CONTENT

SECTION 2

2.1 THE AIMS AND PURPOSE OF TECHNICAL SCIENCES

The main aim of Technical Sciences is to support learners in the three focus areas of technology, namely Mechanical Technology, Electrical Technology and Civil Technology. Learners will have an NQF level 4 competence in Technical Sciences.

Learners at Technical High Schools will be able to integrate scientific knowledge in a more informed way in their subject offerings in technology. Scientific concepts and skills will be more accessible to learners that have a technical orientation in schooling. Technical Sciences will address the needs of the industry and the technology subjects by being an enabling

Skills that learners will acquire include classifying, communicating, measuring, designing an investigation, drawing and evaluating conclusions, formulating models, hypothesizing, identifying and controlling variables, observing and comparing, interpreting, predicting, problem-solving and reflecting. The main skill will be practical application.

Technical Sciences will prepare learners for further education and training, employment, citizenship, holistic development and socio-economic development. Learners choosing Technical Sciences as a subject in Grades 10 – 12 will have improved access to applied technology courses, vocational career paths and entrepreneurial opportunity. Technical Sciences will also promote skills development in the fields of technology, thus promoting economic growth and social well-being of more citizens in our country.

The six main knowledge areas that Technical Sciences

- Mechanic
- Matter and Materials
- Electricity and Magnetism
- Waves, Sound and Light
- Heat and Thermodynamics
- Chemical Change

2.2 OVERVIEW OF TOPICS

Table 1

TOPIC	CONTENT	
Mechanics	Grade10	**Units and measurements, Scientific notation, Working with formulae, Rate, Vectors and scalars** (Vectors, scalars, graphical representation of vectors), **Motion in one dimension:** (position, displacement, distance, speed, velocity, acceleration), **Introduction of Force** (Definition of force, contact force, non-contact force), **Kinds of forces** (Tension, normal force, force of gravity, frictional Force), **Force diagram and free body diagram, Resultant and Equilibrant.** **Equilibrium of forces in one dimension, Moment of a Force (Torque)** (Laws of moments), **Simple Machines** (Lever, fulcrum, types of levers, mechanical advantage), **Energy** (gravitational potential energy, kinetic energy, mechanical energy) (**53 hours**)
	Grade 11	**Introduction to Mechanics** (Sign conventions, graphs, Theorem of Pythagoras), Co-linear vectors, co-planar vectors, **Resultant of forces in two dimensions** (head-to-tail method, Theorem of Pythagoras, Parallelogram of forces), **Resolution of a forces into components, Frictional forces** (Static frictional force, Kinetic frictional force) (**32 hours**)
	Grade 12	**Newton's laws of motion** (Newton's First Law of motion, inertia, mass, acceleration, Newton's Second Law of motion, Newton's Third Law of motion), **Momentum** (Impulse and change in momentum), **Work energy and Power** (Work, Energy, Conservation of mechanical energy, Power, Power and velocity). **Elasticity** (Deforming force, restoring force, elasticity, perfectly elastic body, elastic limit, stress, strain, Hooke's Law,) **Viscosity** (effect of temperature on viscosity, motor oil viscosity grades), **Hydraulics** (Thrust, pressure, practical unit of pressure, fluid pressure, Pascal's Law, hydraulic lift) (**47 hours**)
Matter and Materials	Grade 10	**Classification of Matter** (Pure substances, elements, compounds, naming of compounds, cation and anion table, molecular formulae, balancing of equations), **Metals, Metalloids and Non-metals, Electrical conductors, semiconductors and insulators,** **Thermal conductors and insulators, Magnetic and non-magnetic, Structure of the atom** (Atomic Number, mass number, isotopes, The Periodic Table, electron configuration) (**31 hours**)
	Grade 12	**Electronic Properties of Matter** (Semiconductor, intrinsic semiconductor, doping, n-type semiconductor, p type semiconductor, p-n junction diode) (**4 hours**) **Organic chemistry** (Organic molecules, molecular and structural formulae, functional group, homologous series, saturated hydrocarbons, unsaturated hydrocarbons, isomers, IUPAC naming and formulae, physical properties of organic compounds, reactions of organic compounds, plastics and polymers) (**12 hours**) **Total : 16 hours**

Waves and Sound	Grade 11	**Pulses** (Transverse pulses, longitudinal pulses) **Waves** (Transverse wave, longitudinal wave), **Wave Terminology** (Amplitude, crest, trough, points in phase, wavelength, period, frequency, wave speed) **Superposition of waves** (constructive interference, destructive interference). **Sound waves** (Speed of sound in different media, reflection of sound, echo, pitch, loudness, range of sound frequencies) (**32 hours**)
	Grade 12	**Light** (Reflection of light, Refraction**,** Critical angle, total internal reflection, Dispersion, lenses) **Electromagnetic radiation** (Nature of Electromagnetic radiation**,** properties of electromagnetic radiation, electromagnetic spectrum, uses of electromagnetic radiation, photons, energy of a photon) (**12 hours**)

Electricity and Magnetism	Grade 10	**Electrostatics** (Two kinds of charge, charge conservation). **Electric circuits** (Components of a circuit, current, potential difference, emf, measurement of voltage and current), resistance, resistors in series, resistors in parallel) (**25 hours**)
	Grade 11	**Magnetism** (Magnets, the magnetic field, poles of permanent magnet, direction of magnetic field, magnetic field of a bar magnet, force a magnet, properties of magnetic field lines, earth's magnetic field) (**8 hours**) **Electrostatics** (Coulomb's Law, electric field, electric field lines, electric field between parallel plates, applications of electrostatics) (**10 hours**) **Electric circuits** (Ohm's Law, ohmic and non- ohmic conductors, circuit calculations, emf, internal resistance) (**17 hours**) (**Total = 35 hours**)
	Grade 12	**Electrostatics** (Capacitor, capacitance, factors affecting capacitance) **Electric circuits** (Power**,** heating effect of electric current) **Electromagnetism** (Magnetic effect of a current-carrying conductor, electromagnetic induction Faraday's Law, magnetic flux, magnetic flux density, Lenz's Law, transformer, generator, motor) (**18 hours**)
Heat and Thermodynamics	Grade 10	**Heat and Temperature** (Heat, temperature, different types of thermometers, Celsius scale, kelvin scale) (**6 hours**)
	Grade 11	**Heat** (Specific heat capacity and heat capacity, practical application of heat capacity, Law of conservation of heat) **Thermodynamics** (Terminologies, thermodynamic system, surrounding, open system, closed system, isolated system, thermodynamic variables or co-ordinates, internal energy of a thermodynamic system, first Law of Thermodynamics, working substance, heat engine, efficiency of heat engine, second law of thermodynamics, refrigerators) (**13 hours**)

Chemical Change	Grade 11	**Oxidation and reduction** (Oxidation, reduction, oxidizing agent, reducing agent, assigning oxidation numbers) **Electrolysis** (Electrolyte, cathode, anode) (**14 hours**)
	Grade 12	**Electrochemical cells** (Electrolytic cells, galvanic cells, components of galvanic cells, half reactions, net reaction, standard conditions, ionic movement, standard cell notation, emf of a cell) **Alternate Energies** (Biodiesel, fuel cells, photovoltaic cells) (**10 hours**)

2.3 OVERVIEW OF PRACTICAL WORK

Practical work must be integrated with theory to strengthen the concepts being taught. These may take the form of simple practical demonstrations, practical investigations or experiments. There are several practical activities given alongside the *content, concepts and skills* columns throughout **Section 3.** Some of these practical activities will be done as part of formal assessment and others can be done as part of informal assessment. Below is a list of experiments from which the formal list of POA can be selected.

Table 2

Grade	Term	List of experiments
Grade 10	Term 1	**Experiment:1** Determine the velocity of a trolley. **Experiment: 2** Measure the weight of different objects using a spring balance. **Experiment : 3** Use spring balances to demonstrate the resultant and equilibrant.
	Term 2	**Experiment: 4** Use a meter stick and mass pieces to prove the laws of moments. **Experiment: 5** Determine the mechanical advantage of a type 1 lever. **Experiment : 6** Determine the potential energy of an object at different heights.
	Term 3	**Experiment : 7** Determine the electrical conductivity of different materials. **Experiment: 8** To investigate the insulation ability of polystyrene cup. **Experiment**: **9** To determine whether a given material is magnetic or nonmagnetic. **Experiment: 10** To investigate the two kinds of charges. **Experiment: 11** Construct an electric circuit to measure current through a resistor and the voltage across a resistor; draw diagrams of the circuits.

	Term 4	**Experiment: 12** Investigate the factors that affect the resistance of a conductor. **Experiment: 13** Assemble a circuit to show that a series circuit is a voltage divider, while current remains constant. **Experiment: 14** Assemble a circuit to show that a parallel circuit is a current divider, while potential difference remains constant. **Experiment: 15** Measure the melting point of wax.

Table 3

Grade	Term	List of experiments from which the formal list of POA can be selected Prescribed
Grade 11	Term 1	**Experiments : 1** Use the parallelogram of forces to: a) Determine the resultant of two forces acting a point. b) Determine the weight of given body. **Experiment: 2** a) Determine the relation between the force of limiting friction and the normal force. b) Determine the coefficient of friction between a block and horizontal surface. **Experiment: 3** Determine the north pole of the earth by using a bar magnet. **Experiment: 4** a) Determine whether a material is a magnetic material or a magnet. b) Determine the polarity of the magnets. **Experiment**: **5** Mapping a magnetic field.
	Term 2	**Experiment: 6** Observe the motion of a single pulse travelling along a long, soft spring or heavy rope **Experiment: 7** Use a ripple tank to demonstrate constructive and destructive interference of two pulses. **Experiment : 8** a) Determine the speed of sound in air. b) Determine whether sound travels in a vacuum. **Experiment : 9** Determine the difference between pitch and loudness using an oscilloscope.
	Term 3	**Experiment : 10** Determine the resistance of an unknown resistor. **Experiment: 11** Obtain current and voltage data for a piece of copper wire and semi-conductor, and determine which obeys Ohm's law. **Experiment: 12** Determine the internal resistance of a battery. **Experiment: 13** Determine the heat capacity of a solid.

	Term 4	**Experiment: 14** Electrolysis of a salt solution.

Table 4

Grade	Term	Prescribed Practical Activities Formal	Recommended Practical
Grade 12	Term 1	**Experiment : 1** Determine the relationship between acceleration and force for a constant mass. **Experiment: 2** Show that the action reaction pairs are equal in magnitude and opposite in direction. **Experiment: 3** To determine if momentum is conserved during a collision. **Experiment: 4** Determine the power output of an individual.	
	Term 2	**Experiment: 5** **Determine** the characteristics of p-n junction diode. **Experiment: 6** Determine the position of an image in a flat mirror. **Experiment: 7** Determine the path of a ray of light through a glass slab for different angles of incidence.	
	Term 3	**Experiment: 8** Determine the power dissipated in bulbs connected either in series or parallel or both in series and both in parallel. **Experiment: 9** Determine the effect of the change in magnetic field or magnetic flux in a coil. **Experiment:10** Electrolysis of Copper Chloride **Experiment: 11** To determine the electrode potential of a Cu-Zn electrochemical cell.	
	Term 4		

2.4 WEIGHTING OF TOPICS [40 WEEK PROGRAMME

TOPICS	GRADE 10	GRADE 11	GRADE 12
	%	%	%
Mechanics	46	25	47
Waves, sound and light	0	26	13
Electricity and magnetism	22	28	18
Matter and materials	27	0	13
Chemical change	0	11	10
Heat and thermodynamics	5	10	0

2.5 OVERVIEW OF FORMAL ASSESSMENT

For Grades 10-12, THREE prescribed experiments/practical investigations chosen from tables 2,3, and 4 as PAT. TWO control tests, a midyear examination and a Final examination are written as formal assessment in each of Grades 10 and 11. ONE control test, a midyear examination, a preparatory examination and a final examination are written as formal assessment for Grade 12.

SECTION 3

There are no changes in this section as yet.

SECTION 4

4. ASSESSMENT

4.1 INTRODUCTION

Assessment is a continuous planned process of identifying, gathering and interpreting information about the performance of learners, using various forms of assessment. It involves four steps: generating and collecting evidence of achievement; evaluating this evidence; recording the findings; and using this information to understand and thereby assist the learners' development in order to improve the process of learning and teaching.

Assessment should be both informal (Assessment for Learning) and formal (Assessment of Learning). In both cases regular feedback should be provided to learners to enhance the learning experience. Assessment is a process that measures individual learner's attainment of knowledge (content, concepts and skills) in a subject by collecting, analyzing and interpreting the data and information obtained from this process to:

- enable the teacher to make reliable judgments about a learner's progress
- inform learners about their strengths, weaknesses and progress
- Assist teachers, parents and other stakeholders in making decisions about the learning process and the progress of the learners.

Assessment should be mapped against the content, concepts and skills, and the aims specified for Technical Sciences and in both informal and formal assessments it is important to ensure that in the course of a school year:

- all of the subject content is covered
- the full range of skills is included
- a variety of different forms of assessment are used.

4.2 INFORMAL OR DAILY ASSESSMENT

Assessment for learning has the purpose of continuously collecting information on a learner's achievements that can be used to improve their learning.

Informal assessment is a daily monitoring of learners' progress. This is done through written work (classwork and homework), observations, discussions, practical demonstrations, experiments, practical investigations, learner-teacher conferences, informal classroom interactions, etc. Informal assessment may be as simple as stopping during the lesson to observe learners or to discuss with learners how learning is progressing. Informal assessment should be used to provide feedback to the learners and to inform planning for teaching, but need not be recorded. It should not be seen as separate from learning activities taking place in the classroom. Learners or teachers can mark these assessment tasks. It is recommended that as far as possible schools should conduct informal practical activities.

Self-assessment and peer assessment actively involves learners in assessment. This is important as it allows learners to learn from and reflect on their own performance. The results of the informal daily assessment tasks are not formally recorded unless the teacher wishes to do so. The results of daily assessment tasks are not taken into account for promotion and certification purposes.

Informal, on-going assessments should be used to structure the acquisition of knowledge and skills and should be precursors to formal tasks in the Programme of Assessment (POA). Informal assessment provides teachers with a systematic way of evaluating how well learners are progressing in a grade and in a particular subject.

4.3. FORMAL ASSESSMENT

FORMAL assessments consist of SBA, PAT and the Final Examination. All assessment tasks that make up a formal Programme of Assessment for the year are regarded as Formal Assessment. Examples of formal assessments include control tests, examinations and practical tasks (PAT). Formal assessment tasks are marked and formally recorded by the teacher for progression and certification purposes. All Formal Assessment tasks are subject to moderation for the purpose of quality assurance and to ensure that appropriate standards are maintained.

Table 1: Formal Assessment

SBA: 25%	PAT: 25%	FINAL EXAMINATION: 50%
Grade 10 and 11		
• 2 control tests • Midyear examination	THREE experiments/practical investigation	One paper
Grade 12		
• 1 control test • Midyear examination • Preparatory examination	THREE experiments/ practical investigation	One paper

4.3.1 Control tests & examinations

Control tests and examinations should be set using an analysis grid to ensure fair distribution of cognitive levels. Control tests and examinations are written under controlled conditions within a specified period of time. Questions in tests and examinations should assess performance at different cognitive

levels with an emphasis on process skills, critical thinking, scientific reasoning and strategies to investigate and solve problems in a variety of scientific, technological, environmental and everyday contexts.

4.3.1.1. Marks and time allocation for the control test

A single control test should be administered in one seating under controlled conditions. The control test will consist of one paper ONLY.

Table 2: Composition and mark allocation for control tests

Grade	Marks	Duration
10	50	1 hour
11	50	1 hour
12	75	1 hour

4.3.1.2. Structure of the control tests

The question paper could comprise of multiple choice, matching-columns and structured questions. However, multiple choice and matching-columns questions should have a maximum weighting of 10% each. It is not compulsory for a paper to have both multiple choice and matching-column questions, but it should have at least one of them together with structured questions.

4.3.1.3 Content for control tests and examinations

Table 3: Content for control tests and examinations

Grade	Assessment Item	Content covered	Term
10	Control test 1	Mechanics: Units and measurements Scientific notation Working with formulae Rate Vectors and scalars Motion in one dimension Forces	1
	Midyear Exam	Mechanics: Units and measurements Scientific notation Working with formulae Rate Vectors and scalars Motion in one dimension Forces Moments of forces Laws of moments Beams Simple machines Energy Classification of matter	2
	Control test 2	Metals, metalloids and non-metals	3

		Electrical conductors, semiconductors and insulators Thermal conductors Magnetic and non-magnetic materials Structure of the atom Electrostatics Electric circuits	
11	Control test 1	Signs and conversions Graphs Theorem of Pythagoras an its application Co-linear vectors Co-planar vectors Resultant of forces in two dimensions Resolution of forces into components Frictional forces Magnetism and Electricity	1
	Midyear Exam	Signs and conversions Graphs Theorem of Pythagoras an its application Co-linear vectors Co-planar vectors Resultant of forces in two dimensions Resolution of forces into components Frictional forces Magnetism Pulses Waves Wave terminology Superposition of waves Sound waves	2
	Control test 2	Coulombs law Electric fields Electric circuits Heat Thermodynamics	3
12	Control test 1	Newton's laws of motion Momentum Work, energy and power Elasticity	1
	Mid-year Examination	Newton's laws of motion Momentum Work, energy and power Elasticity Viscosity Hydraulics Electronic properties of matter Organic chemistry Light Electromagnetic radiation	2

12	Preparatory Examination	All content, concepts and skills as prescribed in the CAPS for terms 1- 3	3
10-12	Final Examination	Grade 10-12: All content, concepts and skills as prescribed in the CAPS for terms 1- 4.	4

4.3.2 Mid-year and Preparatory examinations

The question paper could comprise of multiple choice, matching-columns and structured questions. However, multiple choice questions and matching-columns questions should have a maximum weighting of 10% each. It is not compulsory for a paper to have both multiple choice and matching-column questions, but it should have at least one of them together with structured questions. Mid-year examination papers should consist of term 1 and term 2 content, concepts and skills and the preparatory examination for grade 12 should consist of all content, concepts and skills as prescribed in the CAPS for terms 1- 3.

4.3.3 End-of-year examinations

Grades 10 and 11 (internal assessment)

The end-of-year examination paper for Grades 10 and 11 will be internally set, marked and moderated, unless otherwise instructed by provincial or national departments of education. The internally set, marked and moderated examination will consist of ONE paper. The question paper could comprise of multiple choice, matching-columns and structured questions. However, multiple choice questions and matching-columns questions should have a maximum weighting of 10% each. It is not compulsory for a paper to have both multiple choice and matching-column questions, but it should have at least one of them together with structured questions.

Grade 12 (external assessment)

The external examinations are set externally, administered at schools under conditions specified in the *National policy on the conduct, administration and management of the National Senior Certificate: A qualification at Level 4 on the National Qualifications Framework (NQF)* and marked externally.

The core content outlined in the Technical Sciences Curriculum and Assessment Policy Statement (CAPS) is compulsory and will be examined through ONE paper. Note that all the topics in the Grade 12 curriculum are examinable at the end of year examination. The question paper could comprise of multiple choice, matching-columns and structured questions. However, multiple choice questions and matching-columns questions should have a maximum weighting of 10% each. It is not compulsory for a paper to have both multiple choice and matching-column questions, but it should have at least one of them together with structured questions. The final end-of-year examination is nationally set, marked and moderated. All of the questions will focus on content as stated in the National Curriculum Statement.

Table 4: Year-end examination content for final examinations

Grade	Content
10	Mechanics and Electrostatics Matter and materials Chemical change Heat and thermodynamics

11	Mechanics, Magnetism and Electricity Chemical change, Heat and thermodynamics, Waves and Sound
12	Mechanics, Magnetism and Electricity Organic chemistry Chemical change, Waves Sound and Light

Table 5: Marks and duration of content, concepts and skills for examination papers

Grade	Examination	Total marks	Duration
10	Mid-year examination	150	2 hours
	Final examination	200	3 hours
11	Mid-year examination	150	2 hours
	Final examination	200	3 hours
12	Mid-year examination	150	2 hours
	Preparatory examination	200	3 hours

Table 6: Weighting of topics for final examination papers

Grade	Content	% Weighting
10	Mechanics	47
	Electricity and Magnetism	22
	Matter and material	26
	Heat and Thermodynamics	5
11	Mechanics	25
	Electricity and Magnetism	28
	Chemical change	11
	Heat and Thermodynamics	11
	Waves ,Sound and Light	25
12	Mechanics	47
	Electricity and Magnetism	17
	Matter and materials	15
	Chemical change	9
	Waves ,Sound and Light	12
	Preparatory Examination	
12	Mechanics	47
	Electricity and Magnetism	17
	Matter and materials	15
	Chemical change	9
	Waves ,Sound and Light	12

4.4 COGNITIVE LEVELS

All assessment tasks should address the cognitive levels in Table 1.

Table 7: Weighting and description of cognitive levels

Cognitive levels	Description	Percentage
1	Remembering	40%
2	Understanding and Routine Application	30%
3	Analysing and advanced application	20%
4	Creating and Evaluating	10%

4.5 PRACTICAL INVESTIGATIONS/ EXPERIMENTS

Practical investigations/ experiments should focus on the practical aspects and the process skills required for scientific inquiry and problem solving. Assessment activities should be designed so that learners are assessed on their use of scientific inquiry skills, like planning, observing and gathering information, comprehending, synthesising, generalising, hypothesising and communicating results and conclusions. Practical investigations should assess performance at different cognitive levels and focus on process skills, critical thinking, scientific reasoning and strategies to investigate and solve problems in a variety of scientific, technological, environmental and everyday contexts.

The difference between a practical investigation and an experiment is that an experiment is conducted to verify or test a known theory, whereas an investigation is an experiment that is conducted to test a hypothesis, i.e. the result or outcome is not known beforehand.

A list of experiments/ practical investigations is found in Section 2.

4.6 Practical Assessment Task (PAT)

The requirements for the Practical Assessment Task (PAT) are as follows:

- PAT accounts for the skills the learner has mastered;
- PAT accounts for 25% of the learner's final examination mark;
- The PAT in each of grade 10,11 and 12 will consist of 3 experiments/practical investigations;
- The PAT must be conducted under controlled conditions;
- The PAT will assess a range of skills that are relevant for the study of Technical Sciences. Some examples of these skills are classifying, assembling equipment; observing, troubleshooting; communicating, measuring, designing an investigation, conducting an experiment, drawing and evaluating conclusions, formulating models, hypothesising, identifying and controlling variables, inferring, observing and comparing, interpreting, analysing, predicting, problem-solving and reflective skills;
- Each learner is required to conduct each experiment /practical investigation in the PAT;
- Each learner is assessed as an individual for the PAT;

- Each learner is expected to write his/her individual report on the PAT.

Provinces must ensure that all apparatus required for the PAT are available at schools.

The table below shows the compilation of the Practical Assessment Task (PAT) mark.

Table 8: PAT

Description	Time Frame	Weighting in terms of final PAT mark
Experiment/practical investigation 1	Term 1	40%
Experiment/practical investigation 2	Term 2	30%
Experiment/practical investigation 3	Term 3	30%
Total PAT Mark		100%

Note: Each experiment can be set out of a minimum of 30 marks and the total mark should be converted as per the prescribed weighting.

4.6.1 Assessment of PAT

The assessment tools used, specifying the assessment criteria for each task will be indicated by the nature of the task and the focus of assessment. The assessment tool could be any one or a combination of rubrics, checklists, observation schedules and memoranda.

Grade 10-11

The grade 10 and 11 PAT is internally set and moderated.

Grade 12

The grade 12 PAT should be externally set and moderated.

4.7 PROGRAMME OF ASSESSMENT

The Programme of Assessment is designed to spread formal assessment tasks in all subjects in a school throughout a term. Formal assessment consists of three components: SBA (25 %), PAT (25%) and the final examination which makes up the remaining 50%.

Tables 9, 10 and 11 illustrate the assessment plan and weighting of tasks in the programme of assessment

Table 9: Assessment in grade 10

Programme of Assessment for Technical Sciences Grade 10								
Assessment Tasks		**Term 1**	**Term 2**	**Term 3**	**Term 4**	**% of Final Promotion Mark**		**Marks**
SBA	Control Test 1 (30% of SBA)	1 paper				7,5	25%	The marks of all three tasks are converted according to the weightings to give a total mark out of 100
	Mid-year examination (40% of SBA)		1 paper			10		
	Control test 2 (30% of SBA)			1 paper		7,5		
PAT	Experiment 3 (40% of PAT)	1				10	25%	The marks of all four tasks are converted according to the weightings to give a total mark out of 100
	Experiment 4 (30% of PAT)		1			7.5		
	Experiment 7 (30% of PAT)			1		7.5		
External Examination	1 Final Examination paper				1 Paper	50	50%	1 paper out of 200 marks for 3 hours.
Final Promotion Mark							100	SBA + PAT + Final Examination = 100 + 100 + 200 = 400

Table 10: Assessment in grade 11

Programme of Assessment for Technical Sciences Grade 11								
Assessment Tasks		**Term 1**	**Term 2**	**Term 3**	**Term 4**	**% of Final Promotion Mark**		**Marks**
SBA	Control Test 1 (30% of SBA)	1 paper				7,5	25%	The marks of all three tasks are converted according to the weightings to give a total mark out of 100
	Mid-year examination (40% of SBA)		1 paper			10		

	Control test 2 (30% of SBA)			1 paper		7,5		
PAT	Experiment (40% of PAT)	1				10	25%	The marks of all four tasks are converted according to the weightings to give a total mark out of 100
	Experiment 2 (30% of PAT)		1			7.5		
	Experiment (30% of PAT)			1		7.5		
External Examination	1 Final Examination paper				1 Paper	50	50%	1 paper out of 200 marks for 3 hours.
Final Promotion Mark							100	SBA + PAT + Final Examination = 100 + 100 + 200 = 400

Table 11: Assessment in grade 12

Programme of Assessment for Technical Sciencess Grade 12								
Assessment Tasks		**Term 1**	**Term 2**	**Term 3**	**Term 4**	**% of Final Promotion Mark**		**Marks**
SBA	Control Test 1 (20% of SBA)	1 paper				5	25%	The marks of all three tasks are converted according to the weightings to give a total mark out of 100
	Mid-year examination (30% of SBA)		1 paper			7.5		
	Preparatory examination (50% of SBA)			1 paper		12.5		
PAT	Experiment 2 (40% of PAT)	1				10	25%	The marks of all three tasks are converted according to the weightings to give a total mark out of 100
	Experiment 2 (30% of PAT)		1			7.5		
	Experiment 3 (30% of PAT)			1		7.5		
External Examination	1 Final Examination paper				1 paper	50	50 %	1 paper of 200 marks for 3 hours
Final Promotion Mark							100	SBA + PAT + Final Examination = 100 + 100 + 200 = 400

Maximum marks for the Final Examination, SBA, and PAT

Table 12: Formal assessment marks

Description	Maximum Mark
SBA	100 marks
PAT	100 marks
Final Examination	200 marks
Programme of Assessment	**400 marks**

4.8 RECORDING AND REPORTING

Recording is a process in which the teacher documents the level of a learner's performance in a specific assessment task. It indicates learner progress towards the achievement of the knowledge and skills as prescribed in the Curriculum and Assessment Policy Statements. Records of learner performance should provide evidence of the learner's conceptual progression within a grade and readiness to progress or be promoted to the next grade. Records of learner performance should also be used to verify the progress made by teachers and learners in the teaching and learning process.

Reporting is a process of communicating learner performance to learners, parents, schools and other stakeholders. Learner performance can be reported in a number of ways. These include report cards, parents' meetings, school visitation days, parent-teacher conferences, phone calls, letters, class or school newsletters, etc. Teachers in all grades report in percentages against the subject.

4.8.1 Recording and reporting in the first, second and third terms

Schools are required to provide quarterly feedback to parents on the Programme of Assessment using a formal reporting tool such as a report card. The schedule and the report card should indicate the overall level of performance of a learner. The term reporting will only be based on the SBA tasks per term. For the first term the reporting will only be based on the control test for grade 10-12.For term 2 the reporting will only be based on the mid-year exam for grade 10-12. For term 3 the term reporting will be based on the control test for grade 10-11 and on the preparatory exam for grade 12. Schools are also required to provide quarterly feedback to parents and learners of the marks obtained by learners in the assessment tasks as given.

4.8.2 Recording and reporting at the end of the academic year

The weighting of tasks in the Programme of Assessment must be strictly adhered to when calculating the final mark of the learner for promotion purposes in each of Grades 10, 11 and 12, at the end of the academic year.

4.9 MODERATION OF FORMAL ASSESSMENT

4.9.1 Moderation of SBA for grade 10-12

Moderation refers to the process that ensures that the assessment tasks are fair, valid and reliable. Moderation should be implemented at school, district, provincial and national levels. Comprehensive and appropriate moderation practices must be in place for the quality assurance of all subject assessments.

All formal tasks are internally/externally moderated. The subject head or departmental head for Technical Sciences at the school will generally manage this process at the school level. SBA tasks should be moderated at all levels *(school/cluster/district/province/national)*.

4.9.2 Moderation of PAT for grade 10-12

Moderation of each term's PAT component can be done as early as the following term, i.e. experiment 1 can be moderated as soon as the second term starts.

The moderation process is as follows:

- During face moderation learners may be selected at random to demonstrate the different skills developed while conducting the experiments and/or investigations;
- During face moderation a 10% random sample of learners may be selected and asked to conduct the PAT experiments and to answer questions based on them.
- Learners may not request or obtain assistance from other learners during moderation.
- The school must ensure that all apparatus for the PAT experiments are available and in working condition at school during moderation.
- Upon completion of the moderation process the moderator will, if necessary, adjust marks of the entire group upwards or downwards.
- Normal examination protocols for appeals will be adhered to.

4.10 GENERAL

This document should be read in conjunction with:

4.10.1 ***[National Protocol of Assessment]*** *An addendum to the policy document, the National Senior Certificate: A qualification at Level 4 on the National Qualifications Framework (NQF), regarding the National Protocol for Assessment (Grades R – 12).*

4.10.2 **Progression and Promotion Requirements Grades 10 – 12.**

4.10.3 Subject specific exam guidelines as contained in the draft policy document:

National policy pertaining to the programme and promotion requirements of the National Curriculum Statement, Grades R – 12.

APPENDIX 1

4.2.1 Assessment taxonomy for Technical Sciences

Table 2 provides a possible hierarchy of cognitive levels that must be used to ensure that tasks include opportunities for learners to achieve at various levels. The verbs given in the fifth column below could be useful when formulating questions associated with the cognitive levels given in the first column.

APPENDIX 1: **Assessment taxonomy for Technical Sciences**

DESCRIPTION OF COGNITIVE	LEVEL	EXPLANATION	SKILLS DEMONSTRATED	ACTION VERBS
CREATING	**4**	The learner creates new ideas and information using the knowledge previously learned or at hand. At the extended abstract level, the learner makes connections not only within the given subject area but also beyond it and generalises and transfers the principles and ideas underlying the specific instance. The learner works with relationships and abstract ideas.	• Generating • Planning • Producing • Designing • Inventing • Devising • Making	Devise, predict, invent, propose, construct, generate, make, develop, formulate, improve, plan, design, produce, forecast, compile, originate, imagine
EVALUATING		The learner makes decisions based on in-depth reflection, criticism and assessment. The learner works at the extended abstract level.	• Checking • Hypothesising • Critiquing • Experimenting • Judging • Testing • Detecting • Monitoring	Combine, integrate, modify, rearrange, substitute, compare, prepare, generalise, rewrite, categorise, combine, compile, reconstruct, organise, justify, argue, prioritise, judge, rate, validate, reject, appraise, judge, rank, decide, criticise
ANALYSING	**3**	The learner appreciates the significance of the parts in relation to the whole. Various aspects of the knowledge become integrated, the learner shows a deeper understanding and the ability to break down a whole into its component parts. Elements embedded in a whole are identified and the relations among the	• Organising • Comparing • Deconstructing • Attributing • Outlining • Finding • Structuring • Integrating	Analyse, separate, order, explain, connect, classify, arrange, divide, compare, select, infer, break down, contrast, distinguish, draw, illustrate, identify, outline, point out, relate, question, appraise, argue, defend, debate,

		elements are recognised.		criticise, probe, examine, investigate, experiment
APPLYING		The learner has the ability to use (or apply) knowledge and skills in other familiar situations and new situations.	• Implementing • Carrying out • Using • Executing	apply, demonstrate, calculate, complete, illustrate, show, solve, examine, modify, relate, change, classify, experiment, discover, construct, manipulate, prepare, produce, draw, make, compile, compute, sequence, interpret
UNDERSTANDING AND ROUTINE APPLICATIONS	**2**	The learner grasps the meaning of information by interpreting and translating what has been learned.	• Exemplifying • Comparing • Explaining • Inferring • Classifying	summarise, describe, interpret, calculate, contrast, associate, distinguish, estimate, differentiate, discuss, extend, comprehend, convert, explain, give example, rewrite, infer, review, observe, give main idea
REMEMBERING	**1**	The learner is able to recall, remember and restate facts and other learned information.	• Recognising • Listing • Describing • Identifying • Retrieving • Recalling • Naming	list, define, tell, describe, identify, show, know, label, collect, select, reproduce, match, recognise, examine, quote, name