KWAZULU-NATAL DEPARTMENT OF PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

# 2024 CUSTOMISED KZN Recovery ATP: Grade 12 – Term 1: PHYSICAL SCIENCES

| | | | | | | | % Curriculum Coverage | |
|---|---|---|---|---|---|---|---|---|
| **Weeks** | | **Knowledge Area** | **Concepts for week** | **Page in CAPS doc** | **Date completed** | **SMT Member Signature** | **Per Term** | **Annual** |
| **Week 1 17 – 19 Jan** | | **MECHANICS: Momentum & Impulse** | • Define & calculate the momentum of a moving object: p = mv<br>• Describe the vector nature of momentum & draw vector diagrams.<br>• State Newton's second law in terms of momentum: $F_{net} = \frac{\Delta p}{\Delta t}$<br>• Calculate the change in momentum when a resultant force acts on an object.<br>• Define impulse<br>• Use the impulse momentum theorem ($F_{net}\Delta t = m\Delta v$) in calculations for a variety of situations (1-D). | **99** | | | 8.6 | 2.9 |
| **Week 2 22 – 26 Jan** | | **MECHANICS: Momentum & Impulse** | • Impulse and safety considerations.<br>• State the principle of conservation of linear momentum.<br>• Explain what is meant by an isolated system, internal and external forces.<br>• **Prescribed Experiment (Formal)** Verify the conservation of linear momentum<br>• Apply conservation of momentum to collisions of two objects (one dimension). Distinguish between elastic and inelastic collisions by calculation. | **101**<br>**100** | | | 31.4 | 10.7 |
| **Week 3 29 Jan – 02 Feb** | | **MECHANICS: Vertical projectile motion** | • Explain what a projectile means.<br>• Use equations of motion to determine the position, velocity and displacement of a projectile at any given time.<br>• Sketch x vs t, v vs t and a vs t graphs for a free falling object, an object thrown vertically upwards, an object thrown vertically downwards & bouncing objects. | **102** | | | 42.8 | 14.6 |
| **Week 4 05 – 09 Feb** | | **MECHANICS: Vertical projectile motion** | • For given x vs t, v vs t or a vs t graphs, determine position, displacement and velocity or acceleration at any time t.<br>• For given x vs t, v vs t or a vs t graphs, describe the motion of an object bouncing, thrown vertically upwards & thrown vertically downward.<br>• **Recommended Experiment:**<br>• (Informal)Investigate the motion of a falling body. Draw a graph of position vs time and velocity vs time for a free falling object and Use the data to determine the acceleration due to gravity | **102 - 103** | | | 54.2 | 18.4 |
| **Week 5 12 – 16 Feb** | | **MATTER & MATERIALS: Organic molecules** | • Define organic molecules, functional group, hydrocarbon, homologous series, saturated and unsaturated compounds, and structural isomers.<br>• Write condensed, structural & molecular formulae (max 8 C atoms, 1 functional group per molecule) for alkanes (no rings), alkenes (no rings), alkynes, alcohols, haloalkanes (no rings), carboxylic acids, aldehydes, ketones and esters.<br>• Write IUPAC names for structural / condensed structural formulae for compounds from above series. | **104** | | | 65.6 | 22.3 |
| **Week 6 19 – 23 Feb** | | **MATTER & MATERIALS: Organic molecules** | • Write IUPAC names from structural or condensed structural formulae for compounds listed (one functional group per molecule, max. two functional groups for haloalkanes).<br>• Identify alkyl substituents (methyl- and ethyl-); max. THREE alkyl substituents.<br>• Identify compounds that are saturated, unsaturated, structural isomers (chain, positional and functional).<br>• Physical properties: boiling point, melting point, vapour pressure | **104 - 108** | | | 77 | 26.2 |

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| **Week 7 26 Feb – 01 March** | | **MATTER & MATERIALS: Organic molecules** | • Relationship between physical properties and strength of IMF, type of functional group, chain length and branching<br>• Combustion of alkanes in excess $O_2$ and use as fuels.<br>• Equation & reaction conditions for the formation of an ester and IUPAC names for reactant and products.<br>• Classify reactions as elimination, addition or substitution.<br>• Equations and reaction conditions for addition reactions of alkenes. | **106** | | | 88.4 | 30.1 |
| **Week 8 04 – 08 March** | | **MATTER & MATERIALS: Organic molecules** | • Equations and reaction conditions for elimination reactions: dehydrohalogenation of haloalkanes, cracking of alkanes, dehydration of alcohols<br>• Equations and reaction conditions for substitution reactions: hydrolysis of haloalkanes, halogenation of alkanes | **107 – 117** | | | 100 | 34 |
| **Week 9 11 – 15 March** | | **CONTROLLED TEST (2 Hours)** | **ONE PAPER (100 Marks)**<br>• Newton's laws of motion<br>• Momentum and impulse<br>• Vertical projectile motion<br>• Organic molecules<br>• | | | | | |
| **Week 10 18 – 20 March** | | **CONTROLLED TEST (2 Hours)** | **ONE PAPER (100 Marks)**<br>• Newton's laws of motion<br>• Momentum and impulse<br>• Vertical projectile motion<br>• Organic molecules<br>• | | | | | |

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# 2024 CUSTOMISED KZN Recovery ATP: Grade 12 – Term 2: PHYSICAL SCIENCES

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|---|---|---|---|---|---|---|---|---|
| | | | | | | | Per Term | Annual |
| Week 1 03 – 05 April | | | Discussion and corrections of March Controlled Test | N/A | | | 8.6 | 36.9 |
| | | MECHANICS: Work, energy and power | **Work**<br>• Define the work done on an object.<br>• Draw force diagrams & free body diagrams.<br>• Calculate the net work done on an object.<br>• Distinguish between positive work and negative net work done on a system. | 117 | | | | |
| Week 2 08 – 12 April | | MECHANICS: Work, energy and power | • State the work-energy theorem.<br>• Apply the work-energy theorem on horizontal, vertical and inclined planes.<br>• Define conservative and non-conservative forces and give examples.<br>• State the principle of conservation of mechanical energy.<br>• Solve problems using the equation<br>• $W_{nc} = \Delta Ek + \Delta Ep$<br>Show that $E_{mech}$ is conserved in absence of non-conservative forces | 118 | | | 17.2 | 39.8 |
| Week 3 15 – 19 April | | MECHANICS: Work, energy and power | • Define power and calculate the power involved when work is done<br>• Perform calculations using $P_{ave} = Fv_{ave}$ when an object moves at a constant speed along a rough horizontal surface or a rough inclined plane<br>• Calculate the minimum power required of an electric motor to pump water from a borehole of a particular depth at a particular rate using $W_{nc} = \Delta Ek + \Delta Ep$<br>• **Recommended practical investigating(**Informal**)** Perform simple experiments to determine the work done in walking up (or running up a flight of stairs). Record the time for the run or the walk and calculate the power in each case | 117 - 120 | | | 25.8 | 42.7 |
| Week 4 22 – 26 April | | WAVES, SOUND & LIGHT: Doppler Effect | • State the Doppler Effect and explain (using illustrations) the change in pitch observed when a source moves toward or away from a listener (sound and ultra sound).<br>• State applications of the Doppler Effect.<br>• Solve problems using the Doppler formula. $f_L = \frac{V \pm V_L}{V \pm V_S} f_s$ when EITHER source or listener moves. | 121 - 122 | | | 34.4 | 45.6 |
| Week 5 29 Apr – 03 May | | WAVES, SOUND & LIGHT: Doppler Effect | • Calculations involving Doppler formula.<br>• With light, explain 'red shifts' & use the Doppler Effect to explain why we conclude that the universe is expanding | 122 | | | 43 | 48.5 |
| | | CHEMICAL CHANGE: Rate and extent of reaction | • Rates of reaction and factors affecting rate (nature of reacting substances, concentration [pressure for gases], temperature and presence of a catalyst). | 123 | | | | |
| Week 6 06 – 10 May | | Chemical Change: Rate & Extent of reaction | • Explain in terms of the collision theory, how various factors affect the rate of chemical reactions.<br>• Answer questions, and interpret data (graphs or tables) on different experimental techniques for measuring the rate of reaction.<br>• Define the term ***positive catalyst***<br>• Interpret graphs of distribution of molecular energies to explain how a catalyst, temperature and concentration affect the reaction rate.<br>• Recommended experiment (Informal)<br>• Rate of chemical reactions with sodium thiosulfate and hydrochloric acid.<br>• **Recommended experiment (Informal)**<br>• Rate of chemical reactions with sodium thiosulfate and hydrochloric acid | 123 - 124 | | | 54.4 | 52.4 |
| Week 7 13 – 17 May | | CHEMICAL CHANGE: Chemical equilibrium | • Explain: open & closed systems; reversible reactions; dynamic equilibrium | 124 | | | 65.8 | 56.3 |

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|---|---|---|---|---|---|---|---|---|
| | | | • List the factors that influence the position of an equilibrium.<br>• State Le Charterlier's principle and use it to explain changes in equilibria.<br>• Interpret simple graphs illustrating equilibrium.<br>• List the factors that influence the value of the equilibrium constant $K_c$. | | | | | |
| **Week 8 20 - 24 May** | | **CHEMICAL CHANGE: Chemical equilibrium** | • Write an expression for the equilibrium constant from a given equation.<br>• Perform calculations**(Stoichometry)** based on $K_c$ values.<br>• **Recommended experiment** (informal): Investigate equilibrium and the factors influencing equilibrium in the equilibrium of $CoCl_2$ and $H_2O$.<br>• Design and perform an experiment to investigate effects of pH on equilibrium systems such as $Br_2$ in water, and $Cr_2O_7^{2-}$ in water.<br>• Explain the significance of high and low values of the equilibrium constant. | **125** | | | **77.2** | **60.2** |
| **Week 9 27 – 31 May** | | **CHEMICAL CHANGE: Acids & bases** | • Define acids and bases according to Arrhenius and Lowry-Brønsted.<br>• Distinguish between strong and weak acids/bases with examples.<br>• Distinguish between concentrated and dilute acids/bases.<br>• Identify conjugate acid-base pairs for given compounds.<br>• Write neutralisation reactions of common laboratory acids and bases.<br>• **Prescribed experiment** (formal)<br>How do you use the titration of oxalic acid against sodium hydroxide to determine the concentration of sodium hydroxide?<br>• Perform calculations**(Stoichometry)** based on titration reactions & motivate the choice of an indicator. | **125 - 126** | | | **88.6** | **64.1** |
| Week 10 03-07 June | | **CHEMICAL CHANGE: Acids and bases** | • Titration calculations<br>• Determine the approximate pH of salts in salt hydrolysis.<br>• Explain the pH scale and calculate pH values of strong acids and strong bases.<br>• Define the concept of $K_w$ and explain the auto ionization of water.<br>• Compare the $K_a$ and $K_b$ values of strong and weak acids and bases.<br>• Compare strong and weak acids by looking at pH, conductivity & reaction rate. | **126 - 128** | | | **100** | **68** |
| **Week 11 10 – 14 June** | | **JUNE EXAMINATION 2hours Duration for each of papers 1 and 2** | **June Examination (200 marks)**<br>Paper 1<br>• Newton's laws of motion<br>• Momentum and impulse<br>• Vertical projectile motion<br>• Work, energy and power<br>• Doppler effect<br>• Electricity and Magnetism **(Grade 11)** | | | | | |
| | | | Paper 2<br>• Stoichiometry<br>• Organic Molecules<br>• Rate and Extent of Chemical Reactions<br>• Chemical Equilibrium Acids & Bases | | | | | |

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|---|---|---|---|---|---|---|---|---|
| | | | | | | | Per Term | Annual |
| Week 1<br>09 – 12<br>July | | | Discussion and corrections of June Controlled Test | **N/A** | | | | |
| | | **ELECTRICITY & MAGNETISM: Electrostatics** | • **Electrostatics:**<br>• Coulomb's Law<br>• Electric field | **84 – 85** | | | 9.1 | 70.9 |
| | | | • **Electric circuits**<br>• Solve problems involving current, voltage and resistance for circuits containing arrangements of resistors in series and in parallel (maximum four resistors excluding internal resistance) | **85** | | | | |
| Week 2<br>15 – 19<br>July | | **ELECTRICITY & MAGNETISM: Electric circuits** | • Explain the term internal resistance.<br>• Solve circuit problems using<br>• $\varepsilon = IR_{ext} + Ir$ or $\varepsilon = V_{load} + V_{int\ resistance}$.<br>• Solve problems, with internal resistance, for circuits containing arrangements of resistors in series and in parallel (maximum four resistors). | **129** | | | 21.2 | 74.8 |
| Week 3<br>22-26<br>July | | **ELECTRICITY & MAGNETISM: Electrodynamics** | • State the energy conversion in generators & use principle of electro-magnetic induction to explain how generators work.<br>• Give examples of uses of AC & DC generators & functions of components.<br>• State the energy conversion in motors & use motor effect to explain how motors work.<br>• Explain the functions of components of motors and give examples of uses of motors.<br>• State the advantages of alternating current over direct current.<br>• Draw and interpret sketch graphs of voltage vs time and current vs time for AC and DC generators. | **130** | | | 33.3 | 78.6 |
| Week 4<br>29 July –<br>02 August | | **ELECTRICITY & MAGNETISM: Electrodynamics** | • Define the term *rms* for an alternating voltage or an alternating current.<br>• Solve problems using<br>$I_{rms} = \frac{I_{max}}{\sqrt{2}}$<br>$R_{rms} = \frac{R_{max}}{\sqrt{2}}$<br>$P_{ave} = I_{rms}^2 R$<br>$P_{ave} = \frac{V_{rms}^2}{R}$<br>$P_{ave} = \frac{1}{2} I_{rms} V_{rms}$ | **130** | | | **39.4** | **80.6** |
| | | **M & M: Optical phenomena and properties of materials** | **Optical phenomena and properties of materials**<br>• Describe the photoelectric effect and state its significance.<br>• Define threshold frequency, $f_o$.<br>• Define work function, $W_o$. | **130** | | | | |
| Week 5<br>05 – 08<br>August | | **MATTER & MATERIALS: Optical phenomena and properties of materials** | • Perform calculations using the photoelectric equation:<br>$E = W_o + K_{max}$, where<br>$E = hf$ and $W_o = hf_o$ and<br>$K_{max} = ½\ m(v_{max})^2$<br>• Explain the effect of intensity and frequency on the photoelectric effect.<br>• Explain the formation of atomic spectra by referring to energy transition.<br>• Explain the difference between atomic absorption spectra and atomic emission spectra | **132** | | | **51.5** | **84.5** |
| Week 6<br>12 – 16<br>August | | **CHEMICAL CHANGE: Electrochemical reactions** | • Define oxidation & reduction in terms of electron transfer & oxidation numbers.<br>• Define oxidising & reducing agents in terms of oxidation and reduction.<br>• Define an anode and cathode in terms of oxidation and reduction.<br>• Define an *electrolyte*<br>**Galvanic cells**<br>• Define a galvanic cell. | **134 - 138** | | | **63.6** | **88.3** |

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| **Week 6<br>12 – 16<br>August<br>Continued** | | | • State the function of a salt bridge.<br>• Predict the movement of ions and the direction of electron flow in external circuit.<br>• Write half-reactions at each electrode & the overall cell reaction.<br>• Predict in which half-cell oxidation / reduction takes place.<br>• Use cell notation or diagrams to represent a galvanic cell.<br>• Calculate emf for a galvanic cell.<br>• Explain that $V_{cell}$ decreases as [product ions] increases and [reactant ions] decreases and $V_{cell}$ = 0 when equilibrium is reached, (the cell is 'flat').<br>• State the standard conditions under which standard electrode potentials are determined. | | | | | |
| **Week 7<br>19 - 23<br>August** | | **CHEMICAL CHANGE: Electrochemical reactions** | • Describe the standard hydrogen electrode and explain its role as the reference electrode.<br>• Explain how standard electrode potentials can be determined using the reference electrode; state the convention regarding positive and negative values.<br><br>**Electrolytic cells**<br>• Define an electrolytic cell.<br>• Describe the movement of ions in the solution.<br>• State the direction of electron flow in the external circuit.<br>• Write equations for the half-reactions at the anode and cathode.<br>• Write down the overall cell reaction.<br>• Describe, using half-reactions and the equation for the overall cell reaction as well as the layout of the particular cell using a schematic diagram, the following electrolytic processes:<br>➢ The decomposition of copper(II) chloride<br>➢ Electroplating, e.g. the electroplating of an iron spoon with silver/nickel<br>➢ Refining of copper<br>➢ The electrolysis of a concentrated solution of sodium chloride. | **134** | | | **75.7** | **92.2** |
| **Week 8<br>26 – 30<br>August** | | **Paper 2 Revision** | • **Paper 2**<br>• Representing chemical change (Gr 10)<br>• Intermolecular forces<br>• Energy and chemical change **(Gr 11)**<br>• Stoichiometry (application only) (Gr 11)<br>• Chemical Change<br>• Matter & Materials | | | | **87.8** | **96.1** |
| **Week 9<br>02 – 06<br>Sept** | | **Paper 1 Revision** | • Newton's laws (Gr 11)<br>• Electrostatics (Gr 11)<br>• Electric circuits (Gr 11)<br>• Mechanics<br>• Waves, Sound and light<br>• Electricity and magnetism<br>• Matter & Materials | | | | **100** | **100** |
| **Week 10, 11<br>09 – 20<br>Sept** | | **PREPARATORY EXAMINATION<br>P1: 3 hrs<br>P2: 3 hrs** | **PAPER 1: 150 marks**<br>• Mechanics (65)<br>• Waves, Sound and light (15)<br>• Electricity and magnetism (55)<br>• Matter & Materials (15)<br><br>**PAPER 2: 150 marks**<br>• Chemical Change (92)<br>• Matter & Materials (58)<br><br>The following **gr 10 and 11 topics** will form part the two papers: **Paper 1:**<br>• Newton's laws (Gr 11)<br>• Electrostatics (Gr 11)<br>• Electric circuits (Gr 11)<br>• **Paper 2** | | | | | |

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| **Week 10, 11 09 – 20 Sept Continued** | | | • Representing chemical change (Gr 10)<br>• Intermolecular forces<br>• Energy and chemical change **(Gr 11)**<br>• Stoichiometry (application only) (Gr 11) | | | | | |
| | | **Term 3 Reflection:** | | | | | | |

**NB: week ending, duration written is the content guide.**

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| **Week 1 01 – 04 Oct** | | **REVIEW: PREPARATORY EXAMINATIONS** | Discussion and correction of errors in Preparatory Exams (P1 & P2) | | | | | |
| **Week 2 07 – 11 Oct** | | **REVIEW: PREPARATORY EXAMINATIONS** | Discussion and correction of errors in Preparatory Exams (P1 & P2) | | | | | |
| **Week 3 14 – 18 Oct** | | **CONSOLIDATION AND REVISION** | Preparation for final Exams | | | | | |
| **Week 4 21-25 Oct** | | **CONSOLIDATION AND REVISION** | Preparation for final Exams | | | | | |
| **Week 5 28 Oct – 01 Nov** | | | **PAPER 1: 150 marks**<br>• **Mechanics (65)**<br>Momentum and impulse; Vertical projectile motion, Work, energy and power, Newton's laws (Gr 11)<br>• **Waves, Sound and light (15)** Doppler effect<br>• **Electricity and magnetism (55)**<br>Electric circuits, Electrodynamics, Electrostatics (Gr 11), Electric circuits (Gr 11)<br>• **Matter & Materials (15**)<br>Optical phenomena and properties of materials<br>**PAPER 2: 150 marks**<br>• **Chemical Change (92)**<br>Rate and extent of reaction, Chemical equilibrium, Acids and bases, Representing chemical change (Gr 10), Energy and chemical change (Gr 11), Stoichiometry (application only) (Gr 11), Electrochemical reactions<br>• **Matter & Materials (58)**<br>Organic molecules, Intermolecular forces (Gr 11) | | | | | |