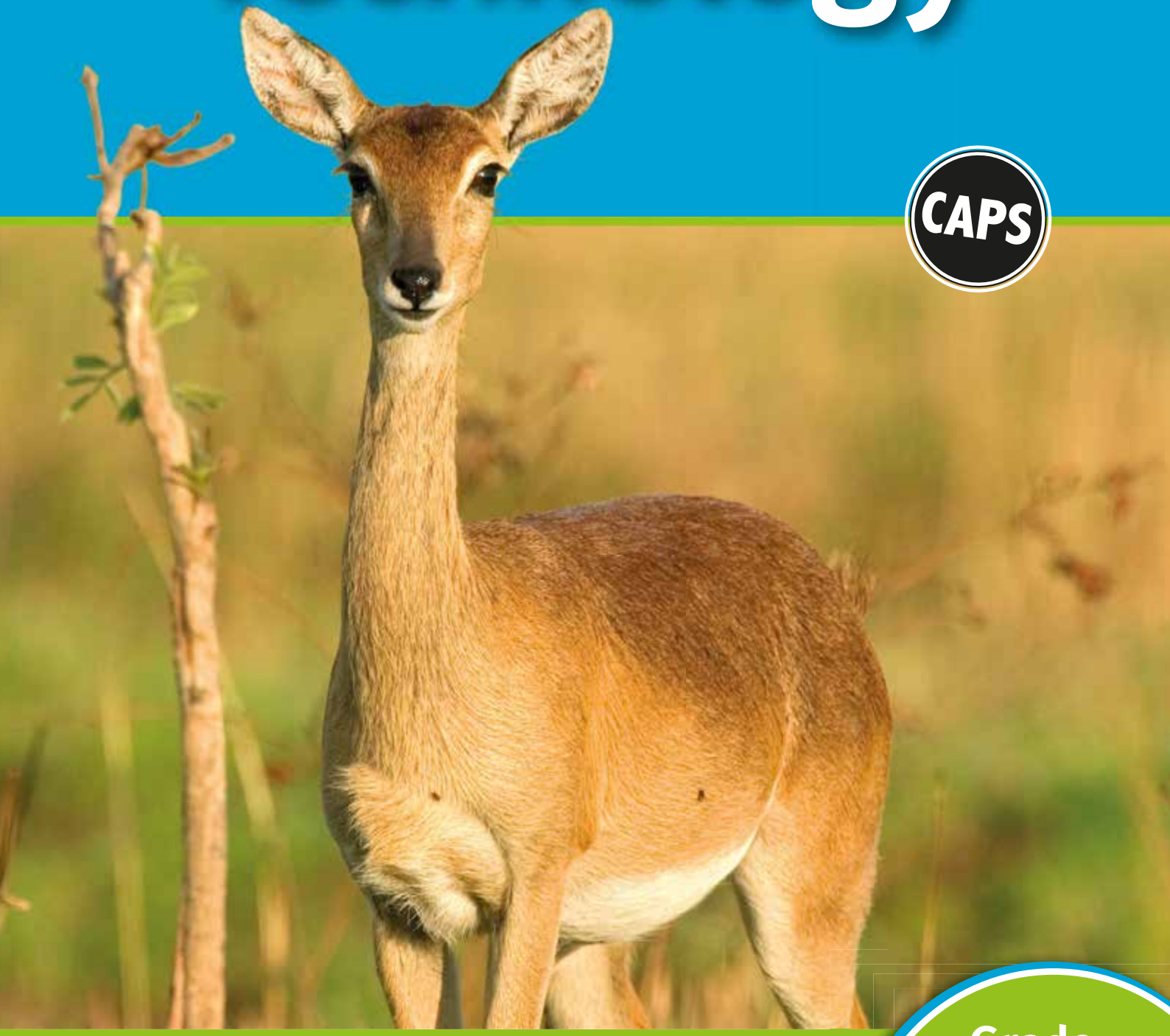
Study & Master

Technology



CAPS

Teacher's Guide

Grade 8

Ria de Jager • Lin Bassett • Neel Ramdutt
Lynn Pocock • Barbara Munsami

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Term	Strand	Module	Unit	Time allocation (weeks and hours)	Lesson	Activities	CAPS content, concepts and skills	Assessment tasks	LB page	TG page
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					Lesson 2		Case study 1: Impact of plastic shopping bags on environment	Teacher assessment of written report	53	D27
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						Extension activity	Homework activity: Letter to newspaper	Teacher assessment of formal letter	54	D27
			4.2 Positive technology	Week 2 (2 hrs)	Lesson 3		Positive impact of technology on society Case study 2: The packaging industry Investigating recycling	Discussion in pairs	55	D28
						Activity 3	Action plan to assist PRASA	Group work: Posters, skits, raps, etc Class report back	56	D28
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Term	Strand	Module	Unit	Time allocation (weeks and hours)	Lesson	Activities	CAPS content, concepts and skills	Assessment tasks	LB page	TG page
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						Activity 6	Counteracting effects of negative technology	Homework activity: Survey	62	D30
					Lesson 8	Activity 7	Class discussion: Possible solutions for negative impact of technology	Discussion Plan of action Implement action plan	62	D30
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					Lesson 10		Adapting materials to withstand forces: reinforcing concrete, plywood	Class discussion	65	D33
							Beams: I-beams, angle iron, T-bars		66	D33
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						Activity 11	Evaluation skills	Self-assessment rubric	69	D33

Term	Strand	Module	Unit	Time allocation (weeks and hours)	Lesson	Activities	CAPS content, concepts and skills	Assessment tasks	LB page	TG page
					Lessons 12 and 13	Activity 12	Make a module/prototype/ product	Recycling container	69	D33
				Week 7 (2 hrs)	Lesson 14	Activity 13	Evaluate solution: effectiveness in solving or reducing the negative aspect of the technology identified: objectivity, fairness, accuracy, scope (depth)	Group assessment checklist	70	D34
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				1 hr			Formal Assessment Test	Mid-year exams		

Term	Strand	Module	Unit	Time allocation (weeks and hours)	Lesson	Activities	CAPS content, concepts and skills	Assessment tasks	LB page	TG page
3	Mechanical systems and control	3. Mechanical systems and control	3.2 Revision: Levers and linkages	Week 1 (2 hrs)	Lesson 1	Activity 1	Revise single levers and levers linked in pairs	Identify load, effort and fulcrum	75	D39
						Activity 2	Mechanical advantage	Learners calculate mechanical advantage and identify single-class levers	76	D39
						Activity 3	Second-class levers	Learners identify second-class levers	77	D40
						Activity 4	Third-class levers	Learners identify third-class levers	77	D40
								Learners complete self-evaluation table	78	
			3.3 Gear systems		Lesson 2	Activity 5	Gear systems: Concepts (counter rotation, idler, velocity ratio, force multiplication)	Learners calculate gear ratios with diagrams	79	D40
						Activity 6	Two spur gears of unequal size: velocity ratio, force ratio (mechanical advantage)	showing speed ratio and force ratio	79	D41
						Activity 7	Two spur gears connected via an idler: synchronised rotational direction Suitable materials: idler harder material than other gears Two bevel gears linked to transfer axis of rotation through 90° Mechanical advantage: calculations using ratios: tooth ratios, gear-wheel diameters, velocity ratios	List of household objects that use gears	80	D41

Term	Strand	Module	Unit	Time allocation (weeks and hours)	Lesson	Activities	CAPS content, concepts and skills	Assessment tasks	LB page	TG page
				Week 2 (2 hrs)	Lesson 3	Activity 8 Activity 9	Represent gear systems graphically: - driven gear opposite to driver - driven gear same direction to driver (with idler gear) - driven gear rotating faster than driver (with and without idler) - driven gear rotating slower than driver (with and without idler)	Learners draw gear systems	81	D41 D42
					Lesson 4	Activity 10 Activity 11	Learners write design brief with specifications for a device that uses a combination of gears: - mechanical advantage with force multiplication of three times - increase in output velocity of four times Design skills: Learners draw sketches using isometric projection with maths sets: show three-gear systems already discussed	Learners write a design brief for a hand-held fan Learners complete checklist for design brief Isometric drawings	82 82	D42 D43

Term	Strand	Module	Unit	Time allocation (weeks and hours)	Lesson	Activities	CAPS content, concepts and skills	Assessment tasks	LB page	TG page
				Week 3 (2 hrs)	Lesson 5	Activity 12	Learners complete 2-D drawings for a device that uses a combination of gears: - mechanical advantage with force multiplication of three times	Learners complete drawings in table Teacher uses rubric to assess 2-D drawings	83 83	D43
						Activity 13	Sketches of 2-D gear systems that: provide output force 4x greater than input force (MA = 4 : 1); provide double the rotation rate on a driver axle at 90° to the driver axle	Learners complete drawings in table Teacher uses rubric to assess drawings	84 84	D43
					Lesson 6	Activity 14	Systems analysis: bicycle gear system	Simple systems diagram	85	D44
						Activity 15	Analysis of gears used on modern bicycles – terminology: master/slave or driver/driven, chain wheel, cogs	Learners work in groups, answer the questions and complete the table	86	D44
				Week 4 (2 hrs)	Lesson 7	Activity 16	Analyse a mechanical system by breaking it into input-process-output Draw a systems diagram for a gear system with a mechanical advantage of 4 : 1	Learners draw a systems diagram for a bicycle gear system (MA = 4 : 1)	87/88	D45
						Activity 17	Plan a mechanical system to produce a specific output Produce a systems diagram for a gear train with driven gear rotating faster than the driver	Learners design a mechanical system to draw water in a bucket from a well.	88	D45

Term	Strand	Module	Unit	Time allocation (weeks and hours)	Lesson	Activities	CAPS content, concepts and skills	Assessment tasks	LB page	TG page
			3.4 Impact of and bias in technology/ indigenous technology		Lesson 8	Activity 18	Learners investigate impact on the environment through mining: acid mine drainage; dust pollution from mine dumps; indigenous mining of iron in South Africa	Learners work in groups and compile report on chosen topic	89	D45
				Week 5 (2 hrs)	Lesson 9	Activity 19	Investigate bias in technology	Learners respond to question on gender bias	89	D46
						Activity 20	Gender bias in career choice/opportunities related to mining	Learners investigate gender bias related to mining. A debate can be held once research is complete	90	D46
					Lesson 10	Activity 21	Tendering for contract constructing headgear for a mine/quarry	Learners must design headgear for mine	91	D46
				Week 6 (2 hrs)	Lesson 11	Activity 22	Investigate: Lifting mechanisms (wire rope-driven mine headgear) in use in South African mines	Learners investigate mine headgear	92	D47
					Lesson 12	Activity 23	Sketch initial ideas to meet the requirements of given scenario	Learners complete initial sketches for mining headgear	92	D47
						Activity 24	Design brief with specifications and constraints	Learners write design brief to specs provided	92	D47

Term	Strand	Module	Unit	Time allocation (weeks and hours)	Lesson	Activities	CAPS content, concepts and skills	Assessment tasks	LB page	TG page
				Week 7 (2 hrs)	Lesson 13	Activity 25	Simulation in groups who form mechanical engineering companies. They evaluate learners' sketches and select best idea for team tender	In groups, learners use assessment rubric to select best ideas fro tender bid.	93	D48
					Lesson 14	Activity 26	Draw 2-D isometric drawing of selected design; give dimensions and draw to scale Draw 2-D working drawing showing one or more views with dimensions and lines	Learners do isometric drawing and working drawing of chosen idea	93	D48
				Week 8 (2 hrs)	Lesson 15	Activity 27	Teams prepare realistic budget detailing expected costs of constructing a real mine shaft head-gear; detailing valid prices of materials and labour costs of the range of workers who would design and build such a device	Learners work in groups to produce realistic budget for construction of real mine shaft head-gear	93	D48
				Week 9 (2 hrs)	Lesson 16	Activity 28	Teams build their working scale model using safe working practices	In groups, learners build scale model of head-gear design	94	D48
					Lesson 17	Activity 29	Teams present their tender proposal for mine shaft head-gear (research, plans, flowchart, model and budget) to the 'Tender Board'	Teacher reviews presentations	94	D49
				Week 19 (2 hrs)			Formal Assessment Test: Summative Assessment		94	D50

Term	Strand	Module	Unit	Time allocation (weeks and hours)	Lesson	Activities	CAPS content, concepts and skills	Assessment tasks	LB page	TG page
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						Activity 2	Correct connections, short circuits: Electrical components and their symbols	Strip and join wires for an electric circuit Teacher checks completed joints	101	D58
					Lesson 2	Activity 3	Drawing electrical circuits using accepted symbols	Groups make circuit	102	D59
						Activity 4	Set up circuits using a range of components. Draw the circuits using symbols	Learners draw group's circuit using correct symbols and drawing techniques	102	D59
						Activity 5		Learners complete self-assessment in exercise books	103	D60
					Lesson 3	Activity 6	Energy for heating, lighting and cooking in rural and informal settlements	Pair discussion: sharing energy Learners complete table: types of energy	104 105	D61

Term	Strand	Module	Unit	Time allocation (weeks and hours)	Lesson	Activities	CAPS content, concepts and skills	Assessment tasks	LB page	TG page
			5.2 Energy	Week 2 (2 hrs)		Activity 7	Energy from illegal connections, ethical issues, safety considerations	Group discussion: lighting and cooking in rural and informal settlements - dangers	105	D61
						Activity 8	Class discussion: Equitable sharing of resources (industry's needs, schools, etc)	Class discussion	106	D62
					Lesson 4	Activity 9	Written report: Learners write a balanced report on above issues	Report writing: issues in Activity 8	106	D62
						Activity 10		Learners complete self-assessment checklist	107	D62
			5.3 Electrochemical cells	Week 3 (2 hrs)	Lesson 5	Activity 10	Electrochemical cells	Learners record results of potato battery	108	D62
						Extension activity	Fruit and vegetable batteries	Practical examples using other fruit and vegetables	109	
						Activity 11	Salt water batteries	Learners make salt water battery in pairs	109	D62

Term	Strand	Module	Unit	Time allocation (weeks and hours)	Lesson	Activities	CAPS content, concepts and skills	Assessment tasks	LB page	TG page
					Lesson 6	Activity 12 Activity 13 Activity 14	Advantages and disadvantages of series and parallel batteries Photovoltaic cells – advantages and disadvantages of solar cells	Learners record findings Learners explore advantages/ disadvantages of solar cells Group discussion: advantages/ disadvantages of solar cells Learners complete table and spokesperson reports back Self-assessment	110 110 110/111	D63 D63 D64
			5.4 Electricity generation	Week 4 (2 hrs)	Lesson 7	Activity 15 Activity 16	Generate electricity for the nation – advantages and disadvantages of: Thermal power stations (steam turbines – sources of heat: coal, gas, nuclear, Sun) Hydroelectric power stations (including pumped storage schemes) Wind-driven turbines	Pair discussion: how does electricity affect our lives? Rubric evaluating pair discussion Group discussion around energy sector in South Africa	112 112	D64 D65

Term	Strand	Module	Unit	Time allocation (weeks and hours)	Lesson	Activities	CAPS content, concepts and skills	Assessment tasks	LB page	TG page
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					Lesson 8	Activity 18 Activity 19	Distributing electric power across the country	Class discussion: electricity across South Africa Learners make a poster about electric power distribution in South Africa Teacher assesses poster	114 115	D66 D67
				Week 5 (2 hrs)	Lesson 9	Activity 20	Practical: Learners draw circuit diagrams and connect circuits – resistors in series and parallel	Group discussion: circuits/circuit diagrams	116	D67

Term	Strand	Module	Unit	Time allocation (weeks and hours)	Lesson	Activities	CAPS content, concepts and skills	Assessment tasks	LB page	TG page
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						Activity 22	Introducing Ohm's Law (*no calculations*).	Learners make circuits: connect resistors in series and in parallel Draw a circuit diagram	121	D68
						Activity 23		Learners complete self-assessment checklist in exercise books Answer questions		D68
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						Activity 25	Investigate: OR logic gate and simple cases where it is used	Learners investigate OR gates	123	D70
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Term	Strand	Module	Unit	Time allocation (weeks and hours)	Lesson	Activities	CAPS content, concepts and skills	Assessment tasks	LB page	TG page
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					Lesson 14	Activity 30	Connect the components specified to form a circuit suitable for at least two switches	Make sure learners use two switches in circuit	124	D71
						Activity 31	Learners draw a truth table for their device	Learners draw a truth table	125	D72
						Activity 32	Learners prepare an advertising poster for their device	Learners complete poster: planning with mind map or flow chart Learners use assessment checklist to assess results		D72
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Section A: Introduction

Welcome to **Technology Grade 8**. This course includes a Learner's Book and Teacher's Guide that provide the core material you need to cover the content required by the Curriculum and Assessment Policy Statement for Grade 8 Technology.

In the Introduction (Section A) you will find information about the core features of the National Curriculum and detailed advice on the Technology subject in particular.

Assessment is covered in Section B and explains how and when assessment should be done. Section B also contains control tests with memoranda that can be used at the end of each term.

Section C (Planning) contains a detailed phase plan, teacher plan (work schedule) and an exemplar of a lesson plan. The answers to all activities can be found in Section D. These include rubrics and checklists for formal and informal assessment of prescribed practical work.

Section E contains photocopiable worksheets, activities, rubrics and an exemplar of a recording sheets to record marks, and in Section F you can file your copy of the Curriculum and Assessment Policy Statement. You can also file your own documents in this section.

As a teacher at the General Education and Training (GET) level, your two main resources are:

- your expertise in the subject
- your teaching experience — knowing how to help learners master the skills and knowledge of this subject.

Curriculum and Assessment Policy Statement (CAPS)

The new Curriculum and Assessment Policy Statement (CAPS) makes two core demands on you as the teacher:

- to follow a learning programme that enables learners to develop all the skills, knowledge, values and attitudes relevant to Technology
- to have a sound, up-to-date knowledge of the content and methods of your subject, and a clear understanding of its social relevance, so that you can act as a guide, facilitator and subject expert in the classroom.

This textbook helps you to meet these demands in the following ways:

- it provides a structure for your teaching programme for the year and a teaching plan (work schedule) that is in line with the CAPS requirements
- it provides solutions to all the activities in the Learner's Book
- it explains all the assessment requirements of the curriculum and provides practical activities with their rubrics and checklists that are required by CAPS
- it contains examples of generic rubrics, checklists and assessment sheets that you can use or adapt for your assessment work throughout the year.

General aims of the South African Curriculum

The National Curriculum Statement Grades R to 12 gives expression to knowledge, skills and values that are regarded to be worth learning. This statement will ensure that learners acquire and apply knowledge and skills in ways that are meaningful to their own lives. In this regard, the curriculum promotes the idea of grounding knowledge in local context, while being sensitive to global imperatives.

The purpose of the National Curriculum Statement Grades R to 12

The National Curriculum Statement (**NCS**) aims to:

- equip learners, irrespective of their socio-economic background, race, gender, physical ability or intellectual ability, with the knowledge, skills and values necessary for self-fulfilment and meaningful participation in society as citizens of a free country
- provide access to FET and higher education.

The principles of the National Curriculum Statement Grades R to 12

The principles of the NCS:

- social transformation
- active and critical learning
- high knowledge and high skills
- progression
- human rights, inclusivity, environmental and social justice
- valuing indigenous knowledge systems
- credibility, quality and efficiency.

These principles can be applied to your school context in the following ways:

Social transformation

What does this mean in your classroom? Your learners will come from families and communities that have been affected in diverse ways by South Africa's past. They will have many different ideas about the kind of future career they want and the kind of society they want to live in. In the learning programme that you plan for the year, you need to provide opportunities for the learners to analyse, research and come to understand the role that this particular subject plays in shaping the kind of society we want to create in South Africa and in offering them possibilities for their future.

For example: Create opportunities for learners to research and discuss questions such as how many people in their families have studied Technology and to what levels? How does access to Technology education relate to access to different kinds of employment? What factors influence people's access to and success in the subject?

Active and critical learning

What does this mean in your classroom? Many of the laws and principles in Technology have been developed and formulated over centuries.

You need to explain the background of how these laws and principles were developed and the meaning and application of their formulation. Make the learners aware that technological knowledge is man-made solutions or ideas to solve problems, for example one way of processing food is to make food last longer and can change as new technologies become available.

High knowledge and high skills

What does this mean in your classroom? You, as a subject expert, should inspire your learners with relevant knowledge and activities that will encourage them to want to explore technology in depth. Encourage them to relate what they learn to their lives outside school and to possible future career paths. Strive to develop a high level of knowledge and skills in this subject in all your learners.

For example: Relate the study of particular Technology topics to future career paths such as electrical, chemical and mechanical engineering and electrical and telecommunications technology. Where possible, create opportunities for learners to meet professional practitioners in these and other relevant fields. Set projects that challenge learners to apply their technology skills outside the school context. Inform them about what they can expect to learn if they follow these subjects in the FET and later on enrol for higher education in technology-related subjects.

Progression

What should this mean in your classroom? This Technology curriculum contains material at the appropriate level to meet the criteria required for Grades 7/8/9. If you plan a learning programme using this curriculum, you will ensure that your learners progress appropriately through the levels of knowledge and skills that the curriculum requires.

Human rights, inclusivity, environmental and social justice

What should this mean in your classroom? In all activities that you organise and facilitate, create opportunities to relate Technology to the broader social goal of promoting human rights, environmental justice and social justice. Take into account that some of your learners might grapple with issues such as poverty, language and disability in their daily lives. Encourage them to explore these issues in ways that relate to this subject.

For example, identify a social issue of relevance in the learners' community and help them research and design a technology solution to a community problem. This could relate to the availability of a bridge to cross a river or to design a two-way switch for a gate or for a light in a passage.

Valuing indigenous knowledge systems

What should this mean in your classroom? This Technology curriculum contains material that draws on indigenous knowledge systems and encourages learners to take these systems into account in their research and practical work. You should also draw on the expertise in your subject that may be available in your local community. Compile information about individuals and organisations in your region that can support your classroom work by means of relevant indigenous knowledge to which they have access.

Encourage learners to recognise sources of relevant indigenous knowledge in their own communities, and to include these sources in their research and practical work. For example, people from indigenous cultures have always found ways to preserve food.

Credibility, quality and efficiency

What should this mean in your classroom? The content of the Technology curriculum has been reviewed by experts in their fields of civil, electrical and mechanical engineering and covers all facets required to prepare learners to go on to FET.

Qualities and skills of learners

The National Curriculum Statement aims to produce learners who are able to:

- identify and solve problems and make decisions using critical and creative thinking
- work effectively as individuals and with others as members of a team
- organise and manage themselves and their activities responsibly and effectively
- collect, analyse, organise and critically evaluate information
- communicate effectively using visual, symbolic and/or language skills in various modes
- use science and technology effectively and critically, showing responsibility towards the environment and the health of others
- demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation.

Inclusivity

Inclusivity should become a central part of the organisation, planning and teaching at each school. This can happen only if all teachers have a sound understanding of how to recognise and address barriers to learning and how to plan for diversity. We have included some guidelines below on how teachers can achieve this.

Inclusive education and training should:

- acknowledge that all children and youth can learn, and that all children and youth need support
- accept and respect the fact that all learners are different and have different learning needs, which are equally valued
- enable education structures, systems and learning methodologies to meet the needs of the learner
- acknowledge and respect differences in children, whether due to age, gender, ethnicity, language, class, disability, HIV status, or any other reason.
- maximise the participation of all learners in the culture and the curriculum of educational institutions and uncover and minimise barriers to learning.

What should this mean in your classroom? In this series of books the learners work together in groups and pairs, which gives them the opportunity to learn from each other, as well as at their own pace. The learning methodologies cater for learners with different learning abilities. Gender is also addressed as both boys and girls are able to participate in all the activities. Learners also have the opportunity to learn about diversity within the subject matter covered.

Learners with physical barriers can work in groups or with a partner so they can be assisted where necessary. You must therefore group learners with disabilities together with learners with other disabilities or no disabilities so they can support each other.

Special needs

In many classrooms, learners with special needs require additional attention; some learners require very little attention, while others need more extensive help. As a teacher, be especially sensitive towards these learners without drawing too much attention to the learners' possible barriers to learning.

Discreetly make the fellow learners aware of the need to treat each other with respect without exception. This vital life skill should be engrained in all young people so that it becomes part of their personalities for the rest of their lives. The information that follows will assist you in addressing some of these special needs in your classroom in an inclusive way. Be aware of these and other special needs of learners in your classroom.

Partial sight or blindness: For partially sighted learners who find it difficult to read text, you could enlarge the text on a photocopy machine. Also, ensure that these learners sit in the middle at the front of the class so that their poor eyesight does not become a barrier to their learning.

Alternatively — and especially in group work — read the text aloud to these learners. Remind the learners to read loudly, clearly and slowly as partially sighted and blind learners rely heavily on their

memories. When doing experiments, these learners might not be able to see results. Train a few fellow learners with excellent social skills to convey results to their peers.

It is also a good idea to let these learners stay in the groups where there are learners you have trained specially to help their challenged classmates.

Hard of hearing: Once again, these learners should sit in the front of the class. When giving instructions or when reading text to these learners, the speaker or reader should face the learner directly and speak loudly and clearly, but without exaggerating. Learners who are hard of hearing learn to lip-read very early in life.

Impaired social skills: The nature of these difficulties varies, but could, in some cases, become a serious barrier to learning.

- Learners who are very shy or highly-strung might find class presentation extremely stressful. Although you should encourage them to develop this life skill, remember that you can never change someone's nature completely. Work gently with these learners — their shyness or nervousness may be the result of negative circumstances at home. Let them present their 'class presentations' in written form at first, and then move slowly as the year progresses, at first letting them present their work to one classmate only, then to a small group, and finally to the whole class.
- Children with ADS (Attention Deficit Syndrome, also known as ADD, Attention Deficit Disorder) will find it extremely difficult to work in groups or to sit still and concentrate for very long — in some cases having to listen for two minutes is too long. Learners with ADS could affect the class atmosphere and class discipline in a negative way, and although everyone will agree that the deficiency is no fault of their own, they should not be allowed to ruin their fellow learners' education.

The school should have a policy that parents must inform the school confidentially if their child suffers from ADS. If learners have been diagnosed, they could be on medication. It is essential that teachers are informed; otherwise the learner could be branded as 'extremely naughty', which would be unfair and result in inappropriate handling. Teachers should be very careful not to judge a 'naughty' learner too quickly. ADS is quite common, and in some cases may not have been diagnosed.

Look out for a learner who:

- finds it difficult or even impossible to concentrate
- frequently interrupts the teacher with irrelevant or seemingly 'stupid' questions
- fidgets all the time to the point of irritating peers
- jumps up frequently and asks to go to the bathroom (or somewhere else) at inappropriate times
- shouts out answers or remarks when the class has been asked to put up their hands
- is unable to deal with group work or pair sessions — these periods are interpreted as a 'free-for-all'
- shows signs of aggression when fairly disciplined
- argues with the teacher when asked to keep quiet.

Please note that:

- the disorder is more prolific among boys than among girls
- diet could play role in controlling the disorder — fast foods and junk foods should be kept to a minimum.

Extreme poverty: This barrier to learning requires extreme sensitivity from the teacher. If you know that there are one or more learners in your class who come from poverty-stricken backgrounds, you could handle the situation as follows:

Learners are often required to bring resources from home, especially in practical learning areas such as Technology. Some learners may be unable to afford additional resource materials: magazines for research; rulers; calculators and mathematical sets. Keep a supply of these items in your classroom without informing your learners and unobtrusively give them to those learners you know have difficulty in acquiring them. Be careful not to encourage 'forgetters' to make use of this offer! You could ask community groups in your area, such as churches, to provide support in collecting supplies of materials for you to keep in your classroom.

The key to managing inclusivity is ensuring that barriers are identified and addressed by all the relevant support structures within the school community, including teachers, district-based support teams, institutional-level support teams, parents and special schools as resource centres. To address barriers in the classroom, teachers should use various curriculum differentiation strategies such as those included in the Department of Basic Education's *Guidelines for Inclusive Teaching and Learning* (2010).

Time allocation

The instructional time in Grade 7, 8 and 9 is shown in the table:

SUBJECT	HOURS
Home Language	5
First Additional Language	4
Mathematics	4,5
Natural Sciences	3
Social Sciences	3
Technology	2
Economic Management Science	2
Life Orientation	2
Arts and Culture	2
TOTAL	**27,5**

The allocated time per week may only be used for the minimum required NCS subjects as specified above. Should a learner wish to take additional subjects, these will have to be done outside this time.

Technology in the school curriculum

Purpose

Technology education was introduced into the South African curriculum in recognition of the need to produce engineers, technicians and artisans needed in modern society and the need to develop a technologically literate population for the modern world. The subject stimulates learners to be innovative and develops their creative and critical thinking skills. It teaches them to manage time and material resources effectively, provides opportunities for collaborative learning and nurtures teamwork. These skills provide a solid foundation for several FET subjects as well as for the world of work.

In the educational context, Technology can be defined as:
the use of knowledge, skills, values and resources to meet people's needs and wants by developing practical solutions to problems, taking social and environmental factors into consideration.

Specific aims

Technology as a subject contributes towards learners' technological literacy by giving them opportunities to:

- develop and apply specific design skills to solve technological problems
- understand the concepts and knowledge used in Technology education and uses them responsibly and purposefully
- appreciate the interaction between people's values and attitudes, technology, society and the environment.

The intention is to introduce learners to the basics needed in Civil Technology, Mechanical Technology, Electrical Technology and Engineering Graphics and Design. Additionally, learners gain an idea of the way engineers apply scientific principles to practical problems. In addition, evaluation skills will be fostered and the introduction of product design and production will be useful in other FET subjects that use these skills — such as Consumer Studies and Design.
It is expected that Technology education will provide learners with some experience to help them to make career-oriented subject choices at the end of Grade 9.

Unique features and scope

Key issues to teach:
1. Problem solving using the design process
2. Practical skills
3. Knowledge and application of knowledge

Technology will give learners the opportunity to learn:

- to solve problems in creative ways
- to use authentic contexts rooted in real situations outside the classroom
- to combine thinking and doing in a way that links abstract concepts to concrete understanding
- to evaluate existing products and processes, and to evaluate their own products
- to use and engage with knowledge in a purposeful way
- to deal with inclusivity, human rights, social and environmental issues in their tasks
- to use a variety of life skills in authentic contexts (such as decision making, critical and creative thinking, cooperation, problem solving and needs identification) while creating positive attitudes, perceptions and aspirations towards technology-based careers
- to work collaboratively with others
- through practical projects using a variety of technological skills (investigating, designing, making, evaluating and communicating) that suit different learning styles.

Topics and core content areas in Technology

The table below indicates the main focus areas in the Technology curriculum:

1.	The design process skills (non-linear) • Investigation skills • Design skills • Making skills • Evaluation skills • Communication skills
2.	Structures
3.	Processing of materials
4.	Mechanical systems and control
5.	Electrical systems and control
6.	Technology, society and the evironment • Indigenous technology • Impact of technology • Bias in technology

There are four core content areas in Technology in Grades 7–9. These are:

Structures	Processing	Mechanical systems and control	Electrical systems and control

NB: All electric circuits must be battery powered in the GET Band – max 9 V C

These four content areas form the basis of the four strands which must be done each year in every grade. Where possible in the senior phase, the learner should engage in projects that integrate processing, structures and systems and control. The recommended approach is to introduce the required knowledge followed by practical work in which the knowledge is applied. In all cases, the teaching will be structured using the design process as the backbone for the methodology. Some of these elements will be assessed formally each term. As learning progresses, learners must be made aware of the interrelationship between technology, society and the environment. Wherever applicable, learners should be made aware of different coexisting knowledge systems. They should learn how indigenous cultures have used specific materials and processes to satisfy needs, and become aware of indigenous intellectual property rights. Learners should be able to consider the impact of technology, both positive and negative, on people's lives. Learners should be made aware of bias in technology and be able to express opinions that explain how certain groups within society might be favoured or disadvantaged by products of technology.

The importance of design in Technology education

No product has ever been manufactured that did not undergo development through *design*. Technology education is an introduction to a range of careers that work in similar ways. All tend to use the **design process** as they develop solutions to problems, needs or wants.

The country needs informed, critical consumers and producers of knowledge.

A key element to teach is the ability to *design*.

With many similar products on the market, design excellence is a key element in attracting consumers.

Examples of careers that use design:

Civil engineering – designing a bridge Architecture – designing a house Textile design – developing a textile for a specific purpose Electrician – designing the electrical wiring for a lamp	Dietician – designing a diet to combat malnutrition and obesity Mechanical engineering – designing a supporrt system for the roof of a stadium

Designers need to have...

- an understanding of the problem, need or opportunity;
- knowledge of the design process;
- knowledge of types and properties of suitable materials, and how to use them optimally;
- the ability to calculate the quantities and costs of the materials needed;
- knowledge of the conventions/building codes;
- an ability to sketch initial ideas on paper;
- the ability to draw working drawings in sufficient detail for the task;
- the practical skills required to create a solution;
- the ability to work safely using appropriate tools;
- the ability to adhere to health precautions;
- the ability to present the solution effectively to the client/ customer.

Learners need to work collaboratively with others; doing practical projects using a variety of technological skills (investigating, designing, making, evaluating and communicating) to suit different learning styles.

Teaching methodology (*how tasks will be approached*)

NB: As learners progress through a task, they must be **taught** the associated knowledge and skills needed to **design and create** a solution.

Knowledge is important, BUT the learners must show that they can **use the knowledge**, and not just memorise it.

The **design process** (**I**nvestigate, **D**esign, **M**ake, **E**valuate, **C**ommunicate — **IDMEC**) forms the *backbone* of the subject and should be used to structure the delivery of all learning aims. Learners should be exposed to a problem, need or opportunity as a starting point. They should then engage in a systematic process that allows

them to develop solutions that solve problems, rectify design issues and satisfy needs. *Investigation* in this subject involves finding out about *contexts and needs*, investigating or evaluating *existing products* in relation to key design aspects and *performing practical tests* to develop understanding of particular aspects of the content areas or determining a product's fitness-for-purpose. While investigating, learners should be provided with opportunities to explore values and attitudes and develop informed opinions that can help them to make compromises and value judgements. Investigation can happen at any point in the design process. It should not be seen as something that must be completed before design begins.

Designing, making and evaluating

These skills should not be seen as separate — they are interrelated.

Evaluation skills, for example, are used to choose ideas. At this level, learners should be introduced to key aspects of design. These should be used to evaluate both existing and designed products against predetermined criteria.

When **making**, learners should be encouraged to continue to reflect on their progress against these criteria and to modify their solutions based on problems encountered.

As learners progress they should be able to demonstrate *increasing accuracy and skill*, *better organisation* and *safer working practices*.

Criteria for teaching and assessing design features:

- Originality and aesthetics
- Value for money/cost-effectiveness
- Fitness-for-purpose and suitability of materials
- Ease of manufacture
- Safety and ergonomics
- Environmental impact
- Bias towards or against a group

Communication should also be seen as integral to the overall process. Learners should be recording and presenting progress in written and graphical forms on an ongoing basis. Their presentations should show increasing use of media, levels of formality and conventions as they progress through the phase.

Technology develops valuable problem-solving skills that will benefit every learner in many life contexts.

Note on drawing: the Grade 9 learner must be able to *identify and explain a problem, need or opportunity from a given real-life context***.**

In Grades 7–9 Technology, drawing is separated into three fields:

- freehand sketches in the design stage
- working drawings in the making stage, using formal draughting techniques in line with conventions
- artistic impressions in the communication stage, using artistic techniques including perspective, texture rendering, shading, colours and shadows in order to advertise the product to potential users.

NB: Perspective drawing here is purely **artistic** and has **no link** to the method of linking the perspective to the working drawing, using formal construction lines. In Technology, learners draw both technical AND artistic graphics.

Time allocation for Technology

The teaching time for Technology is two (2) hours per week. As this subject involves practical work, 60 minutes of the two hours should be one continuous period for practical work, e.g. one double period comprising two periods of 30 minutes.

Schools using alternative period lengths, or a cycle system, must ensure that all subjects get their correct time allocation and that sufficient time is allocated for practical sessions.

Requirements for Technology

1. Each learner must have:
   - an approved textbook
   - a 72-page A4 workbook/exercise book (In secondary schools learners may require two books per year.)
   - stationery, including basic mathematical set (drawing instruments), pencil, eraser, ruler and set squares.
2. A designated teaching venue with a Technology teacher.
3. Technology rooms must be secure, with doors that lock, and with burglar-proofing if possible. Enough cupboards should be available to store and lock away all resources.
4. It is **the responsibility of the school** to provide each learner with the minimum tools and material to meet the needs of the subject and to develop the teacher's appropriate knowledge and skills.
5. **Enabling tasks:** Activities used to teach and then practise specific skills in preparation for a more advanced task — sometimes also called resource tasks. These tasks are assessed informally.
6. **Mini-PAT:** A short Practical Assessment Task which makes up the main formal assessment of a learner's skills and knowledge application during each term. It may be an assignment covering aspects of the design process, or it may be a full capability task covering all aspects of the design process (IDMEC).

Note: The curriculum for Grade 7 has been described very specifically to ensure that all these learners cover the same work in all schools across the country before graduating to secondary schools. Some limited variations will be developed by the various textbook authors.

The curriculum for Grade 8 has some sections described fairly specifically while other sections give a lot of freedom for the innovation expected from textbook authors.

The Grade 9 learners have to be able to 'identify a problem, need or opportunity' in a given context. Consequently the curriculum for Grade 9 is non-specific and textbook authors have free rein to develop ideas that suit the given content.

Section B: Assessment

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:

1. Generating and collecting evidence of achievement
2. Evaluating this evidence
3. Recording the findings
4. Using this information to understand and thereby assist the learner's 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 learners' attainment of knowledge (content, concepts and skills) in a subject by collecting, analysing and interpreting the data and information obtained from this process to:

- enable the teacher to make reliable judgements 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, skills and aims specified for Technology 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.

Informal or daily assessment

Assessment for learning has the purpose of continuously collecting information on learners' achievements that can be used to improve their learning. Informal assessment is a daily monitoring of the learners' progress.

This is done through observations, discussions, practical demonstrations, 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. Use informal assessment to provide feedback to the learners and to inform planning for teaching. Do not view informal assessment as separate from learning activities taking place in the classroom. The results of the informal daily assessment tasks are not formally recorded unless the teacher wishes to do so. Learners or teachers can mark informal assessment tasks. Self-assessment and peer assessment actively involve learners in assessment.

This is important as it allows learners to learn from and reflect on their own performance. Informal assessment also helps learners to take responsibility for their own learning and for the learning of

their peers. In this way they develop a sense of self-discipline and commitment to each other's well-being.

The results of daily assessment tasks are not taken into account for promotional and certificate purposes. Use informal, ongoing assessments to structure the acquisition of knowledge and skills and as a precursor to formal tasks in the Programme of Assessment.

Using group and pair work

Many teachers in South Africa work in overcrowded classrooms, which make learning difficult. You can overcome some of these problems by getting a class to work in groups. Practical work is normally done in groups, while many activities lend themselves to working in pairs. Smaller groups are easier to handle and learners will also start to feel more positive about themselves.

Teamwork is an important aspect of learning skills and constructing knowledge. Sharing the workload and being aware of personal contributions to the community is important for every learner. In a group, the different roles and responsibilities people take on are essential to the success of the activity. At the GET level, learners should already become aware of the roles and responsibilities that are likely to be combined in 'professional' teams working in your particular subject areas in the real working world.

Setting up

Certain learning tasks are better approached through a whole-class session; others lend themselves to group work. Working in pairs and in groups of three to six learners, learners have a chance to express themselves more often than when they are part of a class of forty or more. They learn to work in a team, helping each other freely when their knowledge or skill is strong, and being helped when it is weak. Some learners might be too shy to ask a question in front of a whole class, but feel at ease asking a small group of friends.

Group work

There are many ways of organising learners into groups. Here are some ideas:

- Language groups: If you have learners with different home languages, you can put the speakers of each language into their own language group. Same-language groups enable all the learners to develop their understanding of a new concept in their own language. At other times you can create mixed language groups. Learners working in their second language or third language can be helped with translation and have a greater chance to contribute than they would in a large class.
- Ability groups: There are times when it is useful to divide learners into groups according to how well they achieve in the learning area. The top achievers in the class are grouped together, the average learners form a group, and the slowest learners are grouped

together. Top achievers can do enrichment activities while you attend to the slower learners.

- Remediation groups: When you have finished assessing some aspects of the learners' work, you may often find a few learners from different groups with the same problem. There may be a new concept they haven't quite grasped, or a few learners may have been absent at the same time while you were dealing with new work. You can then group them together temporarily while you help them sort out the problem.
- Mixed-ability groups: These groups work well on their own while you circulate between them. Vary the members of these groups so that learners have experience in working with different classmates. For instance, new groups can be formed each time a new unit of work is started.

Guidelines for using group work

- When planning group work, you should decide on the composition of each group and not always leave it to learners to cluster together with those they work with most easily.
- Divide tasks fairly among the members of each group: each member must understand his role.
- Give the learners clear and concise instructions.
- Define the work to be done clearly so that the group can go ahead without constantly referring to you.
- Learners must be settled and attentive when instructions are given.
- You must monitor progress at all times and should take into consideration not only the end result, but also focus attention on how the group has interacted and progressed through each step. This will be possible if you circulate amongst the groups and give information and guidance where and when it is required.
- Allow time for feedback so that learners have an opportunity to present evidence of their progress at the end of a session.
- Regular reminders of time limits and what progress should have been made at a particular stage are valuable when facilitating group work.
- Place groups as far apart as possible so that they enjoy a sense of privacy. Allow a certain amount of interaction as this often assists learners in solving problems or coping with complex areas.

Pair work

Pair work is easier to control than group work, particularly in large classes where it is difficult to rearrange the seating. It is a very useful strategy for task-based teaching as it frees the teacher to be a facilitator, support guide and evaluator.

Pair work also allows for differentiation: pairs that work faster can be given extra tasks; some pairs can be given more challenging tasks; in mixed-ability pairing, one partner can assist the other.

Solving problems related to pair and group work

- Noise can become a problem. Differentiate between 'good learning noise' and 'disruptive chatter'. Firmly remind learners that they might be disturbing neighbouring classes and that they should keep their voices down.
- Certain learners dominate a group, while others are idle and not actively involved. Each individual must understand his or her role or task, which should be constantly monitored. Use the report-back to assess each learner's involvement and progress.
- Learners may not like the partners they are paired or grouped with. There is no quick-fix solution to this problem. You must, however, use your knowledge of the learners and avoid grouping personalities or characters that are likely to clash.

Formal assessment

All assessment tasks that make up the formal Programme of Assessment for the year are regarded as formal assessment. 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.

Formal assessment provides teachers with a systematic way of evaluating how well learners are progressing in a grade and in a particular subject.

Examples of formal assessment include tests, examinations, practical tasks, projects, oral presentations, demonstrations and performances.

The formal assessment requirements for Technology are as follows:

- Formal assessment for Technology will consist of the mini-Practical Assessment Tasks (Mini-PATs) and pen-and-paper tests or examinations.
- **At least 40 out of the 70 mini-PAT marks per term must be attributed to practical work.**
- Tasks done by learners for formal assessment purposes should be monitored by teachers at all times.
- Work done 'off-campus' outside the direct control of the teacher should normally not form part of the formal assessment record.
- The end-of-year promotion mark will comprise **40% SBA** and **60% (mini-PAT 20%; examination 40%) end-of-year examination:**

<table>
<tr><th colspan="6">Table 1: Formal Assessment in Technology – Grades 7, 8 and 9</th></tr>
<tr><td></td><td rowspan="2">INFORMAL DAILY ASSESSMENT</td><td colspan="4">FORMAL ASSESSMENT: TERM MARKS</td></tr>
<tr><td></td><td colspan="3">Practical Task and Theory Test / Examination</td><td>TOTAL</td></tr>
<tr><td></td><td>Enabling Tasks</td><td colspan="2">Mini-PAT</td><td>Term Test / Examination</td><td>Term Mark</td></tr>
<tr><td>Term 1</td><td rowspan="3">0%</td><td colspan="2">70%</td><td>30%</td><td>100%</td></tr>
<tr><td>Term 2</td><td colspan="2">70%</td><td>30%</td><td>100%</td></tr>
<tr><td>Term 3</td><td colspan="2">70%</td><td>30%</td><td>100%</td></tr>
<tr><td>Term 4</td><td colspan="2">70 marks = 100%</td><td>No test</td><td>100%</td></tr>
<tr><td rowspan="4">Promotion Mark</td><td colspan="2">CASS Component: 40%</td><td colspan="2">Final Examination Component: 60%</td><td rowspan="2">Promotion</td></tr>
<tr><td>Continous Assessment: Test and Mini-PATs 40</td><td colspan="2">Combined Mini-PAT: 20</td><td>Examination 40</td></tr>
<tr><td>Term 1 + Term 2 + Term 3 + Term 4</td><td colspan="2">T1 + T2 + T3 + T4</td><td rowspan="2">40</td><td rowspan="2">100</td></tr>
<tr><td>10 + 10 + 10 + 10</td><td colspan="2">5 + 5 + 5 + 5</td></tr>
</table>

This breakdown is in line with the FET practical subjects where the PAT mark is included as part of the final examination component. In FET, the PAT mark contributes $\frac{1}{3}$ of the final exam mark, i.e. 25 out of 75.

The above breakdown ensures that Technology in the GET band retains its focus on practical aspects. However, since GET Technology is not specialising as happens in FET, there are four mini-PATs that need to be added together in equal portions to provide the practical examination component. As with the FET practical subjects, the combined mini-PAT marks contribute $\frac{1}{3}$ to the final exam mark, i.e. 20 out of 60.

The forms of assessment used should vary and be age- and developmental level-appropriate. The design of these tasks should cover the content of the subject and should include a variety of tasks designed to achieve the theoretical and practical objectives of the subject.

Formal assessment tasks form part of a year-long formal Programme of Assessment in each grade and subject, and should be adapted to meet the needs of inclusivity where necessary.

Control tests and examinations

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. Examinations papers and control tests in Technology Grade 8 should adhere to the weighting of cognitive levels given in the table below. A detailed description of the cognitive levels follows on page B14.

RECALL	UNDERSTANDING	APPLICATION	ANALYSE	SYNTHESISE	EVALUATE
ROUTINE	DIAGNOSTIC	STRATEGIC	INTERPRET	CREATE	
Low order	Middle order		Higher order		
30%	40%		30%		

Mini-Practical Assessment Task (Mini-PAT)

Definition: a set of short **practical** assessment tasks which make up the main formal assessment of a learner's skills and application of knowledge during each term. It may be an assignment covering aspects of the design process, or it may be a full capability task covering all aspects of the design process (IDMEC). It is composed of a variety of forms of assessment suited to the range of activities that make up a mini-PAT.

Purpose: A mini-PAT is intended to formalise the practical component of Technology contextualised within a knowledge focus. Practical activities should make up at least 40% of a Mini-PAT's mark allocation.

- The Mini-PAT is designed to give learners the opportunity to develop and demonstrate their levels of ability (i.e. capability) as they progress through the task's activities.
- Each mini-PAT focuses **primarily** on one of the knowledge foci of Technology (viz. structures, mechanical systems and control, electrical/electronic systems and control and processing), but may be **integrated** and may target more than one knowledge focus.
- These tasks are structured according to the design process:

Investigate – Design – Make – Evaluate – Communicate.

NB: *This is NOT a LINEAR process happening in a fixed sequence*.

- Assessment in a mini-PAT need not cover all aspects of the design process each term.
- A mini-PAT is an extended formal assessment task and must be planned with other school activities.

The table below provides a guide for the mini–PAT per term per grade:

	TERM 1	TERM 2	TERM 3 Capability task	TERM 4
GRADE 7	• **Mini-PAT:** Mechanical systems and control Design + Make	• **Mini-PAT:** Structures Investigate + Design + Make	• **Mini-PAT:** Electrical/ Structures/ Mechanisms Investigate + Design + Make + Evaluate + Communicate	• **Mini-PAT:** Processing Design + Make
GRADE 8	• **Mini-PAT:** Communicate + Design + Make	• **Mini-PAT:** Impact of Technology/ Processing Investigate + Design + Make	• **Mini-PAT:** Mechanical systems and control/ Structures Investigate + Design + Make + Evaluate + Communicate	• **Mini-PAT:** Electrical systems and control Design + Make
GRADE 9	• **Mini-PAT:** Structures Communicate + Design + Make	• **Mini-PAT:** Mechanical systems and control Investigate + Design + Make	• **Mini-PAT:** Mechanical systems and control Investigate + Design + Make + Evaluate + Communicate	• **Mini-PAT:** Processing Design + Make

- A learner must present the full design process once as a Mini-PAT in term 3 of each grade. This meets the requirement of one project per subject per annum.
- The preferred tool to be used to assess learner performance in a mini-PAT is an **analytical rubric.**
- Teachers will assess skills and values using analytical rubrics which should have clear descriptors for each level. This means that a descriptor should say why an achievement is deemed to be, say, 'meritorious' or 'elementary'.
- Schools must take responsibility for providing resources (both tools and materials) needed during the Mini-PAT.
- Learners must complete the Mini-PATs for formal assessment under teacher supervision.
- Teachers will assess the Mini-PATs formally.

Tests

- A standardised test makes up 30% of the first three term's assessment.
- A test for formal assessment should cover a substantial amount of skills and content and should be set as follows: Grade 7: 45 minutes; Grades 8 and 9: 60 minutes

The mark for tests is not prescribed but should be determined by the teacher taking into account the volume of the content covered and the time available. Testing in Technology will be limited to ONE test each in terms 1, 2 and 3. This may take place either just before or just after the mini-PAT, and must be planned in the school assessment programme.

Mini-PAT

- The Mini-PAT makes up 70% of each term's assessment. Practical work must make up more than half of the marks.

Examinations

- All examinations must include questions that integrate **knowledge** and **values** with **design process skills.**
- In Technology the final end-of-year exam comprises 60% of the learners' promotion mark and should be set out as follows:

Grade	Time allocation	Mark weighting
7	60 minutes	60 marks
8	90 minutes	100 marks
9	120 minutes	120 marks

- The content assessed at the end of the year is based on the year's work as specified in the CAPS document for the grade. However, prior knowledge from a previous grade may be necessary to interpret and answer some of the questions in the higher grade.

Type of questions for pen-and-paper test

- The value of memorising by rote learning has little weight in a subject requiring *innovation*, *creativity* and *problem-solving* skills. The ability to *think laterally* and to develop *original* and *appropriate solutions* is a key element in learning Technology.
- Learners should be able to **investigate** using a variety of sources, demonstrate their ability to **draw** in a specific style, **write** a design brief, give specifications and constraints, **select** appropriate materials for a model, **plan** the sequence of manufacture of a product, **evaluate** a design objectively, **analyse** a system using systems diagrams and **communicate** their solutions using a range of techniques.
- Questions that integrate knowledge, skills and values have more value in Technology than a mere recall of knowledge facts.

The use of case studies

- Case studies are used to bring reality into the classroom.
- The intention should be to show learners that Technology is a subject that is close to the way the world works.
- Case studies can be used both to develop and to assess a technological skill (drawing, for example), knowledge concepts, and values.

Assessment tools

Checklists

Checklists consist of separate statements describing how the teacher can expect the learners to perform in a particular task. These statements are the criteria that the learners must meet to succeed.

Rubrics

Rubrics are a combination of rating codes and descriptions of standards –that is, what the learner must do, the level of competence, and so on – to be rated with a particular code. The rubric describes the range of acceptable performance in each band of the rating scale. Rubrics require teachers to know exactly what the learner must achieve – the level of competence, and so on – to meet the particular outcome being assessed.

To design a rubric, you need to decide on the following:

- What is the outcome that you are aiming at?
- What kind of evidence should be collected?
- What are the different parts of the performance that will be assessed?
- What different assessment instruments best suit each part of the task?
- What knowledge should the learners demonstrate?
- What skills should learners apply or what actions should they take?

It is crucial that you share the criteria in the rubric for the task with the learners **before** they do the required task. The rubric clarifies both what the learners should do and what they should be learning as they carry out the task. It becomes a powerful tool for self-assessment.

When the learners have completed the task and you are assessing their performance, you need to be sure that:

- each learner is assessed only once for each criterion within the rubric
- you add comprehensive comments where necessary for later moderation purposes.

Rubrics and checklists in Technology

The generic rubrics and checklists are in Section E: Photocopiable resources. Modify them for your needs and use them as a guideline to help you develop rubrics specifically for your activities and projects.

Programme of Formal Assessment

The Programme of Formal Assessment is designed to spread formal assessment tasks in all subjects in a school throughout a term and for the whole year. In addition to daily assessment (informal assessment), teachers should develop a year-long formal Programme of Assessment for Grade 7, 8 or 9.

The learner's performance in this Programme of Formal Assessment will be used for promotion purposes to Grade 7, 8 or 9. Assessment is school-based.

The marks achieved in each of the assessment tasks that make up the Programme of Formal Assessment must be reported to parents.

The table below illustrates an assessment plan and weighting of tasks in the Programme of Formal Assessment in Technology Grade 7, 8 or 9.

End-of-year examination

The end-of-year examination papers for Grade 7, 8 or 9 will be internally set, marked and moderated, unless otherwise instructed by provincial Departments of Education. The internally set, marked and moderated examination will consist of two papers. The table below shows the weighting of questions across cognitive levels and the specification and suggested weighting of the content for Grade 7, 8 or 9 end-of-year examinations across two papers.

Table 3: Content weighting for tests and examinations: Grades 7–9

Investigate, design, make, evaluate and communicate **Design Process Skills:**	Structures, Processing, Mechanical and Electrical/ Electronic Systems and Control **Knowledge:**	(Technology, Society and the Environment) Indigenous /Impact /Bias **Values and Attitudes:**
50%	**30%**	**20%**

NB: The above **weighting for assessment** should *guide the approach to teaching* in Technology. Most of the knowledge will be acquired purposefully during the development of design process skills. For example, learners will *investigate* required knowledge aspects, and will *evaluate* the possible impact on society or the environment.

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 Statement. Records of learner performance should provide evidence of the learners' conceptual progression within a grade and their 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 for the subject. The various achievement levels and their corresponding percentage bands are shown in the table below.

CODES AND PERCENTAGES FOR RECORDING AND REPORTING

RATING CODE	DESCRIPTION OF COMPETENCE	PERCENTAGE
7	Oustanding achievement	80–100
6	Meritorious achievement	70–79
5	Substantial achievement	60–69
4	Adequate achievement	50–59
3	Moderate achievement	40–49
2	Elementary achievement	30–39
1	Not achieved	0–29

Note: The seven-point scale should have clear descriptions that give detailed information for each level. Teachers will record actual marks for the task by using a record sheet and report percentages for the subject on the learner's report card.

Moderation of assessment

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 Grade 7, 8 or 9 tasks are internally moderated. The subject head or head of department for Technology at the school will generally manage this process.

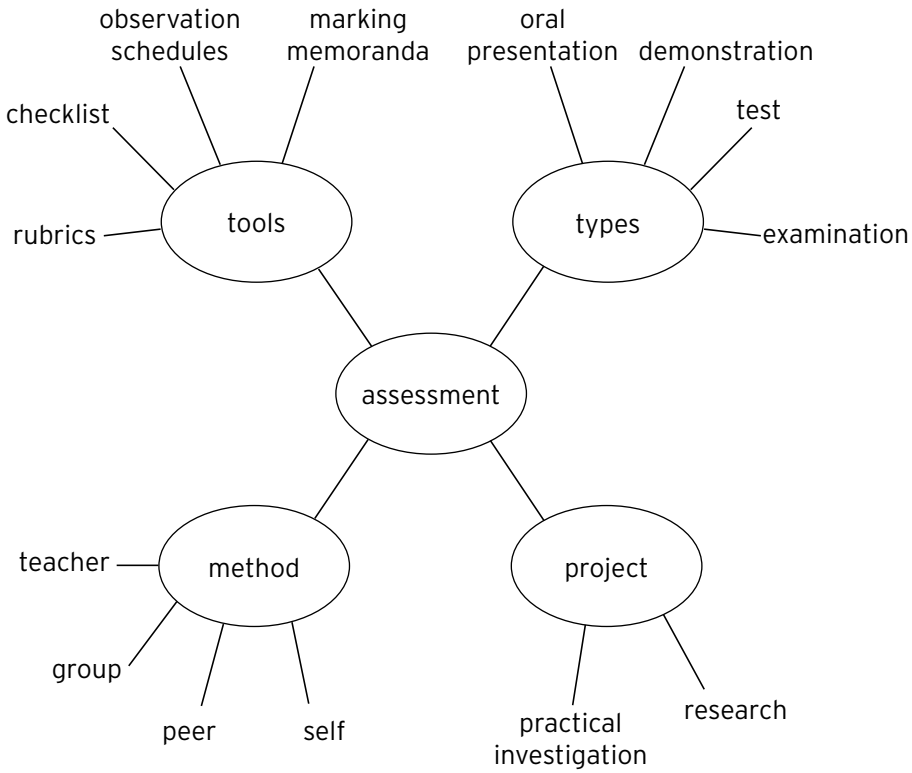
Assessment taxonomy

The next table provides a possible hierarchy of cognitive levels that the teacher can use to ensure tasks include opportunities for learners to achieve at various levels and tools for assessing the learners at various levels. This information can also be used as a guide when setting papers.

The next table gives more information that can be used as a guide when setting papers.

Knowledge Recall	Understanding	Applying	Evaluating	Analysing	Synthesising
30%	**40%**		**30%**		
LOW	**MIDDLE**		**HIGH**		
Count Define Identify Label List Match Name Outline Point out Quote Recite Repeat Reproduce Select State Trace	Classify Compare Convert Define Describe Discuss Distinguish Estimate Explain Generalise Give examples Illustrate Infer Interpret Match Paraphrase Plan Rearrange Restate Rewrite Select Summarise Translate	Change Compute Construct Demonstrate Draw Illustrate Predict Relate Solve Use	Breakdown Differentiate Discriminate Investigate Relate Separate	Arrange Combine Compile Construct Create Design Formulate Generalise Generate Group Integrate Organise Summarise	Appraise Conclude Contrast Criticize Critique Decide Evaluate Grade Justify Interpret Support Recommend

Summary of assessment



Section C: Planning

Teachers are involved in different levels of planning for each subject. These different levels of planning make up the learning programme for that subject.

A learning programme consists of a subject framework, work schedules and lesson preparations.

Teacher plan (work schedule)

The teacher plan specifies the scope of learning and assessment for the three grades in a phase of the GET band.

The Curriculum and Assessment Policy Statement (CAPS) specifies the core knowledge and concepts to be covered during the GET phase, as well as the amount of time in hours and weeks to be devoted to each topic.

Lesson preparation

A lesson preparation is a more detailed plan for a particular section of work, a period of time during the year or a particular lesson. It describes what learning is going to take place, and how it will take place. In addition to the information in the work schedule, it explains how the activities and assessment will take place as well as the use of resources. The lesson preparation also refers to prior and future learning.

You will need to carry out your own lesson preparation for your class.

Your lesson preparation will indicate when and how you will introduce each activity, each section of new knowledge, each assessment activity, and so on, using and expanding the information from the work schedule.

Exemplar of Lesson Plan Grade 8

Term 1: Week 5 – Lessons 9 and 10		
Teacher's name:		
Grade: 8	**Time: 2 hours**	**Date:**
Focus: Mechanical systems and control		

Content, concepts and skills:
Revision: Mechanical advantage. Well-designed machines give 'mechanical advantage'.
- All complex machinery consists of combinations of simple mechanisms.
  - the wedge: e.g. inclined plane or ramp, door wedge, knife blade, etc.
  - the wheel and axle: e.g. from bicycle to shopping trolley.
- Gears (wheels with wedges for teeth):
  - Show how meshing of two spur gears causes counter-rotation.
  - Show how introducing an idler gear between two spur gears synchronises rotation of the driver and driven gears.

Note: Since a small idler will rotate more times than the larger gears, it should be made of harder material.
  - Gear ratios: Show how different-sized gears result in a change in the velocity ratio as well as an 'opposite' change in the force ratio – if force increases, speed decreases, and vice versa.
- Mechanisms that change the direction of movement:
  - The cam: show how a cam converts rotary motion into reciprocating motion. Compare an eccentric wheel and a snail cam.
  - The crank: an adaptation of a second-class lever. Show how a crank converts rotary

Prior knowledge: **Communication** **Purpose of graphics:** develop and communicate ideas. **Conventions:** outlines (thick/dark); construction lines (thin/feint); hidden detail (dashed); centre lines (chain dash-dot); scaling up and scaling down; dimensioning (in mm). **Working drawing techniques for planning:** • Single view flat 2D drawing with dimensions, line types and scale. • Isometric – using underlying isometric grid (term 1) and simple instruments (term 3). **Artistic drawing:** Double vanishing-point perspective with colour, texture and shading. • Sketching – using pencil, ruler and blank paper. • Enhancing drawing to promote realism using colour, texture, shading and shadows.	**Next week:** Setting the scene for the Mini-PAT
Teachers activities: Explain basic mechanisms Revise input – process – output and learners identify it in pictures Explain different types of movement Revise mechanical advantage Investigate gears as a form of wheels and wedges. Explain ways in which gears can work. Explain change of movement created by cams and cranks	**Learners activities:** Activities 14–22

Resources:
Pictures of simple mechanisms
If possible have real examples for learners to play with and see how they work.

Planned Assessment:
Informal assessment that will lead up to the formal assessment.
Teacher, group and peer assessments

Inclusive teaching and learning: (Barriers, remedial and extension activities)
Most of the learners will find it more beneficial to look at real mechanisms than at pictures.

Teacher reflection:

Exemplar of recording sheet

Note different methods to calculate the 40% SBA.

Grade Class	Term 1				Term 2 Examination				Term 3				Term 4		SBA	Practical	Theory	Final
	Mini-PAT	Test 1	%	Code	Mini-PAT	Test 2	%	Code	Mini-PAT	Test 2	%	Code	Mini-PAT	%				
Maximum marks	70	30	100		70	30	100		70	30	100		70	100	40	20	40	100
Date																		
Learner names																		

Section D: Teaching guidelines

TERM 1

TERM 2

TERM 3

TERM 4

Mini-Practical Assessment Task

Remember that at the end of this term, learners will be doing the Mini-PAT and a test. This is designed to give learners the opportunity to develop and demonstrate their level of ability as they progress through the activities of the task.

It is important that learners are told about the Mini-PAT before they start the term's work. They have to imagine that a large preschool and after-care facility were recently built near their school. The children's playground is a plain grassed area and has no equipment.

The school principal has approached their Technology class and asked for ideas for a fun playground. She would like funfair-type equipment in the playground.

In groups, learners have to use their knowledge and skills of systems and control to design and make a scale model of the playground.

The resources for the Mini-PAT are the school's responsibility, so before you start this term ensure that you have all the resources you require. You must supervise the Mini-PAT as learners may not take it home for completion. You must also assess it.

Here is an analytical rubric to assess design capability in the Mini-PAT.

The learner is able to:					
LEVELS OF COMPETENCE					
	Exemplary	**Competent**	**Developing, but not yet mastered**	**Progressing**	**Progressing**
	5	**4**	**3**	**2**	**1**
Generate and develop design ideas	Using drawings reflectively to generate new ideas	Progression of ideas across or within drawing	Design ideas are generated but not developed	Simple sketch showing object to be made	Drawing a picture not designing a product
Explore the possibilities of the problem/ the need	Combining novel solutions to produce innovative design	Using drawings to develop novel design solution/s	Recording possible creative solution/s to the task	Stereotypical response, showing little creative thought	Design possibilities are not addressed in the drawing
Address the constraints of the problem/need	Task constraints treated as part of iterative process	Task constraints considered as the design proceeds	Records way to address task and/or client needs and wants	Drawing show some understanding of task constraints	Minimal understanding of task/user needs
Plan the look of the product	Ideas about finishing are developed within overall designing	Ideas about finishing are added to design while drawing	Overall decoration scheme considered	Little consideration of final appearance of product	Appearance of the product is not considered
Communicate design ideas	Clear enough for somebody else to make the product	Conveys sense of the object to be made e.g. Working drawing	Conveys some sense of the object to be made e.g. indicates the materials	Simple unlabelled sketch/ es; relying on shared meanings	Use of narrative or other drawing genre
Plan construction	Constructional issues considered on route to final design	Drawing demonstrates consideration of construction	Drawing indicates some consideration of construction	Minimal consideration of construction whilst drawing	Yet to define the design task
Evaluate whilst drawing	Changes made a result of considering design drawings	Decisions made about product whilst drawing	Considered and rejected a range of designs	Minimal evaluation at drawing phase	Yet to define the design task
Provide a basis for making	Using drawings as a resource during making	Clear development path through drawing into making	Object is one of the ideas drawn	Product relates to ideas recorded in the drawing	Making and object seen as separate new activity
Comments to improve the learners performance in design capability:					

Module 1 Structures

Unit 1.1 Frame structures LB p. 5

Week 1

This week learners will revise man-made and natural structures, and frames and shells.

Lesson 1

ACTIVITY 1 **Examples of forces LB p. 8**

Pair work

Walk around the school and identify examples of various forces in advance. Take the learners on the same route and discuss which forces they can see.

Each learner must draw an example of each force and explain where he or she has found it.

ACTIVITY 2 **Identifying forces LB p. 8**

Work alone

Learners must label the forces they identify in each diagram. Then learners give their answers to partners to assess.

a) compression
b) compression
c) tension and compression
d) tension
e) torsion
f) bending
g) shearing
h) tension and compression

Unit 1.2 Structural members LB p. 9

Lesson 2: Case study

ACTIVITY 3 **Talking about pylons LB p. 9**

Group work

The learners look at the pictures of electricity pylons and then discuss their designs and how they fit with the environment.

Possible answers

- All are basic columns.
- All made of steel or steel alloy, reinforced concrete.
- The shapes of the pillars/columns are very different. Some have triangulated beams of steel.
- Some of the columns have broad bases, and some have external wiring while others have wiring underground.

Preference will be personal. So will learners' ideas about how the structures fit into the environment. Those that have no wires and whose shapes are more organic and not regular are more pleasing than those where the size is overwhelming. Pylons are useful in supplying electricity which powers all our appliances. Pylons are all made of extremely tough material; some are reinforced with concrete; they are broader at the base than the top; triangulation has improved the strength of the structures.

ACTIVITY 4 Assessment worksheet LB p. 9

Pair work

Learners decide whether the structural members are under compression or tension. Learners draw arrows to indicate the forces.

Possible answers

1. a) compression and tension
   b) compression and tension
   c) tie beams, compression and tension
   d) compression and tension
   e) compression and tension, cross braces for support
   f) triangular braces, compression and tension

Week 2

Lesson 3

ACTIVITY 5 Testing the strength of beams LB p. 10

Pair work

Pairs of learners carry out the experiment. They must read the information in the Learner's Book on different kinds of beam and record their results.

ACTIVITY 6 Thinking about lintels LB p. 11

Work alone

Learners must look at the pictures of lintels, list the materials used and explain the purpose of the lintels.

Possible answers

Wooden beams and concrete slabs have been used. Lintels are used to support the weight of the material (bricks, stones), and to build over openings such as windows and doors in the walls.

Lesson 4

ACTIVITY 7 Identifying types of bridge LB p. 16

Pair work

Read through the information with the class and look closely at the pictures illustrating the different kinds of bridges.

Learners examine the different pictures of bridges, and identify each type.

Possible answers

A – beam
B – log
C – clapper
D – cantilever
E – suspension
F – arch

Discuss structural failure and explain that a structure needs strength, stability and stiffness. Also point out that the three most likely ways for a structure to fail are by bending, fracturing and toppling over.

Divide the learners into groups of five for Activities 8 and 9. Each group must discuss roles of members in a group, and then appoint a recorder, timekeeper, leader, doer and resource coordinator. Explain where necessary the duties of each role but give the learners an opportunity to discover theses for themselves.

ACTIVITY 8 Testing different shapes of beams LB p. 17

Group work

The materials learners use must include paper, wood and cardboard, and the results must be recorded graphically. To ensure fair testing, learners must use similar lengths of material and the load must remain constant.

ACTIVITY 9 Testing beam strength LB p. 18

Group work

Possible answer

The foam begins to bend as the load increases. The upper part in the middle of the foam has been compressed. The closer the books are (or the smaller the gap), the heavier the load that can be supported. The wider the gap, the smaller the load that can be supported.

ACTIVITY 10 Homework assessment task LB p. 19

Work alone

Possible answers

The guys keep the tower upright and prevent it from falling over. The structure is tall and thin so it would topple over if not supported. The guys are stabilising it and providing a broader base.

The base should be wide and the top narrow. The structure should be as low as possible, and have a broad base which is heavier at the bottom and lighter at the top.

Strut A will topple more easily as the speaker is supported by a long pole and the speaker makes the structure top-heavy.

Module 2

Communication skills

Unit 2.1 Purpose of graphics LB p. 20

Lesson 5

Discuss the idea of communication and specifically graphic communication, with reference to the different types of line and their meanings. Also discuss the concept of scale as a tool when drawing structures which may be too big to draw in real size on paper.

Week 3

ACTIVITY 11 Scale drawings LB p. 22

Pair work

Learners draw a plastic lunchbox using a scale of 1 : 3, and then they draw a key using a scale 2 : 1. The first drawing is scaled up as it is bigger than in reality; the second is scaled down as it is smaller than it is in reality.

Lesson 6

Discuss working drawings with the different views and the use of dimensions.

Week 4

Lesson 7

ACTIVITY 12 Using an isometric grid LB p. 25

Work alone

Learners have to redraw a lunchbox, using the isometric grid. As an extension, they should draw a space case or cell phone using grid lines.

Lesson 8

One-point perspective

Look at the cube and go through the drawing with the class.

Two-point perspective

Discuss the concept of two vanishing points and go through the drawing of the cube using two points.

ACTIVITY 13 Two-point perspective drawing LB p. 26

Work alone

Each learner must draw a table using two-point perspective. Go through the steps with them. Discuss the use of various techniques such as colour, texture, shading and shadows.

ACTIVITY 14 Drawing LB p. 27

Group work

Learners work in their groups, and then discuss their ideas. Then each learner must examine the pictures and draw them, using shading, colour and texture.

Module 3

Mechanical systems and control

Unit 3.1 Revision: Mechanical advantage

LB p. 27

Week 5

Lesson 9

ACTIVITY 15 **Input, process and output** LB p. 28

Group work

Divide the class into groups of three or four. Each group must discuss this idea: a mechanism is something that can change an input movement and force into an output movement and force. Learners should use the picture in the Learner's Book to help them.

ACTIVITY 16 **What is a mechanism?** LB p. 29

Group work

Possible answer

Picture b is first, then Picture c and then Picture a.

Group members must assess learners' answers.

ACTIVITY 17 **Homework: Identifying the input and output motion** LB p. 29

Work alone

Possible answers

a. turning the handle as the 3-jaw chuck rotates
b. turning the key, the dancer turns around
c. adjusting the centre part; the legs get smaller apart or wider apart
d. applying squeezing force to the handles; holding object as jaws grip tighter
e. inserting the crank and turning, raise off the ground as the jack moves up
f. turning the pedals and moving forward
g. turning the bottom which has a knurled grip; the lipstick is propelled out
h. turning/pressing the top; lead is propelled forward through the bottom

ACTIVITY 18 Homework–Peer assessment: Examining movement LB p. 30

Work alone

The learners must look at the picture of a street intersection and then complete a table about types of movement.

Column A	Column B
Taxi	linear
Sports car	linear
Car wheels	rotary
Tightrope walker's legs	linear
Tightrope walker's arms	reciprocating
Swing	oscillating

ACTIVITY 19 Identifying the types of machine – levers, gears, cranks LB p. 30

Work alone

Possible answers

Learners must identify the types of mechanism/machine: levers, gears or cranks.

a. lever
b. gears, crank
c. gears, crank
d. lever

Simple machines

Discuss the simple machines with the learners and then explain the idea of mechanical advantage and the formula for working out mechanical advantage.

Wedges

Use the pictures to discuss how wedges are used.

Wheels and axles

Use the pictures in the Learner's Book to start a discussion.

ACTIVITY 20 Homework: The wheel and axle LB p. 33

Work alone

Discuss the different types of wheel, and then assign this activity for homework. Answers should be checked by a peer or discussed as a class.

Possible answers

The wheels in the pictures are all round. They are made of rubber. This shape and material works best. Some are smaller/bigger than others. The wheels are attached with axles. Other mechanisms that have wheels are trolleys, hospital beds and luggage.

Vehicles: Advantages	Vehicles: Disadvantages
transport over long distances	pollution
transport people, goods	use up fossil fuel
good communication	spoil landscape with roads
quick transport	expensive to run

Lesson 10

ACTIVITY 21 Discussing gears LB p. 34

Group work

A gear is a wheel which has toothed edges. It looks like a wheel with ridged edges. It transfers movement. A gear cannot work alone; it is meant to be used in conjunction with another gear.

Discuss the function of gears and as an extension/homework activity encourage the learners to make several similar and different-sized gears.

ACTIVITY 22 Homework: Making gears LB p. 36

Work alone

Learners choose which set of gears they want to make.

ACTIVITY 23 Group assessment LB p. 37

Group work

Possible answers

1. The other gear will go in the opposite direction.
2. The other will turn clockwise.
3. The driven gear will now turn in the same direction of the driver gear because of the idler gear.

4. + 5. Discussion

6. It speeds up or slows down the speed of the driven gear.
7. more
8. It needs to be stronger as it will turn more often and so must be made of durable material.

Week 6

Lesson 11

Speed ratio

Discuss the concept of gear ratios with the class and explain carefully how to work out the gear ratio.

Extension activity

Work alone

The speed ratio can be calculated in the following way:

$$\text{Speed ratio} = \frac{\text{number of teeth on the driven gear}}{\text{number of teeth on the driver gear}}$$
$$= \frac{40}{10}$$
$$= 4 : 1$$

Lesson 12

ACTIVITY 24 Comparing LB p. 40

Group work

Focus on cam systems. Use the picture of the cam to discuss cam movement. If there is time, build an eccentric cam wheel and a snail cam mechanism to show to the class to facilitate discussion. Ideally you should provide one of each mechanism for each group of five or six learners. Discuss how the movements differ. The eccentric wheel orbits in an oval way. It converts rotary into linear motion. A snail cam has a drop/fall that is sudden and unsmooth. It converts rotary into reciprocating motion.

ACTIVITY 25 Investigation skills LB p. 41

Group work

The learners must look at the pictures of cranks and answer the questions.

Possible answers

A crank consists of an arm/lever attached at one end to a shaft that can rotate. The arm/lever must be attached to the shaft at a 90º angle. On the other side of the arm there is a pedal, handle or pin.

A crank is a mechanism through which rotary movement and torque can be applied to a shaft. A crank handle is an example.

When there are a number of cranks on one shaft we call it a crankshaft. This is often found in a car engine.

Learners draw a crank and label its parts.

Communication skills

ACTIVITY 26 Artist's impressions LB p. 42

Work alone

The learners must draw an artist's impression of each of the following:

- a wedge
- a wheel and axle
- an example of two different gears
- a cam
- a crank

Remind the learners to look back at the techniques used by artists when sketching as discussed earlier in the unit, such as colour, line, texture and shading.

Week 7

Lessons 13/14

Explain carefully to the learners the context of the Mini-PAT problem and ensure that they understand exactly what is required of them. The learners must look at examples of complex structures and list the advantages and disadvantages of each design.

Week 8

Lesson 15 Design skills

The learners must draw up a design brief with specifications and constraints for the project. They must also produce a 3D isometric projection with dimensions and drawn to scale.

Lesson 16 Design skills and building skills

The learners must produce a working drawing in 2D showing one view with dimensions and line types. Teams must build the structure. adding the mechanisms. They must work safely.

Week 9

Lesson 17 Making skills and design skills

Learners must continue building the structure to house the mechanisms. They must also produce a sketch in double vanishing-point perspective, using two of the following: colour, texture, shading.

Week 9

Lesson 18

Teams present models, drawings, plans.

Week 10

Lessons 19/20

Teams present models, drawings, plans. Learners prepare for formal assessment.

Week 10

Lesson 20 Formal Assessment Test

1. Look at the following list and indicate whether they are frame structures or not.

   a) a helmet 
   b) a hinged box 
   c) a fish tank
   d) a bird cage 
   e) an egg box 

   (10)

2. Give a definition of a frame structure and provide three of your own examples. (8)
3. Look carefully at the following list. Describe how the structural members work.

   a) a king-truss
   b) a queen-truss
   c) struts
   d) column
   e) ties
   f) beams
   g) buttress
   h) stays

   (16)

4. Draw and label pictures to illustrate the five different forces. (10)
5. Label the force shown by each picture.

   a) Arch bridge 

   b) Suspension bridge 

   (4)

6. Fill in the missing words . The pictures will help you.
   Bridges enable us to cross (a) b_ _ _ _ _ _ _ in our environment. (b)  were built from large stone slabs put on top of boulders. A (c) b _ _ _ is a good way of bridging a short gap. The upright on either side of a bridge is called a (d) pa _ _ _ _ _ .

   (e)  can be built under the middle of the span to strengthen it.
   A new beam called a (f) t _ _ _ _ gi _ _ _ _ was used. Many railway bridges were built like this, using a frame made up of many pieces.

Where concrete is used, it can be reinforced with (g) s _ _ _ _ .
(h) B _ _ gi _ _ _ _ _ are thin-walled rectangular tubes of steel or concrete. They are (i) l _ _ _ _ but strong.

A (j)  bridge consists of a beam held down at one end, but not supported at the other. Large brackets called (k) ca _ _ _ _ _ _ _ _ _ stick out from the banks of the river.
(l) A _ _ _ were built centuries ago using shaped blocks of stone.
(m) Su _ _ _ _ _ _ _ _ bridges can span large gaps very easily.
The cables are under (n) te _ _ _ _ _ and the pillars are under (o) co _ _ _ _ _ _ _ _ _. (15)

7. Explain the three most likely ways of a structure to failing. (6)
8. Name three ways in which structures can be made rigid. (3)
9. Name three ways in which to prevent a structure from toppling over. (3)
10. a) Look at this picture of a lintel. How has the opening been reinforced and why? (2)

b) Look at a picture of an electricity pylon. How has the structure been reinforced? (2)

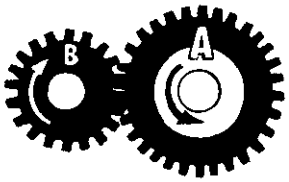
11. a) Why is communication so important?
b) How do we communicate in Technology? (4)
12. What is scale and why is it used? (4)
13. Complete the table below.

Type of line	Draw the line	Where you would use it
continuous thick		
chain-thin		
continuous-thin; freehand		
dashed, thick		
continuous thin – straight with zigzag		
dashed, thin		
continuous, thin – straight and curved		

(14)

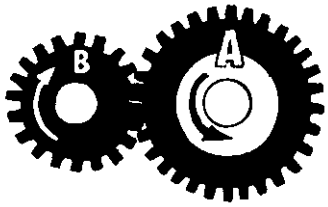
14. How would you start a one-point perspective drawing? (2)
15. Draw a two-point perspective drawing of a cell phone (10)
16. Which three methods can be used to give drawings depth? (3)

17. a) What is a simple mechanism?
    b) What do we call the energy used to operate a machine?
    c) What word describes the power that a machine produces? (3)

18. 

    a) Name this kind of gear wheel.
    b) When two or more gears are used together, we say they are a _____.
    c) Draw and label the gear directions when two gears mesh.
    d) What do we call the gear which turns the other gear?
    e) What do we call the gear which is turned by the first gear? (5)

19. Which mechanisms are at work in this picture?



(2)

20. What is the formula for the speed ratio? (2)
21. a) What is the function of gears?
    b) Define a gear.
    c) Where can gears be used? (6)
22. What does a crank do? (2)
23. Draw and label a simple crank. (2)
24. Label the crank in the following picture.

(3)

25. Explain how a crank can change one type of movement into another. (3)
26. a) Describe the cam mechanism. (3)
    b) Draw a diagram of a cam with a follower. Label the parts to show which cam profile you have drawn. (3)

Total: 150

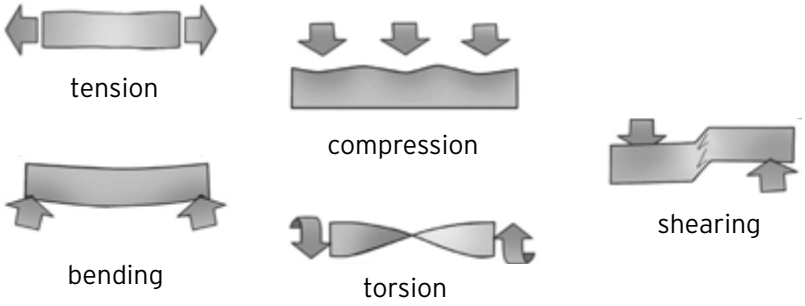
Formal Assessment Test Memorandum

1 a) shell
b) frame
c) frame
d) shell
e) shell (10)

2. A frame structure is made up of different parts which provide a framework ladder, house, skeleton. (8)

3 a) king truss – framework of beams forming several triangles
b) queen truss – framework of beams with two vertical posts
c) struts – support a compressive load
d) column – vertical; supports a compressive load
e) ties – structural members in tension
f) beams – structural members that prevent loads from bending
g) buttress – provides a pushing force in compression against a wall
h) stays – structural members which push against a beam (16)

4.



(10)

5. a) arch bridge – compression force
b) suspension bridge – compression force (4)

6. a) barriers
b) clapper
c) beam
d) parapet
e) piers
f) truss girder
g) steel
h) box girders
i) light
j) cantilever
k) cantilevers
l) arch
m) suspension
n) tension
o) compression (15)

7. fracturing, bending, toppling over (6)

8. changing its shape, adding extra members, triangulation reinforcing the material of which it is made (3)

9. It should be as low as possible. The base should be as wide as possible and the top as narrow as possible. The weight of the structure should be heavier at the bottom and lighter at the top. (3)

10. a) The opening has been reinforced with a lintel to take the pressure of the wall above the opening. (2)
    b) It has been reinforced by triangulation and cross braces. (2)

11 a) It is essential that we communicate our ideas accurately so that there is no doubt or misinterpretation of information. (2)
    b) We communicate graphically by means of drawing. (2)

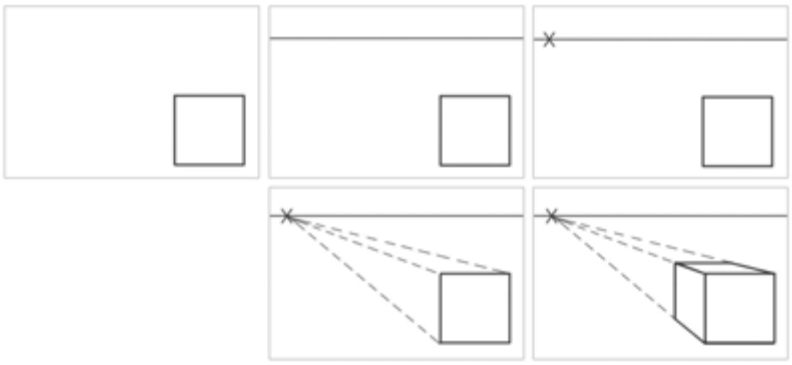
12. Scale indicates the measurement of an object in ratio with how big it is in reality. It is used because many objects are far too large to draw them to size on a piece of paper. (4)

13.

Type of line	Description and appearance	Uses
A ———	continuous, dark	visible outlines, margins
B ———	continuous, feint	extension lines, dimension lines, construction lines, section lines, projection lines, fold lines in developments
C ———	freehand continuous, feint	limits of part-section views, limits of shortened components
D – – – – – – – –	short dashed, feint	hidden detail
E —— – —— – ——	chain line, feint	centre lines, symmetrical axes, pitch circles
F —— – —— – ——	chain line, dark	shows planes which must be finished off specially
G —— – – —— – – ——	chain line with two dashes, feint	adjacent components alternative positions

(14)

14.



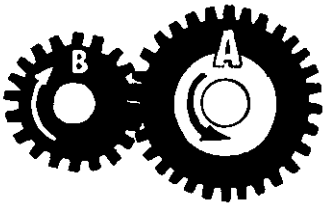
(2)

15. Teacher to check if this is correct. (10)

16. colour, texture and shading (3)

17. a) All machines are simple mechanisms. They can change an input movement and force into the desired output movement and force
    b) This is the input. Mechanical energy.
    c) This is the output. Mechanical advantage. (3)

18.



a) spur gear
b) gear train
c) Teacher to check if learner's drawings are correct.
d) driver
e) driven (5)

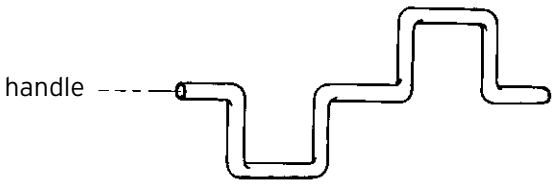
19. gears, cogs, wheels (2)

20. Speed ratio: $\frac{\text{number of teeth on the driven gear}}{\text{number of teeth on the driver gear}}$ (2)

21. a) They can change the direction of rotation.
They can change the angle of rotation of the driven axle.
They can change the speed of the rotation.
They can change the turning power.
b) A gear is a wheel with toothed edges.
c) In machines of all types (6)

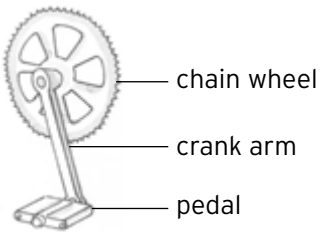
22. A crank is a mechanism through which rotary movement and torque can be applied to a shaft. (2)

23.



(2)

24.

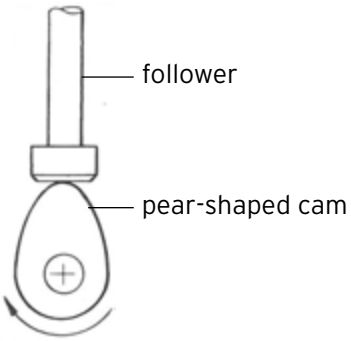


(3)

25. A bevel gear is used to change the direction of the drive in a gear system by 90º, e.g. a hand drill. As the handle of the drill turns in a vertical direction, the bevel gear changes the rotation of the chuck to a horizontal direction. (3)

26. a) It is similar to the wheel but the axle is not in the middle of the wheel or the shape of the wheel is not round. It changes one type of movement into another. (3)

b) (3)



(Award one mark for the drawing.)

Mini-Practical Assessment Task

This term's module will cover processing. Learners will investigate the positive effects of technology. Since this subject deals with practical solutions to problems, the task at the end of this module will be to make a container for homes and schools that will encourage people to separate their household waste for recycling.

It is important for learners to know about the Mini-PAT task. They will be presented with a scenario (an imaginary context or situation). This scenario gives them a picture of the problem that they must try to solve.

Landfills are places where rubbish is dumped, covered with sand and left to decompose. In the past these sites were placed next to poor communities. Landfills can negatively affect the environment and the health of the people living close by.

Household waste adds to the growing size of landfills. We must try to reduce the amount of waste sent to landfills so that we can help limit the negative effects. Learners will build a structure that can encourage people to separate waste so that it can be recycled.

Here is an analytical rubric to assess design capability in the Mini-PAT.

The learner is able to:					
LEVELS OF COMPETENCE					
	Exemplary	**Competent**	**Developing, but not yet mastered**	**Progressing**	**Progressing**
	5	**4**	**3**	**2**	**1**
Generate and develop design ideas	Using drawings reflectively to generate new ideas	Progression of ideas across or within drawing	Design ideas are generated but not developed	Simple sketch showing object to be made	Drawing a picture not designing a product
Explore the possibilities of the problem/ the need	Combining novel solutions to produce innovative design	Using drawings to develop novel design solution/s	Recording possible creative solution/s to the task	Stereotypical response, showing little creative thought	Design possibilities are not addressed in the drawing
Address the constraints of the problem/need	Task constraints treated as part of iterative process	Task constraints considered as the design proceeds	Records way to address task and/or client needs and wants	Drawing show some understanding of task constraints	Minimal understanding of task/user needs
Plan the look of the product	Ideas about finishing are developed within overall designing	Ideas about finishing are added to design while drawing	Overall decoration scheme considered	Little consideration of final appearance of product	Appearance of the product is not considered
Communicate design ideas	Clear enough for somebody else to make the product	Conveys sense of the object to be made e.g. Working drawing	Conveys some sense of the object to be made e.g. indicates the materials	Simple unlabelled sketch/ es; relying on shared meanings	Use of narrative or other drawing genre
Plan construction	Constructional issues considered on route to final design	Drawing demonstrates consideration of construction	Drawing indicates some consideration of construction	Minimal consideration of construction whilst drawing	Yet to define the design task
Evaluate whilst drawing	Changes made a result of considering design drawings	Decisions made about product whilst drawing	Considered and rejected a range of designs	Minimal evaluation at drawing phase	Yet to define the design task
Provide a basis for making	Using drawings as a resource during making	Clear development path through drawing into making	Object is one of the ideas drawn	Product relates to ideas recorded in the drawing	Making and object seen as separate new activity
Comments to improve the learners performance in design capability:					

Module 4

Processing

Unit 4.1 The positive impact of technology

LB p. 49

Week 1

Lesson 1

ACTIVITY 1 **The positive impact of technology**

LB p. 52

Pair work

Learners investigate the positive impact of eco-friendly biodegradable materials. They discuss the impact of biodegradable and non-biodegradable materials on the environment and then write about alternative solutions to the problem of solid waste products.

What you will need in Week 1

- chart paper
- koki pens
- Prestik

You can informally assess learners by checking on completion of tasks.

Lesson 2

CASE STUDY 1 **Investigate the impact of plastic shopping bags on the environment**

LB p. 53

Many natural materials have been replaced by new or improved materials. Some new materials are environmentally friendly by being biodegradable.

Learners have to redraw the chart and include a third column entitled 'Environmentally friendly biodegradable waste'. Then they tick the waste products that belong in this category.

Product	Time taken to decompose	Environmentally friendly, biodegradable waste material
banana peel	2 months	✓
notebook paper	3 months	✓

Product	Time taken to decompose	Environmentally friendly, biodegradable waste material
comic book	6 months	✓
wool mitten	1 year	✓
cardboard milk carton	5 years	
wooden baseball bat	20 years	
leather baseball glove	40 years	
steel can	100 years	
aluminium soda can	350 years	
plastic sandwich bag	400 years	
plastic six-pack ring	450 years	
polystyrene foam cup	Maybe never	
car tyre	Maybe never	
glass bottle	Maybe never	

They also write down as many solutions as they can to try to solve the problems created by people dumping solid waste into household bins.

Possible answers

For each of the items mentioned, learners should consider whether the waste product can be reused, recycled or reduced, e.g. banana peels can be placed on garden compost heaps to be used as fertiliser, and notebook paper can be put into paper recycling bins.

Accept all suitable answers and ask learners to give reasons for any solutions they may come up with.

Have a report-back session where learners report back on new and improved materials or methods that are being used to reduce the problem. Mention these ideas:

- Schools have recycling programs.
- Companies are setting up recycling programs at school.
- Individuals collect waste materials and sell to companies that recycle waste to earn money.
- Supermarkets use thicker plastic bags that people have to pay for – people are now using their own shopping bags that don't need to be thrown away.
- The amount of household waste is being reduced because people are recycling waste instead of throwing it into the bin.
- Municipalities are encouraging recycling by providing specific bags for the collection of plastic and cardboard.
- Recycling bins for different types of waste are being set up at dump sites.
- Schools are educating learners about the benefits of recycling waste material.

As an extension activity display the charts around the school to make learners aware of alternative ways of disposing of solid waste.

Report writing

ACTIVITY 2 **Communication skills** LB p. 54

Work alone

Learners investigate the impact of plastic shopping bags on the environment. They write a report on the effectiveness of thicker biodegradable shopping bags.

As revision, have a discussion on the effects of biodegradable and non-biodegradable waste on the environment, and the impact of plastic shopping bags on the environment.

Refer learners to the information on writing reports (Appendix 1).

Assess individual reports, using the assessment tool, Rubric for report writing, which you must give to and discuss with learners before they begin the task. (See Appendix 2.)

Extension activity LB p. 54

Work alone

Learners write a letter to the editor in which you express your concerns regarding the article on waste plastic bags littering the environment.

Some suggested marking guidelines:

- Formal letter – use of correct tone is important.
- Learners must use block format.
- No punctuation is used except in the body of the letter.
- The letter must have a heading to indicate what it is about.
- The salutation should be 'Sir', and not 'Dear Sir'.
- Learners should leave out 'Yours faithfully' at the end as no reply is needed.

Unit 4.2 Positive technology LB p. 55

What you will need in Week 2

- photocopies of Appendix 3 (Planning guideline)
- A4 white art-paper
- colour pencils/kokis/crayons/pens
- marking rubric (Appendix 4)

Lesson 3

Learners investigate how waste paper and cardboard are recycled to produce new products for the packaging industry.

CASE STUDY 2 **The packaging industry** LB p. 55

Pair work

Discuss the case study (Nampak/PRASA/how paper is recycled).

ACTIVITY 3 LB p. 56

Group work

Tell learners that their school has decided to assist PRASA to help reduce the amount of recoverable paper that goes to landfill sites by increasing the paper recovery rate and to help promote the concept of reuse, reduce, recycle and recover by increasing education and awareness campaigns in households, businesses and schools.

They have to draw up an action plan on how their group thinks that this should be done. Learners must include suitable posters, skits, raps, etc. that they think will best sell their idea.

Hold a class report back.

Extension/homework activity LB p. 56

Learners can present their ideas at a school assembly.

Suggested answers

1. The difference between bio-degradable and non-biodegradable materials: Biodegradable materials are able to break down or decompose into natural components and be recycled into the life cycle naturally. They are materials that decompose through the actions of bacteria, fungi, other living organisms, temperature and sunlight. Examples are vegetable waste, food, paper, cardboard. These materials are less damaging to the environment and are said to be environmentally friendly materials.

   Non-biodegradable materials are waste materials that do not break down into natural components and remain in the environment for a long time. Some of these substances may be toxic and can pollute the soil and water around them. Examples are tyres, plastics, electronic components, metals, etc.
2. See the answer to Question 1.
3. Non-biodegradable materials end up in landfill sites – these sites can be harmful to the environment and the people that live close to them. Landfills cause pollution and are unattractive. They can also contain toxic substances that are harmful to people's health, e.g. lead acid batteries that are used in cars. Long-term exposure to even small amounts of lead can cause brain and kidney damage, hearing impairment and learning problems in children. (Fortunately both the lead and acid in these batteries can be recycled which lessens their environmental impact.)
4. Plastic bags sometimes end up in the ocean and kill marine life. The vast majority of plastic, especially plastic bags, winds up in landfills. Most plastic is not biodegradable, which means it remains present in landfills indefinitely. Many bags end up as roadway litter on trees, pylons and fences because they are light and can be caught by wind or they end up in storm-water drains and can cause flooding.
5. Businesses have helped by making plastic bags thicker so that they can be recycled and reused. Companies have established 'cradle

to grave' policies so that they become responsible for how waste products are disposed of. Many companies have set up recycling programmes in communities to encourage recycling of plastic products. They have also introduced educational programmes that they take to schools to educate children about recycling.

6. PRASA stands for the Paper Recycling Association of South Africa. It aims to reduce the amount of recoverable paper that goes to landfill sites by increasing the paper recovery rate. PRASA tries to do this by promoting the concept of reuse, reduce, recycle and recover by increasing education and awareness campaigns in households, businesses and schools.

Development of an opened container

Lesson 4

ACTIVITY 4 Draw a development of an opened container LB p. 57

Work alone

Learners read the following scenario carefully and complete the design task that follows. Your teacher will give you worksheets to ensure that you are guided with regard to your planning.

Scenario: Learners at your previous primary school spend a lot of time and effort creating gifts for Mother's Day and Father's Day but very little time is spent on the packaging of these gifts. You feel that since you are learning about packaging this year it would be a kind gesture for learners in your grade to make packaging to donate to these learners so that their gifts will look more impressive. The packaging must be:

- easy to mass produce
- of a suitable size
- made of readily available materials
- cost-effective
- attractive.

In addition, the packaging must have an appropriate slogan or message.

Learners must consider the above scenario and design packaging for this purpose. Accept all design ideas (provide nets if learners are finding it difficult to come up with suitable solutions).

Learners must draw a development of the opened packaging. Get them to bring in old packaging of chips, sweets, chocolates and biscuits that can be opened out and used as a development that can be traced.

Give learners the planning guidelines (Appendix 3) and the marking rubric (Appendix 4) to plan the making of their product. Recap the task to make sure learners are aware of what is expected of them. Discuss safe use of a glue gun. Also discuss the 'making rubric'.

Designing and making packaging for a purpose

Week 3

Lessons 5/6

ACTIVITY 5 Practical activity – Mass-production of gift-bags LB p. 58

Group work

Learners must set out their mass-production lines as planned in the previous lesson and manufacture as many gift-bags as they can in the allocated time.

Assess teams according to the criteria sheet (Appendix 4).

Week 4

The negative impact of technological products

Lesson 7

CASE STUDY 3 The problem of landfills LB p. 61

Discuss the case study which is about the problem of landfills.

ACTIVITY 6 LB p. 61

Group work

Learners must read and discuss the case study which was part of a report for an organisation called the 'Carbon Trade Watch'. They should then answer the questions in the Learner's Book.

Suggested answers

Illegal waste being dumped	Source of waste
sewage sludge	residential homes/industries
rotten eggs	waste removal companies
industrial waste	neighbouring industries

According to the article 'Bisasar Road Landfill is a domestic-waste site', examples are discarded packaging from food products, cans, bottles, cardboard, paper, plastic containers, vegetable peels, unwanted food, etc.

Landfill item	Reuse/Recycle/Reduce
organic	
paper	reuse
construction	reuse
plastics	recycle
metal	recycle
other	recycle
glass	recycle

Homework activity LB p. 62

Learners must carry out a survey with at least five neighbours in their area to find out:

- what goes into their household bin
- which or if any of the waste is recycled, reused or reduced
- reasons why they recycle or why they do not recycle their household waste.

Accept any reasonable answers from learners' questionnaires.

Possible solutions to the dumping waste

Lesson 8

ACTIVITY 7 LB p. 62

Group work

Learners investigate and discuss possible solutions (based on their findings from their surveys) that can compensate for the negative impact of the technology identified.

Reasons why people discard waste items indiscriminately include:

- lack of available recycling depots in the community
- lack of recycling service provision by the local municipalities.

There are several ways in which these habits can be changed, including:

- educating the community
- setting up recycling depots at schools and in the communities.

Use this opportunity to instil in learners a sense of responsibility towards the environment, e.g. Each-One-Teach-One/War on Waste/ Less Waste which means that less ends up in already overflowing landfill sites; less waste reduces the need for new raw materials; less waste means less pollution and saving money, Get in the loop – Reduce, Recycle, Reuse.

Reducing is the most important step since this will also reduce the amount that needs to be recycled and re-used. People can reduce by:

- taking their own shopping bags to supermarkets
- not buying pre-packed fruit and vegetables
- buying bulk whenever possible

- using plastic picnic dishes instead of disposable plates, cups and cutlery
- storing food in re-usable containers instead of throwaway plastic bags and cling-wrap
- avoiding unnecessary printing and using both sides of printing paper.

They should also recycle paper, glass and plastic products.

Week 5

What you will need for Week 5

- Learner's Book
- stationery
- firm cardboard
- 2 mm round-head split pins

Lesson 9

Learners revise forces that act on material, adapting materials to withstand forces, selecting metal sections to withstand forces and to save material.

You can observe learners during the discussion and assess their written answers.

ACTIVITY 8 Revision of forces that act on materials LB p. 64

Work alone

Possible answers

- Three different types of structures are shell, frame and solid structures.
- Structures can
  - span a gap
  - enclose, contain or protect.
- Structural failure can occur because of forces acting on a structure. Two different types of force that can act on structures are dynamic forces (moving forces) and static forces (stationary forces).
- When a force acts on a structure, it will react in different ways. The different reactions a structure can have are compression, tension, bending , torsion and shearing.
- When a force is applied to a simple four-sided structure and it moves out of shape, the structure is said to be non-rigid. When the structure cannot be forced out of shape, it is said to be rigid.
- When a force is added to a structure and the structure does not topple over it is said to be stable.

Lesson 10

ACTIVITY 9 LB p. 67

Work alone

Learners should record their planning on the planning worksheets that you will give them and file these to create a Technology Portfolio. They will be required to show all their planning together with their finished product for an assessment mark in Week 7.

Learners should decide whether their containers will have frames and work out what they will be made of.

They must think about rigidity and stability, and about whether they will be able to withstand the forces of nature. They should also decide how the material will be attached to the frame.

Week 6

Lesson 11

ACTIVITY 10 LB p. 68

Work alone

Learners design a product, using freehand sketches, that will solve the problem or reduce the impact of the technology identified. They complete the second planning activity as part of their portfolio.

Homework activity

Learners use the provided isometric grid.

ACTIVITY 11 LB p. 69

Group work

Learners work in groups to make the model of the product safely.

Use the assessment rubric (Appendix 7).

Lessons 12 and 13

ACTIVITY 12 LB p. 69

Group work

Learners work safely in their groups to make a structure that will allow them to recycle different types of household waste. This is an assessment task.

Some things that they will need

- resources and equipment as per the design
- safety gloves
- multi-cutters
- hammer

- nails
- bin bag to collect waste after they have completed their product

Learners evaluate their solution in terms of effectiveness in solving or reducing the negative impact of the technology identified.

Week 7

Lesson 14: Evaluation skills

ACTIVITY 13 **LB p. 70**

Group work

Learners needs to present their products together with a completed group assessment rubric to the group for evaluation. Learners are to discuss the product and agree to a final group-assessment mark.

Week 8

Lessons 15 and 16: Evaluation skills

ACTIVITY 14 **Teacher evaulation of learners' solutions LB p. 70**

You must evaluate each team's work, using the rubric on p. 70 of the Learner's Book.

Mini-Practical Assessment Task control

South Africa has many minerals. There are mines in every province of our country, ranging from copper and iron in the Northern Cape and Limpopo, chrome and platinum in Limpopo and North West, gold in Gauteng and Free State, coal in Mpumalanga and KwaZulu-Natal, titanium in the Eastern Cape and phosphate in the Western Cape. In addition, opencast quarrying for road gravel is widely spread throughout the country. Although mining is not evenly distributed in all provinces, the mines and their related industries attract a workforce derived from every corner of our country, and impact the lives – directly or indirectly – of every member of society. We have huge reserves of coal, copper and iron ore. We are the main suppliers of platinum, manganese and chromium in the world. Although it is the source of our nation's wealth, mining is a dangerous, labour-intensive activity that has negative impacts on the environment.

The deeper our mines, the more dangerous mining becomes since tunnelling through rock under massive pressures leads to 'rock bursts' and cave-ins.

Here is an analytical rubric to assess design capability in the Mini-PAT.

The learner is able to:					
LEVELS OF COMPETENCE					
	Exemplary	**Competent**	**Developing, but not yet mastered**	**Progressing**	**Progressing**
	5	**4**	**3**	**2**	**1**
Generate and develop design ideas	Using drawings reflectively to generate new ideas	Progression of ideas across or within drawing	Design ideas are generated but not developed	Simple sketch showing object to be made	Drawing a picture not designing a product
Explore the possibilities of the problem/ the need	Combining novel solutions to produce innovative design	Using drawings to develop novel design solution/s	Recording possible creative solution/s to the task	Stereotypical response, showing little creative thought	Design possibilities are not addressed in the drawing
Address the constraints of the problem/need	Task constraints treated as part of iterative process	Task constraints considered as the design proceeds	Records way to address task and/or client needs and wants	Drawing show some understanding of task constraints	Minimal understanding of task/user needs
Plan the look of the product	Ideas about finishing are developed within overall designing	Ideas about finishing are added to design while drawing	Overall decoration scheme considered	Little consideration of final appearance of product	Appearance of the product is not considered
Communicate design ideas	Clear enough for somebody else to make the product	Conveys sense of the object to be made e.g. Working drawing	Conveys some sense of the object to be made e.g. indicates the materials	Simple unlabelled sketch/ es; relying on shared meanings	Use of narrative or other drawing genre
Plan construction	Constructional issues considered on route to final design	Drawing demonstrates consideration of construction	Drawing indicates some consideration of construction	Minimal consideration of construction whilst drawing	Yet to define the design task
Evaluate whilst drawing	Changes made a result of considering design drawings	Decisions made about product whilst drawing	Considered and rejected a range of designs	Minimal evaluation at drawing phase	Yet to define the design task
Provide a basis for making	Using drawings as a resource during making	Clear development path through drawing into making	Object is one of the ideas drawn	Product relates to ideas recorded in the drawing	Making and object seen as separate new activity
Comments to improve the learners performance in design capability:					

Module 3

Mechanical systems and control

Unit 3.2 Revision: Levers and linkages LB p.73

Week 1

Lesson 1

ACTIVITY 1 LB p. 75

Work alone

A lever is a rigid bar that pivots at a point called the 'fulcrum' and is used to move things. Levers are one of the basic simple machines that are used to make jobs easier for people.

Single-class levers have the fulcrum in the middle, e.g. a seesaw. Another name for a single-class lever is a first-class lever. The pivot in a single-class lever is placed in the middle.

Second-class levers have the fulcrum at one end, the force at the other end and the load in the middle. An example of a second-class lever is a wheelbarrow.

Third-class levers have the fulcrum at one end and the load at the other end, with the force in the middle. A baseball bat is an example of a third-class lever.

The input force is called the effort and the output force is called the load.

Mechanical advantage (**MA**) is the use of a mechanism to change a small input or effort to create bigger output.

The formula to calculate MA is:

$$MA = \frac{\text{Load}}{\text{Effort}}$$

ACTIVITY 2 LB p. 77

Work alone

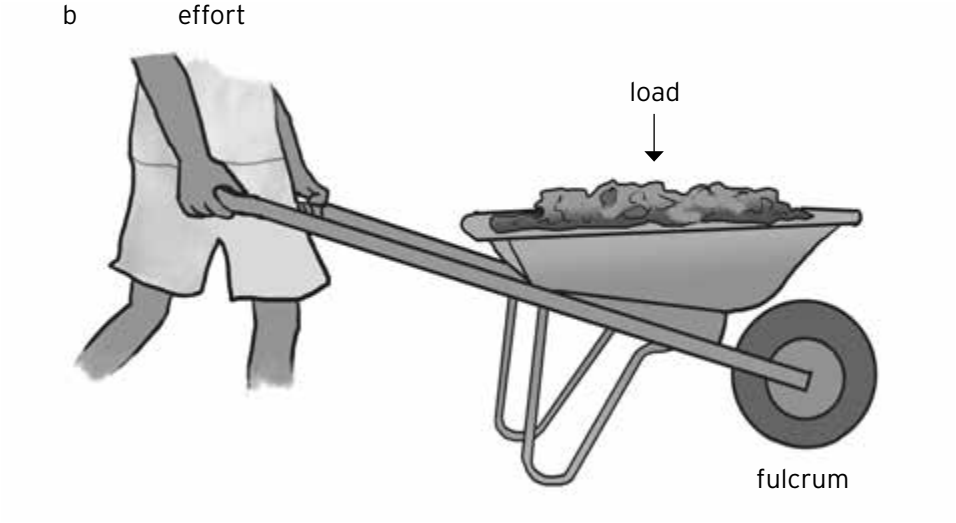
Possible answers

a seesaw, a crowbar and a pair of scissors

ACTIVITY 3 LB p. 77

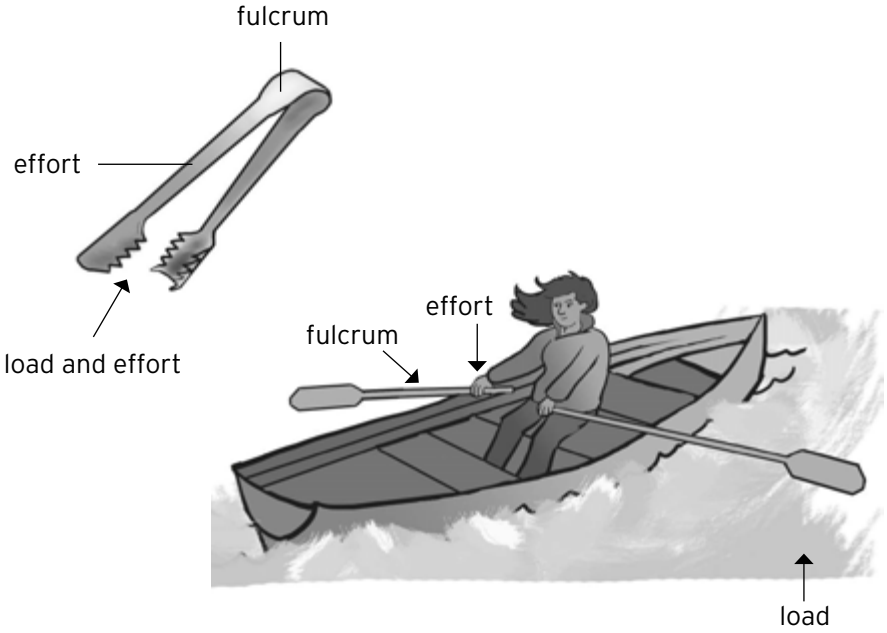
Work alone

b effort



ACTIVITY 4 LB p. 77

Work alone



Unit 3.3 Gear systems LB p. 79

Lesson 2

Learners revise gears.

ACTIVITY 5 Calculate gear ratios LB p. 79

Work alone

Possible answers

1. $\frac{\text{Distance moved by effort}}{\text{Distance moved by load}} = \frac{6}{18} = 1{:}3$

2. $\frac{\text{Distance moved by effort}}{\text{Distance moved by load}} = \frac{35}{5} = 7{:}1$
3. $\frac{\text{Distance moved by effort}}{\text{Distance moved by load}} = \frac{56}{6} = 9{,}3{:}1$

ACTIVITY 6 LB p. 79

Work alone

Some examples: An eggbeater, a bicycle, a salad spinner, a clock, a watch, hand grinder, a hand drill

ACTIVITY 7 LB p. 80

Work alone

1.
- lever: a bar pivoted about a fulcrum to transfer a force
- gear: a mechanical system with teeth
- cogs: one of a series of teeth on the rim of a wheel, for transmitting or receiving motion by fitting between the teeth of another wheel
- meshing: the action of interlocking with another object
- mechanical advantage: the advantage given by the multiplication of a force

2. The fishing rod is a third-class lever. A third class lever has the effort in the middle.

Week 2

Lesson 3

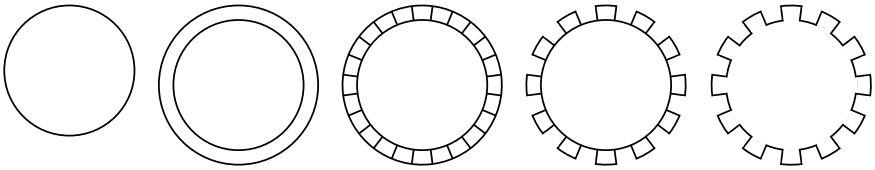
ACTIVITY 8 LB p. 81

Work alone

Give learners these instruction for drawing gear systems:

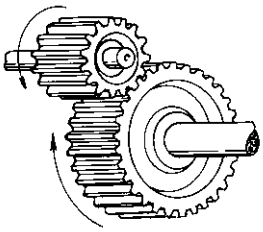
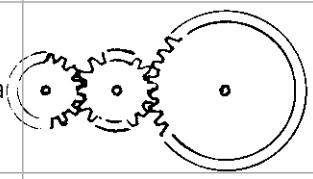
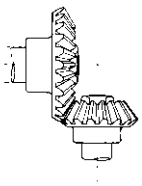
1. Find a picture of a spur gear and study it. You can find pictures of spur gears in many construction and machinery magazines. A picture of a spur gear is available at winchbin.com.
2. Draw a circle on your paper using a pair of compasses. This first circle will act as the centre of the spur gear.
3. Lightly draw a larger circle around the circle you drew in Step 1. Start at the centre of your first circle and make the legs of your compass wider. Now draw the circle so that it is larger than the first circle.
4. Draw triangular teeth on the outside of your larger circle. The teeth should start and end on the outer circle's lines, and all teeth should be the same size. Space the triangles out so that they're not touching each other; there should be equal space between each triangle.
5. Square off the teeth by drawing a line on each tooth to cut off the tip of each triangle. Spur-gear teeth are not pointed – they're squared off. Erase the tips of your triangles.

6. Erase the lightly drawn larger circle; be careful not to erase the teeth you drew in Step 4. Leave only the inner circle and the teeth of the gear. Darken the lines of the inner circle and the gear teeth.



ACTIVITY 9 LB p. 82

Work alone

Type	Diagram	Motion	Formula – Speed	How the train works
Two gears of unequal size		Movement is in opposite directions	Gear ratio The distance moved by the effort/ The distance moved by the load	One gear acts as a driver while the other is driven
Two spur gears connected via an idler		Two will move in a clockwise direction while the idler moves in an anti-clockwise direction	–	All three gears move
Two bevel gears linked to transfer the axis of rotation through 90º		Bevel gears can be used to change the direction of drive in a gear system by 90º. An example is the main mechanism for a hand drill. As the handle of the drill is turned in a vertical direction, the bevel gears change the rotation of the chuck to a horizontal rotation	–	The one gear drives the other gear

Lesson 4

ACTIVITY 10 LB p. 82

Work alone

Learners have to write a design brief with specifications that will use a combination of gears to achieve a mechanical advantage with force multiplication of 3 and an increase in output velocity of 4. The design brief must be a short statement of the problem to be solved and not a description of the solution. An open brief allows for more creativity than a closed brief, which describes a solution.

The factors that will limit design ideas are the constraints. These can be stated as one word; e.g. time, materials, tools, human resources, cost. These must be considered prior to listing the product specifications.

ACTIVITY 11 LB p. 82

Work alone

Learners practise using isometric projection techniques.

Week 3

Lesson 5

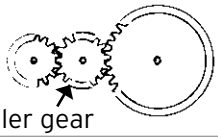
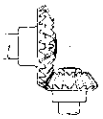
ACTIVITY 12 LB p. 83

Work alone

Learners complete a table.

ACTIVITY 13 LB p. 84

Work alone

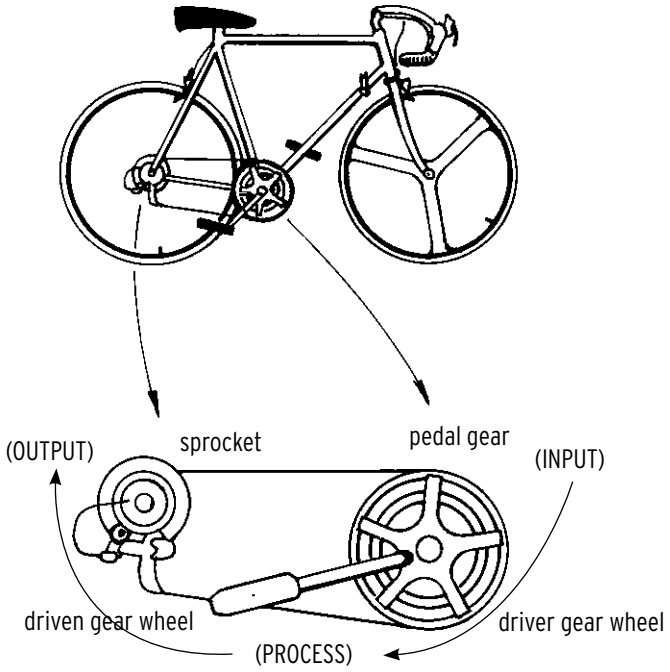
Description	2-D drawing
1. Provide an output force four times greater than the input force (M.A = 4:1)	 idler gear
2. Provide double the rotation rate on a driven axle at 90º to the driver axle	

Criterion	5	4	3	2	1	0	Total
1. Accuracy of drawing							
2. Uses scale							
3. Uses all relevant lines							
4. Prints neatly and accurately							
5. Dimensions correct							
6. Demonstrates good aesthetic design							
Total							

Lesson 6

ACTIVITY 14 LB p. 85

Work alone



ACTIVITY 15 LB p. 86

Group work

Sub-systems	Goal	Input	Process	Output
Power sub-system	Produce motion	Rider pedals	The crank turns the chain and sprocket	The bike moves forward/ speed
Steering sub-system	To change direction	Rider controls the steering	Turns it left or right	The bike changes direction
Brake sub-system	To stop the bike from moving	Rider depresses the brake lever	Brake cable compresses the brakes	The bike slows down / comes to a standstill
Chain-sprocket sub-system	Chain transfers force from chain to the gears	Rider turns the crank	Crank engages the chain that engages the gears	Bike can move faster or slower

Week 4

Lesson 7

ACTIVITY 16 LB p. 88

Work alone

Have a discussion on systems diagram on a bicycle with a mechanical advantage of 4:1.

ACTIVITY 17 **Design skills** LB p. 88

Work alone

In this activity, learners are required to plan a mechanical system to produce a specific output. They must design a gear mechanical system that is able to lower and raise a bucket into a well to draw water and to retrieve the bucket from the well once it is full of water. Refer to www.technologystudent.com on ratchet systems.

Unit 3.4 Impact of and bias in technology/ Indigenous technology LB p. 89

Lesson 8

ACTIVITY 18 LB p. 89

Group work

Discuss the impact on the environment as a result of mining. Focus on these topics.

- Acid mine drainage
- Dust pollution from mine dumps
- Indigenous mining of iron in South Africa.

For this activity, groups of learners are required to investigate and report on one of the above topics. (Distribute the investigations so that all are covered and reported, in class.)

Week 5

Lesson 9: Investigation of bias in technology

Gender refers to the socially constructed roles and responsibilities given to males and females in society. How a particular society is organised impacts on how women and men relate to one another. It affects how males and females are perceived and what roles and responsibilities are assigned to them. The experience of being gendered thus differs from one society and context to another.

In the mining industry, the roles played by men and women have been quite traditional. Men have entered the public sphere (the mine workplace), while women have remained in the domestic sphere (the home). Men have been breadwinners, while women have been responsible for maintaining the family. On the mines, women have also provided sexual services to male mineworkers. Moving from such traditional and relatively static gender roles into a space where women and men can be seen as people of equal worth and dignity, equal workers and earners, is a big step. This requires a significant shift in gender roles, relations and responsibilities from both women and men.

ACTIVITY 19 LB p. 89

Work alone

Learners answer questions about bias in technology.

ACTIVITY 20 LB p. 90

Work alone

As an assignment learners investigate gender bias in career choice/ opportunities related to mining. This should be well researched, showing both quantitative and qualitative data. Proper research methodology should be followed. At the end you can hold a debate between two teams.

Lesson 10

ACTIVITY 21 LB p. 91

Work alone

Discuss what tenders are, and discuss the tendering process. Tender procedures must be clearly set out and recorded to ensure evidence of full compliance with the Code. Care should be taken regarding the receipt, recording, assessment, confidentiality, etc. of all communications including verbal, written and electronic methods. Audits may be undertaken at any stage of the tender process by internal or external auditors such as the Auditor General's Office or the Ombudsman.

The standard tender process consists of four main stages:

- Pre-tender
- Tender
- Evaluation
- Award.

For this activity, learners are required to design a tender for the construction of shaft head-gear suitable to transport miners to and from the work face, and for raising ore and waste in loads not exceeding 10 tons at a time.

Week 6

Lesson 11

ACTIVITY 22 Investigation skills LB p. 92

Work alone

Learners must investigate lifting mechanisms (wire rope driven mine head-gear) in use at South African deep-level mines for raising people and ore. (As preparation, discuss examples of head-gears.) Learners will design their own solutions. At least three drawings should be presented. They need to take ergonomics into consideration as well as aesthetics. Each learner in the group should sketch his or her own ideas as the group discusses ways to solve the problem. Labels and arrows should be included to identify parts and how they might move. These drawings should be quick and brief and should include sketches.

Lesson 12

ACTIVITY 23 Sketching LB p. 92

Work alone

Learners will draw three possible solutions to their problem. In this step, each learner should develop two or three ideas more thoroughly. They should create new drawings that are orthographic projections (multiple views showing the top, front and one side) and isometric drawings (three-dimensional drawings). These are to be drawn neatly, using rulers to draw straight lines and to make parts proportional. Parts and measurements should be labelled clearly.

Three-dimensional sketches are best suited to show design ideas. Use notes with freehand sketches and enhance designs using colour, tone, shade, texture, and thick and thin lines.

Formal drawing conventions are used to show the final design plan as a working drawing. Accuracy is important when completing the formal drawings. Grid paper can be used as a guide for sketching and doing formal drawings. When sketching or drawing a 3-D view of an object, it is a good idea to draw the item in a box that it will fit into (called crating) then add thick and thin lines and render and enhance as required. Working drawings include dimensions and notes that indicate material, construction methods and finish.

ACTIVITY 24 Writing a design brief LB p. 92

Work alone

The design brief must be a short statement of the problem to be solved and not a description of the solution. An open brief allows for more creativity than a closed brief, which describes a solution.

Week 7

Lesson 13

ACTIVITY 25 Simulation LB p. 93

Group work

Learners work in teams to form mechanical engineering companies. They are required to evaluate the sketches of individuals and select the best idea for the team tender bid. They can use the following assessment rubric.

Criterion	5	4	3	2	1	0	Total
1. Accuracy of drawing							
2. Makes use of scale							
3. Makes use of all relevant lines							
4. Prints neatly and accurately							
5. Dimensions the drawing correctly							
6. Demonstrates good aesthetic design							
7. Total							

Lesson 14

ACTIVITY 26 Making skills LB p. 93

Work alone

Learners will need technical drawing equipment for this activity.

Week 8

Lesson 15

ACTIVITY 27 Designing skills, budgeting LB p. 93

Group work

Start with a discussion of budgeting. In this activity, groups prepare a realistic budget detailing expected costs of constructing a real mine shaft head-gear, detailing valid prices of materials and labour costs of the range of workers who would be involved in designing and building such a device.

Lesson 16

ACTIVITY 28 Making skills LB p. 94

Group work

Groups build their working scale models using safe working practices of their head-gear designs.

Lesson 17

ACTIVITY 29 Communicating skills LB p. 94

Group work

Groups must present their tender proposals for the mineshaft headgear together with research, plans, flow chart, model and budget to the 'Tender Board'.

Summative Assessment Test

MECHANICAL SYSTEMS AND CONTROL

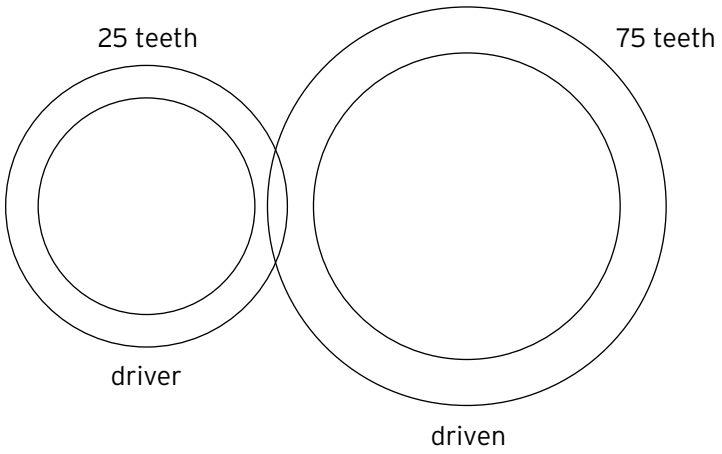
LEVERS

1. Identify the mechanism illustrated in the diagrams below. Indicate in each diagram where the load, effort and fulcrum are found. (35)

2. Sketch one example of each class of lever (class-one, class-two and class-three) and state where the fulcrum is in terms of the effort and load. (3)

GEAR SYSTEMS

1. Briefly explain the following concepts with regard to gears: (4)
   - Counter revolution
   - Idler gear
   - Velocity ratio
   - Force multiplication
2. Why is it necessary for the idler gear to be made of a harder material than the other gears? (1)
3. What do you understand by the term mechanical advantage? (1)
4. What is the formula to calculate the mechanical advantage of a lever? (2)
5. Calculate the mechanical advantage that a person has when making use of a wheelbarrow. (3)
6. State what class of lever the wheelbarrow represents. (1)
7. Calculate the gear ratio/velocity ratio for the following example. Show the formula and the calculations. (5)



8. When gears mesh together what are they called. (1)
9. Name and describe a mechanical device with gears. (1)

10. Draw a systems diagram of one aspect of a bicycle gear system, e.g. the chain and sprocket system, and label all parts. State which is the driver and which the driven. State the input, process and output of this gear system (15)
11. Briefly explain each of the following concepts in your own words (6)
    - Acid mine drainage
    - Mine dumps dust pollution
    - Indigenous mining of iron
12. State five examples of GENDER BIAS that are prevalent in the mining industry. (5)

Mini-Practical Assessment Task

For the mini-PAT, learners will design and make a model and a circuit with either a panic button or a passage light.

Here is an analytical rubric to assess design capability in the Mini-PAT.

The learner is able to:					
LEVELS OF COMPETENCE					
	Exemplary	**Competent**	**Developing, but not yet mastered**	**Progressing**	**Progressing**
	5	**4**	**3**	**2**	**1**
Generate and develop design ideas	Using drawings reflectively to generate new ideas	Progression of ideas across or within drawing	Design ideas are generated but not developed	Simple sketch showing object to be made	Drawing a picture not designing a product
Explore the possibilities of the problem/ the need	Combining novel solutions to produce innovative design	Using drawings to develop novel design solution/s	Recording possible creative solution/s to the task	Stereotypical response, showing little creative thought	Design possibilities are not addressed in the drawing
Address the constraints of the problem/need	Task constraints treated as part of iterative process	Task constraints considered as the design proceeds	Records way to address task and/or client needs and wants	Drawing show some understanding of task constraints	Minimal understanding of task/user needs
Plan the look of the product	Ideas about finishing are developed within overall designing	Ideas about finishing are added to design while drawing	Overall decoration scheme considered	Little consideration of final appearance of product	Appearance of the product is not considered
Communicate design ideas	Clear enough for somebody else to make the product	Conveys sense of the object to be made e.g. Working drawing	Conveys some sense of the object to be made e.g. indicates the materials	Simple unlabelled sketch/ es; relying on shared meanings	Use of narrative or other drawing genre
Plan construction	Constructional issues considered on route to final design	Drawing demonstrates consideration of construction	Drawing indicates some consideration of construction	Minimal consideration of construction whilst drawing	Yet to define the design task
Evaluate whilst drawing	Changes made a result of considering design drawings	Decisions made about product whilst drawing	Considered and rejected a range of designs	Minimal evaluation at drawing phase	Yet to define the design task
Provide a basis for making	Using drawings as a resource during making	Clear development path through drawing into making	Object is one of the ideas drawn	Product relates to ideas recorded in the drawing	Making and object seen as separate new activity
Comments to improve the learners performance in design capability:					

Below is the table of weekly lessons for the term. As teacher, you must spend two hours each week on Technology. The lessons can be broken up into two one-hour sessions or one two-hour session. The work for this term has been divided into one-hour lessons. If the learners know a lot of the work and want to work ahead of the schedule, ensure they have covered the basics. There are some extension activities that have been put in for the learners that work quickly and grasp the different concepts quickly.

The learners will be investigating different circuits this term.

Hrs and week	Lesson	Focus	Content, concepts and skills	Enabling tasks	Assessment
Module 5 Electrical systems and control					
Week 1 2 hrs	Lesson 1 (p. 99)	**Revision: circuits** **Circuit components** **Simple circuits**	**Revision lesson:** Simple circuit Correct connections; short circuits	Activity 1 Activity 2	Teacher
	Lesson 2 (p. 102)	**Drawing circuits** **Design skills**	Drawing electrical circuits Setting up circuits using a range of components Drawing the circuits.	Activity 3 Activities 4 and 5	Teacher
Week 2 2 hrs	Lesson 3 (p. 104)	**Energy sources** **Impact/bias** **Evaluation**	Energy use in rural and informal settlements Illegal connections, ethical issues; safety considerations Sharing of resources	Activities 6, 7 and 8	Teacher
	Lesson 4 (p. 106)	**Evaluation**	Balanced report on sharing resources	Activity 9	Written report: Teacher
Week 3 2 hrs	Lesson 5 (p. 108)	**Electrochemical cells** **Electrical systems and control**	Electrochemical cell Make batteries: fruit, vegetable and salt batteries	Activities 10 and 11	Practical: Teacher
	Lesson 6 (p. 110)	**Impact of technology**	Advantages and disadvantages of series and parallel batteries Photovoltaic cells – advantages and disadvantages of solar cells	Activities 12, 13 and 14	Teacher
Week 4 2 hrs	Lesson 7 (p. 112)	**Electricity generation** **Impact of technology**	Generating electricity for the nation Thermal power stations Hydroelectric power stations Wind-driven turbines Alternating current	Activities 15, 16 and 17	Investigation: Teacher

Hrs and week	Lesson	Focus	Content, concepts and skills	Enabling tasks	Assessment
	Lesson 8 (p. 114)	**Distributing power**	Distributing electric power	Activities 18 and 19	Teacher
Week 5 2 hours	Lesson 9 (p. 116)	**Design skills**	**Circuit diagrams:** AND connect circuits resistors connected in series and parallel	Activity 20	Teacher
Formal assessment task: Mini-PAT: **Context:** Panic button, or a stair or passage light					
	Lesson 10 (p. 118)	**Investigation skills**	**Investigation:** Introduce Ohm's Law (Qualitative) Cells in series cause current increase	Activities 21, 22 and 23	Investigation: Teacher
Week 6 2 hours	Lesson 11 (p. 122)	**Investigation skills**	AND logic gate OR logic gate	Activities 24 and 25	Teacher
	Lesson 12 (p. 123)	**Truth tables**	Truth tables for AND and OR logic conditions	Activity 26	Teacher
Week 7 2 hours	Lesson 13 (p. 124)	**Design skills** **Making skills**	**Write design brief:** suitable panic button system OR scenario given by the textbook Circuit diagram	Activities 27, 28 and 29	Design brief: Teacher
	Lesson 14 (p. 124)	**Communication skills**	Circuit suitable for at least two switches Truth table for the device Advertising poster for the device	Activities 30, 31 and 32	Teacher

Module 5

Electrical systems and control

Unit 5.1 Revision: Circuits LB p. 99

Week 1

In Week 1 the learners will be covering simple circuits and the components. They will also have to draw the circuit diagrams using the correct symbols for the components.

The teacher must discuss what the icons mean in the book before they start working. Which icon is used when working along, which icon is used when working in pairs etc. It is important that the children try and stick to the activities and work accordingly.

Lesson 1

ACTIVITY 1 What is a simple circuit? LB p. 99

Group work

The learners will be revising circuits and components. Make sure you understand circuits and how to make them before you start the lesson in Week 1. They also need to know the different symbols. You could make a poster of the symbols and put it up on the wall before the lessons starts.

It is important that the learners revise the work from last year. Not all learners at the school might have done this work, and some of them will have forgotten some of the facts and symbols when working with electricity. They will also need to identify and give the uses for the different components.

Look at the different components below we use when building a circuit:

Input device	Output device	Control device
electrochemical cell	resistor	switch
generator	lamp/bulb	
solar panel	heater	
	buzzer	

The learner will study the different components and see what they do and how they normally fit into a circuit.

Discuss the different input, output and control devices. Ask learners these questions:

- Why do you think they are called input devices?
- Why are the components called output devices?
- Why do you need a control device?

Possible answers

- An input device is a component that feeds power to the circuit – electrochemical cell, a generator and a solar panel. They are called input devices because they feed in or give the circuit power.
- The output device is the component that does something in the circuit – it lights the lamp, it stops the circuit from burning up, it makes something hot, it makes a noise, etc.
- A control device is a component that controls the input like a switch, a light detector, etc. It is able to switch on and off the circuit. It stops and starts the flow in the circuit.

In the Learner's Book, there is a simple table to study the different circuit components.

Remedial tip:
Display posters of the components with the names and symbols in the classroom. Learners may battle to read the words, but the visual elements will help them.

ACTIVITY 2 Correct connections and short circuits LB p. 101

Group work

The teacher needs to set up a few circuits for the learners to draw as circuit diagrams. Get the learners to work in groups. Place different circuits on different tables and the learners can rotate from table to table in the same group. Encourage them to study the circuits before they start drawing. As they finish the one drawing they will move to the next table. They can help each other and teach each other as they go around.

Make a poster of the following information for the wall (photocopy and enlarge if possible).

Fault-finding in your circuit
Electrical circuits should never really break – you can always fix them if you know how! Here are some things to check when building a circuit: 1. Is the circuit made to the circuit diagram? If not correct it to suit the diagram. 2. Are the joins firm? Check them. Make sure they have proper contact. Make them secure. 3. Is there a short circuit? This means that the connecting wires are touching. Try to fix it. 4. Is there a break in the wire? Replace the wire or fix the break. 5. Are the components connected the right way round? Check and change the way they are connected. 6. Are the components working? Check the battery, etc. Check each component with a meter or in another circuit. 7. Are the values of the components correct? Check the values of the components match what is needed for the circuit. 8. Are the cells or battery connected the right way? Reconnect them correctly.

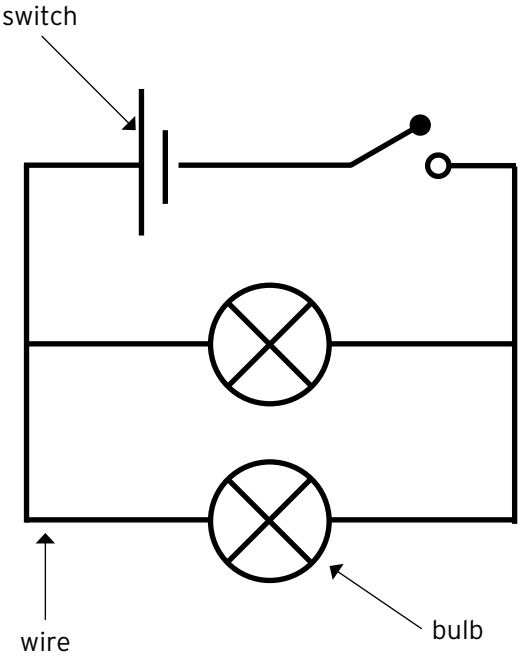
9. Is the battery or cell strong enough or not flat? Replace the battery or cell.

If the circuit is still not working try the steps again.

ACTIVITY 3 Drawing an electrical circuit LB p. 102

Group work

Here is a circuit that you can set up in the classroom:



Make sure you use a range of components. It might be an idea to set the circuits up in different places in the classroom. The learners can go around in groups and draw the circuit diagrams using the correct symbols.

Lesson 2

ACTIVITY 4 Drawing a simple circuit LB p. 102

Group work

Make sure the learners have a piece of paper, a book or clipboard to press on, and their rulers, pencils and erasers before they walk around, drawing the circuit diagrams. Give help if necessary.

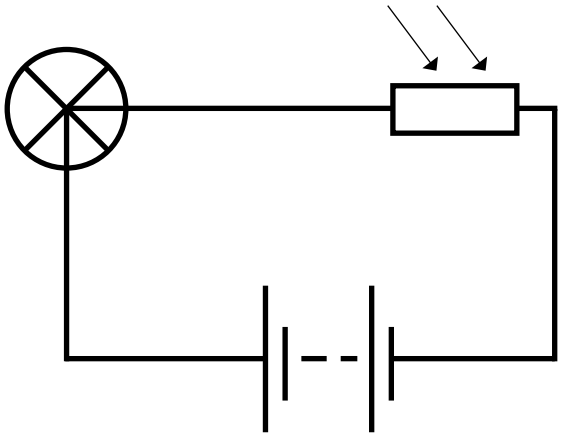
Remedial tip:
The learners with learning barriers will remember their mistakes better if you correct these while they are doing something (and not after they have finished). It is important to keep an eye on these learners and check on what they are doing.

ACTIVITY 5 Self-assessment LB p. 103

Work alone

This is a self-assessment activity.

Possible answers:

1. light bulb
2. battery
3. resistor
4. 

5. Check the chart in the Learner's Book.

You can make a poster of tips on how to draw circuit diagrams:

Here are some tips:

- Make sure you use the correct symbol for each component.
- Draw connecting wires as a straight line (use a ruler).
- Put a 'blob' (•) – a solid dot – at each junction between wires.
- Label components such as resistors and capacitors with their values.
- The positive (+) supply should be at the top and the negative (-) supply at the bottom.
- Try to arrange the diagram so the signals flow from left to right: inputs and controls should be on the left, outputs on the right.

In Week 2 talk about energy and sharing resources. The world is in crisis. There is not much fossil fuel left and we need to cut back on energy use and look for other sources.

Collect pictures of things that use electricity or energy – stoves, lights, heating, etc. – and make posters for the classroom. Eskom has some big posters on different energy sources and safety. Contact your local Eskom office and see if they will come and talk to the learners and bring some posters.

Discuss the consumption of energy by big cities and towns. Talk about how people in remote areas cope with no electricity. Discuss how the government should be sharing power. Ask learners whether employers should get priority over homes.

Week 2

Lesson 3

Remedial tip:
Display posters of the different energy sources. Eskom will come to your school and give a talk and also supply posters on the different energy sources that are used in South Africa to supply power. Remember that some learners work better with visual presentation of the facts.

Give the learners ideas on power sharing before they start writing their reports. They need to write a balanced report of the issues of sharing resources.

Remedial tip:
Learners with barriers to learning may need to type their reports on a computer (with a spellchecker) or 'buddy up' with stronger learners so that they can pool their ideas and write the report together.

Discuss the different types of energy we use everyday – light, heat and electrical. See the chart in the Learner's Book.

Week 2

Lesson 3

ACTIVITY 6 **Sharing energy LB p. 104**

Pair work

The learners will divide into pairs and discuss the table in the Learner's Book. It is important that the teacher walks around and listens to the discussions. Often the learners need a bit of advice on how to tackle the subject. The teacher must also make sure that every learner gives an opinion.

ACTIVITY 7 **Electricity can be dangerous LB p. 105**

Group work

Help the learners in their discussions of the dangers of paraffin lamps and candles, and illegal connections.

ACTIVITY 8 Keeping everyone happy! LB p. 106

Group work

At the moment in South Africa a number of cities and town are experiencing blackouts. There seems to be no simple solution to the problem of prioritising who should get limited electricity but at least the learners can see how it is difficult to keep everyone happy.

Lesson 4

ACTIVITY 9 Writing a report LB p. 106

Work alone

The learners should be able to write their own balanced report on this important issue! They must include the following aspects in the report:

- Identify the problem.
- Give reasons for their statements.
- List examples.

Unit 5.3 Electrochemical cells LB p. 108

Week 3

In Week 3 show the learners how electrochemical cells work. You can set up some examples of electrochemical cells and have them working so the learners can see that they can power a lamp or make a buzzer go off.

Lesson 5

ACTIVITY 10 and 11 Making your own batteries LB p. 108

Group work; pair work

When the learners are making the electrochemical cell make sure they have all the materials ready before making the fruit, vegetable or salt batteries. The salt battery is a difficult one to make so it would be better if the learners start with the fruit battery.

Discuss electrochemical cells. Discuss how these cells can be made.

Remedial tip:

Display a poster of the steps the learners will follow to make the electrochemical cells. Write out Step 1, Step 2 etc. You could take photos as the learners do each step and keep them for the next group. Remember that some learners learn 'in pictures'.

Ensure that the learners do the experiment as directed. If the cells or batteries don't work they must check each step to see if they have followed the instructions correctly.

This experiment can be done by the groups that work a bit faster. Each group will need potatoes, zinc nails and a voltmeter.

1. Get the learners to create two separate cells like they did in the experiment in the Learner's Book. If they are using large potatoes, they can cut them into pieces and then use each piece as a separate cell.
2. The learners will measure and record the open-circuit voltage of each of the cells.
3. They will use jumper leads to hook these two cells up in series to make a two-cell battery.
4. They will then measure and record the open-circuit voltage of the two-cell battery.

The learners should find that each individual cell has an open-circuit voltage of about 0.75 volts. When they connect the cells in series and measure the two-cell battery, they should measure about 1,5 volts (or maybe less). With this battery they can actually power any electronic device that is designed to operate at about 1,5 volts and that does not draw too much current. This means it will probably power up things that will run on small watch-sized or calculator-sized batteries.

Lesson 6

ACTIVITY 12 LB p. 110

Work alone

The learners will discover that working with veggie batteries is a lot of fun and interesting. They can try powering up a calculator, small buzzer or a low-voltage transistor radio.

The learners must write out ideas about the advantages and disadvantages of electrochemical cells. These include:

- easily available especially in the house – if there are no other cells.
- not very economical
- cannot generate enough power
- The cell will run out of power and you will not always know how long it will last.
- Lemon, oranges and other fruit could be used.

The learners will revise connecting batteries in series and in parallel and record their observations.

ACTIVITY 13 LB p. 110

Work alone

Photovoltaic cells are solar cells that rely on the sun to generate power. South Africa has ample sunlight to power a solar cell, so it is very cost effective. See the activity below for answers to questions.

ACTIVITY 14 LB p. 110

Group work

Here are some possible answers to the question about the advantage and disadvantage of solar cells:

Advantages of solar cells	Disadvantages of solar cells
• Do not pollute the air and are 'green' (or environmentally friendly) • Save on electricity bills • Some remote areas don't have power	• Not always attractive on a house if they cover a big area on the roof • Do not have enough power to supply the big demand for electricity – especially in big factories • Difficult to position them as they need to catch the sunlight and they are quite bulky. They need plenty of space especially if they are going to free-standing.

Week 4

In Week 4 you will investigate ways that South Africa generates electricity for the nation. We have only about 300 years left of coal supplies. The country needs to look into the future and find ways that are environmentally friendly as well as viable.

Unit 5.4 Electricity generation

Lesson 7

ACTIVITY 15 **Generating electricity for a nation**
LB p. 112

Pair work

We use a great deal of electricity in our daily lives. Let the learners discuss this in pairs. They should think about the impact different electrical and electronic devices have on our lives.

Possible answers

- We use some devices for communicating – telephone, cell phones, computers to e-mail, etc.
- We use electricity for transport – cars, buses, aeroplanes, etc.
- We use electricity to produce food for a nation – tractors, sprinkles, etc.
- We use electricity for education – computers at school, lights to light up rooms, overhead projectors, tape recorders, etc.
- We use lights to play sport at night, fitness machines, swimming – pool pumps for keeping water clean, etc.
- Businesses cannot function to produce a number of products without power.

- We use electricity for games and leisure – television, computer games, etc.

The negative ways electricity can affect us include:

- Pollution
- Noise
- Children watch too much television and don't read or play outside – they become lazy.
- Working on a computer all day can damage people's eyes.
- Some people waste electricity, adding to the cause of blackouts.
- Some people do not consider that electricity is dangerous and they make illegal connections which can kill.

ACTIVITY 16 LB p. 112

Group work

Here are some ideas that you can share with the learners. You could make this into a chart to display in the classroom.

Coal	This is the longest-lasting of fossil fuels, but will run out eventually in about 300 years. It is a 'dirty' fuel, and mining damages the countryside. Burning coal can pollute the atmosphere.
Oil	Oil provides the most fuel for industry and transport, but known sources will run out in about 100 years. It is difficult to find and to tap into new sources.
Gas	Gas burns 'cleanly' and is a useful domestic cooking fuel. However, it is difficult to store and transport. Gas is probably the first of the fossil fuels that will run out.
Uranium	Uranium provides a lot of energy per gram. It is suitable for generating electricity. The sources will last a long time. The danger is in radioactive waste products.
Water	Water is free and clean, but it depends on suitable sites. Waves and tides are difficult to harness and hydro-electric power is almost fully exploited.
Geothermal	This is free and fairly clean. There could possibly be an endless supply. This source of energy is limited to certain areas of the world. It is difficult to tap into if source lies in deep rocks instead of at the surface.
Solar	It is a free, clean and endless supply. It is difficult to collect in large amounts, and potentially limited in colder countries to domestic heating.
Wind	It is a free, clean and endless supply, but can generate only a small amount of power, so potential limited to local use. The wind does not always blow.
Plants	Plants are a renewable source. However, they are a limited source because of limited land. Ocean farming has not been exploited. Growth is slow.

In South Africa we rely heavily on steam turbines that are heated by coal. Our resources are running out! We have plenty of sunshine and we need to look at more solar heating for homes. This will help people living in remote areas. South Africa has one uranium-run power

station which is always a concern. We have only a few hydroelectric power stations, which are not big enough to supply large areas.

ACTIVITY 17 Advantages and disadvantages LB p. 114

Work alone

Discuss each energy source with the learners and get them to list advantages and disadvantages. They can have group discussions first and then record what they have discussed.

Maybe they can make posters of the different energy sources. If there is a local energy supplier in the area of the school, investigate taking learners on an educational tour.

Lesson 8

ACTIVITY 18 Distributing power across the country LB p. 114

Class work

Talk about how electricity is distributed around the country. A power station produces a very high voltage which travels along the power lines to certain destinations. Once it reaches the local power supply stations, it has to be transformed into lower kilowatts – see below.

Possible answers

- Are we using our sources of energy to the fullest? In South Africa we do not use enough wind, sun and water power. We should make better use of our natural power sources.
- Should we help save electricity? We should all start in our homes and schools and workplaces first. This all helps. We need to be aware of how electricity should not be wasted.
- Should we use our own means of saving power? We should have power sources like solar panels on our homes. We should make sure that the homes are properly built to save heating bills, etc.
- Should the government use solar power to run traffic signs? If there is a power cut then traffic lights will continue to work because they are using solar power. Even street lights should be solar powered.
- Do businesses and homes waste the power supply? Yes. People should be made aware of how to save electricity. Often big businesses leave lights on after the workers have gone home. If you exit a room, the lights should be switched off. People should switch off geysers and only put them back on when hot water is needed.
- Should businesses and homes be encouraged to use less power? Yes, every small saving counts.
- Here are some suggestions for saving power: Switch off lights when you are not in the room. Don't use too much water when

bathing – your geyser uses the most power in your house. Switch off the stove and the pot will continue to cook for a while. Don't use heaters too often – dress warmly instead. Try to use some solar heating.

ACTIVITY 19 **LB p. 115**

Work alone

Discuss the important points when making a poster. Show examples of posters. Eskom has posters that it often distributes. Try to obtain some of these from the local office. Read through the list of poster 'rules' in the Learner's Book.

Display a map where all the power stations are marked with different coloured pins or stickers for easy reference.

Week 5

Lesson 9

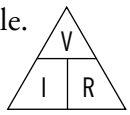
ACTIVITY 20 **LB p. 116**

In this lesson the learners will look at diagrams of resistors connected in series and parallel. Once they have discussed the diagrams of the circuits and the circuit diagrams, they will attempt to build both the circuits in series and in parallel.

The learners are not required to do the calculations when they have finished connecting their resistors in series and parallel. They do need to draw the circuit diagrams.

Lesson 10

The scientist George Ohm discovered a relationship between voltage, current and resistance. The relationship can be written down as a 'memory aid' triangle.



This is how you calculate voltage:

$V = I \times R$ $I = \frac{V}{R}$ and $R = \frac{V}{I}$

ACTIVITY 21 **LB p. 118**

Group work

The drawing of the National Grid in the Learner's Book has a lot of detail. It is important for the learners to see that not all areas of South Africa have electricity. The grid shows that most of the rural areas do not have access to electricity. Make a photo copy of the map or find other information from the Internet and make some posters to put on the wall to help the learners with their research.

Electricity is supplied to consumers through the National Grid at very high voltage to reduce energy losses during transmission. Transformers are used to increase or decrease the voltage of supply.

Electricity is charged in units. One unit is equivalent to one kilowatt of electricity used in an hour.

ACTIVITY 22 LB p. 121

Pair work

A transformer is an electrical device that changes the voltage of an alternating current (AC) supply. It can change high voltage supply into a low-voltage one and vica versa.

- A transformer that increases the voltage is called a step-up transformer.
- A transformer that decreases the voltage is called a step-down transformer.

Step-up transformers are used at power stations to produce the very high voltage needed to transmit electricity through the National Grid power lines. These high voltages are too dangerous to use in the homes, so step-down transformers are used locally to reduce the voltage to safe levels. We have 230 V in our homes.

Explain how and why it needs to be lower voltage when it comes into our homes.

Remedial tip:
If the school has access to the Internet, download pictures of different circuits and make these into posters. Label the parts with words and symbols.

ACTIVITY 23 LB p. 121

Work alone

Resistors are devices which make use of poor conductors to limit the flow of electricity through a circuit. They allow only a certain amount of current to flow and this is very useful because some electrical components will burn out if the current is too high. Different resistors will allow different amounts of currents to the circuit. Resistors have coloured bands on them to tell you how much resistance they have.

Since resistors are too small for the value to be written on the actual resistor, special colour coding is used, allowing you to determine the resistance values without using a meter. The colour-coding system (shown in the Learner's Book) is standard and used world wide.

Resistors are generally made of substances which only partially conduct electricity. The unit of resistance is 'ohm' (pronounced 'owm' as in 'show'). The symbol of resistance is the Greek letter omega.

In Week 5 the learners will learn about resistors and why we need resistors in certain circuits.

It is important that the learners know about the different values

of different resistors. These are used all over the world with a standard colour coding! Go over Ohm's law with them. Set up some circuits with different resistors. The first circuit will be with circuit connected with one cell. Then another connected with two cells and another connected with three cells. Then set up three with circuits with the cells connected in parallel. If there are not enough components, connect one at a time and discuss each circuit. The learners must state their conclusions.

Formal Assessment Task: Mini-PAT

Topic: Electrical systems and control
Context: An electrical circuit to suit a need for safely
Content: Structures, electricity and logic gates

Scenario

Either

Crime is a problem facing every community in South Africa. Criminals invade homes especially where women, children or the elderly are often vulnerable and defenceless. Armed response companies can be summoned to the scene by alarms triggered by panic buttons placed strategically in the house. You must find out about AND and OR logic gates and select the appropriate logic for wiring a panic button.

or

You need a stair light or passage light. You want to switch on the light on entering the passage/stair and switch it off at the end, and vice versa. You must find out about AND and OR logic gates and select the appropriate logic for wiring a pair of switches.

Discuss the mini-PAT with the learners. Discuss what the panic buttons are used for and talk about the passage light. Explain to learners that they will do only one of the tasks. Stronger learners might be able to complete both in the given time or they might want to take one home and try it at home.

Remember that learners must do the Mini-Pat in class as it is for assessment. It is not a project that they can take home. You need to see that they are able to do the task on their own.

They will learn about the different gates. They can set up a simple circuit with the AND gate and one with the OR gate. They will also learn how to make a truth table.

Week 6

Lesson 11

In the language of logic, a switch is said to be at logic state when it is pressed down or switched on. An open switch (or when the switch is off) is said to be at logic state 0. In other words, when a logic gate produces an output, the output is said to be at logic state 1, while no output means it is at logic state 0.

ACTIVITY 24 Examining the AND gate LB p. 122

Pair work

The learners will work with the circuits. They will discover how an AND gate works.

Possible answers

State of switch	Bulb lights up	Bulb remains off
Switch A and Switch B off		✓
Switch A on and Switch B off		✓
Switch B on and Switch A off		✓
Switch A and Switch B on	✓	

ACTIVITY 25 Examining the OR gate LB p. 123

Pair work

An example of OR logic is a house bell. The door bell rings if it is pressed at the front door or if it is pressed at the back door.

Learners follow these instructions:

- Work with the same partner. What happens when you press down switch A? What will happen if you press down switch B? What happens when both switches are pressed down?
- Copy the truth tables into your workbook and complete them by putting in the sate '0' or '1' in the output column. (Note that letter Z has been used to indicate output.)
- Extension – build this circuit. Replace the buzzer with a bulb.

Discuss as a class where you could use an AND gate and where you could use an OR gate.

Explain to the learners that the design brief is very important. It plans their ideas in sequence and helps them work and make in an organised way.

Remind them that they must draw the circuit diagram to go with their project! They must use the correct symbols. They can go back and check the tips on how to draw a neat circuit diagram.

Lesson 12

ACTIVITY 26 Truth tables LB p. 123

Work alone

The learners will copy the truth tables into their books. It is important that they understand how these tables work.

Once all the planning is done, ensure they move onto making their project.

Week 7

Lesson 13

ACTIVITY 27 **LB p. 124**

Work alone

Make sure the learners have all the tools they need for the Mini-PAT task. They must think about the specifications needed for their projects. Give learners the design brief.

ACTIVITY 28 **LB p. 124**

Work alone

The learners must list all the tools and materials that they will need to build their project. Often they will leave something out, but they can go back and write it in.

When the project is complete, learners will draw up their truth table for their device. They must check if it is an AND or OR gate.

Remedial tip:
Learners with reading disabilities will find this written part (design brief) of the design process difficult. It is important that either you or faster learners help those who are struggling. You could also have a special 'Technology dictionary' with words often used in your Technology class along with the tools and materials available.

Allow slower learners to write shorter sentences. You might have to give them extra time as well. You should tell them that they will not lose marks for poor spelling. Mark all the tools and materials with large letters for the learners to copy. Allow the learners to have their books in front of them to copy different words for circuits, etc.

ACTIVITY 29 **LB p. 124**

Work alone

The learners have to draw the circuit diagram for the project. Make sure they go back in the module to check on the different components and their symbols.

Lesson 14

ACTIVITY 30 **LB p. 124**

Work alone

The circuit must be drawn with at least two switches. The learners must decide where the switches must go and whether they will be using an OR or an AND gate.

ACTIVITY 31 LB p. 125

Work alone

Check that the learners draw their truth tables neatly. Learners must use their rulers.

ACTIVITY 32 LB p. 125

Work alone

Make sure the learners have all the materials ready before they start making their posters.

Test Assessment

Base line assessment:

1. Draw the symbols for the following components::

Component	Function	Draw the symbol
a cell	Supplies energy	
a bulb	Converts electrical energy to light energy	
a buzzer	Converts electrical energy into sound energy	
a push switch	Controls the flow of current in a circuit; the current flows only when the switch is pushed	
a bell	Converts electrical energy into sound energy	

2. Choose the correct answer: What happens to the voltage when the lamps are connected in series?
   a. they become brighter
   b. the voltage is shared
   c. they don't work
3. Choose the correct answer: What are switches used for in a circuit?
   a. to move up and down
   b. to turn the circuit off and on
   c. to give the components power
   d. to work as an insulator
4. Choose the correct answer: How do you connect a LED (light emitting diode) to a circuit?
   a. you connect the one leg only to the circuit
   b. you connect the negative leg to the positive path
   c. you connect both the legs of the LED to insulated wire
   d. you don't connect the legs of the LED to any insulated wire
5. Choose the correct answer: What is the flow of electricity measured in?
   a. it is measured in metres
   b. it is measured in amps
   c. it is measured in ohms
   d. it is measured in kilograms

Middle assessment

1. Describe how you would make your own battery from fruit or vegetables or salt water. Remember you must only choose one. Make sure you write down the experiment in detail. (8)
2. Write down the advantages and disadvantages of photovoltaic cells. (5)
3. Draw a circuit diagram of bulbs connected in series.
4. Draw a circuit diagram of bulbs connected in parallel.

5. Complete this table for an OR gate:

State of switch	Bulb lights up	Bulb remains off
Switch A and Switch B off		
Switch A on and Switch B off		
Switch B on and Switch A off		
Switch A and Switch B on		

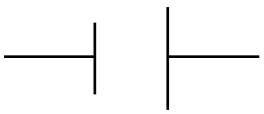
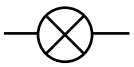
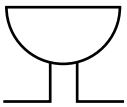
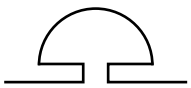
Complete this table for an AND gate:

State of switch	Bulb lights up	Bulb remains off
Switch A and Switch B off		
Switch A on and Switch B off		
Switch B on and Switch A off		
Switch A and Switch B on		

Assessment Test Memorandum

Base line assessment:

1.

Component	Function	Draw the symbol
a cell	supplies energy	
a bulb	converts electrical energy to light energy	
a buzzer	converts electrical energy into sound energy	
a push switch	controls the flow of current in a circuit; the current flows only when the switch is pushed	
a bell	converts electrical energy into sound energy.	

2. See Learner's Book
3. See Learner's Book
4. (b)
5. (b)

Middle assessment

1. Power from salt: See Learner's Book
   Power from potato: See Learner's Book
2. See LB
3. Circuit connected in series: See Learner's Book

4. Circuit connected in parallel: See Learner's Book
5. OR gate

State of switch	Bulb lights up	Bulb remains off
Switch A and Switch B off		
Switch A on and Switch B off		
Switch B on and Switch A off		
Switch A and Switch B on		

AND gate

State of switch	Bulb lights up	Bulb remains off
Switch A and Switch B off		
Switch A on and Switch B off		
Switch B on and Switch A off		
Switch A and Switch B on		

Section E: Photocopiable resources

This part of your Teacher's Guide is for storing all photocopiable templates, worksheets, and resources that are provided or that you may come across in your planning and research.

Checklist for self-assessment for the practical task

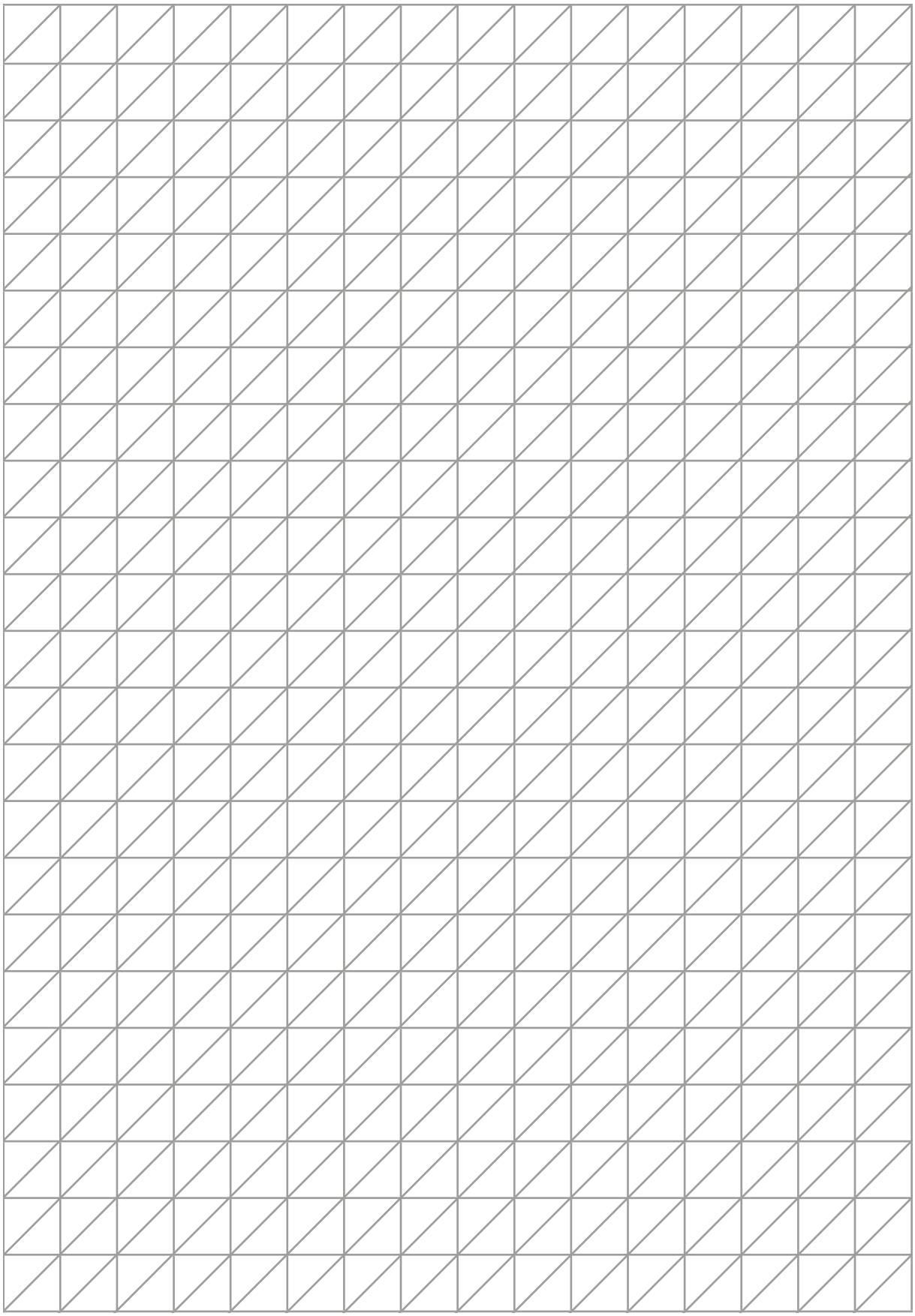
Name: _____

Checklist

(A copy should be given to each group so they know what they are being assessed on!)

DESIGN BRIEF:	YES	NO	COMMENTS
Problem is stated in simple sentences			
Solution is described simply			
The function of the product is described			
Type of crane			
Height of crane			
Type of crank or pulley system			
Type of switch for magnet			
The user is described			
The context is described			
SPECIFICATIONS:			
Specifications with regard to features			
Specifications with regard the electromagnet and crane			
Specifications with regard to attractiveness of design and use			
Specifications with regard to durability			
WORKING DRAWING:			
3-D oblique drawing techniques			
Drawn on squared paper (quadrant) using a pencil and ruler			
Appropriate scale			
Line types and dimensions			
Flow chart detailing the sequence of manufacture			
MAKING SKILLS:			
Used simple materials			
Model able to pivot or to raise and lower its arm			
Electromagnet with a switch			
A light on electromagnet to show if it is on			
Electromagnet made with correct materials			
EVALUATION SKILLS:			
Ability to evaluate a product or process			
Develop a rubric to evaluate the models of other teams			
Uses their rubric to evaluate			
Assessed objectively, fairly and made valid comments			
COMMUNICATION SKILLS:			
Strategy to present model and plans to class			
Ideas and roles by each member indicated			
Presented sketches, working drawing and function of model			
Demonstrate how well model works			
Explained principles of magnetic sorting			
Commented on value of recycling and explained sorting of metals			
Enhanced presentation with posters giving an artist's impression			
Poster of electromagnet in use			

Grid



Appendix 1

Guidelines on report writing

- It is impersonal (lacks emotion).
- It is based on facts.
- It is written in passive speech, e.g. 'Research has shown that biodegradable plastic bags cause less harm to the environment than non-biodegradable bags' instead of 'I have studied the effects of non-biodegradable plastic bags and have found that…'
- Avoid the use of personal pronouns, e.g. 'In conclusion **we** can say…'; rather use '…**one** can say that…'
- Use a short headline (e.g. The effectiveness of biodegradable shopping bags)
- Back up your statements with evidence or research.
- Include a short introduction and conclusion.
- Use words such as 'finally' and 'in conclusion' to indicate that you are at the end of your report.

Appendix 2

Rubric for the assessment of report writing

	0 marks	1 mark	2 marks	3 marks
Content: Learner's ability to evaluate effectiveness				
Learner's ability to select relevant facts to support evaluation				
Learner's ability to support facts by providing relevant evidence				
Writing skills – good use of grammar and appropriate use of paragraphs				
Presentation – Learner's ability to set out and present work in a neat and logical manner				
Total				

Key: 0 = information not included; 1 = very little evidence presented; 2 = main aspects included with minor omissions; 3 = all aspects included and presented in a clear logical manner

Appendix 3

Planning guidelines for the mass production of gift bags	
Group members	Delegation of tasks

Design brief: (Include what are you planning to make, for who, why.)

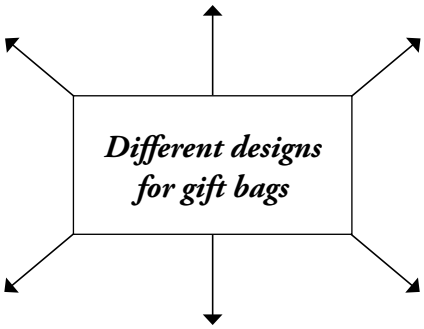
_____

_____

_____

_____

Possible designs for gift bags:



Best design:

_____

_____

_____

Reasons for our choice:

_____

_____

_____

Resources needed:

_____

_____

_____

Equipment needed:

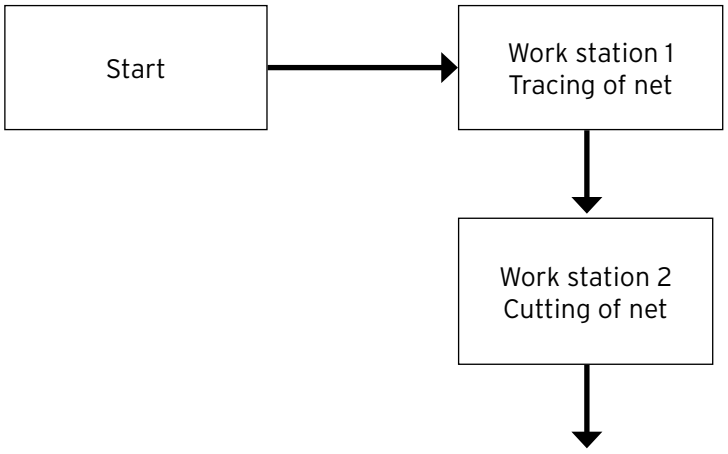
_____

_____

_____

Design specification sheet (Include a drawing of your product with labels and notes – include colour, material it will be made of, measurements, etc.)

Set up a mass-production line. (Indicate who is going to do what.) Continue with the example below or start your own.



Appendix 4 (Assessment Rubric)

Assessment rubric for the mass production of gift bags

Name of manufacturing company: _____

Production team:	**Production tasks:**
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

	Criteria	**Marks Allocated**		
	Aesthetic value	5-4	3-2	1-0
	Productivity			
	Durability			
	Suitable slogan/information on packaging			
	Construction of product/quality control			
	Total			

Key

Aesthetic Value

5–4 = Original and very attractive

$\frac{3}{2}$ = Attractive

1 = little attention paid to aesthetic value of product

Productivity

5–4 = Exceeds the number of bags needed to be produced in the allocated time [highest number produced]

$\frac{3}{2}$ = Meets the requirements (second highest number produced)

$\frac{1}{0}$ = very little work done in the allocated time

Durability

5–4 = strong/very good choice of material used

$\frac{3}{2}$ = suitable material but not very durable

$\frac{1}{0}$ = inappropriate choice of material

Slogan/information on packaging

5–4 = very good, relevant information included

$\frac{3}{2}$ = most information included – a few minor omissions

$\frac{1}{0}$ = little or no information included

Construction/Quality Control

5–4 = Very good attention to details (scoring and fold lines neatly done, all joins are secure)

$\frac{3}{2}$ = some attention to detail most joins, scoring and fold lines neatly done]

$\frac{1}{0}$ = construction is insecure and appears rushed

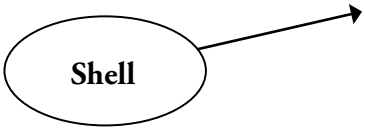
Appendix 5

Planning sheet – recycling container

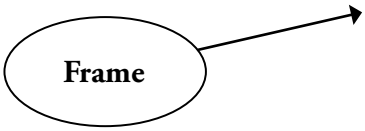
Planning activity **Date:** _____

Type of container:_____

Types of materials I could use



Frame could be made of …



Will the materials be able to withstand forces? How? Why?

_____

_____

_____

How will the material be attached to the frame or, if it is going to be a shell structure, what will the shell be made of?

_____

_____

Is the structure rigid?

_____

_____

What will I use/do to ensure that the structure is rigid?

_____

_____

Will the structure be aesthetically pleasing?

_____

_____

What will I do to ensure this?

_____

_____

Equipment needed:

- _____
- _____
- _____
- _____
- _____

Safety precautions:

_____

_____

_____

What will the cover be made of? How will it be attached?

_____

_____

Appendix 6

Individual planning activity

Planning activity **Date: _____**

Freehand sketches of two possible containers:

Idea 1	Idea 2

Preferred solution:

_____

_____

Give reasons for my choice

- _____
- _____
- _____

Resources and equipment needed to build my container:

- _____
- _____
- _____
- _____
- _____
- _____

Draw a flow diagram outlining the steps in the making process. Include an estimated time for each activity.

Use the isometric grid provided to draw your solution in 3-D.

Appendix 7

Assessment rubric – recycling container

Self/Peer assessment

Date: _____

Group members: _____ _____

_____ _____

_____ _____

	Criterion	Rating			
1	Aesthetic value	6-5	4-3	2-1	0
2	Ergonomics				
3	Stability				
4	Durability				
5	Additional effort				
	Total				

Key

6–5 = Exceeds requirements, all aspects complete, excellent aesthetic value, excellent implementation of ergonomic principles, excellent durability and reinforcing techniques,, a lot of additional work put in

4–3 = A good attempt – minor omissions with regard to details involved in completing tasks, good implementation of ergonomic principals, good stability and durability, some additional effort put in.

2–1= All tasks attempted, poor organisational skills – a rushed effort

0 = No effort made

Appendix 8

Assessment rubric – recycling container

Teacher assessment

Date: _____

Group members: _____ _____

_____ _____

_____ _____

	Criterion	Rating			
1	Aesthetic value	6–5	4–3	2–1	0
2	Ergonomics				
3	Stability				
4	Durability				
5	Additional effort				
6	Planning task: Details written work				
7	Planning task: Presentation				

Key

6–5 = Exceeds requirements
4–3 = A very good attempt – minor omissions
2–1 = Very poor organisational skills – a rushed effort
0 = No effort made

Formal Assessment Task

An example of a generic analytical rubric to assess design capability in a Mini-PAT

	Levels of competence				
	Exemplary	**Competent**	**Developing but not yet mastering**	**Progressing**	
	5	**4**	**3**	**2**	**1**
Generate and develop design ideas	Uses drawings reflectively to generate new ideas	Progression of ideas across or within drawings	Design ideas are generated but not developed	Simple sketch showing object to be made	Drawing a picture not designing a product
Explore the possibilities of the problem/need	Combining novel solutions to produce innovative design	Using drawings to develop novel design solution(s)	Recording possible creative solution(s) to the task	Stereotypical response, showing little creative thought	Design possibilities are not addressed in the drawing
Address the constraints of the problem/ need	Task constraints treated as part of iterative process	Task constraints considered as the design proceeds	Records way to address task and/or client needs and wants	Drawings show some understanding of task constraints	Minimal understanding of task/user needs
Plan the look of the product	Ideas about finishing developed within overall design	Ideas about finishing are added to design whilst drawing	Overall decoration scheme considered	Little consideration of final appearance of product	Appearance of product is not considered
Communicate design ideas	Clear enough for somebody else to make the product	Conveys sense of the object to be made, e.g. working diagram	Conveys some sense of the object to be made, e.g. indicates materials	Simple unlabelled sketch(es); relying on shared meanings	Use of narrative or other drawing genre
Plan construction	Constructional issues considered en route to final design	Drawing demonstrates consideration of construction	Drawing indicates some consideration of construction	Minimal consideration of construction whilst drawing	Not planning to make the object drawn
Evaluate while drawing	Changes made as a result of considering design drawings	Decisions made about products whilst drawing	Considered and rejected a range of ideas	Minimal evaluation at drawing phase	Yet to define the design task
Provide a basis for making	Using drawings as a resource during making	Clear development path through drawing into making	Object is one of the ideas drawn	Product relates to ideas recorded in the drawing	Making an object is seen as separate new activity
Comments to improve the learner's performance in design capability:					

Section F: Documents

This section is for you to file your copy of the Curriculum and Assessment Policy Statement (CAPS) for Technology in the Senior Phase.

You may add any other documents you receive in this section and list them below for easy reference.

_____

_____

_____

_____

_____

Grade 8

Study & Master

Technology

Study & Master Technology **has been specially developed by experienced educators to meet all the requirements of the Curriculum and Assessment Policy Statement (CAPS). This new and easy-to-use course not only helps learners master essential content and skills in the subject, but gives them the best possible foundation on which to develop and build their Technology knowledge and understanding.**

The comprehensive Learner's Book:

- **provides an overview of content, concepts and skills covered in each term**
- **supplies activities that develop learners' skills and understanding of each of the topics specified by CAPS**
- **includes investigations, and practical tasks, as well as Formal Assessment Tasks in the form of Mini-PATs for each term**
- **features 'Did you know?' boxes with interesting additional information and 'Safety tip' and hint boxes that provide guidance on how to do technology tasks safely and easily**
- **includes a glossary of key words to help with the understanding of new terms and concepts.**

The innovative Teacher's Guide includes:

- **an expanded contents page and a work schedule for the year**
- **guidance on the teaching of each lesson and on each form of assessment**
- **step-by-step support in the teaching of activities and the carrying out of practical tasks**
- **photocopiable record sheets and templates, as well as additional worksheets to support your teaching.**

Ria de Jager has a Masters Degree in Technology Education. She is Deputy Chief Education Specialist in Technology in KZN and Chairperson of the SA Technology Association. **Lin Bassett** has taught Technology at both government and private schools and presented various workshops at Technology conferences. **Barbara Munsami** is subject head (Technology) at Marist College and has facilitated workshops for both NGOs and DBE. **Lynn Pocock** has trained in Technology teaching methods, taught at a pilot school for Technology in 2005 and has been working in Special Needs and Remedial Schools for over a decade. **Neel Ramdutt** has an MEd in Educational Studies and Multimedia Design as well as a Certificate in Technology Education. He is is now Deputy Chief Education Specialist (Technical Subjects / Technology) at the KZN Head Office.

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