PHYSICAL SCIENCES

Answering multiple choice & easy to score marks

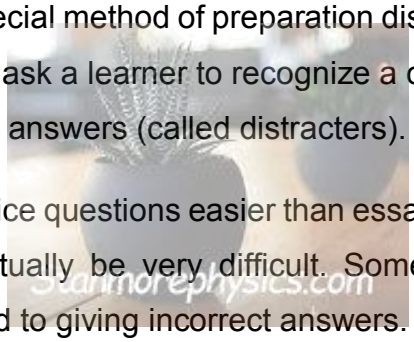
education

MPUMALANGA PROVINCE

REPUBLIC OF SOUTH AFRICA

PREPARING FOR AND ANSWERING MULTIPLE CHOICE QUESTIONS

Studying for a multiple choice exam or test requires a special method of preparation distinctly different from an essay exam. Multiple choice questions ask a learner to recognize a correct answer among a set of options that include 3 or 4 wrong answers (called distracters).



For many reasons learners usually consider multiple choice questions easier than essay type questions. However multiple choice questions can actually be very difficult. Sometimes learners resort to guessing which may many a times lead to giving incorrect answers.

There are strategies that can be used to maximize your success on answering multiple choice questions. The best way to improve your chances off course is to study carefully before the exam and make you understand your work instead of just memorizing.

A multiple choice question consists of a phrase or stem followed by 3-4 options to select the correct answer from. Here are a few tips to help reduce possibilities of making mistakes or of getting confused by distracters that look very similar to the correct answer.

STEP 1

- Always cover the possible options given with a piece of paper or your hand while you read the stem or body of the question.
- Read carefully and make sure you understand what you are required to do. Many a times learners just rush through the questions and this may result in a misinterpretation of questions.

STEP 2

- Try to anticipate the correct answer before looking at the given options.

STEP 3

- Uncover and read the responses, if you see the response you anticipated or one that closely matches your anticipation circle / mark it and then check the others to make sure none of them is a better response. It is important to read all given responses.
- If your anticipated response is not amongst the given ones or if you are not able to anticipate an answer read the given options and eliminate those you know are wrong.
- By eliminating wrong options, you will be left with fewer options to select your answer from and this makes it easier to look for the correct option.

STEP 4

- Look at the remaining options, compare them for differences and then refer to the stem of the question to find your correct answer.

The following strategies can be used to assist you eliminate responses/options that are probably wrong. However, none of these are infallible, a smart examiner will avoid writing questions for which these strategies work but you can always hope for a lapse of attention.

1. Responses that use absolute words, such as “always” or “never” are less likely to be correct than ones that use conditional words like “usually” or “probably”
2. Funny responses are usually wrong.
3. “All of the above” is often a correct response. If you can verify that more than one of the other responses is correct, then choose “all of the above”
4. “None of the above” is often an incorrect response, but this is reliable than the “All of the above” rule.
5. Look for grammatical clues e.g. if the stem ends with the indefinite article “an” then the correct response probably begins with a vowel.
6. The longest response is often the correct one, because the examiner tends to load it with qualifying adjectives or phrases.
7. Look for verbal associations. A response that repeats key words that are in the stem is likely to be correct.
8. If all else fails, choose response B or C. Many examiners subconsciously feel that the correct answer is “hidden” better if it is surrounded by distracters. Response is usually least likely to be the correct one.

If you cannot answer a question within a minute or less, skip it and plan to come back later.

PHYSICAL SCIENCES

NOTES ON EASY TO SCORE MARKS

Read through the table below thoroughly. It will assist you to obtain all the easy to score marks during the examination thus ensuring that you obtain at least the minimum marks required to pass each paper.

GENERAL (ALL TOPICS – BOTH PAPERS)	
• Defining or stating the Laws, definitions, concepts or principles correctly without leaving out the key words.	• Study and understand the laws, definitions, concepts or principles as stated in the examination guidelines. Leaving out the key words makes the definition to be incorrect. • You can also learn the laws, definitions, concepts or principles from the attached document in which the key words are in bold. This document was developed using the examination guidelines and the marking guideline of past examination papers
• Using the formula sheet to select the appropriate formulae, writing them as they appear on the formula sheet and substituting some values even if not sure.	• Learners should be encouraged to always use the formulae from the formula sheet. • They should always substitute after writing the formula and this will guarantee getting at least a mark for the formula. • The formula sheet should therefore be provided to learners right from the beginning of the year.
• Free body diagrams	• The mark allocation is a guide to the number of forces required in the diagram e.g. for 4 marks 4 labelled forces should be drawn. • Drawing extra forces, leaving out the arrow heads and if the arrows do not touch the dot (object) results in loss of marks due to negative marking. • Practice sketching free-body diagrams based on different scenarios, e.g. vertical plane, horizontal and inclined plane, object on a rough surface (with friction) or a smooth surface(frictionless) etc.

PAPER 1		
Easy to score	**Comments & what to know**	**Mark allocation**
NEWTON'S LAWS (Minimum 6 marks)		
Definitions	**Definitions to be studied:** ● Normal force ● Frictional force ● Static frictional force ● Kinetic frictional force ● Newton's first Law ● Newton's second Law ● Newton's third Law ● Newton's Law of universal Gravitation ● Acceleration ● Inertia	2
Free-body diagrams	Use many different past examination papers to practice as many different scenarios as possible.	3 to 5
Formulae, substitutions and calculations.	The formulae are in table 2 under FORCE.	1
VERTICAL PROJECTILE MOTION (minimum 4 marks)		
Definitions	Definitions to be learnt: ● Free fall	2

	• Projectile	
Free body diagrams	• The direction of g or weight is always downwards ∴ it is always represented by a downwards arrow.	1
Formulae and substitution	• The formulae are in table 2 under MOTION. • Remember that gravitational acceleration 'g' is **always** downwards and is equal to 9,8 $m \cdot s^{-2}$.	1
Graphs: • Displacement vs time • Velocity vs time • Acceleration vs time	• Correct X and Y axes with correct labels and units.	2
MOMENTUM AND IMPULSE (Minimum 3 marks)		
Definitions	Definitions to be studied: • Momentum • Newton 2 in terms in momentum • Impulse • Principle of Conservation of momentum • Closed / Isolated system • Elastic and inelastic collisions	2
Formulae, substitutions and calculations.	• The required formulae are in table 2 under FORCE. • The correct formula for conservation of momentum is $\Sigma p_i = \Sigma p_f$ **or** **Total p (before) = Total p (after)** • This formula '$\Sigma p_i = \Sigma p_f$, is not in the formula sheet. Make sure you learn and write it correctly.	1

	Note: ● ~~($p_i = p_f$ is incorrect)~~	
WORK, ENERGY AND POWER		
Definitions	Definitions to be studied: ● Conservation of mechanical energy ● Work energy theorem ● Conservative and non-conservative forces ● Power	2
Free body diagrams	● Use many different past examination papers to practice as many different scenarios as possible.	3 to 5
Formulae and substitution	● The required formulae are in table 2 under WORK, ENERGY AND POWER. ● You should be aware that $\mathbf{F_{net}}$ and $\mathbf{W_{net}}$ are different from **F** and **W** (make sure you understand the difference and the importance of using the appropriate symbol).	1
WAVES, SOUND AND LIGHT - DOPPLER EFFECT		
Definition	● Definition of 'Doppler effect'.	2
The relationship between frequency of the detected sound and the motion of the listener or the source of sound.	● A decrease in frequency means the listener is moving away from the sound source or source is moving away from the listener. ● An increase in frequency means the listener is moving towards the sound source or the source is moving towards the listener.	1

Formulae, substitutions and calculations.	• The required formulae are in table 2 under WAVES, SOUND AND LIGHT.	1
Application	E.g. • Doppler flow meter • Sonar • Radar	2
Red and blue shift		2
ELECTROSTATICS		
Definitions	Definitions to be studied: • Coulomb's Law • Electric field • Electric field at a point	2
Electric field patterns	• A mark for the direction of field lines (direction in which a positive point charge would move when placed in the field). • A mark for the shape. • Lines should not cross each other and they should touch the sphere (negative marking is applied).	2
Free body diagrams	• Use past examination papers to practice as many different scenarios as possible.	2
Formulae, substitutions and calculations.	• The formulae are in table 2 under ELECTROSTATICS. • Make sure you can differentiate between the formulae for 'F' and that for 'E' and use them appropriately.	1
ELECTRIC CIRCUITS		
Definitions	Definitions and Laws: • Ohm's Law.	2

	• Ohmic and non-ohmic conductors • Power • Emf • Potential difference	
Formulae, substitutions and calculations.	• Formulae are in table 2 under ELECTRIC CIRCUITS.	1
ELECTRODYNAMICS		
Definitions	Definitions to be learnt: • V_{rms} • I_{rms}	2
Differentiating between the different types of machines.	Energy conversion in a motor or a generator. • Identifying the differences between a motor and a generator. • Identifying the differences between an AC and a DC generator or motor. • Labelling the parts of a simple motor or generator.	2
Formulae, substitutions and calculations.	• Formulae are in table 2 under ALTERNATING CURRENT. **Note that it is very important to include the subscripts in your formulae**.	2

Graphs	• Graphs of
	  ○ AC vs time
	  ○ DC vs time
		1

PHOTOELECTRIC EFFECT		
Definitions	Definitions to be learnt: • Photoelectric effect • Cut-off frequency / threshold frequency • Work function	2

Formulae, substitutions and calculations.	• Formulae are in table 2 under WAVES, SOUND AND LIGHT.	2
PAPER 2		
Easy to score	**Comments**	**Mark allocation**
ORGANIC MOLECULES		
• Definitions	Learn definitions of the following: • Organic molecules • Chain isomer • Functional isomer • Positional isomer • Boiling point • Vapour pressure; • Melting point	4

• IUPAC naming	• Identify the parent chain • Identify the branch	2
• Drawing structural formulae	• Functional group	1
• Intermolecular forces	• Identification of the type of Intermolecular force, e.g. London; dipole-dipole, hydrogen • Comparing the strength of the different types of intermolecular forces - hydrogen bonds have the highest strength. • Mentioning that a lot or little energy is required to overcome the intermolecular forces.	3
• Types of reactions	• Identification of reactions as elimination, substitution or addition. • Note that: ▪ Addition reactions only occur in unsaturated hydrocarbons (Alkenes) ▪ Substitution only in saturated hydrocarbons (Alkanes; halo-alkanes and alcohols) ▪ **Conditions for substitution** = mild heat and dilute strong base ▪ Elimination only occurs in saturated compounds (Alkanes; halo-alkanes and Alcohols) • **Conditions for elimination** = high temperature and concentrated strong base • Practicing flow diagrams can enable you to obtain more marks.	3
RATE AND EXTENT OF REACTION		
Definitions	Learn the definitions of: ▪ Heat of reaction ▪ Exothermic reaction ▪ Endothermic reaction ▪ Activation energy ▪ Activated complex ▪ Rate of reaction ▪ Positive catalyst	2

Variables	Be able to identify the different variables in a reaction i.e. ▪ a dependent variable ▪ an independent variable ▪ a controlled variable	2
Investigations	Be able to write the investigative question and a conclusion for an investigation. **Note that an investigative question cannot be answered with a yes or no answer. It is the relationship between the dependent and independent variables in question form.**	2
CHEMICAL EQUILIBRIUM		
Definitions	● Learn the definitions of: ● Chemical Equilibrium / dynamic equilibrium ● Reverse reaction ● Be able to state Le Châtelier's principle	2
Equilibrium constant (K_c)	● Writing down the correct equilibrium constant expression (K_c).	1
	● Substituting the correct value of K_c into the expression.	1
	● **WRITING THE EXPRESSION AS** $K_c = \frac{[products]}{[reactants]}$ **LEADS TO LOSS OF MARKS BECAUSE IT IS INCORRECT AND THIS.**	
ACID AND BASES		
Definitions	Definitions of the following: ● Acid/ Base according to Arrhenius and Lowry-Brønsted ● Ampholytes	2

<table>
<tr><td></td><td>• Hydrolysis</td><td></td></tr>
<tr><td>Acid-base conjugate pairs</td><td>Identification of Conjugate Acid-base pair
Difference between an acid and its conjugate base is H^+ and vice versa</td><td></td></tr>
<tr><td></td><td>Monoprotic and Diprotic acids (exam guidelines)</td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Indicator selection</td><td><table>
<tr><td>Strong acid</td><td>Strong base</td><td>pH 6 – 8 (neutral)</td><td>Bromothymol blue</td></tr>
<tr><td>Strong acid</td><td>Weak base</td><td>pH less than 7 (acidic)</td><td>Methyl orange</td></tr>
<tr><td>Weak acid</td><td>Strong base</td><td>pH greater than 7 (basic)</td><td>phenolphtalein</td></tr>
</table></td><td>1</td></tr>
<tr><td>pH calculations</td><td>$pH = -Log\,[H_30^+]$</td><td>1</td></tr>
<tr><td>Titration calculations</td><td>Using the formulae - C=$\frac{n}{V}$; ; n=$\frac{m}{M}$ and $\frac{n_a}{n_b} = \frac{C_aV_a}{C_bV_b}$</td><td>1</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td colspan="3">ELECTROCHEMICAL CELLS</td></tr>
<tr><td>Definitions</td><td>Learn the definitions of
▪ Galvanic cell
▪ Electrolytic cell
▪ Oxidation and reduction in terms of electron transfer.
▪ Oxidation and reduction in terms of oxidation numbers
▪ Oxidizing and reducing agents in terms of oxidation and reduction.
▪ Anode and cathode in terms of oxidation and reduction.
▪ Electrolyte
▪ Electrolysis</td><td>2</td></tr>
</table>

Galvanic cells	▪ Energy conversion in Galvanic cell – from chemical to electrical energy	2
	▪ Reactions in galvanic cells are **spontaneous and exothermic**	2
	▪ Stating the function of a salt bridge.	2
	▪ Standard conditions	1
	▪ Cell notation	3
Electrolytic cells	▪ Energy conversion in Electrolytic cell – from electrical to chemical energy ▪ Reactions in galvanic cells are **non-spontaneous and endothermic**	2
	▪ Writing the half-cell and net reactions.	2
	Learn the following 4 processes ● Electrolysis of copper chloride - Copper is formed at cathode and Chlorine gas formed at anode ● Electroplating (object is cathode and anode is the metal that you want to coat with, electrolyte must have ions of the anode) ● Electrolysis of Sodium Chloride (Hydrogen gas/H_2 is formed at the cathode and chlorine gas/Cl_2 at the anode. ● Refining of copper (Impure copper is at the anode and pure formed at cathode)	2
Calculation of cell potential.	The use of the formula $E^{\theta}_{cell} = E^{\theta}_{cathode} - E^{\theta}_{anode}$	1

DEFINITIONS, PRINCIPLES AND LAWS FROM THE EXAMINATION GUIDELINE

PAPER 1 – PHYSICS

NEWTON'S LAWS

1. **Normal force, N,** is the force or the component of a force which a surface exerts on an object with which it is in contact, and which is **perpendicular** to the surface.
2. **Frictional force, f,** is the force which opposes the motion of an object and which acts parallel to the surface.
3. **Static frictional force, f_s,** is the force that opposes the tendency of motion of a stationary object relative to a surface.
4. **Kinetic frictional force, f_k,** is the force that opposes the motion of a moving object relative to a surface.
5. **Inertia** is the tendency of an object to **remain at rest** or in the state of **uniform motion**.
6. **Newton's first law of motion:** A body will remain in its state of rest or motion at constant velocity unless a non-zero **resultant** / **net** force acts on it.
7. **Newton's second law of motion:** When a **resultant/ net** force acts on an object the object will accelerate in the direction of the force at an acceleration **directly proportional** to the force and **inversely proportional** to the mass of the object.
8. **Newton's third law of motion:** When one body exerts a force on a second body, the second body exerts a force of **equal magnitude** in the **opposite direction** on the first body.
9. **Newton's Law of Universal Gravitation:** Each body in the universe attracts every other body with a force that is **directly proportional** to the **product** of their masses and **inversely proportional** to the **square** of the distance between their centers
10. **Weight** is the gravitational force the Earth exerts on any object on or near its surface.

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MOMENTUM AND IMPULSE

1. **Momentum** is the product of an object's mass and its velocity
2. **Newton's second law of motion in terms of momentum:** The net (or resultant) force acting on an object is equal to the **rate** of change of momentum of the object in the direction of the resultant/net force.
3. **Impulse** is the **product** of the **resultant/ net** force acting on an object and the time the resultant/ net force acts on the object
4. **A closed / an isolated system** (in Physics) i.e. A system on which the **resultant/ net external** force is zero.
5. **Principle of conservation of linear momentum:** The **total** linear momentum of an **isolated** / **closed** system remains constant (is conserved)
6. **Elastic collision:** this is a collision in which both momentum and kinetic energy are conserved

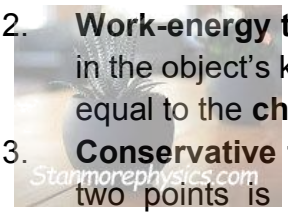
7. **Inelastic collision**: this is the collision in which **only** momentum is conserved.

VERTICAL PROJECTILE MOTION IN ONE DIMENSION (1 D)

1. **Projectile** is an object upon which the only force acting is the force of gravity.
2. **An object in free fall** is an object moving under the influence of the gravitational force **ONLY**

WORK-ENERGY AND POWER

1. **Work** done on an object by a constant force F is equal to $F\Delta x \cos\theta$ where F is the magnitude of the force, Δx is the magnitude of the displacement and θ is the angle between the force and the displacement.
2. **Work-energy theorem:** The **net/total** work done on an object is equal to the **change** in the object's kinetic energy OR the work done on an object by a **resultant/net** force is equal to the **change** in the object's kinetic energy.
3. **Conservative force** is a force for which the **work done** in moving an object between two points is **independent of the path taken**. Examples are gravitational force, electrostatic forces (coulomb forces) and the elastic force in a spring.
4. **Non-conservative force** is a force for which the **work done** in moving an object between two points **depends on the path taken**. Examples are the frictional force, air resistance, tension in a cord, etc.



5. **Principle of conservation of mechanical energy:** The **total** mechanical energy (**sum** of gravitational potential energy and kinetic energy) in an **isolated system** remains constant.
6. **Power** is the **rate** at which work is done or the **rate** at which energy is expended, used, transferred / released.

DOPPLER EFFECT

1. **Doppler effect** is the 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.

ELECTROSTATICS

1. **Coulomb's Law:** The magnitude of the electrostatic force exerted by one-point charge (Q_1) on another point charge (Q_2) is **directly proportional** to the **product** of the magnitudes of the charges and **inversely proportional** to the square of the distance (r^2) between them.
2. **Electric field** is a region of space in which an electric charge experiences a force. (The direction of the electric field at a point is the direction that a positive test charge would move if placed at that point.)
3. **Electric field at a point:** The electric field at a point is the electrostatic force experienced **per unit positive** charge placed at that point.

ELECTRIC CIRCUITS

1. **Ohm's law:** The potential difference across a conductor is **directly proportional** to the current in the conductor at **constant temperature**.
2. **Power** is the **rate** at which work is done.
3. **Kilowatt hour** (kWh) refers to the use of 1 kilowatt of electricity for 1 hr. (the number of kilowatts of electricity used in 1hour)
4. **Electromotive Force (Emf):** The **maximum** energy supplied by a battery **per coulomb/unit charge** passing through it.

   OR

   The **maximum** work done by a battery **per coulomb/unit charge** passing through it.
5. **Potential Difference:** The amount of work done **per coulomb of charge** moved between two points.
6. **Current**: the rate of flow of charge.

ELECTRODYNAMICS

1. **The rms value** of AC voltage is the **DC** potential difference which dissipates the same amount of energy as AC.
2. **The rms value** of AC current is the **DC** current which dissipates the same amount of energy as AC.

OPTICAL PHENOMENA AND PROPERTIES OF MATERIALS

1. **Photoelectric effect** is the process whereby electrons are ejected from a metal surface when light of suitable frequency is incident on that surface.
2. **Threshold frequency, f_o,** is the **minimum** frequency of light needed to emit electrons from a certain metal surface.
3. **Work function, W_o:** of a metal is the **minimum energy** that an electron in the metal needs to be emitted from the metal surface

PAPER 2 – CHEMISTRY

INTERMOLECULAR FORCES

1. **Hydrogen bonding:** Forces between molecules in which hydrogen is covalently bonded to nitrogen, oxygen or fluorine
2. **Boiling point:** The temperature at which the vapour pressure of a substance equals atmospheric pressure.
3. **Melting point:** The temperature at which the solid and liquid phases of a substance are at equilibrium.
4. **Vapour pressure:** The pressure exerted by a vapour at equilibrium with its liquid in a closed system.

ORGANIC MOLECULES

1. **Molecular formula:** A chemical formula that indicates the type of atoms and the correct number of each in a molecule.
2. **Hydrocarbon:** Organic compounds that consist of hydrogen and carbon only.
3. **Functional group:** A bond or an atom or a group of atoms that determine(s) the physical and chemical properties of a group of organic compounds.
4. **Homologous series:** A series of organic compounds that can be described by the **same general formula** OR in which one member **differs from the next by a --CH_2 group**.
5. **Saturated compounds:** Compounds in which there are no multiple bonds between C atoms in their hydrocarbon chains.
6. **Unsaturated compounds:** Compounds with one or more multiple bonds between C atoms in their hydrocarbon chains.
7. **Structural isomer:** Organic molecules with the same molecular formula, but different structural formulae.
8. **Chain isomers:** Organic molecules with the same molecular formula, but different types of chains

e.g. butane and 2-methylpropane.

9. **Positional isomers:** Organic molecules with the same molecular formula, but different positions of the side chain, substituents or functional groups on the parent chain,

e.g. 1-chloropropane and 2-chloropropane **OR** but-2-ene and but-1-ene.

10. **Functional isomers:** Organic molecules with the same molecular formula, but different functional groups

e.g. methyl methanoate and ethanoicacid

11. **Hydrohalogenation:** The addition of a hydrogen halide to **an alkene**.

12. **Halogenation:** The reaction of a halogen (Br_2, $C\ell_2$) with a compound.

13. **Hydration:** The addition of water to a compound.

14. **Hydrogenation:** The addition of hydrogen to an **alkene**.

15. **Dehydrohalogenation of haloalkanes:** The elimination of hydrogen and a halogen from a haloalkane

16. **Dehydration of alcohols**: Elimination of water from an alcohol.

17. **Hydrolysis:** The reaction of a compound with water.

18. **Halogenation of alkanes:** The reaction of a halogen (Br_2, $C\ell_2$) with a compound.

19. **Cracking of alkanes:** The chemical process in which **longer chain hydrocarbon molecules are broken down to shorter more useful molecules**.

20. **Macromolecule:** A molecule that consists of a large number of atoms.

21. **Polymer:** A large molecule composed of smaller monomer units covalently bonded to each other in a repeating pattern.

22. **Monomer:** Small organic molecules that can be covalently bonded to each other in a repeating pattern.

23. **Polymerisation:** A chemical reaction in which monomer molecules join to form a polymer.

24. **Addition polymerisation:** A reaction in which small molecules join to form very large molecules by adding on double bonds.

25. **Addition polymer:** A polymer formed when monomers (usually containing a double bond) combine through an addition reaction.

26. **Condensation polymerisation:** Molecules of two monomers with different functional groups undergo condensation reactions with the loss of small molecules, usually water

27. **Condensation polymer:** A polymer formed by two monomers, with different functional groups, that are linked together in a condensation reaction in which a small molecule, usually water, is lost.

28. **Boiling point is the temperature** at which the **vapour pressure** of a substance equals **atmospheric /external pressure.**

ENERGY AND CHANGE

1. **Heat of reaction (ΔH):** Is the energy absorbed or released in a chemical reaction.
2. **Exothermic reaction**: Is the reaction that releases energy.
3. **Endothermic reaction:** Is the reaction that absorbs energy.
4. **Activation energy:** Is the minimum energy needed for a reaction to take place.
5. **Activated complex:** Is the unstable transition state from reactants to products.

RATE AND EXTENT OF REACTION

1. **Reaction rate:** Is the **change in concentration** of reactants or products **per unit time**.
2. **Positive catalyst:** Is a substance that increases the rate of a chemical reaction without itself undergoing a permanent change.
3. **Open and closed systems:** Is the continuously interacts with its environment, while a closed system is isolated from its surroundings.
4. **A reversible reaction:** A reaction is reversible when products can be converted back to reactants.

CHEMICAL EQUILIBRIUM

1. **Chemical equilibrium:** It is a dynamic equilibrium when the rate of the forward reaction equals the rate of the reverse reaction.
2. **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/cancel the disturbance**.

ACIDS AND BASES

1. **Arrhenius theory:**
   An acid is a substance that produces hydrogen (H^+) / hydronium (H_3O^+) ions when it dissolves in water.
   A base is a substance that produces hydroxide ions (OH^-) when it dissolves in water.
2. **Lowry-Brønsted theory**:
   An acid is a **proton** (H^+ ion) **donor**.
   A base is a **proton** (H^+ ion) **acceptor**.
3. **Strong acids:** Ionise completely in water to form a high concentration of hydronium ions (H_3O^+) ions.

   e.g Hydrochloric acid (HCl), Sulphuric acid (H_2SO_4) and Nitric acid (HNO_3)
4. **Weak acids** Ionise incompletely in water to form a low concentration of hydronium ions (H_3O^+)

   e.g ethanoic acid (CH_3COOH) and oxalic acid $(COOH)_2$
5. **Strong bases:** Dissociate completely in water to form a high concentration of hydroxyl ions(OH^-

e.g Sodium hydroxide (NaOH), Potassium hydroxide (KOH)

6. **Weak bases:** Dissociate/ionise incompletely in water to form a low concentration of hydroxyl ions (OH^-).

   e.g Ammonia (NH_3), Calcium carbonate ($CaCO_3$), Potassium carbonate (K_2CO_3) and Sodium hydrogen carbonate ($NaHCO_3$)
7. **Concentrated acids:** Contain a large amount (number of moles) of acid in proportion to volume of water.
8. **Concentrated bases:** Contain a large amount (number of moles) of base in proportion to volume of water.
9. **Concentration:** The amount of solute a given solution contains at a given temperature
10. **Dilute acids:** Contain a small amount (number of moles) of acid in proportion to volume of water.
11. **Dilute bases:** Contain a small amount (number of moles) of base in proportion to volume of water.
12. **The concept of K_w:** Is the equilibrium constant for the ionisation of water/ the ionic product of water / ionisation constant of water.
13. **Auto-ionisation of water:** Is the reaction of water **with itself** to form H_3O^+ ions and OH^- ions
14. **Hydrolysis:** Is the reaction of a salt with water.

ELECTRO CHEMICAL REACTIONS

1. **Galvanic cell:** Is a cell in which **chemical energy is converted into electrical energy**.
2. **Electrolytic cell:** Is a cell in which **electrical energy is converted into chemical energy**.
3. **Oxidation and reduction in terms of electron (e^-) transfer:**

   - **Oxidation:** Is a loss of electrons.
   - **Reduction:** Is a gain of electrons.
4. **Oxidation and reduction in terms of oxidation numbers:**

   - **Oxidation:** An increase in oxidation number
   - **Reduction:** A decrease in oxidation number
5. **Oxidizing agent:** A substance that is reduced / gains electrons.
6. **Reducing agent:** A substance that is oxidised / loses electrons.
7. **Anode:** The electrode where oxidation takes place.
8. **Cathode:** The electrode where reduction takes place
9. **Electrolyte** A solution / liquid / dissolved substance that conducts electricity through the movement of ions.
10. **Electrolysis:** The chemical process in which electrical energy is converted to chemical energy / the use of electrical energy to produce a chemical change.