you don't know the answer, look at the options given.
- **Step 4:** Eliminate the obvious incorrect 2 answers by crossing them out in pencil.

  Eliminate! – Eliminate! – Eliminate!

  - Get rid of choices you know are incorrect at 1st glance
    - doing so improves chances of selecting a correct answer

- **Step 5:** From the 2 remaining alternatives choose the most correct. Never leave an MCQ without an answer.

Mathematical manipulations

- **Learners to copy the formula as it appears in the in the data sheet**
  - Learners to make substitutions before changing the subject of the formula.
  - Write an answer with correct SI Unit
- **Use of calculators**
  - Use a calculator you are familiar with
- Round off the final answer correctly to a minimum of two decimal places.

ALL DEFINITIONS /LAWS/PRINCIPLE S:

ALL DEFINITIONS /LAWS/PRINCIPLE S:

- There are certain key words that **should not be omitted** from definitions, laws and principles. Examples:
  - **<u>Principle of Conservation of Mechanical Energy:</u>**

    The **total** mechanical energy in an **isolated** system is **conserved**.
  - **<u>Principle of Conservation of Momentum</u>**

    The **total linear** momentum in an **isolated** system is **conserved.**
  - **Work energy Theorem**

    Total/net work done is equal to change in kinetic energy
  - **Doppler Effect** is the **apparen**t change in frequency (or pitch) of the sound detected by a listener because the sound source and the listener have different velocities relative to the medium of sound propagation.

FORMULAE

- Use formulae in the formula sheets to avoid using incorrect formulae / equations.
- Always include the subscripts in formulae that have subscripts
  - e.g. W_{net} instead of just W

    $P_{av} = V_{rms} I_{rms}$
- Write the formula for the law of conservation of momentum as **$\sum p_{before} = \sum p_{after}$**
- not $p_{before} = p_{after}$

UNITS

- The final answer should always have a unit.
- Avoid using capital letters in the place of small letters
- Capital letters in Science have a different meaning to small letters Eg F is net force and f is frictional force

STRATEGIES For PAPER ONE

- More emphasis should be placed on definitions and concepts until learners can show understanding and application by doing exam type questions correctly in terms of the demands as laid out in the memorandum of past exam papers.
- The important of Data sheet and how it relates to the definitions and Theories/laws/principles

Free body/force diagram

- Do not leave out the arrow heads when drawing vectors to represent forces.
- Make sure all the arrows touch the dot representing the object.
- Always check the marks awarded to the question and make sure the number of forces you draw is equivalent to the marks

    e.g. 4 marks – 4 forces

Electric field lines

- direction of field lines must be correct i.e (**from positive charge to negative charge**)
- field lines must be drawn **perpendicular** to charge; **not overlapping**; **not touching charge**; the field lines **must not** be drawn into the charge
- Draw two charges not far from one another in order to show the shape
- the density of the field lines must correspond with the magnitude of the charge
- **N.B Parallel field plates not examinable (Do not study)**

Electrodynamics

- State the energy conversion in generators e.g **Mechanical to Electrical** for generators and **Electrical to mechanical** for motors
- Motors use **left hand rule** while generator uses **Right hand rule**
- **Slip rings** for AC Generator and **Split rings/Commutator for DC**
- Use the principle of electromagnetic induction to explain how a generator works
- Explain the functions of the components of an AC and a DC generator.
- **AC** GRAPH IS A SINE GRAPH AND **DC** IS FROG JUMP

Circuits

- Know how to calculate equivalent resistance
- Maximum of four resistors
- The main formula is R = $\frac{V}{I}$
- The relationships between resistors in series/ parallel with potential difference/current

EXAMINABLE TOPICS IN GRADE 10 and 11

Physics from grade 11	Chemistry from grades 10 and 11
1. Newton's Laws (Newton 1, 2, 3 and Newton's Law of Universal Gravitation) and Application of Newton's Laws. 2. Electrostatics (Coulomb's Law and Electric field) 3. Electric circuits (Ohm's Law, Power and Energy)	**1. Chemical change (grade 10)** **2. Intermolecular forces (grade 11)** **3. Stoichiometry (grade 11)** **4.Energy and Change (grade 11)**

PAPER 2: CHEMISTRY

Question 2:Organic Chemistry- Nomenclature

Drawing of structural formulae of organic compounds

1. All bonds must be shown as a short vertical or hoizontal line. No parts of the structure should be condensed e.g. CH_3 is condensed because the bonds between C and H are not shown.
2. Even the bond between O and H must be shown i.e. – O – H AND NOT – OH
3. All H atoms should be shown around C atoms. Marks are deducted if only bonds are shown and not the H atoms.

Question 2:Organic Chemistry- Nomenclature

Writing of IUPAC names of organic compounds

1. Hyphens are used between a word and a number e.g. 2-methylpentane.
2. Commas are used between numbers e.g. 2,3-dimethylpentane
3. Marks are deducted if hyphens and/or commas are omitted.
4. Hyphens should NOT be used between words.
5. All IUPAC names are written as one word, except esters and carboxylic acids.
   Examples:
   Propanoic acid (two words)
   Ethyl propanoate (two words)
   Methylpropane (one word(two words)
   Chloromethane

IUPAC naming and formulae

- Write down the IUPAC name when given the structural formula or condensed structural formula for compounds from the homologous series above, restricted to one functional group per compound, except for **haloalkanes**. For haloalkanes, maximum two functional groups per molecule.
- Write down the structural formula when given the IUPAC name for the above homologous series.

Question 3: Organic Chemistry -Reactions

- See summary of reactions
- ORGANIC REACTIONS GRADE 12 Summary 2018.docx

Question 4: Organic Chemistry- Properties

- Specify the type of van der Waals force and relate them with Boiling Point , Melting Point and Vapour pressure .
- Describe the trend in the boiling points / Melting Point and Vapour pressure of the compounds.
- Give an explanation for the trend. In your explanation make reference to INTERMOLECULAR FORCES and the ENERGY needed.

Question 4: Organic Chemistry- Properties

- The boiling point increases✓ as the molecular mass/size of the molecule increases.
- As the Carbon chain/ surface area increases✓, the strength of the London/dipole-dipole forces increases.✓ Hence more energy is needed to overcome the Intermolecular forces✓. Thus the boiling points/ Melting points increase but Vapour pressure.

(Not just intermolecular forces or van der Waals forces)

Question 5: Rates of Reactions

Energy changes in reactions related to bond energy changes

- Define heat of reaction (ΔH) as the energy absorbed or released in a chemical reaction.
- Define exothermic reactions as reactions that release energy.
- Define endothermic reactions as reactions that absorb energy.
- Classify (with reason) reactions as exothermic or endothermic.

Exothermic and endothermic reactions

- State that $\Delta H > 0$ for endothermic reactions, i.e. reactions in which energy is absorbed.
- State that $\Delta H < 0$ for exothermic reactions, i.e. reactions in which energy is released.

Activation energy

- Define activation energy as the minimum energy needed for a reaction to take place.
- Define an activated complex as the unstable transition state from reactants to products.
- Draw or interpret fully labelled sketch graphs (potential energy vs. course of reaction) of catalysed and uncatalysed endothermic and exothermic reactions.

Question 5: Rates of Reactions

Rates of reaction and factors affecting rate

- Define reaction rate as the change in concentration of reactants or products per unit time.
- Calculate reaction rate from given data.

  Rate = $\frac{\Delta c}{\Delta t}$ (Unit: $mol \cdot dm^{-3} \cdot s^{-1}$)

  Questions may also include calculations of rate in terms of change in mass/volume/ moles/per time.
- List the factors that affect the rate of chemical reactions, i.e. nature of reacting substances, surface area, concentration, pressure for gases, temperature and the presence of a catalyst.
- Explain in terms of the collision theory how the various factors affect the rate of chemical reactions. The collision theory is a model that explains reaction rate as the result of particles colliding with a certain minimum energy to form products.

Measuring rates of reaction

- Answer questions and interpret data (tables or graphs) on different experimental techniques for measuring the rate of a given reaction.

Mechanism of reaction and of catalysis

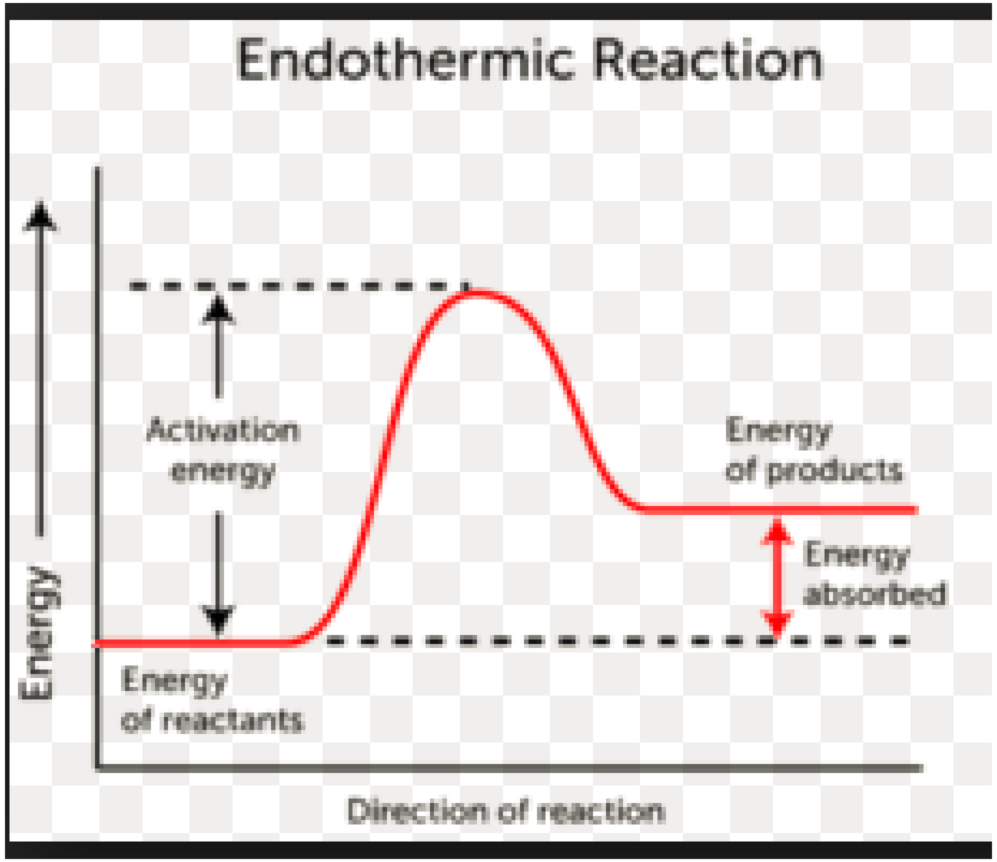
- Define the term (positive) catalyst as a substance that increases the rate of a chemical reaction without itself undergoing a permanent change.

Question 5: Rates of Reactions

- Factors that affect the rate of a reaction

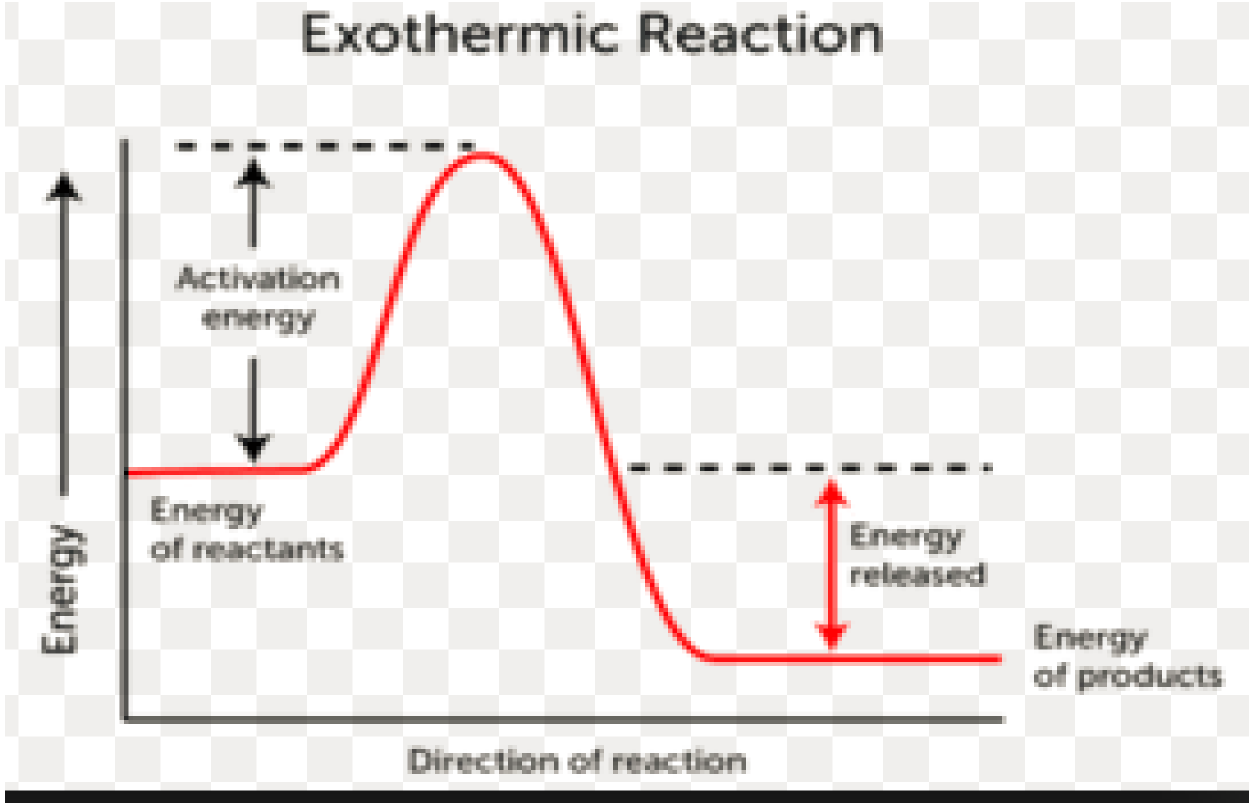
1. Surface area: increase in surface area- increased rate.
2. Concentration: increase in concentration – increase in rate.
3. TEMPERATURE: increase in temperature – increases rate
4. Catalyst: catalyst increases the rate by lowering the activation energy.

ENDOTHERMIC PROFILE



ΔH

EXOTHERMIC PROFILE



ΔH

QUESTION 6: CHEMICAL EQUILIBRIUM

- **DEFINITIONS:**

1. Open and closed system
2. Dynamic Equilibrium
3. Reversable reaction
4. Le Chatelier’s Principal

QUESTION 6: CHEMICAL EQUILIBRIUM

- **Factors that affect the equilibrium**

1. Pressure (gases only)
2. Concentration
3. Temperature

QUESTION 6: CHEMICAL EQUILIBRIUM

Equilibrium constant

- List the factors that influence the value of the equilibrium constant, K_c.
- Write down an expression for the equilibrium constant, having been given the equation for the reaction.
- Perform calculations based on K_c values.
- Explain the significance of high and low values of the equilibrium constant.

QUESTION 6: CHEMICAL EQUILIBRIUM

Application of equilibrium principles

- State Le Chatelier's principle: When the equilibrium in a closed system is disturbed, the system will re-instate a new equilibrium by favouring the reaction that will oppose the disturbance.
- Use Le Chatelier's principle to explain changes in equilibria qualitatively.
- Interpret graphs of equilibrium, e.g. concentration/rate/number of moles/mass/volume versus time.
- Explain the use of rate and equilibrium principles in the Haber process and the contact process.

QUESTION 7: ACIDS AND BASES

Acid-base reactions

- Define acids and bases according to Arrhenius and Lowry-Brønsted theories:
  Arrhenius theory: An acid is a substance that produces hydrogen ions (H^+) in water. A base produces hydroxide ions (OH^-) in water.
  Lowry-Brønsted theory: An acid is a proton (H^+ ion) donor. A base is a proton (H^+ ion) acceptor.
- Distinguish between strong acids/bases and weak acids/bases with examples.
  Strong acids ionise completely in water to form a high concentration of H_3O^+ ions. Examples of strong acids are hydrochloric acid, sulphuric acid and nitric acid.
  Weak acids ionise incompletely in water to form a low concentration of H_3O^+ ions. Examples of weak acids are ethanoic acid and oxalic acid.
  Strong bases dissociate completely in water.
  Examples of strong bases are sodium hydroxide and potassium hydroxide.
  Weak bases dissociate/ionise incompletely in water to form a low concentration of OH^- ions.

QUESTION 7: ACIDS AND BASES

Examples of weak bases are ammonia, calcium carbonate, potassium carbonate, calcium carbonate and sodium hydrogen carbonate.

- Distinguish between concentrated acids/bases and dilute acids/bases.

Concentrated acids/bases contain a large amount (number of moles) of acid/base in proportion to the volume of water.

Dilute acids/bases contain a small amount (number of moles) of acid/base in proportion to the volume of water.

- Write down the reaction equations of aqueous solutions of acids and bases.

Examples: $HC\ell(g) + H_2O(\ell) \rightarrow H_3O^+(aq) + C\ell^-(aq)$ ($HC\ell$ is a monoprotic acid.)

$NH_3(g) + H_2O(\ell) \rightarrow NH_4^+(aq) + OH^-(aq)$

$H_2SO_4(aq) + 2H_2O(\ell) \rightarrow 2H_3O^+(aq) + SO_4^{2-}(aq)$ (H_2SO_4 is a diprotic acid.)

QQUESTION 7: ACIDS AND BASES

- Define an amphiprotic substance and give examples.
- Identify the conjugate acid/base pairs.

QUESTION 7: ACIDS AND BASES

- **Titration**

1. Define end point
2. Define a standard solution
3. Choose a suitable indicator
4. Write a balanced chemical reaction for the reaction
5. Calculations- pH and titration calculations using

QUESTION 7: ACIDS AND BASES

$n = \frac{m}{M}$	$n = \frac{N}{N_A}$
$c = \frac{n}{V}$ or/*of* $c = \frac{m}{MV}$	$n = \frac{V}{V_m}$
$\frac{c_a V_a}{c_b V_b} = \frac{n_a}{n_b}$	$pH = -\log[H_3O^+]$
$K_w = [H_3O^+][OH^-] = 1 \times 10^{-14}$ at/*by* 298 K	

QUESTION 7: ACIDS AND BASES

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Standard pressure *Standaarddruk*	p^θ	$1{,}013 \times 10^5$ Pa
Molar gas volume at STP *Molêre gasvolume by STD*	V_m	$22{,}4\ dm^3 \cdot mol^{-1}$
Standard temperature *Standaardtemperatuur*	T^θ	273 K
Charge on electron *Lading op elektron*	e	$-1{,}6 \times 10^{-19}$ C
Avogadro's constant *Avogadro-konstante*	N_A	$6{,}02 \times 10^{23}\ mol^{-1}$

QUESTION 7: ACIDS AND BASES

- – Do thorough revision on stoichiometry (the mole concept) studied in grade 11.
- Use the formula pH = -log[H_3O^+]/[H] to calculate the pH values of both acids and bases.
  - – pH values are always derived from the [H_3O^+] (concentration of hydronium ions) and not the [OH^-] (concentration of hydroxide ions)

QUESTION 8 and 9 (Electrochemistry

- Be able to differentiate between a galvanic and an electrolytic cell. Two beakers for Galvanic and one for Electrolytic cell
- Understand the processes and redox reactions taking place in both types of cells.
- Five main **electrolytic** processes you should study:
  - Electrolysis of molten salts e.g copper chloride
  - Electrolysis of sodium chloride solution to produce chlorine
  - Electroplating (remember that the object to be electroplated is always the cathode – where reduction occurs)
  - Refining copper
  - Extraction of aluminum from bauxite

QUESTION 8 and 9 Electrochemical cells

- The energy convention in Galvanic and in electrolytic cells
- Calculations using the correct formula N.B NOT (ERED-E ANO)
- Differentiate between Cell notation and cell reactions
- Functions of Salt Bridge
- Standard conditions i.e concentration 1M and Temperature 298K
- Interpretation Standard Electrode Potential
- Do not use an equal sign or a double arrow when writing equations to represent net or half reactions.
- Do not use of capital letters where small letters have to be used when writing atomic symbols e.g.
  - The symbol for aluminium is Aℓ, not AL.

QUESTION 10: FERTILIZERS

- Practice as many flow diagrams as possible.
  - flow diagrams representing the processes used to manufacture fertilisers, processes like:
    - Fractional distillation of liquid air
    - Harber process
    - Ostwald process
    - Contact process
- The meaning of NPK Ratio and that **N** is responsible for **Leafs**. **P** for **roots** and **K** for **flowers**

Calculations

- **Step 1:** Read the question at least twice to ascertain exactly what is expected.
- **Step 2:** Underline/circle or highlight the important information.
- **Step 3:** Write down what is given and what must be calculated in symbol form.
- **Step 4:** Choose the correct equation from the info sheet. Write equation with correct subscripts.
- **Step 5:** Substitute into the equation.
- **Step 6:** Use a calculator to determine the answer.
- **Step 7:** Write the answer with the correct unit and direction (if a vector).

Calculations

- In order to determine the concentration of sulphuric acid (H_2SO_4), 30 cm^3 of a 0,5 mol·dm^3 solution of potassium hydroxide (KOH) was used to neutralise 25cm^3 of the sulphuric acid. Calculate the concentration of the sulphuric acid solution.

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-

Step 3

- Write down what is given and what must be calculated in symbol form.
- C_a = ?
- $C_b = 0,5\ mol{\cdot}dm^3$
- $V_a = 25$
- $V_b = 30$
- $n_a = 1$
- $n_b = 2$

Step 4

- Choose the correct equation from the info sheet. Write equation with correct subscripts.
- $$\frac{C_a \times V_a}{C_b \times Vb} = \frac{n_a}{n_b}$$

Step 5

- Substitute into the equation.
- $$\frac{C_a \text{ x } 25}{0{,}5\ x\ 30}, = \frac{1}{2}$$

Step 6

- Use a calculator to determine the answer.
- $C_a = \dfrac{0{,}5\ x\ 30\ x 1}{25\ x 2}$

Step 7

- Write the answer with the correct unit and direction (if a vector).
- $C_a = 0{,}3\ mol \cdot dm^3$

Good Luck
Grade 12s!!!
Remember #45