basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

2021 National ATP: Grade 12 Term 1: TECHNICAL SCIENCES

Important notes
1.   The content of the tables are CAPS aligned.
2.   The formal assessment will consist of:
    2.1   Term 1 – Control test (35% of SBA) & Formal experiment 1 / PAT1 (40% of PAT)
    2.2   Term 2 – Formal experiment 2 / PAT 2 (30% of PAT)
    2.3   Term 3 – September examination (65% of SBA) & Formal experiment 3 / PAT 3 (30% of PAT)
    2.4   Term 4 – November examination

TERM 1 (45 days)	Week 1 27 - 29 Jan (3 days)	Week 2 01 - 05 Feb (5 days)	Week 3 08 –12 Feb (5 days)	Week 4 15 - 19 Feb (5 days)	Week 5 22 - 26 Feb (5 days)	Week 6 01 - 05 March (5 days)	Week 7 08 - 12 March (5 days)	Week 8 15 - 19 March (5 days)	Week 9 23 - 26 March (4 days)	Week 10 29 - 31 March (3 days)
CAPS Topics	**MECHANICS: Newton's laws of motion (4hrs)**	**MECHANICS: Newton's laws of motion (4hrs)**	**MECHANICS: Newton's laws of motion (4hrs)**	**MECHANICS: Momentum & impulse (4hrs)**	**MECHANICS: Momentum & impulse (4hrs)**	**MECHANICS: Momentum & impulse (4hrs)**	**MECHANICS: Work, energy & power (4hrs)**	**MECHANICS: Work, energy & power (4hrs)**	**MECHANICS: Elasticity (4hrs)**	**MECHANICS: Elasticity (1hr)** **Control Test (1hr)**

Topics /Concepts, Skills and Values	• State Newton's first law of motion.
	• Define inertia.
	• Define mass as a measure of the inertia of a body.
	• Give examples to illustrate Newton's first law.
	• Define acceleration as the rate of change of velocity. $a = \frac{\Delta v}{\Delta t}$
	• State Newton's second law of motion.
	
	 $F_{net} = ma$
		• Use $F_{net} = ma$ to solve problems in the context of technology.
		• Do not include pulley problems and lift problems.
			• State Newton's third law of motion.
			• Give examples to illustrate Newton's third law; action-reaction force pairs.
				• Define momentum; $p = mv$
				• Use $p = mv$ to solve problems in the context of technology.
				• Define the impulse of a force.
				
				 $Impulse = F_{net}\Delta t$
				
				• The impulse is equal to the change in momentum: $F_{net}\Delta t = \Delta p$ OR $F_{net}\Delta t = m\Delta v$
					• Use the equations of momentum to solve problems in the context of technology.
					• Define a net force as the rate of change in momentum. $F_{net} = \frac{\Delta p}{\Delta t}$
					• Give applications of impulse and momentum in road safety.
						• State the law of conservation of momentum.
						• Explain the concepts elastic and inelastic collision.
						• Use conservation of momentum to solve problems in technology.
							• Define work and know work is a scalar.
							• Use $W = F\Delta x cos\theta$ to solve problems involving work, force and displacement.
							• No work is done when F acts at right angles to the direction of motion.
							• Define energy as the capacity to do work.
							• State the principle of conservation of mechanical energy.
							• Use $E_M = E_k + E_p$ to solve problems in one dimension.
								• Define power and use practical units of power in technology, e.g.:
								  ▫ 1 kW=1 000 W
								  ▫ 1 horse power (hp) = 746 W
								• When an object travels at a constant velocity: $P = Fv$
								• Solve power problems including conversions of practical units.
									• Define a deforming and restoring force.
									• Define elasticity and plasticity and distinguish between perfectly elastic and perfectly plastic bodies with examples.
									• Define the elastic limit.
									• Define stress and use the equation $\sigma = \frac{F}{A}$ in calculations.
									• Define strain. In symbols: $\varepsilon = \frac{\Delta l}{L}$
									• Strain does not have a unit.
										• State Hooke's law, $= \frac{\sigma}{\epsilon}$, K a constant, and use it in calculations.
										
										 Control Test (1hr)
										• Newton's laws of motion
										• Momentum
										• Work, energy and power
										• Elasticity

Requisite pre-knowledge	• Scalars & vectors • Motion in 1D • Forces	• Scalars & vectors • Motion in 1D • Forces	• Scalars & vectors • Motion in 1D • Forces	• Scalars & vectors • Forces • Motion in 1D	• Scalars & vectors • Forces • Motion in 1D	• Scalars & vectors • Forces • Motion in 1D	• Work & energy • E_p, E_k & E_M • Gravity • Scalars, vectors and components of vectors • Newton's laws	• Work & energy • E_p, E_k & E_M • Gravitational acceleration • Scalars, vectors and components of vectors • Newton's law	• Area • Gravitational acceleration	• Area • Gravitational acceleration

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Resources (other than textbook) to enhance learning		• Question bank such as previous papers or study guides • Videos	• Question bank such as previous papers or study guides • Practical apparatus • Simulations • Videos	• Question bank such as previous papers or study guides • Practical apparatus • Simulations • Videos	• Question bank such as previous papers or study guides • Videos	• Question bank such as previous papers or study guides • Videos	• Question bank such as previous papers or study guides • Practical apparatus • Simulations • Videos	• Question bank such as previous papers or study guides • Videos	• Question bank such as previous papers or study guides • Practical apparatus • Simulations • Videos	• Question bank such as previous papers or study guides • Videos	• Question bank such as previous papers or study guides • Practical apparatus • Simulations • Videos
Assessment	Homework	• Homework	• Homework • Informal experiment: Relationship between a and m for constant F_{net}.	• Homework • Informal test	• Homework	• Homework	• Homework • Informal experiment: Conservation of momentum during a collision • Informal test	• Homework	• Homework • Informal experiment: Determine the power output of an individual • Informal test	• Homework	• Homework • Informal experiment: Hooke's law •
	None	• None	**Formal experiment:** PAT 1	• None	• None	• None	• None	• None	• None	• None	**Control test** •

2021 National ATP: Grade 12 Term 2: TECHNICAL SCIENCES

TERM 2 (51 days)	Week 1 13 – 16 April (4 days)	Week 2 19 – 23 April (5 days)	Week 3 28 – 30 April (3 days)	Week 4 3 – 7 May (5 days)	Week 5 10 – 14 May (5 days)	Week 6 17 – 21 May (5 days)	Week 7 24 – 28 May (5 days)	Week 8 31 May – 4 June (5 days)	Weeks 9 7 – 11 June (5 days)	Weeks 10-11 14 – 25 June (9 days)
CAPS Topics	**Corrections of Control test (1hr)** **MECHANICS: Viscosity (1hr) & hydraulics (1h)**	**MECHANICS: Hydraulics (4hrs)**	**MATTER & MATERIALS: Electronic properties of matter (4hrs)**	**MATTER & MATERIALS: Organic chemistry (4hrs)**	**MATTER & MATERIALS: Organic chemistry (4hrs)**	**MATTER & MATERIALS: Organic chemistry (4hrs)**	**WAVES & SOUND: Light (4hrs)**	**WAVES & SOUND: Electromagnetic radiation (4hrs)**	**WAVES & SOUND: Electromagnetic radiation (4hrs)**	**Consolidation, Revision and Catching up on learning losses.**
Topics /Concepts, Skills and Values	**Viscosity** • Define viscosity. • Discuss the effect of temperature on viscosity in technology. • Discuss motor oil viscosity grades. **Hydraulics** • Define thrust and pressure and how they are related: $p = \frac{F}{A}$ • Use the above equation in calculations	**Hydraulics.** • Use conversions between practical units of pressure in calculations: ▫ 1 atmosphere $= 1{,}01 \times 10^5$ Pa ▫ 1 bar $= 10^5$ Pa ▫ 1 torr $= 133$ Pa • Define fluid pressure $(p = \rho g h)$ and use the equation in calculations. • State Pascal's law. • Discuss the use of hydraulics in technology e.g. car lifts, jacks, hydraulic brakes, dentists' chairs, etc. • Apply $\frac{F_1}{A_1} = \frac{F_2}{A_2}$ where $A_2 > A_1$ in hydraulic lifts. • Use this equation to calculate force, area and radius of pistons.	**Electronic properties of matter** • Define a semiconductor with examples. (No band theory). • Define intrinsic semiconductors and doping. • Describe n-type ad p-type semiconductors. • Discuss the construction and working of a p-n junction diode. • Study the characteristics of p-n junction diode.	**Organic chemistry** • Define organic molecules. • Write molecular formulae and structural formulae for organic compounds of up to six carbon atoms for alkanes, alkenes, alkynes, alkyl halides, aldehydes, ketones, alcohols, carboxylic acids and esters. • Define the terms functional group, homologous series, saturated and unsaturated hydrocarbons and isomers. • Distinguish between saturated and unsaturated homologous series. • Write structural formulae of given isomers and name the isomers.	**Organic chemistry** • Give the IUPAC names when given the formulae or vice versa for the above homologous series. • Compare physical properties (boiling point, melting point, vapour pressure and viscosity) of different homologous series.	**Organic chemistry:** • Write balanced equations using molecular and structural formulae for oxidation, substitution, addition, halogenation and hydrohalogenation. • Describe the terms polymer, macromolecule, chains and monomers. • Define plastics and polymers and discuss the industrial use of polythene.	**Light** • Discuss the laws of reflection. • Define refraction and discuss the laws of refraction.	• Define the critical angle and total internal reflection. • Demonstrate the total internal reflection of light. • Give uses of total internal reflecting prisms. • Define dispersion of light. • Discuss frequency and wavelength of the various components of light. • Discuss the transmission of light through convex and concave lenses. • Discuss applications of convex and concave lenses .	• Define an electromagnetic wave and discuss its properties. • Discuss the electromagnetic spectrum in terms of frequency and wavelength. • Give the uses of electromagnetic radiation. • Define a photon and give its energy as $E = hf$. • Use $E = hf$ to do calculations.	• Mechanics (4hrs) • Matter and Materials (2hrs) • Waves ad sound (2hrs)

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TERM 2 (51 days)		Week 1 13 – 16 April (4 days)	Week 2 19 – 23 April (5 days)	Week 3 28 – 30 April (3 days)	Week 4 3 – 7 May (5 days)	Week 5 10 – 14 May (5 days)	Week 6 17 – 21 May (5 days)	Week 7 24 – 28 May (5 days)	Week 8 31 May – 4 June (5 days)	Weeks 9 7 – 11 June (5 days)	Weeks 10-11 14 – 25 June (9 days)
Requisite pre-knowledge		• Vectors & scalars • Density	• Vectors & scalars • Density • Conductors & insulators • Periodic table • Atomic structure	• Conductors & insulators • Periodic table • Atomic structure Chemical bonding • Periodic table	• Chemical bonding • Periodic table	• Chemical bonding • Periodic table • Balancing of equations	• Chemical bonding • Periodic table • Geometry	• Geometry	• Waves		
Resources (other than textbook) to enhance learning		• Question bank such as previous papers or study guides • Videos	• Question bank such as previous papers or study guides • Videos	• Question bank such as previous papers or study guides • Practical apparatus • Simulations • Videos	• Question bank such as previous papers or study guides • Videos	• Question bank such as previous papers or study guides • Videos	• Question bank such as previous papers or study guides • Videos	• Question bank such as previous papers or study guides • Practical apparatus • Simulations • Videos	• Question bank such as previous papers or study guides • Videos	• Question bank such as previous papers or study guides • Videos	
Assessment	Informal Assessment: Remediation	• Corrections of March control test • Homework	• Homework • Informal test	• Homework • Informal experiment: Characteristics of a p-n junction diode • Informal test	• Homework	• Homework • Informal test	• Homework •	• Homework • Informal experiment: Position of the image in a flat mirror	• Homework • Informal test	• Homework	
	SBA (Formal)	• None	• None	• None	• None	• None	• None	**Formal experiment:** PAT 2	• None	• None	• None

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2021 National ATP: Grade 12 Term 3: TECHNICAL SCIENCES

TERM 3 (52 days)	Week 1 13 – 16 July (4 days)	Week 2 19 – 23 July (5 days)	Week 3 26 – 30 July (5 days)	Week 4 2 – 6 Aug (5 days)	Week 5 10 – 13 Aug (4 days)	Week 6 16 – 20 Aug (5 days)	Week 7 23 – 27 Aug (5 days)	Weeks 8 - 11 30 Aug-23 Sept (19 days)
CAPS Topics	**ELECTRICITY & MAGNETISM: Electrostatics (4hrs)**	**ELECTRICITY & MAGNETISM: Electrostatics (2hrs)** **Electric circuits (2hrs)**	**ELECTRICITY & MAGNETISM: Electric circuits (4hrs)**	**ELECTRICITY & MAGNETISM: Electromagnetism (4hrs)**	**ELECTRICITY & MAGNETISM: Electromagnetism (2hrs)** **CHEMICAL CHANGE: Electrochemical cells (2hrs)**	**CHEMICAL CHANGE: Electrochemical cells (4hrs)**	**CHEMICAL CHANGE: Electrochemical cells (4hrs)**	**Trial Examination**
Topics / Concepts, Skills and Values	**Electrostatics** • Define a capacitor and give examples of uses in technology. • Define capacitance of a capacitor and use $C = \frac{Q}{V}$ in calculations. • Express capacitance also as $C = \frac{\varepsilon_o A}{d}$ and use it in calculations. •	**Electrostatics** • Continue with capacitance calculations. • Discuss the factors affecting capacitance. **Electric circuits** • Define power and do calculations using: ▫ $P = \frac{W}{\Delta t}$ $P = \frac{V^2}{R}$ $P = VI$ $P = I^{2R}$ SI unit for power is W.	**Electric circuits** • Use kWh as practical unit of power. • Determine the power dissipated in bulbs connected either in series or parallel, or both series and parallel. • The heat produced in a resistor in a circuit is given by $W = I^2 R \Delta t$. • Use $W = I^2 R \Delta t$ in calculations.	**Electromagnetism** • A current carrying conductor produces a magnetic field around it. • Determine the direction of the magnetic field around a current-carrying conductor. • Draw the magnetic field lines around a straight current carrying wire and a current-carrying loop (single) of wire. • Define electromagnetic induction, magnetic flux and magnetic flux density ($\Phi = BA$) and use the equation in calculations. • State Faraday's Law ($\varepsilon = -N\frac{\Delta\phi}{\Delta t}$) and do calculations using this formula. • State Lenz's law and use examples from technology to demonstrate it.	**Electromagnetism (2h)** • Define a transformer and calculate output voltage using $\frac{V_S}{V_p} = \frac{N_S}{N_p}$. • Use the above equation to determine the input voltage, output voltage, and number of turns in the primary and secondary coils. • A transformer that increases the voltage is called a step-up transformer. • A transformer that decreases the voltage is called a step-down transformer. • Define a generator and explain the basic principle of an AC generator. • Explain how a DC generator works and differs from an AC generator. • Define a motor and explain its basic principles. **Electrochemical cells (2h):** • Define an electrolytic cell and a galvanic cell. • State the functions of all components of the galvanic cell.	• Give the half-reactions at the anode and cathode, net cell reaction. • Give the standard conditions under which a standard electrode potentials are determined •	• Describe the movement of ions through the solutions and the salt bridge. • Use standard cell notation or diagrams to represent a galvanic cell. • Calculate the emf of a galvanic cell using the standard electrode potential table. Emf = $E_{cathode} - E_{anode}$ • Discuss the use of alternate energies and their environmental impact.	• All topics covered from term 1 to 3. • **Paper 1** (150 marks) ▫ Mechanics (93) ▫ Electricity and Magnetism (33) ▫ Waves, sound and light (24) • **Paper 2** (75 marks) • Chemical Change (46) • Matter and Materials (29)
Requisite pre-knowledge	• Electric fields • Charges • Forces	• Ohm's law • Unit conversion	• Ohm's law • Unit conversion	• Electric fields • Magnetic fields	• Electric fields • Magnetic fields • Redox reactions • Oxidation numbers	• Redox reactions • Oxidation numbers	• Redox reactions • Oxidation numbers	

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Resources (other than textbook) to enhance learning		• Question bank such as previous papers or study guides • Videos	• Question bank such as previous papers or study guides • Videos	• Question bank such as previous papers or study guides • Practical apparatus • Simulations • Videos	• Question bank such as previous papers or study guides • Videos	• Question bank such as previous papers or study guides • Videos	• Question bank such as previous papers or study guides • Practical apparatus • Simulations • Videos	• Question bank such as previous papers or study guides • Practical apparatus • Simulations • Videos	
Assessment	Informal Assessment: Remediation	• Homework • Informal test	• Homework • Informal test	• Homework • Informal test	• Homework	• Homework • Informal experiment: Determine the effect of the change in magnetic field or magnetic flux in a coil • Informal experiment: Demonstrate an electric motor.	• Homework • Informal experiment: Electrolysis of copper chloride • Informal test	• Homework • Informal test • Informal experiment: Determine the electrode potential of a Zn-Cu cell	
	SBA (Formal)	• None	None	**Formal experiment: PAT 3**	• None	None	• None	• None	**Trial Examination**

2021 National ATP: Grade 12 Term 4: TECHNICAL SCIENCES

TERM 4 (47 days)	Weeks 1 5 – 8 Oct (4 days)	Weeks 2 11 – 15 Oct (5 days)	Weeks 3 - 10 18 Oct – 8 Dec (38 days)	
CAPS Topics	REVISION	REVISION	FINAL END OF THE YEAR EXAMINATION	
Topics /Concepts, Skills and Values	**MECHANICS: (2hrs)** • Newton's laws of motion (25 min) • Momentum & impulse (25 min) • Work, energy & power (25 min) • Elasticity (15 min) • Viscosity (15 min) • hydraulics (15 min) **MATTER & MATERIALS: (1hr)** • Electronic properties of matter (15 min) • Organic chemistry (45 min) **WAVES & SOUND: (30 min)** • Light **(15 min)** • Electromagnetic radiation **(15 min)**	**ELECTRICITY & MAGNETISM: (2hrs)** • Electrostatics (45 min) • Electric circuits **(45 min)** • Electromagnetism **(30 min)** **CHEMICAL CHANGE: (2hrs)** • Galvanic cells (1hr) • Electrolytic cells (1hr))	• All topics covered from term 1 to 3. • **Paper 1** (150 marks) ▫ Mechanics (93) ▫ Electricity and Magnetism (33) ▫ Waves, sound and light (24) • **Paper 2** (75 marks) • Chemical Change (46) Matter and Materials (29)	
Requisite pre-knowledge				
Resources (other than textbook) to enhance learning	• Question bank such as previous papers or study guides • Simulations • Videos	• Question bank such as previous papers or study guides • Simulations • Videos		
Assessment — Informal Assessment: Remediation	• None	• None	• None	•
Assessment — SBA (Formal)	• None	• None	• None	•