GRADE 10

Physical Sciences

Teacher Toolkit: CAPS Planner and Tracker

2019 TERM 1

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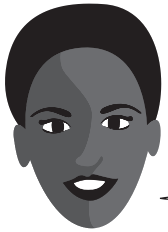
A. ABOUT THE PLANNER AND TRACKER

1. Your quick guide to using this planner and tracker

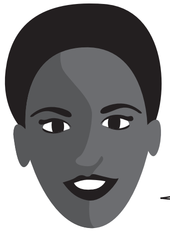


What is the NECT and where do I fit in?

What you do matters! What you do every day as a teacher can change the life-chances of every child that you teach. The NECT supports teachers by providing CAPS planners and trackers so that teachers can plan to cover the curriculum, track progress, and seek help when they are falling behind.

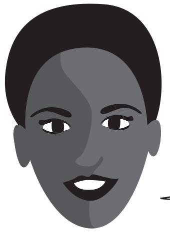
But who will help me?

The NECT will work with your school management team (SMT) and assist them to have supportive and professional conversations with you about curriculum coverage that will be orientated to identifying and solving problems.



I have looked at the planner and tracker. It goes too fast!

The CAPS planner and tracker is an expanded ATP. It helps you pace yourself as if you were able to cover everything in the ATP/CAPS. When you fall behind because time has been lost, or because the learners are progressing slowly, you need to confidently discuss this with your teaching team without feeling blamed. The pace of coverage will be determined by the pace of learning. That is why coverage must be tracked by the teacher and the SMT.



How do I use the planner and tracker?

See the "**Quick 5-step Guide to Using the CAPS Planners and Trackers**" on the opposite page.

QUICK 5-STEP GUIDE TO USING THE CAPS PLANNERS AND TRACKERS

1. Find the textbook that YOU are using.
2. Use the planning page each week to plan your teaching for the week. It will help you link the CAPS content and skills to relevant material in the textbook, the teacher's guide, and other materials such as the DBE workbook.
3. Keep a record of the date when you were able to complete the topic. It may be different from the date you planned, and for different classes. Write this date in the column on the right for your records.
4. At the end of the week, reflect and check if you are up to date. Make notes in the blank space.
5. Be ready to have a professional and supportive curriculum coverage conversation with your HoD (or subject or phase head).

The CAPS planners and trackers also provide guidelines for assessment with samples, and may also have enrichment and remedial suggestions. Read the introduction pages carefully for a full explanation.

2. Purpose of the tracker

The Curriculum and Assessment Planner and Tracker is a tool to support you in your role as a professional teacher. Its main purpose is to help you keep pace with the time requirements and the content coverage of the CAPS by providing the details of what should be taught each day of the term; and of when formal assessments should be done. Each of the sessions for Physical Sciences in Grade 10 is linked to the approved sets of Learner's Books and Teacher's Guides on the National Catalogue, as well as the *Everything Science* textbook (Siyavula) which has been distributed to schools by the Department of Basic Education as an additional resource. You can download it from www.everythingscience.co.za.

The tracker provides a programme of work that should be covered each day of the term and a space for reflection of work done for each of the LTSMs on the National Catalogue. By following the programme in the tracker for the Learner's Book you are using, you will cover the curriculum in the allocated time, and complete the formal assessment programme. By noting the date when each session is completed, you can assess whether or not you are on track. If you are not, strategise with your head of department (HOD) and colleagues to determine the best way in which to make up time to ensure that all the content prescribed for the term is completed. In addition, the tracker encourages you to reflect on what parts of your lessons were effective, and which parts of your lessons can be strengthened. These reflections can be shared with colleagues. In this way, the tracker encourages continuous improvement in practice.

This tracker should be kept and filed at the end of the term.

3. Links to the CAPS

The Grade 10 Physical Sciences tracker is based on the requirements prescribed by the Department of Basic Education's Curriculum and Assessment Policy Statement (CAPS) for Physical Sciences in the Further Education and Training (FET) band. The CAPS prescribes four hours per week for Physical Sciences. The work set out in the tracker for each day is linked directly to the topics and subtopics given in the CAPS, with the specified amount of time is allocated to each topic. It gives the page number in the CAPS document of the topics and subtopics being addressed in each session. This enables you to refer to the curriculum document directly should you wish to do so.

4. Links to approved LTSMs

There is a tracker for each set of Learner's Books and Teacher's Guides of the approved books on the National Catalogue. The tracker aligns the CAPS requirements with the content set out in the approved Learner's Books and Teacher's Guides. You must refer to the tracker for the book that is used by learners at your school. If you have copies of other Learner's Books, you can also refer to these trackers to give you ideas for teaching the same content in a different way. However, ensure that you cover the content systematically. For each set of LTSMs in the tracker, links are given to the relevant pages in both the Learner's Book and Teacher's Guide to make it easier for teachers to access the correct resources. Links to the *Everything Science* materials have been inserted in the trackers for all Learner's Books.

In addition, further suggestions for extension, enrichment, and/or homework exercises have been made. We recommend that you always have an extra activity available for those learners who complete their work earlier than others.

Each tracker is based on the latest print editions of the three approved LTSMs. Take note that page numbers may differ slightly from other print runs of the same Learner's Book. If the page numbers in your edition are not exactly the same as those given in the tracker, you should use the activity/exercise numbers given in the tracker to guide you to the correct pages. These should only differ by a page or two from those given in the tracker.

5. Managing time allocated in the tracker

The tracker provides a suggested plan for 32 hour sessions, organised into four 60-minute sessions per week. Depending on your school's timetable, you may use two of these sessions in one double period. You might also need to adjust the work prescribed for a session to meet other demands of your timetable. However, the content that needs to be covered in a week, should always be covered in a week. If for some reason you do not complete the work set for the week, you need to find a way to get back on track.

The breakdown of work to be done each week corresponds to the annual teaching plan and programme of assessment drawn up by the Department of Education; however the tracker gives a more detailed outline of what should be taught each day.

Please note: The tracker has been planned for a first term of 10 weeks. The curriculum is covered in the first 8 weeks, leaving Week 9 and Week 10 for you to complete any work you have not managed to cover in the first 8 weeks, review assignments and tests, do remediation work with your learners, and for learners to write the term test. If the year in which you are using it has a first term that is longer or shorter than 10 weeks, you will need to adjust the pace of work accordingly. It is important that you take note of this at the start of the year.

Homework has been allocated for most sessions. For learners to benefit from these activities, it is necessary to provide feedback on the homework. Do this at the beginning of the next lesson or at the end of a topic. Learners who do not complete their written work in time can complete the activity for homework. If some learners complete their work well ahead of schedule, consider providing them with enrichment activities. We have provided some examples of enrichment activities in this tracker. If some learners do not complete their written work in time, they can complete the enrichment activity for homework. If for any reason you miss a lesson, or find that you need to spend more time than planned on some aspect of the work, find a way to get back on track so that the curriculum for the term is covered as required.

6. Links to assessment

The tracker indicates where in the series of lessons the CAPS assessment activities/tasks/practical activities should be done. This varies slightly from Learner's Book to Learner's Book, but is always in line with the CAPS specifications. We suggest that you discuss testing times with your colleagues who teach other subjects. In this way you can avoid having learners write several tests on the same day in a single week.

For these informal assessment tasks, you may want to use a variety of assessment methods, including peer assessment, self assessment and spot marking.

7. Resource list

The tracker suggests resources that you could use for certain lessons. In addition, suggestions for alternative equipment and resources have been made. Learners need to **interact** with learning material as much as possible, therefore every attempt has been made to allow for such interaction.

8. Columns in the tracker

The following columns can be found in the tracker for each set of LTSMs:

1. Session number;
2. Relevant CAPS page number;
3. CAPS content, concepts and skills for the day;
4. Learners' Book page number;
5. Learner activity number;
6. Teachers' Guide page number;
7. **Everything Science** Learners' Book page number;
8. **Everything Science** Teachers' Book page number;
9. Date completed – this needs to be filled in each day and there are columns for each of the classes you teach.

9. Weekly reflection

The tracker provides a space to record reflections on a weekly basis. This weekly reflection provides you with a record for the next time you implement the same lesson, and also forms the basis for collegial conversations with your head of department (HOD) and colleagues. It should be shared both informally and at regular departmental meetings. Together with your HOD and colleagues, think of ways of improving your lessons and in turn your learners' work. If for some reason not all the work for the week has been covered, strategise with your HOD and colleagues as to how best to catch up so that the curriculum is covered.

You are encouraged to reflect on your lessons daily – thinking about what went well, or did not go so well in each, and how better to help learners grasp the content being taught. Briefly jot down your reflection by following the prompts in the tracker. When reflecting, you could think about things such as:

- Was my preparation for the lesson adequate? For example: Did I have all the necessary resources? Had I thought through the content so that I understood it fully and could teach it effectively?
- Did the purpose of the lesson succeed? For example: Did the learners reach a good understanding of the key concepts for the day? Could the learners use the language expected from them? Could the learners write what was expected from them?
- Did the learners cope with the work set for the day? For example: Did they finish the classwork? Was their classwork done to an adequate standard? Did I assign any homework?
- What can I do to support learners who did not manage the work, or to extend those who completed the work easily?
- What might I change next time I teach this same content? Will I try a different approach?

B. TERM PLANNING

Before considering weekly and daily plans which are set out in the tracker, think about the term as a whole.

1. Check the term focus

Take note of the focus for the term. The CAPS document provides clear details regarding the focus for Grade 10:

- **Term 1 – Matter and materials: The atom, kinetic molecular theory, the Periodic Table, chemical bonding (Chemistry)**
- **Waves, sound and light, electromagnetic radiation (Physics)**

Overview of Term 1 Topics

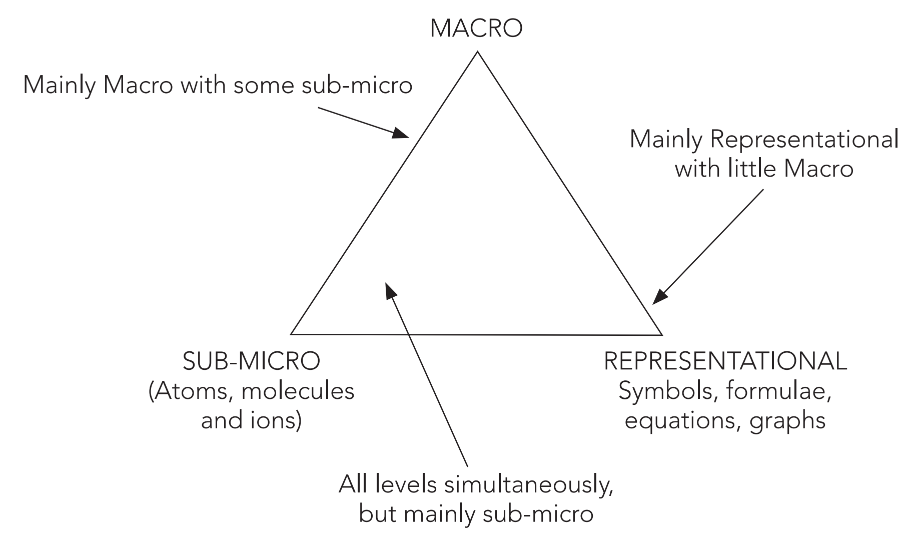
Matter and materials: The atom, kinetic molecular theory, the Periodic Table, chemical bonding

The Chemistry topics for Term 1 provide the foundation for chemistry in Grades 11 and 12 and for learners who will go on to study chemistry at tertiary level. The content builds on to concepts studied in Grade 9. Research shows that many learners struggle with more advanced chemistry because they do not have a clear understanding of the basics concepts. For this reason, we encourage a revision session before each section is handled. It is also helpful to administer a few diagnostic tests where time permits. In this way, you can become aware of learners' misunderstandings and remediate these.

One way of helping learners to make sense of the large number of concepts in chemistry is to use a model called Johnstone's Triangle. Johnstone1 observed that in many introductory chemistry lessons, learners are confronted with three different conceptual levels: they are introduced to materials and substances (macro level), a description of them in molecular or atomic terms (sub-micro level) and a representation of them by symbols and formulae (representational level) – all at the same time. Learners find it difficult to distinguish between these levels, which creates many misconceptions and a poor understanding of critical concepts. We suggest that you make explicit what area or viewpoint you are dealing with, helping learners to understand the links between the macro, sub-micro and representational levels.

It is also important that learners do not try to learn chemistry by rote. Although some important information has to be learnt, e.g. the symbols of the elements found in the Periodic Table, it is essential that learners build up a clear picture of what matter is and how the different terms used to describe matter – such as atom, element, molecule and compound – relate to each other. Since many of these concepts are not concrete because they are found at the sub-micro level, it is essential that you encourage learners to draw diagrams or build models to help them visualise abstract ideas. You should also encourage learners to verbalise and write down their ideas about this topic.

FIGURE 1: JOHNSTONE'S TRIANGLE



It is essential to revise the symbols used in chemistry that were introduced in earlier grades. Writing down the correct chemical formula of compounds is a skill that needs to be revised, discussed and practised often. Learners also need to become very familiar with extracting information from the Periodic Table.

Learners need to recognise that the type of chemical bond in a compound determines the physical and chemical properties of that compound. Through studying the structures of atoms, molecules and ions, and the bonding in elements and compounds, learners will acquire knowledge of important chemical principles. By learning the properties of metals, giant ionic substances, simple molecular substances and giant covalent substances, they should be able to appreciate the interrelation between bonding, structures and properties of substances. In this way, you are helping learners see the links between the macro and sub-micro views and show them how chemists represent these concepts in symbolic forms.

Waves, sound and light, electromagnetic radiation

The Physics topics for Term 1 also lay the foundation for more complex concepts in later years. Learners also get many opportunities to solve physics problems quantitatively. However, it is essential that you ensure that learners can understand and discuss physical phenomena as well as use formulae. It is also important that learners are able to understand the relationship between pulses and waves.

Physics is an intellectually demanding discipline and many students have difficulties learning to deal with it. Our instruction is often far less effective than we realise: recent investigations have revealed that many students, even when getting good marks, emerge from their basic physics courses with significant scientific misconceptions, prescientific notions, poor problem-solving skills, and with an inability to apply what they learned. Students' acquired physics knowledge is often nominal rather than functional.

Many people believe that physics is abstract and boring. There is a general view that while physics is intellectually challenging and worthwhile as a mental exercise, it has little relevance to our everyday lives. We need to change these notions of physics, and bring our learners to an understanding that much of what we do every day functions according to the laws of physics (walking is a trivial yet important example). Indeed, changing *attitudes* is very similar to changing erroneous *conceptual ideas*. Changing ideas and attitudes requires a radical change in outdated teaching methods.

Teachers know that there is a need to move away from the teacher-dominated lecture method of teaching. We also know that many positive steps have been made in this direction (although there are times when teacher talk is necessary). One way of breaking the tedium of the lecture is to intersperse it with short, relevant demonstrations or short learner activities.

Solving physics problems mathematically is a skill that must be learned and which requires practice. You should ensure that learners become able to solve problems with understanding and are not just copying solutions from each other or your solutions on the chalkboard or whiteboard.

Learners do not always make the connections that we think are obvious. They move from learning area to learning area in a day and physical science lessons may be 24 hours or more apart. There is no guarantee that on entering a physics class, they are thinking about physics! They need to be brought back to a previous discussion. When they are engaged in practical work, impress upon them that the activity is related to this or that concept. For example, they can be reminded that working with strings or springs is related to waves and that music is related to frequency, amplitude and wavelength.

(Some of the comments above are adapted from Frederic Reif's Millikan Lecture 1994.)

2. Prepare resources

This stage in your preparation is vital. The prescribed Learner's Books provide both information and activities. The Teachers' Books also provide valuable information as teaching guidelines. When you are planning, you need to be familiar with the information in the textbook your learners will be using. This will ensure that you do not need to either read from the textbook or ask your learners to copy down notes from the chalkboard or projector.

Teaching Physical Sciences should not be based on reading and discussing the textbook. Learners need activities, demonstrations, problem solving opportunities and active debates. This all takes careful planning and preparation of resources.

Resources can range from everyday objects like a marble or a ball, to more scientific apparatus like a ticker timer, or even digital resources like a short video clip or simulation. Whatever resource you select as the focus of the lesson, make sure you think carefully about the questions you will ask learners to think about and discuss. You may plan these discussions in pairs or small groups. Through observation, reflection and discussion you will engage learners in helping them construct their own knowledge. It is important to challenge this knowledge and at times disagree with them even if they are correct. You can also present a common misconception and encourage them to be critical of the proposed idea.

Problem solving and application of knowledge are very important in Physical Sciences. Your learners will need to practise exam-type questions; the textbooks all give worked examples. There are also end-of-chapter or unit questions, exam practice and additional worksheets. These have been referenced in the tracker for each book and are included as homework activities. However, in some cases the Learner's Book may not have enough questions and we have referred you to additional activities from the *Everything Science* textbook. If your learners don't have a copy, they can access these questions online from www.everythingscience.co.za. The Learner's Books can also be downloaded or print copies can be ordered from a supplier referred to on the same site. There is a huge database of questions that will be very useful for learners to work through both for remediation, revision and extension. Not all the activities are referenced in the tracker. If you identify that your learners are struggling in a particular section, select questions that are relevant to them.

A list of resources for the term appears below in case you want to collect these well in advance. Otherwise resources are listed per week.

Week 1: Labels on the containers of food or on medicine bottles, or the wrappers of chocolate and other confectionery; test tubes, glass beaker, filter paper and water-soluble ink pens; mixtures of sand and water, potassium dichromate and water, iodine and ethanol, iodine and water; water, tea, salt water, copper, brass, air, oxygen; copper, lead, aluminium, zinc, iron, sulphur, carbon, iodine, graphite and silicon; glass, wood, graphite, copper, zinc, aluminium and materials of your own choice; play dough or marbles; burner, glass beaker, ice water, and a thermometer.

Week 2: Play dough or marbles, Periodic Table with values of at least one decimal point, watch glass, burner, propette, methanol, bamboo sticks, metal salts including NaCl, $CuCl_2$, $CaCl_2$, KCl and metals such as copper powder, magnesium, zinc powder, iron powder, etc., paint colour samples from a hardware store, waste cardboard; polystyrene balls and wooden sticks.

Week 3: Paint colour samples from a hardware store, waste cardboard; polystyrene balls and wooden sticks.

Week 4: Polystyrene balls and wooden sticks.

Week 5: Slinky spring, rope; ripple tank apparatus.

Week 6: Slinky spring

Week 7: Vuvuzela, string, tuning fork, loudspeaker, drum-head; two 340ml drink cans, two nails, string or copper wire (not too thick); stop watch, toy pistol like the ones used in athletics; vuvuzelas of different sizes, flutes or tuning forks or vuvuzelas, microphone, oscilloscope, loudspeaker, cables; oscilloscope, function generator, loudspeaker, cables.

Week 8: Access to internet or other sources for information about electromagnetic radiation in medicine.

3. Plan for required assessment tasks

Most of the Learner's Books and/or Teacher's Guides provide examples of CAPS-compliant formal assessment tasks, including practical investigations, revision activities and a sample control test.

Where the LTSMs used at your school have the test in the Learner's Book, this test cannot be used because the learners will be able to prepare for it in advance, but it is useful for revision and informal assessment. An exemplar examination is provided in Section F *Printable Resources* of this tracker.

Table 1 gives an overview of the practical task/investigation and optional project in each of the LTSMs. This will help you in your preparation.

TABLE 1: FORMAL ASSESSMENT TASKS INCLUDED IN EACH SET OF APPROVED LTSMS FOR TERM 1

Name of book	Formal practical assessment	Control test
Study and Master Physical Sciences	**Week 2:** LB p. 54; TG D16–D18 *Investigate the heating and cooling curves of water*	**Week 9 or 10:** TG B11–B12 See resources in Section F
Platinum Physical Sciences	**Week 2:** LB pp. 14–15 TG pp. 9–10 *Investigate the heating and cooling curves of water*	**Week 9 or 10:** Test in exam practice book See resources in Section F
Successful Physical Sciences	**Week 2:** LB pp. 32–33 TG p. 39 *Investigate the heating and cooling curves of water*	**Week 9 or 10:** Exemplar test LB pp. 274–275 and on CD Memo in TG pp. 182–184 and on CD See resources in Section F

C. DAILY LESSON PLANNING AND PREPARATION

The tracker provides details of the content (in hour sessions) that you need to teach to your class. However, to deliver the lessons successfully, you must do the necessary preparation yourself. This entails a number of key steps that range from ensuring that you have a good understanding of the term focus through to checking the detailed preparation of resources needed for each lesson. Physical Sciences require a range of resource, from printed material to typical science apparatus, such as test tubes, or household items including food items.

1. Check your own knowledge of the content

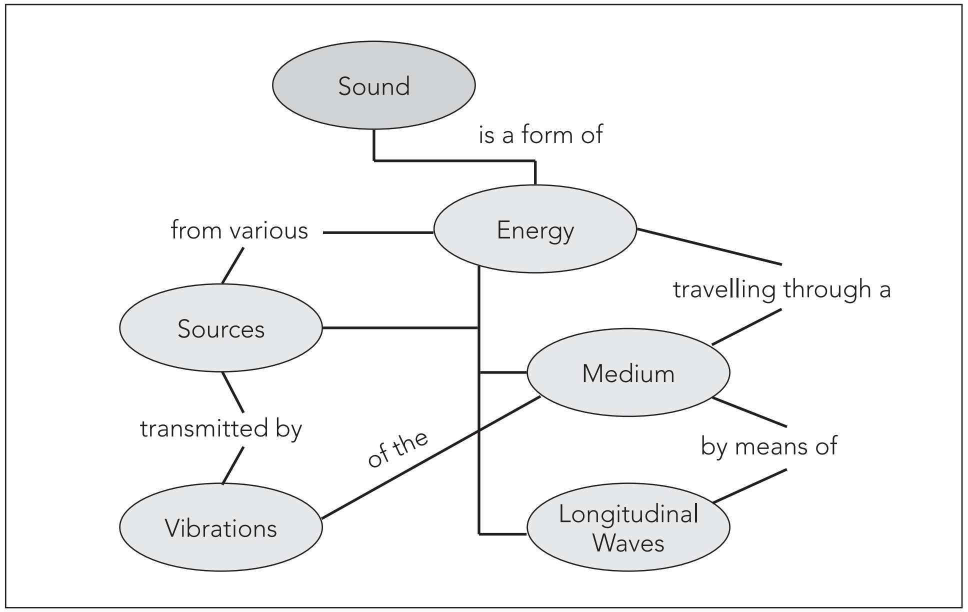
However well you know your work, it is easy to make small mistakes when in a classroom with learners asking questions. Always read through the content that you are going to cover to ensure that you are very familiar with the work. If possible, also do additional reading from other sources. Refer to Section E *Additional Information and Enrichment Activities* of this document where additional information about many of the topics for the term and some common errors – not always made explicit in the Learner's Books or Teacher's Guides – are addressed.

2. Prepare the conceptual framework for the lesson topic

When preparing the content to be taught think carefully about how the concepts are organised in a conceptual framework; how to help learners develop this framework for themselves; what possible questions learners might ask; and difficulties learners might have and how to address these.

One way of preparing the content is to summarise it using a tool like a concept map, as shown in Figure 2. A concept map is different from a mind map because we describe the links between the concepts to show the relationship between them. When you introduce a topic learners will benefit from seeing the big picture and a concept map is a useful way to present this. It is also a useful way of showing learners how the class is progressing. At the end of the topic encourage your learners to make their own summaries in words and/or pictures. In this way, they will interact with concepts, and this in turn will promote deep learning.

FIGURE 2: CONCEPT MAP OF SOUND



While prepare the conceptual framework, it is important to think about what prior knowledge learners should have and to have a clear idea of where and when they will need to draw on the concepts taught in the Grade 9 lessons. In your preparation, think carefully about the types of questions learners will ask. You may want to pre-empt some of these questions by asking open-ended questions to arouse learners' curiosity and to engage them in the process of learning. It is also a good idea to leave a question unanswered for a short time and let the lesson activities suggest a possible answer. If the question is still unanswered, then you should provide the necessary help. Doing this will provide good opportunities for you to correct any wrong ideas or misconceptions.

3. Baseline assessment and remediation of misconceptions

Baseline assessment should take place at the beginning of each new topic. This enables you to establish what learners already know and to pick up any possible misconceptions. Some of the most common misconceptions have been addressed in relation to the relevant CAPS content in Section E *Additional Information and Enrichment Activities* of this document. Baseline assessment can take many forms – such as a quick question and answer session; or a paper and pencil activity. Once a gap in understanding or a misconception has been identified (e.g. some people think that when you kick a ball, it continues to move forward because of the force of the kick), address these misconceptions before moving on to teaching the new work for the term. In this context the word remediation refers to overcoming the learners' wrong ideas.

4. Learner activities

Think about the tasks that learners need to complete in each lesson because it is important that they do something constructive. On rare occasions they may copy something from the chalkboard or another medium, but this should not be the sole focus of the lesson. Some examples of activities they can do in each lesson include, answering questions by writing the answers (the CAPS encourages writing); completing translation activities by converting a drawing to a description, or a table to a graph. You set the stage for the learner activities by giving explanations about different concepts, asking questions, setting problem-solving activities, or giving clear instructions about what learners need to do.

In Section E *Additional Information and Enrichment Activities* of this document you will find ideas for activities linked to several CAPS topics beyond the scope of those given in many of the LTSMs. Refer to this resource when preparing your lessons. In some instances, a more appropriate practical activity than the one in the Learner's Book has been included for your use.

Ensure that you have enough chalk or markers. Where instructions in the Learner's Book that you are using is not clear, use the chalkboard (or whatever media you use in your classroom) to draw or write instructions about what the learners need to do in order to complete the prescribed activity. Chalkboards are also useful for the writing down and explaining of new vocabulary.

Always allow time in your lessons to review learners' work and to give formative feedback on any assessment that has been done. Ensure that during peer or self-assessment you have a list of possible answers.

5. Informal assessment

In addition to specifying the number and nature of the formal assessment tasks, the CAPS suggests that there should also be ongoing informal assessment each term. Learners can do a variety of informal assessment tasks, both in class and for homework, and many of the Learner's Book activities are useful for this purpose. Informal assessment tasks do not have to be marked by the teacher. You can allow learners to mark their own or each other's work. You should consider taking in about five or six pieces of work from time to time to help you assess progress informally and to keep learners attentive. Also change your review techniques from time to time.

While learners do not always need marks for their work, they do need feedback. You need to know which concepts they understood and which one they did not. This will enable you to correct and support their learning. Record any marks that are awarded or key comments for your own interest.

6. Learners with special needs

People are not all the same. Learners will attend the Physical Science classes with different needs, styles of learning and also with a variety of alternative ideas about scientific phenomena. It is challenging for a teacher to accommodate all these differences, but it is important that you consider these differences during your preparation.

For different learning styles, the teacher can use a variety of teaching methods. These include whole class teaching, peer interaction, small-group learning, writing activities, drawing and mind-mapping activities, presentations, debates and role play. Wherever possible, encourage reading, writing and speaking skills.

There is a large amount of additional information to help you in the Teacher's Guides. The Learner's Books also provide additional suggestions. Additional to this, the DBE has published some excellent materials to support you in working with learners with learning barriers. Two such publications are:

- Directorate Inclusive Education, Department of Basic Education (2011) *Guidelines for responding to learner diversity in the classroom through curriculum and assessment policy statements*. Pretoria. www.education.gov.za, www.thutong.doe.gov.za/InclusiveEducation
- Directorate Inclusive Education, Department of Basic Education (2010) *Guidelines for inclusive teaching and learning. Education White Paper 6.*

Special needs education: Building an inclusive education and training system. Pretoria. www.education.gov.za, www.thutong.doe.gov.za/InclusiveEducation

7. Enrichment

In certain tasks, learners will work at different speeds. For those learners who complete their work earlier than others, refer to enrichment or extension activities in the Teacher's Guide, those suggested in Section E *Additional Information and Enrichment Activities* or provided in Section F *Printable Resources* of this document.

8. Homework

It is essential for Grade 10 learners to do homework every day. Examine the tracker and decide what sorts of tasks are appropriate for homework each week. Allow a few minutes at the end of the each lesson to provide homework instructions. Homework can be a useful consolidation exercise and need not take learners very long. If well planned in advance, learners can sometimes be given a longer homework exercise to be handed in within a week. This arrangement allows for flexibility.

If homework tasks are allocated, it is essential to allow a few minutes at the start of the following lesson to review the previous day's homework.

9. Practical work

Practical work must be integrated with theory to strengthen the concepts being taught. This may take the form of simple practical demonstrations or an experiment or practical investigation. Some of these practical activities will be done as part of formal assessment and others can be done as part of informal assessment. Learners are also required to complete one project on either Physics or Chemistry. This gives a total of three formal assessments in practical work in Physical Sciences. It is also recommended that learners do a minimum of four experiments for informal assessment (two Chemistry and two Physics experiments). This gives a total of seven assessments in practical work in Physical Sciences for the year. Learners need to understand and experience that practical work in science distinguishes this discipline from other knowledge areas.

In Term 1, learners are required to investigate the cooling and heating curves of water as the formal assessment for Chemistry. To prepare learners for this formal assessment it is important to give them opportunities to complete other Chemistry investigations.

For learners to achieve the most from their experience of practical work, you need to be extremely well prepared. Think carefully and plan how to accommodate all learners in doing practical activities. In most schools, there may be a limited amount of equipment. This means that you may need to give groups of learners the opportunity to complete the practical work after school hours. If equipment is limited, one solution is to set up different stations with different equipment. Learners rotate from one station to the next in order to complete a series of experiments.

Learners also need to be well prepared for any formal or informal practical work. In the trackers, you will see that learners are required to review the investigations for homework one the day before they are required to do the investigation. You could ask them to complete pre-practical questions.

Safety is critical whenever doing practical work. Please ensure you discuss safety rules with your learners regularly. Refer to the websites below that deal with laboratory safety:

- International chemical safety cards: www.inchem.org/pages/icsc.html
- Merck safety data sheets: www.merck-chemicals.com/msds-search/
- School chemistry laboratory safety guide: www.cdc.gov/niosh/docs/2007–107/pdfs/2007–107.pdf
- WCED laboratory safety guidelines: www.curriculum.wcape.school.za/site/52/pol/view/

To conduct a successful practical activity, the following procedures are suggested:

- Before the practical session, check that the materials are the correct ones so that no mistakes occur.
- Talk through the activity with learners or get them to read the descriptions from the Learner's Book before they come to a practical class.
- Stop from time to time to emphasise certain points. For example, **remember to use safety glasses and not to look directly at burning magnesium.**
- Let learners sometimes work in their chosen groups of friends and change the groups on other occasions.
- Keep a watchful eye on the activity and walk around looking at what learners are doing. This teaching strategy provides you with the opportunity to assess their skills of working with apparatus.
- Drawing the experimental set-up on the chalkboard or another medium helps learners to focus.

- Ensure that books and bags are safely stowed away from the practical work area.
- Enforce a strict rule of **no tasting**. There should be no eating of any kind in the laboratory or classroom where investigations are conducted.
- Ensure that work areas are clean both before and after the practical activity.
- Encourage learners to wear plastic aprons and safety glasses and insist on closed shoes wherever possible.
- Insist on the correct labelling of all tubes and bottles.
- Set a good example by following correct procedures at all times.
- Insist that learners tidy their workplaces when they have finished.
- Have a supply of tap water at hand in case of accidental acid spills. Do not attempt to neutralise acids and bases on a learner or yourself. Simply wash with plenty of water.
- Have a fire extinguisher handy and know how to use it.
- Keep a supply of gauze and plasters in a simple first aid box. A plastic container works well.

D. TRACKERS FOR EACH SET OF APPROVED LTSMs

This section maps out how you should use your Physical Sciences Learner's Book and Teacher's Guide in a way that enables you to cover the curriculum sequentially and in a well-paced manner, aligning with the CAPS for meaningful teaching.

The following components are provided in the columns of the tracker:

1. Lesson number
2. CAPS concepts, practical activities, assessment tasks and page reference number
3. Learner's Book page number
4. Learner's Book activity/task
5. Teacher's Guide page number
6. *Everything Science* Learners' Book page number
7. **Everything Science** Teachers' Book page number
8. Completion date

In addition, a list of resources for each session and enrichment ideas are provided.

Weekly reflection

The tracker provides space for you to jot down both successes and ideas for a different approach in future years. This reflection should be based on the daily sessions you have taught during the week.

Share your ideas with colleagues and with your HOD. Discuss aspects that went well and aspects that did not go as well as you expected.

- Did the learners grasp the main concepts of the lesson?
- Was my content preparation adequate?
- Did I have all the correct resources in sufficient numbers?
- Did the learners interact with the learning material provided?
- Did learners ask and answer questions relating to the concept?
- Did the learners finish their work in time?
- Was there enough work to keep learners busy for the allocated time?
- What quality of homework did learners produce?

Put your thoughts in writing by briefly jotting down your reflections each week but **think** about your lessons daily.

The prompts for reflection in the tracker are as follows:

- *What went well?*
- *What did not go well?*
- *What did the learners find difficult or easy to understand or do?*
- *What will you do to support or extend learners?*
- *What will you change next time? Why?*
- *Did you complete all the work set for the week?*
- *If not, how will you get back on track?*

The reflection should be based on the daily lessons you have taught each week. It will provide you with a record for the next time you implement the same lesson, and also forms the basis for collegial conversations with your HOD and peers.

Explanation of abbreviations and symbols used in the trackers

A	Answer
Act.	Activity
CA	Class activity
Demo.	Demonstration
ES	*Everything Science*

Ex.	Exercise
Exp.	Experiment
HOD	Head of Department
IA	Informal assessment
Inv.	Investigation
LB	Learner's Book
No.	Number
p.	Page
PA	Practical activity
PT	Periodic table
pp.	Pages
Q	Question
S #	Hour session
TG	Teacher's Guide
WS	Worksheet
#	Examined in Grade 12
TYS	Test Yourself

Please note

There is a lot of work prescribed for this term in Grade 10. You will find that the tracker refers to more practical activities and homework exercises than can be completed in a given time. **Select** the practical activities and homework exercises that are most appropriate for your learners. **Refer** frequently to the CAPS document in order to check that you have met all the requirements. The tracker does not copy everything in the CAPS document.

Endote

1 Johnstone A.H., (1982), Macro and microchemistry, School Science Review, 64, 377–379.

Study and Master Physical Sciences (Cambridge University Press)

Study and Master Physical Sciences

Week 1: Matter and classification of matter

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	Revise: Matter and classification (from Grade 9) Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity	15–20										
1	The material(s) of which an object is composed Mixtures: heterogeneous and homogeneous; pure substances: elements and compounds; names and formulae of substances **Classify** a range of materials	15–17	27–42	Act. 2, 3 p. 31 Act. 5 p. 34	D9–D11	22–40 Act. p. 23 Act. p. 24	57–59					
	Resources: Labels on the containers of food or on medicine bottles, or the wrappers of chocolate and other confectionery **Resources:** Mixtures of sand and water, potassium dichromate and water, iodine and ethanol, iodine and water **Resources:** Water, tea, salt water, copper, brass, air, oxygen											
	Homework: Act. 1 p. 28; Act. 4 p. 33; Act. 6 p. 36; Act. 7, 8 p. 42; ES Ex. 2–3 p. 39	15–17	43–47		D9–D12		57–59					
	Resources: Test tubes, glass beaker, filter paper and water-soluble ink pens											
2	Metals, metalloids and non-metals; electrical conductors, semi-conductors and insulators; thermal conductors and insulators; magnetic and nonmagnetic materials	17–19		Act. 9 p. 44 Act. 10 p. 45 Act. 12 p. 46 Act. 13 p. 47	D12–D15	40–52 Act. p. 42 Exp. p. 43 Exp. p. 45 Inv. p. 48	59					
	Resources: Copper, lead, aluminium, zinc, iron, sulphur, carbon, iodine, graphite and silicon											
	Homework: Act. 11 p. 45; ES pp. 51–52	17–19					60–63					
	States of matter and the kinetic molecular theory The kinetic molecular theory and intermolecular forces are the basis for solid, liquid, gas and solution phenomena											

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.	Date completed				
3	Three states of matter	19	48–51			Exp. p. 55						
	Homework: Act. 1 p. 51				D15							
4	Kinetic molecular theory: **Formal practical assessment**	19–20	51–55	Act. 3 p. 54	D16–D8	Act. p. 58						
	Resources: Burner, glass beaker, ice water, and a thermometer											
	Homework: Act. 2 p. 53; ES pp. 59–60				D16		64–66					

Reflection	
Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Study and Master Physical Sciences

Week 2: Atomic structure

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.	Date completed				
	The atom: Basic building block of all matter (atomic structure) All matter is made up of atoms	20										
1	Models of the atom: atomic mass and diameter; give a rough estimate of the mass and diameter of an atom; show that the atom is mainly an empty space with the nucleus occupying a very small space in any atom; describe and use the concept of relative atomic mass	20–21	56–59	Act. 1, p58	D18	Project p. 61 62–68						
	Homework: Finish Act. 1 p. 58; ES Ex. 4.1 p. 65				D18–D19		67					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
2	Structure of the atom: protons, neutrons, electrons Isotopes; explain the term isotope; calculate the relative atomic mass of naturally occurring elements from the percentage of each isotope in a sample of the naturally occurring element and the relative atomic mass of each of the isotopes	21	60–62	Act. 3 pp. 62–3	D20	68–76	67					
	Resources: Play dough or marbles											
	Homework: Act. 2 p. 61; Ex. 4.2 p. 72; Ex. 4.3 pp. 75–76			Act. 4 p. 67	D20		67–70 70–74					
3	Electron configuration; describe atomic orbitals and the shapes of s-orbitals and p-orbitals	22	63–67		D20–D21	77–84						
	Homework: ES Ex. 4.4 p. 85						74					
4	Electron configuration; state Hund's rule and Pauli's Exclusion Principle	22		Act. 5 p. 68	D21	85–92 Ex. 4.4 p. 85						
	Homework: ES Ex. 4.5 p. 87, Ex. pp. 90–92						74–78 78–84					
Recommended experiment for informal assessment: Do flame tests to identify some metal cations and metals **Resources:** Watch glass, burner, propette, methanol, bamboo sticks, metal salts to be tested including NaCl, $CuCl_2$, $CaCl_2$, KCl, and metals to test: copper powder, magnesium, zinc powder, iron powder, etc.												

Reflection	
Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Study and Master Physical Sciences

Week 3: The Periodic Table

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.	Date completed				
	Periodic Table The Periodic Table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure	22										
1	The position of the elements in the periodic table related to their electronic arrangements; understand that elements in the Periodic Table are arranged in order of ascending atomic number	22–24	69–82	Act. 1 p. 73	D22	93–95						
	Resources: Periodic Table with values of at least one decimal point for the entire week and beyond											
	Homework: ES Ex. 1–3 p. 101						90–91`					
2	The position of the elements in the periodic table are related to their electronic arrangements; use the Periodic Table to make a science puzzle to clarify and strengthen concepts	22–23	69–82	Act. 2 p. 81	D23	96–97						
	Resources: Paint colour samples from a hardware store											
	Homework: ES Ex. 5.1 pp. 96–97; Ex. 4 p. 102						88 91–93					
3	Similarities in chemical properties among elements in Groups 1, 2, 17 and 18; relate the electronic arrangements to the chemical properties of group 1, 2, 17 and 18 elements	23	82–88	Act. 3 p. 83	D23–D24	97–99	87–90					
	Homework: ES Ex. 5.5 p. 102						93–94					
4	Similarities in chemical properties among elements in Groups 1, 2, 17 and 18; predict chemical properties of unfamiliar elements in groups 1, 2, 17 and 18 of the Periodic Table	23–24	82–88	Act. 4 p. 88	D24	99–100 Ex. 5.2 p. 99	93					
	Homework: ES Act. p. 100											

Reflection	
Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Study and Master Physical Sciences

Week 4: Chemical bonding

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	Chemical bonding Interactions between matter generates substances with new physical and chemical properties	25										
1	**Covalent bonding:** Draw Lewis dot diagrams of elements; sharing of electrons in the formation of covalent bond single, double and triple bonds; describe and draw the formation of a covalent bond	25	89–92	Act. 1 p. 92	D25	103–111 Ex. 6.1 p. 105	95–97					
	Resources: Polystyrene balls and wooden sticks											
	Homework: ES Ex. 6.2 pp. 110–111						97–99					
2	**Ionic bonding:** Transfer of electrons in the formation of ionic bonding, cations and anions; electron diagrams of simple ionic compounds; describe the structure of an ionic crystal	25	93–95	Act. 2 p. 95	D25	111–114	97–99					
	Homework: ES Ex. 6.3 p. 114						99–100					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
3	**Metallic bonding:** Sharing a delocalized electron cloud among positive nuclei in the metal; Describe the simple model of metallic bonding	25	95–97	Act. 4 p. 97	D26	114–119 Ex. 6.5 p. 118	103–104					
	Homework: Act. 3 p. 94; ES Ex. 6.4 p. 116				D26		101–103					
4	Covalent bonding, ionic bonding and metallic bonding	25	98–100		D26–D28							
	Homework: ES Ex. pp. 120–121						104–107					

Reflection	
Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Study and Master Physical Sciences

Week 5: Waves, sound and light

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.	Date completed				
	Transverse pulses on a string or spring	26										
1	Pulse, amplitude: Observing the motion of a single pulse travelling along a long, soft spring or a heavy rope	26	101–103		D29–D30	122–125 Inv. p. 124	108–109					
	Resources: Slinky spring, rope											
2	Pulse, amplitude: Define amplitude as maximum disturbance of a particle from rest position; know that for a transverse pulse the particles of the medium move at right angles to the direction of propagation of the pulse	26	101–103		D29–D30	125–127 Ex. 7.1 p. 127	108–109					
3	Superposition of pulses: Explain (using diagrams) how two pulses that reach the same point in the same medium superpose constructively and destructively and then continue in the original direction of motion	26	103–105	Act. 1 p. 104	D30	127–130 Exp. p. 131						
	Homework: ES Ex. 7.2 pp. 131–133						109–121					
4	Superposition of pulses **Recommended experiment for informal assessment:** Using a ripple tank to demonstrate constructive and destructive interference of two pulses	26	103–105	Act. 2 p. 105	D30–D31							
	Resources: Ripple tank apparatus											
	Homework: ES Ex. 1–4 p. 134						121–123					

Reflection

Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?

What will you change next time? Why?

HOD: **Date:**

Study and Master Physical Sciences

Week 6: Waves

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	Transverse waves	27										
1	Wavelength, frequency, amplitude, period, wave speed: Generate a transverse wave in a spring; identify the wavelength, amplitude, crests, troughs, points in phase and points out of phase on a drawing of a transverse wave	27	106–109	Ex. 1, 2 109		135–144						
	Resources: Slinky spring											
	Homework: ES Act. p. 136											
2	Wavelength, frequency, amplitude, period, wave speed: Know the relationship between frequency and period, f = 1/T and T = 1/f; define wave speed as the product of the frequency and wavelength of a wave; use the speed equation to solve problems involving waves	27	110–113	Act. 3 p. 112 Act. 4 p. 112	D33 D34	144–152 Ex. 8.1	124–132					
	Homework: Act. 1 p. 110; Act. 2 p. 110–111; ES Ex. 1, 2 p. 151				D32		132–133					
	Longitudinal waves	27–28										
3	On a spring: Generate a longitudinal wave in a spring; draw a diagram to represent a longitudinal wave in a spring, showing the direction of motion of the wave relative to the direction in which the particles move; making a string (or wire) telephone	27–28	114–115	Act. 2 p. 118	D36	153–156 Act. p. 154						
	Resources: Slinky spring											
	Homework: Ex. 1, 2						134–135					
4	Wavelength, frequency, amplitude, period, wave speed	27–28	115–116	Act. 3 p. 119	D36	156–161 Ex. 1–4 pp. 160–161						
	Homework: Act. 1 p. 117				D35							

Reflection	
Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Study and Master Physical Sciences

Week 7: Sound

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	Sound	28–29										
1	Sound waves: Sound waves are created by vibrations in a medium in the direction of propagation; the vibrations cause a regular variation in pressure in the medium; describe a sound wave as a longitudinal wave	28–29	120–122			162–167 Exp. p. 164	136					
	Resources: Two 340ml drink cans, two nails, string or copper wire (not too thick)											
	Homework: ES Act. p. 163											

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
2	Sound wave: Pitch, loudness, quality; how to make sound using a vuvuzela, string, tuning fork, loudspeaker, drum-head	28–29	121–123	Act. 1 Case study p. 123	D37	167–171 Act. p. 170						
	Resources: Vuvuzela, string, tuning fork, loudspeaker, drum-head											
	Homework: Read p. 122; ES Ex. 10.1						136–137					
3	Pitch, loudness, quality; relate the pitch of a sound to the frequency of a sound wave; relate the loudness of a sound to both the amplitude of a sound wave and the sensitivity of the human ear	28–29	124–125	Act. 2 Case study p. 125	D37	168–171						
	Homework: Read Case study p. 125–126											
4	Ultrasound: Describe sound with frequencies higher than 20 kHz as ultrasound, up to about 100 kHz; when a wave encounters a boundary between two media, part of the wave is reflected, part is absorbed and part is transmitted; describe some of the medical benefits of ultrasound	28–29	127–128	Act. 3 p. 128	D37–38	173–175						
	Homework: ES Ex. 1–25 p. 177–181						137–145					

Reflection	
Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Study and Master Physical Sciences

Week 8: Electromagnetic radiation

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	Electromagnetic radiation (EM)	29–31										
1	Dual (particle/wave) nature of EM radiation: Explain that some aspects of the behaviour of EM radiation can best be explained using a wave model and some aspects can best be explained using a particle model	29	129		D38	182–186 192–193						
2	Nature of EM radiation: Describe the source of electromagnetic waves as an accelerating charge; explain how an EM wave propagates; state that mutually regenerating fields travel through space at a constant speed of 3 x 10^8 m/s, or **c**	30	130–132		D38	188–191						
3	EM spectrum		132–140	Act. 1 p. 138	D38–D39	186–188						
	Homework: Act. 2 p. 140; ES Ex. 11.1 p. 187				D39		146–147					
4	Nature of EM as particle: Energy of a photon related to frequency and wavelength; indicate the penetrating ability of the different kinds of EM radiation and relate it to energy of the radiation	30	140	Act. 3 p. 140	D39–D40	188–191						
	Homework: Act. 4 p. 141; ES Ex. 11.2 p. 191				D40		147					

Reflection

Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Study and Master Physical Sciences

Week 9: Completion of work, revision and assessment: Plan your week

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
1	**Waves, legends and folklore; IKS** Detection of waves associated with natural disasters; Discuss qualitatively animal behaviour related to natural disasters across at most two different cultural groups and within current scientific studies	31	131–132			Act. p. 196						
	Homework: ES Ex. 11.3; Ex. pp. 197–198						147–148 148–151					
2	**Revision:** Waves, sound, light		142	Summative assessment task Module 2	D40–D41							
3												
4												

Reflection	
Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Study and Master Physical Sciences

Week 10: Revision and assessment: Plan your week

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
1												
2												
3												
4												

End-of-term reflection

Think about and make a note of:

1. Was the learners' performance during the term what you had expected and hoped for? Which learners need particular support with science in the next term? What strategy can you put in place for them to catch up with the class? Which learners would benefit from extension activities? How can you help them?
2. With which specific topics did the learners struggle the most? How can you adjust your teaching to improve their understanding of this section of the curriculum in the future?
3. What ONE change should you make to your teaching practice to help you teach more effectively next term?
4. Did you cover all the content as prescribed by CAPS for the term? If not, what are the implications for your work on these topics in future? What plan will you make to get back on track?

HOD:

Date:

Platinum Physical Sciences (Maskew Miller Longman)

Platinum Physical Sciences

Week 1: Matter and classification of matter

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	Revise: Matter and classification (from grade 9) Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity	15–20										
1	The material(s) of which an object is composed Mixtures: heterogeneous and homogeneous; pure substances: elements and compounds; names and formulae of substances **Classify** a range of materials	15–17	1–8	Act. 5 p. 4 Act. 5 p. 6 Act. 6 p. 7 Act. 7 p. 8	4–5	22–40 Act. p. 23 Act. p. 24	57–59					
	Resources: Labels on the containers of food or on medicine bottles, or the wrappers of chocolate and other confectionery **Resources:** Water, tea, salt water, copper, brass, air, oxygen **Resources:** Test tubes, glass beaker, filter paper and water soluble ink pens											
	Homework: Act. 1 p. 2; Act. 2 p. 3; Act. 3 p. 4; ES p. 39 Ex. 2–3	15–17	1–8		2–3		59					
2	Metals, metalloids and non-metals; electrical conductors, semi-conductors and insulators; thermal conductors and insulators; magnetic and nonmagnetic materials	17–19	9–11	Act. 10 p. 11	7	40–52 Act. p. 42 Exp. p. 43 Exp. p. 45 Inv. p. 48	60–63					
	Resources: Copper, lead, aluminium, zinc, iron, sulphur, carbon, iodine, graphite and silicon											
	Homework: Act. 8 p. 9; Act. 9 p. 10; ES pp. 51–52	17–19			6–7		64–66					
	States of matter and the kinetic molecular theory The kinetic molecular theory and intermolecular forces are the basis for solid, liquid, gas and solution phenomena	19										
3	Three states of matter	19	14	Act. 1, 2 p. 14	8–9	Exp. p. 55						
	Resources: Burner, glass beaker, ice water and a thermometer											
4	Kinetic molecular theory: **Formal practical investigation**	19–20	14–15	15–16	9–10	Act. p. 58						
	Homework: ES pp. 59–60						64–66					

Reflection	
Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Platinum Physical Sciences

Week 2: Atomic structure

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	The atom: Basic building block of all matter (atomic structure) All matter is made up of atoms	20–22										
1	Models of the atom; atomic mass and diameter; give a rough estimate of the mass and diameter of an atom; show that the atom is mainly an empty space with the nucleus occupying a very small space in any atom; describe and use the concept of relative atomic mass	20–21	17–23	Act. 1 p. 21 Act. 2 p. 23	11–12	62–68 Project p. 61						
	Homework: ES Ex. 4.1 p. 65						67					
2	Structure of the atom: protons, neutrons, electrons Isotopes; explain the term isotope; calculate the relative atomic mass of naturally occurring elements from the percentage of each isotope in a sample of the naturally occurring element and the relative atomic mass of each of the isotopes	21	23–27	Act. 4 p. 24 Act. 5 p. 25 Act. 6 p. 26	13–15	68–76	67					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	Resources: Play dough or marbles											
	Homework: Act. 7 pp. 26–27				15		67–70 70–74					
3	Electron configuration; describe atomic orbitals and the shapes of s-orbitals and p-orbitals	22	27–30	Exp. 1 p. 28 Act. 8 p. 30	15–16	77–84						
	Homework: ES Ex. 4.4 p. 85						74					
4	Electron configuration; state Hund's rule and Pauli's Exclusion Principle	22	31–34	Act. 9 p. 31 Act. 10, 11 p. 34	16–17	85–92 Ex. 4.4 p. 85						
	Homework: ES Ex. 4.5 p. 87, Ex. pp. 90–92						74–78 78–84					

Reflection	
Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Platinum Physical Sciences

Week 3: The Periodic Table

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	Periodic Table The Periodic Table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure	22–24										
1	The position of the elements in the Periodic Table related to their electronic arrangements; understand that elements in the Periodic Table are arranged in order of ascending atomic number	22–24	35–40	Act. 1 p. 36 Act. 2 p. 40	18–19	93–95						
	Resources: Periodic Table with values of at least one decimal point for the entire week and beyond											
	Homework: ES Ex. 1–3 p. 101						90–91`					
2	The position of the elements in the Periodic Table related to their electronic arrangements; use the Periodic Table to make a science puzzle to clarify and strengthen concepts	22–24	40–43	Act. 3 p. 43 Act. 4 p. 43	19–20	96–97						
	Resources: Paint colour samples from a hardware store											
	Homework: ES Ex. 5.1 pp. 96–97; Ex. 4 p. 102						88 91–93					
3	Similarities in chemical properties among elements in Groups 1, 2, 17 and 18	22–24	44–45		20	97–99	87–90					
	Homework: ES EX. 5 p. 101						93–94					
4	Similarities in chemical properties among elements in Groups 1, 2, 17 and 18	22–24	44–45	Act. 5 p. 45	20	99–100 Ex. 5.2 p. 99	93					
	Homework: ES Act. p. 100											

Reflection	
Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Platinum Physical Sciences

Week 4: Chemical bonding

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	Chemical bonding Interactions between matter generates substances with new physical and chemical properties	25										
1	**Covalent bonding:** Draw Lewis dot diagrams of elements; sharing of electrons in the formation of covalent bond single, double and triple bonds; describe and draw the formation of a covalent bond	25	46–48	Act. 1 p. 46 Act. 2 p. 48	21–22	103–111 Ex. 6.1 p. 105	95–97					
	Resources: Polystyrene balls and wooden sticks											
	Homework: ES Ex. 6.2 pp. 110–111						97–99					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
2	**Ionic bonding:** Transfer of electrons in the formation of ionic bonding, cations and anions; electron diagrams of simple ionic compounds; describe the structure of an ionic crystal	25	48–50	Act. 3 p. 50	22	111–114	97–99					
	Homework: ES Ex. 6.3 p. 114						99–100					
3	**Metallic bonding**: Sharing a delocalized electron cloud among positive nuclei in the metal; describe the simple model of metallic bonding	25	50	Act. 4 p. 50	22	114–119 Ex. 6.5 p. 118	103–104					
	Homework: ES Ex. 6.4 p. 116						101–103					
4	Covalent bonding, ionic bonding and metallic bonding	25		Revision pp. 51–53	23–29	103–121						
	Homework: ES Exercises pp. 120–121						104–107					

Reflection

Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Platinum Physical Sciences

Week 5: Waves, sound and light

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	Transverse pulses on a string or spring	26										
1	Pulse, amplitude: Observing the motion of a single pulse travelling along a long, soft spring or a heavy rope	26	58	Exp. 1 p. 58	30–31	122–125 Inv. p. 124	108–109					
	Resources: Slinky spring, rope											
2	**Pulse, amplitude:** Define amplitude as maximum disturbance of a particle from rest position; know that for a transverse pulse the particles of the medium move at right angles to the direction of propagation of the pulse	26	59	Exp. 2 p. 59	31	125–127 Ex. 7.1 p. 127	108–109					
3	**Superposition of pulses**: Explain (using diagrams) how two pulses that reach the same point in the same medium superpose constructively and destructively and then continue in the original direction of motion	26	60–62	Exp. 3 pp. 60–61 Act. 1 p. 62	32	127–130 Exp. p. 131						
	Homework: ES Ex. 7.2 pp. 131–133						109–121					
4	**Superposition of pulses:** Using a ripple tank to demonstrate constructive and destructive interference of two pulses **Recommended experiment for informal assessment**	26	62–63	Act. 2 p. 62 Exp. 4 p. 62 Demo. 1 p. 63	34–35	127–130						
	Resources: Ripple tank apparatus											
	Homework: ES Ex. 1–4 p. 134						121–123					

Reflection	
Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Platinum Physical Sciences

Week 6: Waves

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.	Date completed				
	Transverse waves	27										
1	Wavelength, frequency, amplitude, period, wave speed: Identify the wavelength, amplitude, crests, troughs, points in phase and points out of phase on a drawing of a transverse wave	27	64–65	Exp. 1 p. 64 Act. 1 p. 65	36–37	135–144						
	Homework: ES Act. p. 136											
2	Wavelength, frequency, amplitude, period, wave speed: Know the relationship between frequency and period, $f = 1/T$ and $T = 1/f$; define wave speed as the product of the frequency and wavelength of a wave; use the speed equation to solve problems involving waves	27	66–67	Act. 2 p. 67	37	144–152 Ex. 8.1	124–132					
	Homework: ES Ex. 1, 2 p. 151						132–133					
	Longitudinal waves	27										
3	On a spring: Generate a longitudinal wave in a spring; draw a diagram to represent a longitudinal wave in a spring, showing the direction of motion of the wave relative to the direction in which the particles move; making a string (or wire) telephone	27–28	68–73	Exp. 1 pp. 68–69 Exp. 2 pp. 69–70 Exp. 3 p. 74	38–41	153–156 Act. p. 154						
	Homework: ES Ex. 1, 2						134–135					
4	Wavelength, frequency, amplitude, period, wave speed	27–28	73–77	Exp. 4 p. 75 Act. 2 p. 76	41	156–161 Ex. 1–4 p. 160–161						
	Homework: Act. 3 p. 77				40–42							

Reflection	
Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Platinum Physical Sciences

Week 7: Sound

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	Sound	28–29										
1	Sound waves: Sound waves are created by vibrations in a medium in the direction of propagation; the vibrations cause a regular variation in pressure in the medium; describe a sound wave as a longitudinal wave	28–29	78–79	Act. 1 p. 79	43–44	162–167 Exp. p. 164	136					
	Resources: Two 340ml drink cans, two nails, string or copper wire (not too thick)											
	Homework: ES Act. p. 163											
2	Sound waves; pitch, loudness, quality; how to make sound using a vuvuzela, string, tuning fork, loudspeaker, drum-head	28–29	79–80	Act. 2 p. 79	44	167–171 Act. p. 170						
	Resources: Vuvuzela, string, tuning fork, loudspeaker, drum-head											
	Homework: Read p. 122; ES Ex. 10.1						136–137					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.	Date completed				
3	Pitch, loudness, quality; relate the pitch of a sound to the frequency of a sound wave; relate the loudness of a sound to both the amplitude of a sound wave and the sensitivity of the human ear	28–29	80–81	Act. 3 p. 80	44–45	168–171						
	Homework: Act. 4 p. 81				45							
4	Ultrasound: Describe sound with frequencies higher than 20 kHz as ultrasound, up to about 100 kHz; when a wave encounters a boundary between two media, part of the wave is reflected, part is absorbed and part is transmitted; describe some of the medical benefits of ultrasound	28–29	82–83		45	173–175						
	Homework: ES Ex. 1–25 p. 177–181						137–145					

Reflection	
Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Platinum Physical Sciences

Week 8: Electromagnetic radiation

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	Electromagnetic radiation (EM)	29–31										
1	Dual nature of EM radiation: Some aspects of the behaviour of EM radiation can best be explained using a wave model and some aspects can best be explained using a particle mode; regenerating fields travel through space at a constant speed of 3 x 10^8 m/s or **c**	29	84		46–47	182–186 192–193						
2	EM spectrum	30	87–89	Act. 1 p. 89	47	186–188						
	Homework: ES Ex. 11.1 p. 187											
3	Nature of EM as particle: Energy of a photon related to frequency and wavelength; indicate the penetrating ability of the different kinds of EM radiation and relate it to energy of the radiation	30–31	89–90		48	188–191	146–147					
	Homework: ES Ex. 11.2 p. 191											
4	Waves, legends and folklore; IKS Detection of waves associated with natural disasters; discuss qualitatively animal behaviour related to natural disasters across at most two different cultural groups and within current scientific studies	31	86	Case study p. 86		195–196	147					
	Homework: ES Ex. 11.3											

Reflection

Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Platinum Physical Sciences

Week 9: Completion of work, revision and assessment: Plan your week

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
1	**Revision:** Waves, sound and light		91–93	Practice	48–51		147–148 148–151					
2												
3												
4												

Reflection

Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Platinum Physical Sciences

Week 10: Revision and assessment: Plan your week

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
1												
2												
3												
4												

End-of-term reflection

Think about and make a note of:

1. Was the learners' performance during the term what you had expected and hoped for? Which learners need particular support with science in the next term? What strategy can you put in place for them to catch up with the class? Which learners would benefit from extension activities? How can you help them?
2. With which specific topics did the learners struggle the most? How can you adjust your teaching to improve their understanding of this section of the curriculum in the future?
3. What ONE change should you make to your teaching practice to help you teach more effectively next term?
4. Did you cover all the content as prescribed by CAPS for the term? If not, what are the implications for your work on these topics in future? What plan will you make to get back on track?

HOD: **Date:**

Successful Physical Sciences (Cambridge University Press)

Successful Physical Sciences

Week 1: Matter and classification of matter

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.	Date completed				
	Revise: Matter and classification (from Grade 9) Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity	15–19										
1	The material(s) of which an object is composed Mixtures: heterogeneous and homogeneous; pure substances: elements and compounds; names and formulae of substances **Classify** a range of materials	15–17	21–27	Act. 1 p. 23 Act. 2 p. 24	30–32	22–40 Act. p. 23 Act. p. 24	57–59					
	Resources: Labels on the containers of food or on medicine bottles, or the wrappers of chocolate and other confectionery **Resources:** Water, tea, salt water, copper, brass, air, oxygen **Resources:** Test tubes, glass beaker, filter paper and water-soluble ink pens											
	Homework: Act. 3 p. 25; Act. 4 p. 27; ES p. 39 Ex. 2–3;	15–17			32–33		57–59					
2	Metals, metalloids and non-metals; electrical conductors, semiconductors and insulators; thermal conductors and insulators; magnetic and nonmagnetic materials	17–19	27–29	Act. 5 p. 29	33–38	40–52 Act. p. 42 Exp. p. 43 Exp. p. 45 Inv. p. 48	59					
	Resources: Copper, lead, aluminium, zinc, iron, sulphur, carbon, iodine, graphite and silicon											
	Homework: ES pp. 51–52	17–19					60–63					
	States of matter and the kinetic molecular theory The kinetic molecular theory and intermolecular forces are the basis for solid, liquid, gas and solution phenomena	19–20										
3	Three states of matter	19	30–33	Act. 1 p. 31 Exp. 2 pp. 32–33	39–40	Exp. p. 55						
	Homework: Act. 3 p. 33				41							

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
4	Kinetic molecular theory: **Formal practical investigation**	19–20	32–33	PA 1 p. 39 PA 2 p. 39	42	Act. p. 58						
	Resources: Burner, glass beaker, ice water, and a thermometer											
	Homework: Act. 3 p. 36; ES pp. 59–60				42		64–66					

Reflection	
Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Successful Physical Sciences

Week 2: Atomic structure

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	The atom: Basic building block of all matter (atomic structure) All matter is made up of atoms	20–22										
1	Models of the atom; atomic mass and diameter; give a rough estimate of the mass and diameter of an atom; show that the atom is mainly an empty space with the nucleus occupying a very small space in any atom; describe and use the concept of relative atomic mass	20–21	37–41	Act. 1 p. 39 Act. 1 p. 40	44	62–68 Project p. 61						
	Homework: Act. 2 p. 41; ES Ex. 4.1 p. 65				44		67					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
2	Structure of the atom: Protons, neutrons, electrons Isotopes; explain the term isotope; calculate the relative atomic mass of naturally occurring elements from the percentage of each isotope in a sample of the naturally occurring element and the relative atomic mass of each of the isotopes	21	42	Act. 1 p. 43	45	68–76	67					
	Resources: Play dough or marbles											
3	Electron configuration; describe atomic orbitals and the shapes of s-orbitals and p-orbitals	22	44–45	Act. 1 p. 48	47	77–84	67–70 70–74					
	Homework: ES Ex. 4.4 p. 85											
4	Electron configuration; state Hund's rule and Pauli's Exclusion Principle	22	45–46	Exp. 2 p. 49	47–48	85–92 Ex. 4.4 p. 85	74					
	Homework: ES Ex. 4.5 p. 87 Ex. pp. 90–92											
Recommended experiment for informal assessment: Do flame tests to identify some metal cations and metals **Resources:** Watch glass, burner, propette, methanol, bamboo sticks, metal salts to be tested including NaCl, $CuCl_2$, $CaCl_2$, KCl, and metals to test: copper powder, magnesium, zinc powder, iron powder, etc.												

Reflection	
Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Successful Physical Sciences

Week 3: The Periodic Table

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	Periodic Table	22–24										
	The Periodic Table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure											
	Resources: Periodic Table with values of at least one decimal point for the entire week and beyond											
1	The position of the elements in the Periodic Table related to their electronic arrangements; understand that elements in the Periodic Table are arranged in order of ascending atomic number	22–23	50–54	Act. 1 p. 52 Act. 2 p. 54	49 49–50	93–95						
	Homework: Act. 3 p. 56; ES Ex. 1–3 p. 101				50		90–91					
2	The position of the elements in the Periodic Table related to their electronic arrangements; use the Periodic Table to make a science puzzle to clarify and strengthen concepts **Resources**: Paint colour samples from a hardware store	23	54–59	Act. 4 pp. 57–58 Act. 5 p. 59	51 52	96–97						
	Homework: ES Ex. 5.1 pp. 96–97; Ex. 4 p. 102						88 91–93					
3	Similarities in chemical properties among elements in Groups 1, 2, 17 and 18	24	60–61		52	97–99	87–90					
	Homework: ES Ex. 5 p. 101						93–94					
4	Similarities in chemical properties among elements in Groups 1, 2, 17 and 18	24	62	Act. 1 p. 62	53–54	99–100 Ex. 5.2 p. 99	93					
	Homework: ES Act. p. 100											

Reflection	
Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Successful Physical Sciences

Week 4: Chemical bonding

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	Chemical bonding Interactions between matter generates substances with new physical and chemical properties	25										
1	**Covalent bonding:** Draw Lewis dot diagrams of elements; sharing of electrons in the formation of covalent bond single, double and triple bonds; describe and draw the formation of a covalent bond	25	63–69	Act. 1 p. 65 Act. 1 p. 68	54–55 55–56	103–111 Ex. 6.1 p. 105	95–97					
	Resources: Polystyrene balls and wooden sticks											
	Homework: ES Ex. 6.2 pp. 110–111						97–99					
2	**Ionic bonding:** Transfer of electrons in the formation of ionic bonding, cations and anions; electron diagrams of simple ionic compounds; describe the structure of an ionic crystal	25	69–71	Act. 1 p. 71	57	111–114	97–99					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*						
						LB pp.	TG pp.					
	Homework: ES Ex. 6.3 p. 114						99–100					
3	**Metallic bonding:** Sharing a delocalized electron cloud among positive nuclei in the metal; describe the simple model of metallic bonding	25	72–73	Act. 1 p. 73	58	114–119 Ex. 6.5 p. 118	103–104					
	Homework: ES Ex. 6.4 p. 116						101–103					
4	Covalent bonding, ionic bonding and metallic bonding	25	75–76	Revision	59–60							
	Homework: ES Exercises pp. 120–121						104–107					

Reflection	
Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Successful Physical Sciences

Week 5: Waves, sound and light

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	Transverse pulses on a string or spring	26										
1	Pulse, amplitude: Observing the motion of a single pulse travelling along a long, soft spring or a heavy rope	26	78	Demo. p. 78	61	122–125 Inv. p. 124						
	Resources: Slinky spring, rope											
2	Pulse, amplitude: Define amplitude as maximum disturbance of a particle from rest position; know that for a transverse pulse the particles of the medium move at right angles to the direction of propagation of the pulse	26	79	Act. 2 p. 79	61–62	125–127 Ex. 7.1 p. 127	108–109					
3	Superposition of pulses: Explain (using diagrams) how two pulses that reach the same point in the same medium superpose constructively and destructively and then continue in the original direction of motion	26	80	Exp. 1 p. 81	62	127–130 Exp. p. 131	108–109					
	Homework: ES Ex. 7.2 pp. 131–133											
4	Superposition of pulses: **Recommended experiment for informal assessment:** Using a ripple tank to demonstrate constructive and destructive interference of two pulses	26	81	Act. 2 p. 81	63		109–121					
	Resources: Ripple tank apparatus											
	Homework: ES Ex. 1–4 p. 134											

Reflection	
Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Successful Physical Sciences

Week 6: Waves

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	Transverse waves	27										
1	Wavelength, frequency, amplitude, period, wave speed: Identify the wavelength, amplitude, crests, troughs, points in phase and points out of phase on a drawing of a transverse wave	27	83	Act. 1 p. 83	64	135–144						
	Homework: ES Act. p. 136											
2	Wavelength, frequency, amplitude, period, wave speed: Know the relationship between frequency and period, i.e. $f = 1/T$ and $T = 1/f$; define wave speed as the product of the frequency and wavelength of a wave; use the speed equation to solve problems involving waves	27	84–87	Act. 1 p. 87 (1–4)	64–65	144–152 Ex. 8.1	124–132					
	Homework: Act. 1 p. 87 (5–9); ES Ex. 1, 2 p. 151				65		132–133					
	Longitudinal waves	27										
3	On a spring: Generate a longitudinal wave in a spring; draw a diagram to represent a longitudinal wave in a spring, showing the direction of motion of the wave relative to the direction in which the particles move; making a string (or wire) telephone	27–28	88	Demo. p. 88	66	153–156 Act. p. 154						
	Homework: Ex. 1, 2						134–135					
4	Wavelength, frequency, amplitude, period, wave speed	27–28	89	Act. 2 p. 89 (1–3)	66	156–161 Ex. 1–4 pp. 160–161						
	Homework: Act. 2 (4–5) p. 89				66							

Reflection	
Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Successful Physical Sciences

Week 7: Sound

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	Sound	28–29										
1	Sound waves: Sound waves are created by vibrations in a medium in the direction of propagation; the vibrations cause a regular variation in pressure in the medium; describe a sound wave as a longitudinal wave; how to make sound using a vuvuzela	28–29	90	Demo. 1 p. 90 Act. 2 p. 91	67 67–68	162–167 Exp. p. 164	136					
	Homework: ES Act. p. 163											
2	Sound waves; pitch, loudness, quality; how to make sound using a vuvuzela, string, tuning fork, loudspeaker, drum-head	28–29	92–93	PA 1 p. 92 PA 2 p. 93	69 70	167–171 Act. p. 170						
	Resources: Vuvuzela, string, tuning fork, loudspeaker, drum-head **Resources:** Two 340ml drink cans, two nails, string or copper wire (not too thick)											
	Homework: Read p. 122						136–137					
3	Pitch, loudness, quality; relate the pitch of a sound to the frequency of a sound wave; relate the loudness of a sound to both the amplitude of a sound wave and the sensitivity of the human ear	28–29	93–95	PA 3 p. 93 PA 4 p. 94	70	168–171						
	Homework: Act. 5 p. 95; read case study pp. 125–126				71–72							
4	Waves, legends and folklore; IKS Detection of waves associated with natural disasters; discuss qualitatively animal behaviour related to natural disasters across at most two different cultural groups and within current scientific studies	28–29	96–97	Act. 1 p. 97	72	173–175						

Reflection

Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Successful Physical Sciences

Week 8: Electromagnetic radiation

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	Electromagnetic (EM) radiation	29–31										
1	Dual (particle/wave) nature of EM radiation: Explain that some aspects of the behaviour of EM radiation can best be explained using a wave model and some aspects can best be explained using a particle model	29–30	98–99		73	182–186 192–193						
2	Nature of EM radiation: Describe the source of EM waves as an accelerating charge; explain how an EM wave propagates; state that mutually regenerating fields travel through space at a constant speed of 3 x 10^8 m/s, or **c**	30	99	Act. 1 p. 99	73–74	188–191						
3	EM spectrum	30	100–101	Act. 1 p. 101	74 Act. 1 pp. 74–75	186–188						
	Homework: ES Ex. 11.1 p. 187						146–147					
4	Nature of EM as particle: Energy of a photon related to frequency and wavelength; indicate the penetrating ability of the different kinds of EM radiation and relate it to energy of the radiation	30–31	102–103	Act. 1 p. 103	75 Act. 1 pp. 75–76	188–191						
	Homework: ES Ex. 11.2 p. 191; ES Ex. 11.3						147					
	Revision: pp. 105–106				76–78	195–196						

Reflection

Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Successful Physical Sciences

Week 9: Completion of work, revision and assessment: Plan your week

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
1												
2												
3												
4												

Reflection

Think about and make a note of: What went well? What did not go well? What did the learners find difficult or easy to understand or do? What will you do to support or extend learners? Did you cover all the work set for the week? If not, how will you get back on track?	What will you change next time? Why?
	HOD: **Date:**

Successful Physical Sciences

Week 10: Revision and assessment: Plan your week

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
1												
2												
3												
4												

End-of-term reflection

Think about and make a note of:

1. Was the learners' performance during the term what you had expected and hoped for? Which learners need particular support with science in the next term? What strategy can you put in place for them to catch up with the class? Which learners would benefit from extension activities? How can you help them?
2. With which specific topics did the learners struggle the most? How can you adjust your teaching to improve their understanding of this section of the curriculum in the future?
3. What ONE change should you make to your teaching practice to help you teach more effectively next term?
4. Did you cover all the content as prescribed by CAPS for the term? If not, what are the implications for your work on these topics in future? What plan will you make to get back on track?

HOD:

Date:

E. ADDITIONAL INFORMATION AND ENRICHMENT ACTIVITIES

Activities are listed in italics. The list is not exhaustive and more information can be found in the CAPS document.

CAPS concepts, practical activities and assessment tasks	Additional information and enrichment activities
Week 1: Matter, classification of matter and kinetic molecular theory	
Matter Mixtures: heterogeneous and homogeneous; pure substances: elements and compounds; names and formulae of substances; metals, metalloids and non-metals; electrical conductors, semiconductors and insulators; thermal conductors and insulators; magnetic and nonmagnetic materials *Test various substances to classify them as pure substances, metals, non-metals, mixtures, conductors, semiconductors or insulators as appropriate*	Some learners may still be unclear about what constitutes matter. Some learners may believe that everything is matter, including forms of energy and emotions such as love or fear. Some learners may still find it difficult to conceptualise gases as matter. It is therefore useful to administer a diagnostic test before teaching the section. Ask learners to select from a list which items are matter and which are not. Such a list could include terms like rocks, baby powder, milk, air, light, dust, hate, smoke, bacteria, oxygen, sound waves, heat, Saturn, and others of your choice. Having discussed learners' ideas, help them understand that matter is 'stuff' which is not always seen. However, energy is not a material and nor are emotions. Help them understand the nature of matter by discussing matter across a variety of contexts, not just physical science.
Kinetic molecular theory Three states of matter Investigate diffusion and Brownian motion; list and characterise the three states of matter; define freezing point, melting point and boiling point; identify the physical state of a substance at a specific temperature; define melting, evaporation, freezing, sublimation and condensation as changes in state; demonstrate these changes of state *Describe a solid, a liquid, and a gas according to the kinetic molecular theory in terms of particles of matter; use play dough or marbles to represent gases, liquids and solids; explain the levels: macroscopic, sub-microscopic and use symbols effectively*	At this point, you could check to find out whether or not the learners have retained the idea of a particulate nature of matter. Some learners still believe that solids are hard and malleable, and find difficulty in accepting that fabrics and powders are also solids. Another diagnostic test could be used here, with learners deciding which substances of a group are solid, liquid or gas. Check that learners are aware that in terms of particle spacing, solids and liquids are fairly similar. Emphasise conservation of matter during a phase change.
Week 2: The atom	
Atomic structure Models of the atom; atomic mass and diameter; structure of the atom; protons, neutrons, electrons; isotope; electron configuration *Make a list of key discoveries about atomic structure; note the correct use of scientific notation and the meaning of the values obtained when giving atomic mass or atomic radius; use analogies to show how small the nucleus is compared to the atom; use the Periodic Table to make a science puzzle; describe the structure of the atom in terms of protons, neutrons and*	Atoms consist of a very small, very dense, positively charged nucleus surrounded by a negative charge cloud of fast-orbiting electrons. The number of positive charges on the nucleus is exactly balanced by the number of orbiting electrons. The exception is **ions** which have either a surplus of positive charges or a surplus of negative charges. Only electrons are involved in chemical changes. The number of electrons in the outer orbitals of atoms determines the chemical properties of the element. All atoms of a particular element always have the same number of protons. The number of neutrons can vary, resulting in **isotopes** of the element. Check that learners are very sure of the statements above. As well as making a list of key discoveries, learners could also examine various models of atomic

CAPS concepts, practical activities and assessment tasks	Additional information and enrichment activities
electrons; make a drawing showing interpretation of the structure of an atom; identify isotopes among elements; perform calculations related to isotopic masses; understand and deduce the electronic arrangement of atoms; represent the electronic arrangements of atoms using electron diagrams	structure and discuss the strengths and weaknesses of these in the light of later developments. The activity is a good example of the nature of science and how it works, because it shows how knowledge is not static but changes with time. Chemistry is a conceptual subject; in order to explain many of these concepts, we use models to describe and explain the microscopic world and relate it to the macroscopic properties of matter. Models and analogies are useful, but may lead to misconceptions. Be sure, therefore, to emphasise that models and analogies are not *exact* replicas of the actual situation. Some misconceptions that learners may hold about atoms and atomic structure include: • Electron clouds are pictures of electrons in their orbits • The electron cloud is like a rain cloud, with electrons inside of it like drops of water • An electron cloud has electrons in it, but the cloud itself is made of some other material • The current model of the atom is the right model • Atoms are microscopic versions of elements – hard or soft, liquid or gas, and so forth • All isotopes are radioactive
Week 3: The Periodic Table	
The Periodic Table The position of the elements in the Periodic Table related to their electronic arrangements Elements in the Periodic Table are arranged in order of ascending atomic number; the Periodic Table is a	Elements are listed in order of increasing atomic number and arranged so that elements with similar chemical properties are in the same column. Get the learners to think of the Periodic Table as similar to a calendar or a school timetable where the days of the week are in rows and each day is numbered. Similar, but not identical, things happen on Sundays, for example. So it is with the groups of the Periodic Table.

CAPS concepts, practical activities and assessment tasks	Additional information and enrichment activities
systematic way to arrange elements; define the group number and the period number of an element in the Periodic Table; the position of an element in the Periodic Table is related to its electronic structure and vice versa; understand periodicity by looking at various properties of the elements Li to Ar Similarities in chemical properties among elements in Groups 1, 2, 17 and 18 *Use the Periodic Table to make a science puzzle; search for and present information on elements and the development of the Periodic Table; construct a Periodic Table using colour coding; discover the missing elements in an incomplete Periodic Table*	For innovative ideas on teaching about the Periodic Table, consult one or more of the following websites: www.mcs.net/~ars/spectro/elements.htm www.chemicalelements.com/ periodic.asterics.com/html4css.html It is interesting to note the contributions of some scientists in the development of the Periodic Table, including Dmitri Mendeleev, Johann Döbereiner, Henry Moseley, John Newlands and others. Impress upon learners that the Periodic Table is not a list of meaningless names to be remembered by heart. The Periodic Table can be thought of as a list, but a very sophisticated one, full of information. Give the learners experience in using the Periodic Table as a tool from which much information can be gleaned.
Week 4: Chemical bonding	
Covalent bonding, ionic bonding and metallic bonding **Covalent bonding** involves the sharing of electrons; single, double and triple bonds can be formed **Ionic bonding** involves transfer of electrons where cations and anions are formed due to loss or gain of electrons	Chemical bonding results in a chemical change. The properties of a compound are different from the properties of its component elements. For a useful research article on teaching about chemical bonding and chemical change, consult the following internet resources *before* you teach this topic. Evaluating understanding of chemical bonding: www.ase.org.uk/journals/school-science-review/1999/09/294/1186/SSR294Sept1999p75.pdf.

CAPS concepts, practical activities and assessment tasks	Additional information and enrichment activities
Metallic bonding involves sharing a delocalized electron cloud among positive nuclei in a metal *Make ionic crystal lattices with polystyrene balls and wooden sticks and display in the classroom; make models of other compounds in a similar way*	When teaching this topic, watch out for over-simplified language used by students e.g. *The outer orbital wants an extra electron*. Such statements can lead to poor understanding of chemical bonding in later years. It is better to use standard scientific explanations for these phenomena. However, do not hesitate to use concrete items (paper dots, play dough and plasticine to model chemical changes from reactants to products when revising this work from previous grades.
Week 5: Transverse pulses on a string or spring	
Pulse, amplitude Practical demonstration: Let learners observe the motion of a single pulse travelling along a long, soft spring or a heavy rope In a transverse pulse the particles of the medium move at right angles to the direction of propagation of the pulse **Superposition of pulses** *Recommended experiment for informal assessment: Use a ripple tank to demonstrate constructive and destructive interference of two pulses*	A **pulse** is a single disturbance moving through a medium from one location to another. Learners can easily relate this statement to their own (arterial) pulses. This section is best dealt with at a practical level. Ropes and thick strings are easy to find if slinkies are unobtainable. A ripple tank or any body of water like a pool or pond provides an excellent medium for examination of pulses. Many learners have played with stones or other objects in bodies of water, seeing *how fast* or *how high* the pulse or wave becomes. Now they can learn to put their observations in more formal language.
Week 6: Transverse and longitudinal waves	
Transverse waves Wavelength, frequency, amplitude, period, wave speed *Identify the wavelength, amplitude, crests, troughs, points in and out of phase; know the relationship between frequency and period; use the speed equation to solve problem*	Light and other types of electromagnetic radiation are transverse waves. Water waves and S waves (a type of seismic wave) are also transverse waves. In transverse waves, the vibrations are at right angles to the direction of travel. Ensure that learners understand what is meant by 'at right angles to the direction of motion'. Use blank butchers' paper below the slinky and get learners to *draw* the *direction of the wave* and also the *vibration* on the paper. Give learners experiential practice in generating waves of both types as described above.
Longitudinal waves Draw a diagram to represent a longitudinal wave in a spring, showing the direction of motion of the wave relative to the direction in which the particles move *Define the period and frequency of a longitudinal wave and the relationship between the two quantities; use the equation for wave speed, to solve problems involving longitudinal waves*	Sound waves and waves in a stretched spring are longitudinal waves. P waves (relatively fast-moving longitudinal seismic waves that travel through liquids and solids) are also longitudinal waves. In longitudinal waves, the vibrations are along the same direction as the direction of travel. See above for suggested strategy for developing this concept. *Everything Science* provides useful ideas for teaching this section. You can also visit the following website: www.compadre.org/precollege/items/detail.cfm
Week 7: Sound	
Sound waves *Recommended informal assessment: Practical demonstration: How to make sound using a vuvuzela, string, tuning fork, loudspeaker, drum-head* *Practical activity (project): Make a string (or wire) telephone* *Practical activity: Determine the speed of sound in air*	Learners should understand that sound waves are pressure waves and that sound is a form of energy caused by back and forth vibrations. At this level, learners are expected to build more sophisticated and complex understandings about sound and sound waves. Therefore before assuming that fundamental concepts are in place, you could ask learners which objects from a list involve vibrations when sound is produced. Such a list could include guitars, bubbling water, drums, wind, falling leaves, car engines, bird song, snapped fingers and others with which the learners are familiar. All the objects involve vibrations, some of which are more obvious than others. Some vibrations can be seen, such as guitar strings, and others cannot be seen but can be felt such as our vocal cords when we speak.

CAPS concepts, practical activities and assessment tasks	Additional information and enrichment activities
	Impress upon learners that sound involves energy transfer. As an inspirational piece about the power of vibrations, get learners to read about **Helen Keller** who was both deaf and blind but was able to enjoy Beethoven's Ninth Symphony by placing her fingers on the speaker of the radio and feeling the vibrations.
Pitch, loudness, quality (tone) Relate the pitch of a sound to the frequency of a sound wave; relate the loudness of a sound to both the amplitude of a sound wave and the sensitivity of the human ear *Compare the sounds made by blowing on vuvuzelas of different sizes and by different instruments*	Use whatever musical instruments are available to create sounds of various types. Get learners to use the terms pitch, frequency and amplitude in discussions of the different sounds and noises they hear.
Ultrasound	An **abdominal ultrasound** is a useful way of examining internal organs, including the liver, gallbladder, spleen, pancreas, kidneys, and bladder. **Pelvic ultrasound** is most often used to examine the uterus and ovaries and, during pregnancy, to monitor the health and development of the embryo or foetus. The prostate gland is located directly in front of the rectum, so the ultrasound exam is performed **transrectally**. Ultrasound of the **carotid arterial** system provides a fast, non-invasive means of identifying blockages of blood flow in the neck arteries to the brain, which might produce a stroke or mini-stroke.

CAPS concepts, practical activities and assessment tasks	Additional information and enrichment activities
Week 8: Electromagnetic radiation	
Dual (particle/wave) nature of EM radiation Some aspects of the behaviour of EM radiation can best be explained using a wave model and some aspects can best be explained using a particle model **Nature of EM radiation** **EM spectrum** **Nature of EM radiation as particle – energy of a photon related to frequency and wavelength**	The topic electromagnetic radiation has been encountered previously. For information about South African research efforts, consult the following website: www.emrrfsa.org/ It is important that learners understand the relationship between frequency and wavelength. For example, if they are given two figures for the wavelengths of two different colours of light, they should know immediately which one has the higher frequency. The dual nature of light is a complicated, and at times, controversial concept. At this stage, it is sufficient if learners can solve problems using the equation $E = hf$ where E = energy, h = a constant, and f = the frequency of the radiation. For more information on electromagnetic radiation consult the following website: www.haystack.mit.edu/edu/pcr/RFI/RFI_page20
Waves, legends and folklore Detection of waves associated with natural disasters	Let learners read this section in *Everything Science*. Some research has been conducted on the behaviour of various animals at times of stress, but the field is not yet established. Similarly, anecdotal reports on the harmful effects of types of EM radiation like microwaves and cell phone radiation exist, but they too have not yet reached the stage of scientific testing.

F. ASSESSMENT RESOURCES

1. Sample Item Analysis Sheet

PHYSICAL SCIENCES GRADE 10 TERM 1

Learner surname	Learner name	Task 1 Investigation				Task 2 Written examination				
		Process skills				Questions				
		A	B	C	D	1	2	3	4	5

2. Physical Sciences Grade 10: End-of-Term 1 Physics Test

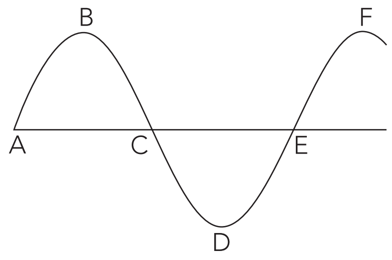
QUESTION ONE

Multiple choice questions

In each of the following questions, four possible answers are provided.

On the Answer Sheet, place a cross (X) over the letter (A, B, C or D) that corresponds to the most correct answer to each question.

1.1 Study the diagram of a transverse wave shown below.



Which of the following correctly shows one wavelength?

	One wavelength
A	AB
B	AC
C	AD
D	AE

(2)

1.2 Which of the following is NOT a property of ultrasound waves?

Ultrasound waves are

A longitudinal waves of frequency greater than 20 000 Hz.
B reflected, absorbed and transmitted when they encounter a barrier between two different media.
C used in diagnostic medical scans, for example, during pregnancy to monitor the growth and health of the foetus.
D within the range of human hearing. (2)

1.3 Which of the following lists, in correct order, electromagnetic radiation of increasing wavelength?

A X-rays, UV rays, IR waves, radio waves
B radio waves, IR waves, UV rays, X-rays
C radio waves, microwaves, visible light, gamma rays
D X-rays, gamma rays, UV waves, visible light (2)

1.4 What is the name given to 'particles of electromagnetic radiation'?

A protons
B photons
C electrons
D neutrons (2)

[8]

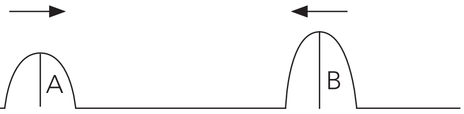
Show all working in any calculations required in the following questions.

QUESTION TWO

Two transverse pulses travel in opposite directions along a slinky (a long soft spring). The pulses meet one another and cross over each other, and then they continue to travel in their original directions. The diagrams 2a and 2b below show the pulses before they meet each other, and afterwards, respectively.

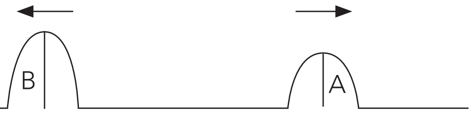
2a)

Before the
pulses meet



2b)

After the
pulses meet

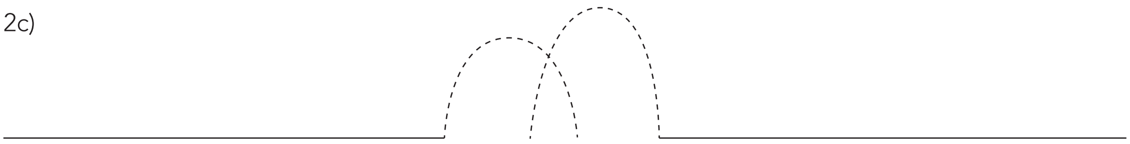


2.1 Define a *transverse pulse*. (Explain both words ‘transverse’ and ‘pulse’.) (2)

2.2 In diagram 2a which pulse has the greater amplitude? Pulse A or Pulse B? (1)

2.3 Examine diagram 2c below. This diagram shows the original shapes of Pulse X and Pulse Y as these two pulses are crossing over each other.

2c)



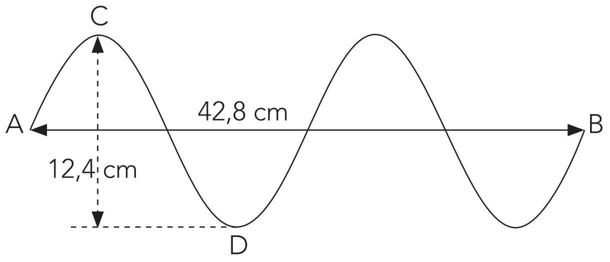
2.3 a) Name the principle used to determine the resultant shape of the spring when the two pulses are crossing over each other. (2)

2.3 b) Draw the resultant shape that the spring will take up when these two pulses are crossing over each at this particular instant. (3)

[8]

QUESTION THREE

Study the diagram of a transverse wave shown below.



A wave with a frequency of 12,3 Hz is travelling from left to right across a rope.

Positions A and B in the diagram are separated by a horizontal distance of 42,8 cm.

Positions C and D in the diagram are separated by a vertical distance of 12,4 cm.

3.1 Calculate the following:

3.1 a) The period of this wave. (3)

3.1 b) The amplitude of the wave. (2)

3.1 c) The wavelength of the wave. (2)

3.1 d) The speed of the wave. (3)

3.2 Explain what a learner should do to generate the transverse wave in a long heavy rope which lies on a long bench when she holds one end of the rope and the other end is attached to a fixed point. (2)

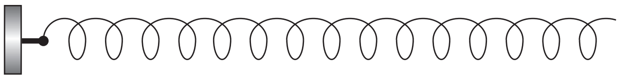
3.3 Refer to the diagram above and state in which direction does point A move in the next 0,002 s? Explain your answer. (3)

[15]

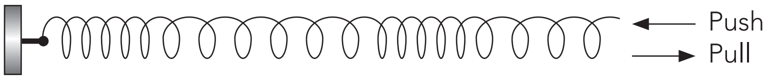
QUESTION FOUR

A diagram of a longitudinal wave in a stretched spring is shown below.

Redraw the diagram and answer questions 4.1 and 4.2 on your diagram.



(a) Normal position of a spring



(b) Longitudinal wave in a spring

4.1 Label a compression. (1)

4.2 Show one wavelength of this wave. Label it with the symbol l. (1)

4.3 Show how the amplitude of the wave can be determined. Explain briefly. (3)

[5]

QUESTION FIVE

5.1 A deep-sea ocean vessel uses SONAR to detect the ocean's bottom. Sound waves are emitted from the surface of the ocean and travel through the water at 1 455 $m \times s^{-1}$. The ocean bottom is 1 600 m below the surface.

Determine the amount of time that passes before the sound waves are reflected back to the surface. (4)

5.2 Herds of African elephants communicate with each other using sound waves which are below the human range of hearing (infrasonic sound waves). Sound waves with low frequencies are able to bend around obstacles and to carry further, so elephants can locate one another and communicate with each other over vast distances.

Scientists measured the frequency of sound waves from a herd of elephants as 15 Hz on a day when the speed of sound in air was 345 $m \times s^{-1}$.

Calculate the wavelength of these sound waves. (4)

[8]

QUESTION SIX

Gamma radiation with a frequency of $1{,}25 \times 10^{14}$ Hz emitted by a radioactive isotope is used to destroy cancerous cells in a patient.

6.1 What is the speed of gamma radiation in air (in a vacuum)? (2)

6.2 Calculate the energy of a particle of gamma radiation. (4)

[6]

TOTAL MARKS: 50

END OF TEST

Physical Sciences Grade 10: End-of-Term 1 Physics Test

ANSWER SHEET

NAME: ______________________________

QUESTION ONE

Multiple choice questions

1.1	A	B	C	D	
1.2	A	B	C	D	
1.3	A	B	C	D	
1.4	A	B	C	D	
TOTAL					

3. Physical Sciences Grade 10: End-of-Term 1 Physics Test Memorandum

QUESTION ONE

1.1 C ✓✓

1.2 D ✓✓

1.3 A ✓✓

1.4 B ✓✓

[8]

QUESTION TWO

2.1 A transverse pulse is a single disturbance ✓ in which the particles move at right angles (perpendicular, at 90°) to the direction (of propagation) of the pulse. ✓

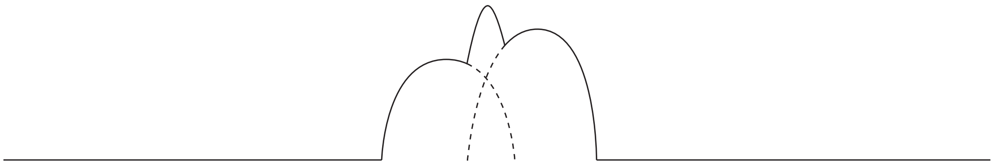
OR equivalent statement. (2)

2.2 (Pulse) B ✓ (1)

2.3 a) (The principle of) superposition. ✓✓ (2)

DO NOT accept 'interference'.

2.3 b)



Shape follows Pulse A's original shape until they intersect with one another. ✓

Shape follows Pulse B's original shape after they intersect one another. ✓

At point of intersection the pulse changes shape as shown; maximum amplitude must be larger than that of Pulse B. ✓ (3)

[8]

QUESTION THREE

3.1 a) $T = \frac{1}{f}$ ✓ (method)

$= \frac{1}{12{,}3}$ ✓ (substitution)

= 0,08 s ✓ (0,081301 s) (accuracy; SI units; s or seconds; DO NOT accepts secs) (3)

3.1 b) Amplitude = $\frac{1}{2}$ (12,4) ✓ (method)

= 6,2 cm ✓ (accuracy; SI units)

NB: The amplitude may be given in m (0,062 m). (2)

3.1 c) Distance from A to B = 2 wavelengths ✓ (method OR method implied)

Wavelength = $\frac{1}{2}$ (42,8) = 21,4 cm ✓ (accuracy; SI units)

NB: The wavelength may be given in m (0.214 m). (2)

3.1 d) $v = f\lambda$ ✓ (method)

= (12,3) (0,214) ✓ (substitutions and conversion)

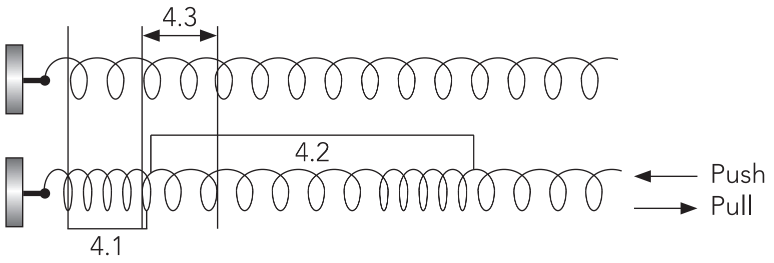
= 2,63 $m \cdot s^{-1}$ ✓ (accuracy; SI units) (3)

3.2 Hold the rope or slinky in one hand, and move it up and down ✓ (on the surface of the bench) with a regular motion ✓ (repeating the motion in a regular way). (2)

3.3 Point A will move vertically ✓ up. ✓ Particles in a transverse wave move at 90° to the direction of motion of the wave. ✓ (3)

[15]

QUESTION FOUR



4.1 Show a compression. ✓ (It can show the other compression.) (1)

4.2 Shows one complete wavelength. ✓

NB: It can show a wavelength from the middle of a compression to the middle of the next successive compression, OR, from the middle of a rarefaction to the middle of the next successive rarefaction. (1)

4.3 On each of the diagrams locate the original position of e.g. the fifth coil of the spring, ✓ and the final position of the fifth coil of the spring. ✓ The gap between these two positions gives the amplitude of the vibration. ✓ (3)

NB. Award one mark if the learner answers: The amplitude is the maximum displacement from the rest position. ✓

[5]

QUESTION FIVE

5.1 Distance that the sound wave travelled = 1 600 × 2 = 3 200 m ✓
(method)

Speed = $\frac{\textit{distance}}{\textit{time taken}}$ ✓ (method)

1 455 = $\frac{3\ 200}{\textit{time taken}}$ ✓ (substitutions; allow 1 600 as 'correct subs')

Time taken = $\frac{3\ 200}{1\ 455}$ = 2,20 s (2,199 s) ✓ (accuracy; SI units) (4)

5.2 $v = f\lambda$ ✓ (method)

345 ✓ = 15 λ ✓ (substitutions)

$\lambda = \frac{345}{15}$ = 23 m ✓ (accuracy; SI units) (4)

Note to the marker: Learners must show working.

[8]

QUESTION SIX

6.1 $3 \times 10^{8}\ \text{m·s}^{-1}$ ✓✓

Also accept: The same as the speed of light. (2)

6.2 $E = hf$ ✓ (method)

$= (6{,}63 \times 10^{-34})$ ✓ $\times (1{,}25 \times 10^{14})$ ✓ (substitutions)

$= 8{,}29 \times 10^{-20}$ J ✓ (accuracy; SI unit) (4)

[6]

TOTAL MARKS: 50

4. Cognitive Analysis for Physical Sciences Grade 10: End-of-Term 1 Physics Test

Level 1: Recall

Level 2: Comprehension

Level 3: Analysis, application

Level 4: Evaluation, synthesis

	Levels					
Question	**1**	**2**	**3**	**4**	**Total**	**Comment**
1.1		2			2	
1.2	2				2	
1.3		2			2	
1.4	2				2	
2.1	2				2	
2.2		1			1	
2.3 a		2			2	Recall with understanding; do not accept the term 'interference'
2.3 b			3		3	
3.1 a		3			3	
3.1 b			2		2	Analysis of data required before the problems can be solved
3.1 c			2		2	
3.1 d		1	2		3	Comprehension to choose the formula, then analysis of data and application
3.2		2			2	
3.3				3	3	Higher level of application required – synthesis
4.1	1				1	
4.2	1				1	
4.3				3	3	Synthesis and evaluation of the information in the diagram required before application
5.1		1	3		4	Comprehension to choose the formula; then analysis of data and application
5.2		1	3		4	
6.1		2			2	Comprehension; learner must recognise gamma rays as EM waves, then find c (speed of light)
6.2			4		4	Analysis and application; using scientific notation is more challenging at this stage
TOTAL	**8**	**17**	**19**	**6**	**50**	
%	16	34	38	12	100	
TARGET	15	35	40	10	100	

5. Physical Sciences Grade 10: End-of-Term 1 Chemistry Test

QUESTION ONE

Multiple choice questions

In each of the following questions, four possible answers are provided.

On the Answer Sheet, place a cross (X) over the letter (A, B, C or D) that corresponds to the most correct answer to each question.

1.1 Ernest Rutherford's team of atomic research scientists discovered
- A the electron
- B the proton
- C the neutron
- D that most of the atom is made up of empty space (2)

1.2 An atom that has a mass number of 142 and an atomic number of 58 has
- A 142 neutrons and 58 protons
- B 58 protons, 58 neutrons and 84 electrons
- C 58 protons and 84 neutrons
- D 58 neutrons and 84 protons (2)

1.3 Name the type of bond between two oxygen atoms.
- A a covalent bond
- B a non-metallic bond
- C an ionic bond
- D a metallic bond (2)

1.4 Which one of the following has a different electronic structure?
- A an argon atom
- B a calcium ion
- C a chlorine atom
- D a sulphide ion (2)

[8]

QUESTION TWO

Refer to the Periodic Table to answer these questions.

2.1 Give the name of the element with the symbol P. (1)

2.2 Write down the electronic configuration of the valence electrons of Ca. (1)

2.3 Name the most reactive gas in Period 2. (1)

2.4 Name the element in Period 2 which has a valency of –2. (1)

2.5 Give the name of the Group 1 metals. (1)

2.6 Give the name of the compound formed when sodium reacts with iodine. (1)

2.7 Give the chemical formula of magnesium bromide. (1)

2.8 Explain why the noble gases (Group 18 elements) are unreactive at room temperatures and pressures. (2)

[9]

QUESTION THREE

Nitrogen gas reacts with lithium to form an ionic compound, lithium nitride, Li_3N, and it also reacts with fluorine to form a covalent compound, NF_3.

Balanced equations for these reactions are shown below:

$6\ Li + N_2 \rightarrow 2\ Li_3N$ $N_2 + 3\ F_2 \rightarrow 2\ NF_3$

3.1 Use Lewis dot diagrams to show the electronic structure in a molecule of:

- a) N_2 (2)
- b) F_2 (2)
- c) NF_3 (2)

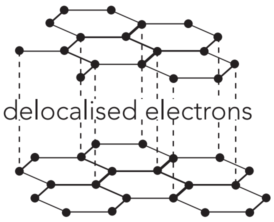
3.2 An *ionic bond* forms between lithium and nitrogen to form the crystalline solid, lithium nitride.

- a) Explain what is meant by an *ionic* bond. (2)
- b) Explain how *lithium ions* are formed. (3)
- c) Explain why the charge on a nitride ion is –3. (3)
- d) Explain how crystals of lithium nitride are formed. (2)

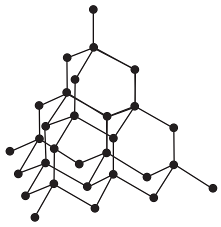
[16]

QUESTION FOUR

Carbon forms various types of structures in its pure form. Two giant molecular forms of carbon are graphite and diamond. The structures of graphite and diamond are shown in the diagrams below.



graphite



diamond

Diamonds are very hard, dense, and they are insoluble in water.

A diamond crystal does not conduct electricity.

Graphite is soft and 'greasy' (slippery to touch).

It is also insoluble in water.

Graphite conducts electric current.

4.1 Write the electronic configuration of electrons in a carbon atom. (3)

4.2 How many valence electrons are there in an atom of carbon? (1)

4.3 A covalent bond forms between carbon atoms. What is a *covalent bond*? (2)

4.4 Give the name which describes *two or more forms of the same element.* (1)

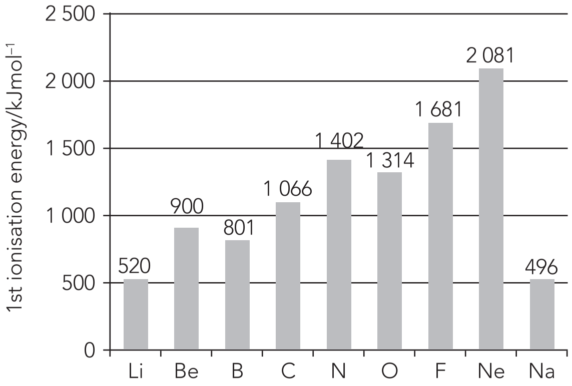
4.5 Graphite can conduct electric current, but diamond does not.

- a) Give the name for *material which cannot conduct electric current.* (1)
- b) Explain how the bonding in graphite allows it to conduct current, but the bonding in diamond does not allow current to pass through it. (2)

[10]

QUESTION FIVE

The first ionisation energies of the elements Li to Na are shown in the chart below.



5.1 Define the term *first ionisation energy.* (2)

5.2 Why do the first ionisation energies of elements generally increase as you go across the period from Li to Ne? (2)

5.3 Which element, Li or Na, is likely to be more reactive? Justify you answer with reference to their ionisation energies. (3)

[7]

TOTAL MARKS: 50

END OF TEST

Physical Sciences Grade 10: End-of-Term 1 Chemistry Test

ANSWER SHEET

NAME: ______________________________

QUESTION ONE

Multiple choice questions

1.1	A	B	C	D	
1.2	A	B	C	D	
1.3	A	B	C	D	
1.4	A	B	C	D	
TOTAL					

6. Physical Sciences Grade 10: End-of-Term 1 Chemistry Test Memorandum

QUESTION ONE

1.1 D ✓✓ (2)

1.2 C ✓✓ (2)

1.3 A ✓✓ (2)

1.4 C ✓✓ (2)

[8]

QUESTION TWO

2.1 phosphorus ✓ (1)

2.2 3 s^2 ✓ (1)

2.3 fluorine ✓ (1)

2.4 oxygen ✓ (1)

2.5 alkali ✓ (1)

2.6 sodium iodide ✓ (1)

2.7 $MgBr_2$ ✓ (1)

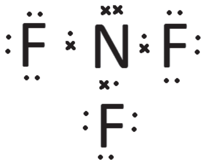
2.8 Atoms of the noble gases each have 8 valence electrons which is a stable arrangement of valence electrons ✓ therefore it will take an enormous amount of energy or force (pressure) to cause these atoms to take part in chemical reactions. ✓ (2)

[9]

QUESTION THREE

3.1 a) N_2  ✓✓

b) F  ✓✓

c) NF_3  ✓✓

One mark for the correct number of valence electrons around each atom; the other mark for the correct bonds. (6)

3.2 a) An ionic bond forms when a metal atom transfers electrons ✓ to a non-metal atom ✓ forming a positive metal ion which attracts the negative non-metal ion. (2)

b) Lithium atoms have one valence electron.

The lithium atom loses ✓ the valence electron to form a lithium ion. ✓

$Li \rightarrow Li^+ + e^-$ OR $Li - e^- \rightarrow Li^+$ ✓ (3)

c) Nitrogen atoms have 5 valence electrons. ✓

Each atom reaches the stable electronic configuration of 8 electrons in the valence shell by gaining 3 electrons. ✓

Electrons have negative charge. ✓ Therefore the charge on a nitride ion is –3. (3)

d) The positive lithium ions attract the negative nitride ions Pand pack tightly together, with each nitride ion having three lithium ions attached to it.

This strong attraction and orderly packing of ions forms a crystal. ✓ (2)

[16]

QUESTION FOUR

4.1 1 s^2 ✓ 2 s^2 ✓ $2p^2$ ✓ (3)

4.2 4 ✓ (1)

4.3 A bond formed by each non-metal atom ✓ donating an electron to be shared between the two atoms. ✓ (2)

4.4 allotropes ✓ (1)

4.5 a) insulator ✓ (1)

b) In graphite each carbon atom bonds to two other carbon atoms so there is a delocalized electron which is free to carry electric current. ✓

In diamond each carbon atom is bonded to three other carbon atoms so there are no free electrons in diamond, therefore it cannot carry current. ✓ (2)

[10]

QUESTION FIVE

5.1 The first ionisation energy of an element is the amount of energy per mole ✓ (of its atoms) that is required to remove the first electron from its atoms. ✓ (2)

5.2 As you go across the period, the nuclear charge (charge on the nucleus) of the atoms increases ✓ (because there is one more proton in each successive nucleus).

So the force of attraction between the valence electron and the nucleus increases. ✓

Therefore the amount of energy required to remove the first electron from the atom increases. (2)

5.3 Sodium is likely to be more reactive than lithium because the first ionisation energy of sodium is lower than that of lithium. ✓

Sodium's atoms have one more energy level in them than lithium atoms, therefore its valence electron is further away from the nucleus than the electrons of the lithium atoms. ✓

The force of attraction from the sodium nucleus to the valence electron is therefore weaker than the force of attraction between the lithium atom and its valence electron. ✓ (3)

[7]

TOTAL MARKS: 50

7. Cognitive Analysis for Physical Sciences Grade 10: End-of-Term 1 Chemistry Test

Level 1: Recall

Level 2: Comprehension

Level 3: Analysis, application

Level 4: Evaluation, synthesis

	Levels					
Question	**1**	**2**	**3**	**4**	**Total**	**Comment**
1.1	2				2	
1.2 2					2	
1.3	2				2	
1.4		2			2	
2.1		1			1	
2.2		1			1	
2.3		1			1	
2.4		1			1	
2.5		1			1	
2.6		1			1	
2.7		1			1	
2.8				2	2	Requires evaluation and synthesis because an explanation is required
3.1			6		6	
3.2 a		2			2	
3.2 b			3		3	
3.2 c			3		3	
3.2 d				2	2	Requires evaluation and synthesis because an explanation is required
4.1		3			3	
4.2		1			1	
4.3	2				2	
4.4	1				1	
4.5 a	1				1	
4.5 b				2	2	Evaluation and synthesis – higher order question requiring explanation
5.1		2			2	
5.2			2		2	
5.3		1	2		3	
TOTAL	**8**	**20**	**16**	**6**	**50**	
%	16	40	32	12	100	
TARGET %	15	40	35	10	100	