GRADE 10

Physical Sciences

Teacher Toolkit: CAPS Planner and Tracker

2018 TERM 2

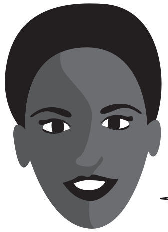
CONTENTS

A. ABOUT THE PLANNER AND TRACKER

1. Your quick guide to using this planner and tracker

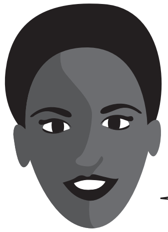
What is the NECT and where do I fit in?

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.



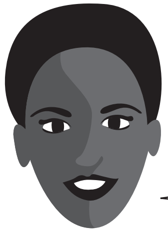
But who will help me?

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.

The tracker has been planned for a second term of 10 weeks. Eight weeks are allocated for covering the set curriculum, with Week 9 for you to complete any work you have not managed to cover in the first eight weeks, review assignments and tests, and do remediation work with your learners. Week 10 is set aside for the mid-year examinations. If the year in which you are using it has a longer or shorter first term, you will need to adjust the pace of work. 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 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. Learner's Book page number;
5. Learner activity number;
6. Teacher's Guide page number;
7. ***Everything Science*** Learner's Book page number
8. ***Everything Science*** Teacher's Guide 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 2 – Particles substances are made of, physical and chemical change, conservation of mass and matter, law of constant composition, balanced chemical equations (Chemistry)

Magnetism, electrostatics, conservation and quantisation of charge, electric circuits, resistance in series and parallel (Physics)

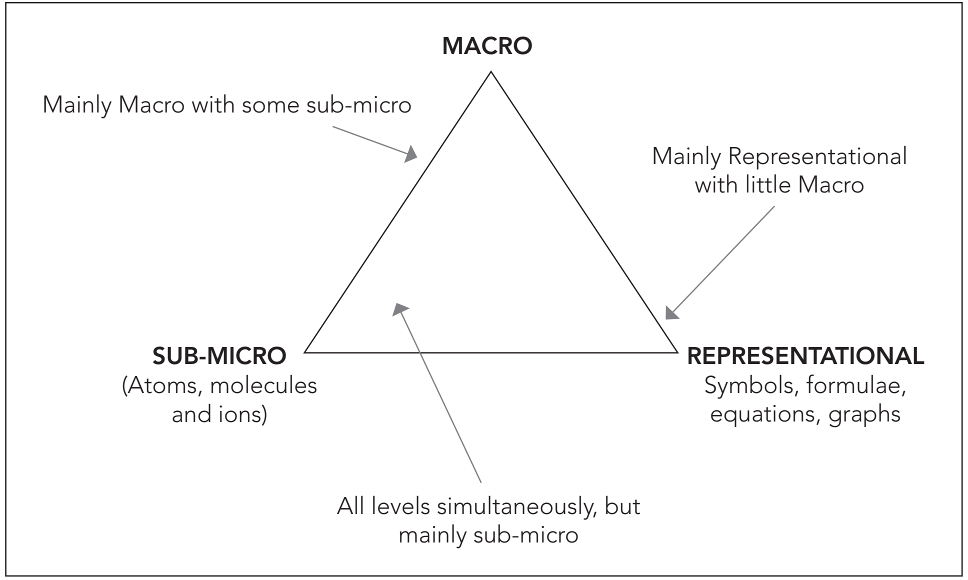
Overview of Term 2 Topics

Particles substances are made of, physical and chemical change, conservation of mass and matter, law of constant composition, balanced chemical equations

The Chemistry topics for Term 2 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. Johnstone[1] 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.

FIGURE 1: JOHNSTONE'S TRIANGLE



To use sulfur as an example: in the introduction of materials and substances at the macro level, they might hear about or see yellow sulfur powder or flowers of sulfur; at the sub-micro level there will be a description of the material or substance in molecular terms or atomic terms – that sulfur is an element with sixteen protons, neutrons and electrons; and then there will be a representation of the material or substance by symbols and formulae, for example S and S_8. We suggest that you make it very clear to learners what area or viewpoint you are talking about, helping them to understand the links between the macro, sub-micro and representational levels. When dealing with the various ways

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

of representing chemical substances – formulae, electronic configurations, ball-and-stick models and so on – say something like 'Sulfur does not really look like this. We are making a drawing or a model to help us understand more about it.'

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.

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.

Magnetism, electrostatics, conservation and quantisation of charge, electric circuits, resistance in series and parallel

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.

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. Think of Vygotsky's notion of the zone of proximal development and provide learners with problems incrementally.

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 Teacher's Guides 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. You will find it worthwhile to collect these well in advance and leave them in a box or something similar. This way, you will avoid a last-minute rush. Remember that some materials are used on several different occasions, so keep laboratory equipment safe and well cleaned. Depending on how quickly your learners complete a section, and on what activities you choose, you may find that you are still on a certain week when the following week's requirements are listed. Continue normally and check with the CAPS document to find out what you still need.

Week 1: Play dough or marbles or plastic pellets, burner, gauze; tripod, glass beaker, ice water, thermometer, filter paper, koki pens or coloured inks, iron filings, flowers of sulfur, magnet, manganese dioxide, hydrogen peroxide, test tubes, gas delivery tube, stopper, water bowl, zinc, hydrochloric acid, lead(II) nitrate, sodium iodide, sodium chloride, sodium hydroxide, Cal-C-Vita tablet, bromothymol blue, plastic bag, rubber band, mass meter, propettes, silver nitrate, sodium chloride, silver nitrate, iron chloride.

Week 2: Glass beaker, propettes, test tubes, water bowl, filter paper, measuring cylinder (10 ml), long gas delivery tube, stopper for gas production, syringe, sodium hydrogen carbonate, dilute sulfuric acid, mass meter.

Week 3: As for Week 2 plus many examples of chemical equations.

Week 4: Many examples of chemical equations, styrofoam spheres, wooden sticks, coloured dots or circles, marbles, Prestik.

Week 5: Sheet of A4 paper, bar magnet(s), iron filings, several small compasses, pictures of everyday examples of static electricity phenomena.

Week 6: Balloon, plastic pen, small pieces of paper, stream of smooth flowing water, pictures of everyday examples of static electricity phenomena.

Week 7: Light bulbs, resistors, batteries, switches, connecting leads, ammeters, voltmeters, screwdrivers and crocodile clips for quick repairs.

Week 8: Light bulbs, resistors, batteries, switches, connecting leads, ammeters, voltmeters, drawings of different circuits with resistors in series and parallel.

3. Plan for required assessment tasks

In Term 2 of Grade 10, the CAPS specifies one practical task and an examination for formal assessment. Most of the Learner's Books and/or Teacher's Guides provide examples of CAPS-compliant formal assessment tasks and activities for revision or informal assessment. Two tests (Physics and Chemistry), together with the memorandum and analysis of cognitive levels of each, are provided in Section F *Assessment Resources* of this tracker. These could be used as the mid-year examination or for practice and informal assessment. The Provincial Department of Education might also provide a common paper.

Table 1 gives an overview of the practical task/investigation and examination papers in each of the LTSMs, and the weeks in which they are scheduled in the tracker. This will help you in your preparation. Where the LTSMs used at your school have the examination in the Learner's Book, this cannot be used because the learners will be able to prepare for it in advance, but it is useful for revision and informal assessment.

Please note: The DBE makes changes to the assessment requirements from time to time. When you receive official notification of such changes, you should change the assessment programme shown here to align with them.

TABLE 1: FORMAL ASSESSMENT TASKS INCLUDED IN EACH SET OF APPROVED LTSMs FOR TERM 2

Name of book	Formal practical assessment	Examination * Use for practice, not for formal assessment
Study and Master Physical Sciences	**Week 8:** Prescribed experiment on resistors in series and parallel, LB pp. 207–208, Act. 5 Parts 1 and 2, TG D58–D50	**Week 10:** TG B17–B20 See Section F
Platinum Physical Sciences	**Week 8:** Prescribed experiment on resistors in series and parallel, LB pp. 158–159, Exp. 2 Parts A and B, TG pp. 83–86	**Week 10:** TG 69–70, TG 86–91 See Section F
Successful Physical Sciences	**Week 8:** Prescribed experiment on resistors in series and parallel, LB pp. 171–175, Exp. 1, TG pp. 103–109	**Week 10:** * LB 278–281, TG 187–191 See 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.

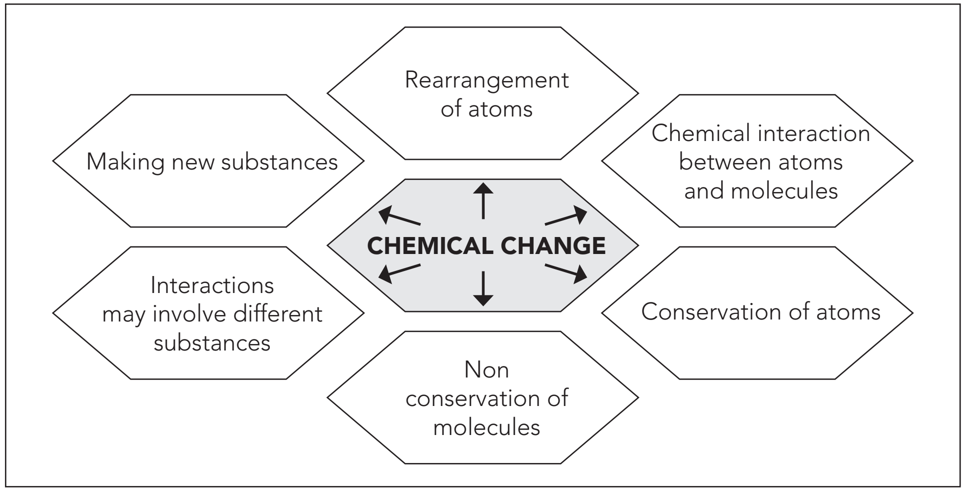
1. Check your own knowledge of the content

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.

FIGURE 2: MIND MAP OF KEY CONCEPTS ASSOCIATED WITH CHEMICAL CHANGE



One way of preparing the content is to summarise it using a tool like a mind map, as shown in Figure 2. 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.

While you 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 G *Additional Worksheets* 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 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 2, learners are required to investigate the effective resistance of series and parallel circuits as the formal assessment for Physics. In order to prepare learners for this formal assessment, it is important to give them opportunities to complete other Physics 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*** Learner's Book page number
7. ***Everything Science*** Teacher's Guide 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
TYS	Test Yourself
WS	Worksheet
#	Examined in Grade 12

1. *Study and Master Physical Sciences* (Cambridge University Press)

Study and Master Week 1: Particles that substances are made of

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				
Particles that substances are made of: • Matter is described as anything that has mass and occupies space • All matter is made up of atoms		32										
1	• When atoms **share electrons** they are bonded covalently and the resulting collection of atoms are called a molecule. As a general rule molecular substances are almost always composed of non-metallic elements	32	147–149	Start Act. 1	D42	199–206	152–155					
Homework: Complete Act. 1 on carbon												
2	• When the **electrons of atoms are transferred** from one atom to another atom to form positive and negative ions, the ions bond with ionic bonds and the resulting solid is called an ionic substance (or salt or ionic compound)	32	149–151	Start Act. 2	D42-D43	199–206	152–155					
Homework: Complete Act. 2 on salt; ES Representing compounds p. 204												
3	• When metal atoms lose their outer electrons to form a lattice of regularly spaced positive ions and the outer electrons form a delocalized 'pool' of electrons that surround the positive ions, the atoms are bonded by metallic bonding *Demonstrate visual representations of atoms, molecules, elements and compounds*	32–33	151–154	Start Act. 3	D43-D44	199–206	152–155					
Homework: Continue Act. 3 on crystal lattices												
Resources: 'Jelly Tots', toothpicks or play dough or atomic model kits to demonstrate chemical bonding in elements and compounds												
4	• Covalent molecular structures consist of separate molecules: oxygen, water, petrol, CO_2, S_8, C_{60} (buckminsterfullerene or bucky balls) *Demonstrate visual representations of atoms, molecules, elements and compounds*	33	154–155		D44	199–206	152–155					
Homework: Complete Act. 3, read about experiments on physical changes LB pp. 156–158												

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 **Week 2: Particles that substances are made of**

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				
Particles that substances are made of: • Matter is described as anything that has mass and occupies space • All matter is made up of atoms												
1	**Experiments:** Identify elements and compounds in chemical reactions	33	156–157	Act. 4	D45	Exp. pp. 205–206	152–155					
Homework: Write up experiments and answer questions; TG D45												
2	**Experiments:** Identify elements and compounds in chemical reactions	33	157–158	Act. 5	D45	Exp. p. 206	152–155					
Homework: Write up experiment and answer questions												

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Date completed				
						LB pp.	TG pp.					
3	• Empirical formulae for covalent *network* structures, e.g. C as diamond and graphite, SiO_2 as quartz, glass or sand	33–34	158–159	Start Act. 6	D45	199–206	152–155					
Homework: Continue Act. 6 on glass												
4	Summative task on matter and material	32–34	160–161	Ass. task	D46	199–206	152–155					
Homework: Read LB p. 162 on chemical change												

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 Week 3: Physical and chemical change

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				
Physical and chemical change • The properties of matter determine how matter interacts with energy • Separation of particles in physical change and chemical change		35–37										
1	• Define a physical change as a change that does not alter the chemical nature of the substance: no new chemical substances are formed • The rearrangement of molecules occurs during **physical changes**	35	162–164		D47-D48	209–210 Act. p. 210	156–160					
Homework: Revise examples of physical changes: water evaporates, ice melts, iron filings and sulfur are separated LB pp. 163–164												
2	• Define a chemical change as a change in which the chemical nature of the substances involved changes: new chemical substances are formed • The energy involved in these chemical changes is much larger than those of the physical change **Practical experiments:** Add H_2O_2 to manganese dioxide and collect the oxygen; burn hydrogen in oxygen	35–36	165–168	Act. 1 Act. 2	D48-D49	211–216 Exp. p. 213 Exp. pp. 214–215	156–160					
Homework: ES p. 216 Ex. 13.1 on physical and chemical change												
3	Conservation of atoms and mass **Recommended experiment for informal assessment:** Law of conservation of matter Act. 3 pp. 169–170	36–37	168–170	Act. 3	D49-D50	217 Act. pp. 217–218 Exp. pp. 218–220	156–160					
Homework: ES Ex. 13.2 pp. 220–221												
4	• State the law of constant proportions: **the ratio** in a particular compound **is fixed** as represented by its chemical formula	36–37	171–172	Act. 4	D50	Investigation pp. 222–223	156–160					
Homework: Read ES pp. 221–222 on law of constant composition; end-of-chapter exercises pp. 224–225												

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 Week 4: Chemical change

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				
Representing chemical change • Balanced chemical equations represent chemical change and concur with the Law of Conservation of Matter • Balanced chemical equations are fundamentally important for understanding the quantitative basis of chemistry		37										
1	• Represent chemical changes using reaction equations, i.e. translate word equations into chemical equations with formulae with subscripts to represent phases (s), (ℓ), (g) and (aq)	37	173–174	Start Act. 1	D51–D52	226–228 Act. p. 227	Ex. 14.1 p. 161					
Homework: Complete Act. 1; ES p. 228 Ex. 14.1 on chemical formulae												
2	**Experiment:** Amount of product is related to amount of reactant (sodium hydrogen carbonate and dilute sulphuric acid) Conservation of matter	37	175–176	Act. 2	D51	228–229 Act. p. 229	162					
Homework: Complete questions related to Act. 2 in LB 175–176												
3	Interpret balanced reaction equations in terms of: • Conservation of atoms • Conservation of mass (use relative atomic masses	37	176–178		D51	229–234	162–166					
Homework: Revise example of **methane** burning LB p. 178; ES pp. 234–235 Ex. 14.2 on balancing chemical equations												
4	Revision of chemical change	37	179	Ass. task	D51	235–236 Exp. p. 237	168–173					
Homework: ES p. 236 on balancing equations; revision pp. 238–239												

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 Week 5: Magnetism and electricity

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				
Magnetic field of permanent magnets, poles of permanent magnets, attraction and repulsion, magnetic field lines, Earth's magnetic field, compass		38–39										
1	• A magnetic field is a region in space where another magnet will experience a force • An electric field is a region in space where an electric charge will experience an electric force • The gravitational field is a region in space where a mass will experience a gravitational force	38	180–181		D52	240–241	173–178					
Homework: Answer Key Questions LB p. 180												
2	• A magnet is an object that has a pair of opposite poles, called north and south • Like magnetic poles repel and opposite poles attract **Recommended practical activity for informal assessment:** Determine the pattern and direction of the magnetic field around a bar magnet	38	182–184	Act. 1	D53-D54	241–242 Investigation p. 242	173–178					
Homework: Read LB pp. 184–185												
3	• Compare the magnetic field of the Earth to the magnetic field of a bar magnet using words and diagrams • Explain the difference between the geographical North pole and the magnetic North pole of the Earth • Give examples of phenomena that are affected by Earth's magnetic field	39	184–187	Act. 2	D54	243–245 Investigations pp. 245–246	173–178					
Homework: LB Act. 2 p. 187												
4	Give examples of phenomena that are affected by the Earth's magnetic field	39	188–189	Act. 3	D54-D55	249–253	173–178					
Homework: LB Act. 4 p. 189; ES Ex. pp. 252–253												

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 Week 6: Electrostatics

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				
Electrostatics: Two kinds of charge, charge conservation, charge quantisation		40–42										
1	• All materials contain positive charges (protons) and negative charges (electrons) • Positively charged objects are electron deficient and negatively charged objects have an excess of electrons • Objects (insulators) can be charged by contact (or rubbing)	40	190–194	Act. 1	D55-D56	254–257	179–184					
Homework: Revise electronic structure from Grade 9; ES Ex. 1 p. 256												

<table>
<tr><th rowspan="2">S #</th><th rowspan="2">CAPS concepts, practical activities and assessment tasks</th><th rowspan="2">CAPS pp.</th><th rowspan="2">LB pp.</th><th rowspan="2">LB act.</th><th rowspan="2">TG pp.</th><th colspan="2">Everything Science</th><th colspan="5" rowspan="2">Date completed</th></tr>
<tr><th>LB pp.</th><th>TG pp.</th></tr>
<tr><td>2</td><td>• Charge conservation
• Know that the SI unit for electric charge is the coulomb
• State the principle of conservation of charge as: The net charge of an isolated system remains constant during any physical process
• Apply the principle of conservation of charge</td><td>41</td><td>194–195</td><td></td><td>D56</td><td>258–259</td><td>179–184</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="13">Homework: ES p. 259 Ex. 2; pp. 266–267 Ex. 6, 7</td></tr>
<tr><td>3</td><td>Charge quantisation
• State the principle of charge quantisation
• Apply the principle of charge quantisation
• Recall that like charges repel and opposite charges attract
• Explain how charged objects can attract uncharged insulators because of the polarisation of molecules inside insulators</td><td>41–42</td><td>195–196</td><td></td><td>D56</td><td>260–263</td><td>179–184</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="13">Homework: ES pp. 262–263 Ex. 3–4</td></tr>
<tr><td>4</td><td>Apply the principle of charge quantisation</td><td>41–42</td><td>197</td><td>Start Act. 2</td><td>D56</td><td>264–271</td><td>179–184</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="13">Homework: Complete Act. 2 p. 197 in LB; ES pp. 264–268 Ex. 5–6; pp. 272–274 end-of-chapter exercises (teacher to choose examples)</td></tr>
<tr><th colspan="13">Reflection</th></tr>
<tr><td colspan="6" rowspan="2">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?</td><td colspan="7">What will you change next time? Why?</td></tr>
<tr><td colspan="4">HOD:</td><td colspan="3">Date:</td></tr>
</table>

Study and Master Week 7: Circuit electricity

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				
Electric circuits: emf, terminal pd, current, measurement of voltage and current, resistance		42–44										
1	**Terminal pd and emf:** • Define potential difference in terms of work done and charge: $V = W/Q$ • Emf and pd are measured in volts (V) • Do calculations using: $V = W/Q$	42	198–199	Act. 1	D56-D57	275–276	185–191					
Homework: Draw circuits in LB p. 199 for practice												
2	**Current:** • Define current, I, as the rate of flow of charge • It is measured in ampere (A), which is the same as coulomb per second • Calculate the current flowing using the equation: $I = Q/t$ • Indicate the direction of the current in circuit diagrams	42	199–201	Act. 3	D57	277–280	185–191					
Homework: Calculations Act. 2 LB pp. 200–201; complete questions LB p. 201												
3	**Measurement of voltage and current** • Draw diagrams to show how to correctly connect an ammeter to measure the current and to show how to correctly connect a voltmeter to measure the voltage across a given circuit element	43	202		D58	280–283	185–191					
Homework: ES pp. 280–283 Ex. 1–3												
4	**Resistance** • Define resistance • Explain that resistance is the opposition to the flow of electric current • Define the unit of resistance • One ohm (Ω) is one volt per ampere	44	203–204		D58-D59	282–284	185–191					
Homework: Act. 5 on circuits LB p. 209												

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 Week 8: Resistors in series and parallel

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				
Resistors in series and parallel												
1	**Resistors in series:** • Current is constant through each resistor in series circuit • Series circuits are called voltage dividers • Calculate the equivalent (total) resistance of resistors connected in series using: $R_S = R_1 + R_2 + \dots$	44	204 Example p. 206 (a)		D57	285–289	185–191					
Homework: Read Exp. LB pp. 207–208; ES p. 106 Ex. Ch. 17 examples 1–4												

<table>
<tr><th rowspan="2">S #</th><th rowspan="2">CAPS concepts, practical activities and assessment tasks</th><th rowspan="2">CAPS pp.</th><th rowspan="2">LB pp.</th><th rowspan="2">LB act.</th><th rowspan="2">TG pp.</th><th colspan="2">Everything Science</th><th colspan="5" rowspan="2">Date completed</th></tr>
<tr><th>LB pp.</th><th>TG pp.</th></tr>
<tr><td>2</td><td>Resistors in series:
• Current is constant through each resistor in series circuit
• Series circuits are called voltage dividers
• Calculate the equivalent (total) resistance of resistors connected in series using: $R_S = R_1 + R_2 + \dots$
Prescribed experiment on resistors: Part 1</td><td>44</td><td>204 & 207–208</td><td>Act. 5 pp. 207–208 Part 1</td><td>D58-D59</td><td>289–291</td><td>185–191</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="13">Homework: Start Act. 5 Test yourself on circuits pp. 209–210 in LB; ES p. 106 Ex. Ch. 17 examples 5–6</td></tr>
<tr><td>3</td><td>Resistors in series and parallel:
• Voltage is constant across resistors connected in parallel
• A parallel circuit is called a current divider
• Calculate the equivalent (total) resistance of resistors connected in parallel using: $R_P = 1/R_1 + 1/R_2 + \dots$</td><td></td><td>205 Example p. 206 (b, c)</td><td></td><td>D59</td><td>291–299</td><td>185–191</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="13">Homework: Continue and complete Act. 5; Test yourself on circuits LB pp. 209–210; ES p. 106 Ex. Ch. 17 examples 7–9</td></tr>
<tr><td>4</td><td>Resistors in series and parallel:
• Voltage is constant across resistors connected in parallel
• A parallel circuit is called a current divider
• Calculate the equivalent (total) resistance of resistors connected in parallel using: $R_P = 1/R_1 + 1/R_2 + \dots$
Prescribed experiment on resistors: Part 2</td><td></td><td>205 & 208</td><td>Act. 5 p. 208 Part 2</td><td>D58-D59</td><td>299–304</td><td>185–191</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="13">Homework: Summative assessment test on electricity and magnetism LB pp. 211–212; ES p. 106 Ex. Ch. 17 examples 10–14</td></tr>
<tr><th colspan="13">Reflection</th></tr>
<tr><td colspan="6" rowspan="2">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?</td><td colspan="7">What will you change next time? Why?</td></tr>
<tr><td colspan="4">HOD:</td><td colspan="3">Date:</td></tr>
</table>

Study and Master Week 9: Completion of work and revision: 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:**

Study and Master Week 10: Revision and examinations: 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

Once the tests and the formal practical have been marked and graded, 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 Physical Sciences 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? What can you do to 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? 2
4. Did you cover all the content as prescribed by the 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:

2. *Platinum Physical Sciences* (Maskew Miller Longman)

Platinum Physical Sciences Week 1: Particles that substances are made of

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				
Particles that substances are made of: • Matter is described as anything that has mass and occupies space • All matter is made up of atoms		32–35										
1	• When atoms **share electrons** they are bonded covalently and the resulting collection of atoms are called a molecule. *Demonstrate visual representations of atoms, molecules, elements and compounds*	32	95–97	Start Act. 1	52	199–206	152–155					
Homework: Complete Act. 1 LB pp. 95–97												
2	• When the **electrons of atoms are transferred** from one atom to another atom to form positive and negative ions, the ions bond with ionic bonds and the resulting solid is called an ionic substance (or salt or ionic compound).	32	98–99	Start Act. 2	53	199–206	152–155					
Resources: 'Jelly Tots', toothpicks or play dough or atomic model kits to demonstrate chemical bonding in elements and compounds												
3	• When the **electrons of atoms are transferred** from one atom to another atom to form positive and negative ions, the ions bond with ionic bonds and the resulting solid is called an ionic substance. *Demonstrate visual representations of atoms, molecules, elements and compounds*	32	98–99	Complete Act. 2	53	199–206	152–155					
Homework: Read up on Exp. 1 LB pp. 100–101; ES Representing compounds p. 204												
4	• Identify elements and compounds in chemical reactions. Elements and compounds are investigated by doing experiments	32	100	Exp. 1	53	199–206	152–155					
Homework: Read up on Exp. 2 LB p. 101												

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: Particles that substances are made of												
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**				
Particles that substances are made of: • Matter is described as anything that has mass and occupies space • All matter is made up of atoms		32										
1	• Identify elements and compounds in chemical reactions. Elements and compounds are investigated by doing experiments.	32	101–102	Exp. 2	53	Exp. p. 205–206	152–155					
Homework: Review summary LB p. 104												
2	• Give **examples of ionic substances** (solids, salts, ionic compounds) based on the above description, e.g. a sodium chloride crystal, potassium permanganate crystal	32–34			53–57	Exp. p. 206	152–155					
Homework: Exam practice questions LB p. 103; ES end-of-chapter revision pp. 207–208												

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Date completed				
						LB pp.	TG pp.					
Physical and chemical change: • The properties of matter determine how matter interacts with energy • Separation of particles in physical change and chemical change		35–36										
3	• Define a physical change as a change that does not alter the chemical nature of the substance (no new chemical substances are formed) • The rearrangement of molecules occurs during **physical changes**	35	106–107		58	209–210	152–155					
Homework: Review diagrams of molecules LB p. 107												
4	**Practical demonstrations:** • Physical change happens when ice is heated in a glass beaker to liquid and further to gas • Show with small plastic pellets or marbles the arrangement of the particles in ice, in water and in water vapour	35	107–108	Prac. Demo. 1 & 2	59–60	210	152–155					
Homework: Prepare for Demos 3 and 4 by reading the methods in LB pp. 108–109												

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: Physical and chemical change

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	**Practical demonstrations:** • Separation reactions like distillation, filtration and paper chromatography can be used to indicate physical change • Mix iron and sulphur and separate with a magnet	35	108–109	Prac. Demo. 3 & 4	59–60	211	156–160					
Homework: Write **your own** definitions of chemical change. Give five examples (use resources from library or internet).												
2	• Define a chemical change as a change in which the chemical nature of the substances involved changes (new chemical substances are formed) • Heat iron and sulphur with a burner and test the new substance that formed to see whether the product is a new substance (result of a chemical reaction)	35	109–110	Prac. Demo. 5	59–60	211–212	156–160					
Homework: Read Exp. 1 and 2 in preparation												
3	**Practical experiments:** • Add H_2O_2 to manganese dioxide (catalyst) and collect the oxygen by the downwards displacement of water in the test tube • Use apparatus for hydrogen combustion to burn hydrogen in oxygen • The energy involved in these chemical changes is much larger than those of physical changes	35–36	110–113	Exp. 1 Exp. 2	59–60		156–160					
Homework: Read LB pp. 114–117; ES Ex. 13.1 p. 216 on physical and chemical changes												
4	Conservation of atoms and mass: Illustrate the **conservation of atoms** and **non-conservation of molecules** during chemical reactions using models of reactant molecules. **Recommended experiment for informal assessment:** Conservation of matter by • Reacting lead(II) nitrate with sodium iodide • Reacting sodium hydroxide with hydrochloric acid • Reacting Cal-C-Vita tablet with water	36–37	113–116	Act. 1 Exp. 3	60–61	Exp. pp. 213–214	156–160					
Homework: Draw diagrams representing molecules at a sub-microscopic level to show how particles rearrange in chemical reactions and atoms are conserved; write out the law of constant proportions; ES pp. 220–221 Ex. 13.2 on conservation of mass												

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 change

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				
Representing chemical change • Balanced chemical equations represent chemical change and concur with the Law of Conservation of Matter • Balanced chemical equations are fundamentally important for understanding the quantitative basis of chemistry		37										
1	• Represent chemical changes using reaction equations, i.e. translate word equations into chemical equations with formulae with subscripts to represent phases (s), (ℓ), (g) and (aq)	37	118–119	Act. 1 Act. 2	64–66	Act. p. 227	Ex. 14.1 p. 181					
Homework: LB pp. 120–121 Act. 3; balance reaction equations by inspection; complete Act. 1; ES Ex. 14.1 p. 228 on chemical formulae												
2	Interpret balanced reaction equations in terms of • conservation of atoms • conservation of mass (use relative atomic masses)	37	121–122	Act. 4	66	Start Ex. 14.1	162					
Homework: Complete ES Ex. 14.1 p. 228 on chemical formulae												

<table>
<tr><th rowspan="2">S #</th><th rowspan="2">CAPS concepts, practical activities and assessment tasks</th><th rowspan="2">CAPS pp.</th><th rowspan="2">LB pp.</th><th rowspan="2">LB act.</th><th rowspan="2">TG pp.</th><th colspan="2">Everything Science</th><th colspan="5" rowspan="2">Date completed</th></tr>
<tr><th>LB pp.</th><th>TG pp.</th></tr>
<tr><td>3</td><td>- Interpret balanced reaction equations in terms of conservation of mass and energy</td><td>37</td><td>122–124</td><td>Act. 5</td><td>67–68</td><td>229–236</td><td>162–167</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="13">Homework: Complete Act. 5 calculations LB pp. 67–68; ES Ex. 14.2 pp. 234–235 on balancing chemical equations</td></tr>
<tr><td>4</td><td>Experiment:
- Test the Law of Conservation of Matter
- Amount of product is related to amount of reactant according to balanced equation</td><td>37</td><td>124–125</td><td>Exp. 1</td><td>68</td><td>Exp. p. 237</td><td>168–173</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="13">Homework: Revision: Exam practice questions LB p. 126; balancing equations ES p. 236; revision ES pp. 238–239</td></tr>
<tr><th colspan="13">Reflection</th></tr>
<tr><td colspan="3" rowspan="2">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?</td><td colspan="10">What will you change next time? Why?</td></tr>
<tr><td colspan="6">HOD:</td><td colspan="4">Date:</td></tr>
</table>

Platinum Physical Sciences Week 5: Magnetism and electricity

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				
Magnetic field of permanent magnets, poles of permanent magnets, attraction and repulsion, magnetic field lines		38–39										
1	• A magnetic field is a region in space where another magnet will experience a force • An electric field is a region in space where an electric charge will experience an electric force • The gravitational field is a region in space where a mass will experience a gravitational force	38	129	Exp. 1	72	240–241	173–178					
Homework: Prepare for investigation ES p. 242												
2	• A magnet is an object that has a pair of opposite poles, called north and south • Like magnetic poles repel and opposite poles attract **Recommended practical activity for informal assessment:** Determine the pattern and direction of the magnetic field around a bar magnet	38–39	130–131	Exp. 2	73	241–242 Investigation p. 242	173–178					
Homework: Prepare for investigations ES pp. 245–246												
3	• Compare the magnetic field of the Earth to the magnetic field of a bar magnet using words and diagrams • Explain the difference between the geographical North pole and the magnetic North pole of the Earth • Give examples of phenomena that are affected by the Earth's magnetic field	39	131–132	Exp. 3	73	243–245 Investigations pp. 245–246	173–178					
Homework: Start ES p. 252 Ex. 15 No. 1–8												
4	• Give examples of phenomena that are affected by Earth's magnetic field	39	132–133	Case Study p. 133	73	249–253	173–178					
Homework: Complete ES p. 252 Ex. 15 Nos. 9–12												

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: Electrostatics**

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				
Electrostatics: Two kinds of charge, charge conservation, charge quantisation												
1	• All materials contain positive charges (protons) and negative charges (electrons) • Positively charged objects are electron deficient and negatively charged objects have an excess of electrons • Objects (insulators) can be charged by contact (or rubbing)	40	134–135	Exp. 1 Exp. 2	75 75	254–257	179–184					
Homework: ES p. 256 Ex. 1												
2	• Explain how charged objects can attract uncharged insulators because of the polarisation of molecules inside insulators	40–41	138–139		75	258–259	179–184					
Homework: ES Ex. 2 p. 259; Ex. 6, 7 pp. 266–267												

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Date completed				
						LB pp.	TG pp.					
3	Charge conservation: • Know that the SI unit for electric charge is the coulomb • State the principle of conservation of charge as: *The net charge of an isolated system remains constant during any physical process* • Apply the principle of conservation of charge	41	139–140 Act. 2		76	260–263	179–184					
Homework: ES pp. 262–263 Ex. 3–4												
4	Charge quantisation: • State the principle of charge quantisation • Apply the principle of charge quantisation	41–42	139–140		139	264–271	179–184					
Homework: ES Ex. 5–6 pp. 264–268; ES end-of-chapter exercises pp. 272–274 (teacher to choose examples)												

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: Circuit electricity

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				
Electric circuits: Emf, terminal pd, current, measurement of voltage and current, resistance		42–44										
1	Terminal pd, emf: • Define potential difference in terms of work done and charge: $V = W/Q$ • Emf and pd are measured in volts (V) • Do calculations using: $V = W/Q$	42	141–144	Case study p. 143	77–79	275–276	185–191					
Homework: Act. 1 on lightning p. 144 in LB												
2	Current: • Define current, I, as the rate of flow of charge • Current is measured in ampere (A), which is the same as coulomb per second • Calculate the current flowing using the equation $I = Q/t$ • Indicate the direction of the current in circuit diagrams	42	145–146	Act. 2	79	277–282	185–191					
Homework: ES pp. 280–283 Ex. 1												
3	• Measurement of voltage and current • Draw diagrams to show how to correctly connect an ammeter to measure the current and to show how to correctly connect a voltmeter to measure the voltage across a given circuit element	43	155–158	Act. 8	83	279 Act. p. 279	185–191					
Homework: ES pp. 280–283 Ex. 2–3												
4	Resistance: • Define resistance • Explain that resistance is the opposition to the flow of electric current • Define the unit of resistance • One ohm (Ω) is one volt per ampere	44	147–149	Act. 4	80	283–284	185–191					
Homework: Review series and parallel circuits from Grade 9												

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: Resistors in series and parallel												
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**				
Resistors in series and parallel												
1	**Resistors in series:** • Current is constant through each resistor in series circuit • Series circuits are called voltage dividers • Calculate the equivalent (total) resistance of resistors connected in series using: $R_S = R_1 + R_2 + \ldots$	44	150–151	Start Act. 5	81	285–289	185–191					
Homework: Complete Act. 5 LB p. 151; ES p. 106 Ex. Ch. 17 examples 1–4												
2	**Resistors in series:** • Current is constant through each resistor in series circuit • Series circuits are called voltage dividers • Calculate the equivalent (total) resistance of resistors connected in series using: $RS = R_1 + R_2 + \ldots$ **Prescribed experiment:** Part A	44	158	Exp. 2 Series circuit	83	289–291	185–191					
Homework: ES p. 106 Ex. Ch. 17 examples 5–6												

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Date completed				
						LB pp.	TG pp.					
3	**Resistors in series and parallel**: • Voltage is constant across resistors connected in parallel • A parallel circuit is called a current divider • Calculate the equivalent (total) resistance of resistors connected in parallel using: $R_P = 1/R_1 + 1/R_2 + \dots$	45	152–154	Start Act. 6	82–83	291–299	185–191					
Homework: Complete Act. 6 LB p. 154; ES p. 106 Ex. Ch. 17 examples 7–9												
4	**Resistors in series and parallel:** • Voltage is constant across resistors connected in parallel • A parallel circuit is called a current divider • Calculate the equivalent (total) resistance of resistors connected in parallel using: $R_P = 1/R_1 + 1/R_2 + \dots$ **Prescribed experiment:** Part B	45	158	Exp. 2 Parallel circuit	84–86	299–304	185–191					
Homework: Exam practice questions on magnetism and electricity LB pp. 159–160; ES p. 106 Ex. Ch. 17 examples 10–14												

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 and revision: 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:**

Platinum Physical Sciences Week 10: Revision and examinations: 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

Once the tests and the formal practical have been marked and graded, 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 Physical Sciences 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? What can you do to 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? 2
4. Did you cover all the content as prescribed by the 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:

3. *Successful Physical Sciences* (Oxford University Press)

Successful Physical Sciences Week 1: Particles that substances are made of

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				
Particles that substances are made of: • Matter is described as anything that has mass and occupies space • All matter is made up of atoms		32–34										
1	Atoms and compounds • Molecules (molecular substances) are due to covalent bonding • The atoms are combined in definite proportions • *Determine the products of the electrolysis of water (sodium sulfate added), identify the elements and the compounds*	32	107–110	Exp. 1	79	199–206	152–155					
Homework: Representing compounds ES p. 204												
2	• When atoms **share electrons** they are bonded covalently and the resulting collection of atoms are called a molecule. *Demonstrate visual representations of atoms, molecules, elements and compounds*	32	110–111	Act. 2	79–80	199–206	152–155					
Homework: Read ES pp. 206 to 207												
3	• Covalent *molecular* structures consist of separate molecules: oxygen, water, petrol, CO_2, S_8, C_{60} (buckminsterfullerene or bucky balls) • Draw diagrams to represent molecules using circles to represent atoms • Represent molecules using molecular formulae for covalent molecular structures, e.g. O_2, H_2O, C_8H_{18}, $C_{12}H_{22}O_{11}$	32	112–113	Exp. 1	80	199–206	152–155					
Homework: Complete laboratory report on Exp. 1												
4	• Covalent *network* structures consist of giant repeating lattices of covalently bonded atoms: diamond, graphite, SiO_2 and some boron compounds • *Demonstrate chemical bonding using atomic model kits*	32–34	114–115	Act. 2	80–81	199–206	152–155					
Homework: Revise ionic bonding from Grade 9												

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: Particles that substances are made of

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				
Particles that substances are made of: • Matter is described as anything that has mass and occupies space • All matter is made up of atoms		32–34										
1	• When the **electrons of atoms are transferred** from one atom to another atom to form positive and negative ions, the ions bond with ionic bonds and the resulting solid is called an ionic substance (or salt or ionic compound) • Give examples of ionic substances	32–34	116–117	PA 1 OR Act. 2	81	Exp. p. 205–206	152–155					
Homework: ES pp. 205–206 review general experiments												
2	• When metal atoms lose their outer electrons to form a lattice of regularly spaced positive ions and the outer electrons form a delocalized 'pool' of electrons that surround the positive ions, the atoms are bonded by metallic bonding and the resulting collection of atoms is called **a metal**	32–34	118–119	PA 1	81	Exp. p. 206	152–155					
Homework: ES pp. 205–206 review general experiments												

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Date completed				
						LB pp.	TG pp.					
3	• Atoms and compounds (structural particles)	33–34	119	Act. 2	82–83	209–210	152–155					
Homework: Particles that substances are made of: Revision LB pp. 121–122												
Physical and chemical change • The properties of matter determine how matter interacts with energy • Separation of particles in physical change and chemical change		35–37										
4	• Define a physical change as a change that does not alter the chemical nature of the substance: no new chemical substances are formed • Describe that the rearrangement of molecules occurs during **physical changes**	35–36	123–125	Prac. Demo.1 Prac. Demo.2	84	209–210	152–155					
Homework: Act. 3 LB p. 126												

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: Physical and chemical change

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	• Mass, numbers of atoms and molecules are conserved during these **physical** changes • Energy change is small in relation to chemical changes • A physical change happens when ice is heated in a glass beaker to liquid and further to gas	35–37	126–127	Prac. Demo. 1	84–85	211	156–160					
Homework: Illustrate the **conservation of atoms** and **molecules** during the physical reactions above – use sweets or coloured dots												
2	• Show chemical change with diagrams of the particles • Describe examples of a **chemical change** as the decomposition of hydrogen peroxide to form water and oxygen and the synthesis reaction that occurs when hydrogen burns in oxygen to form water • Describe the energy involved in these chemical changes is much larger than those of the physical changes	35–36	128–131	Exp. 2 Exp. 3	85	211–212	156–160					
Homework: Illustrate the **conservation of atoms** and **non-conservation of molecules** during the chemical reactions above. Use sweets or coloured dots												
3	Conservation of atoms and mass: **Recommended experiment for informal assessment:** Investigate conservation of matter by: • Reacting lead(II) nitrate with sodium iodide • Reacting sodium hydroxide with hydrochloric acid • Reacting Cal-C-Vita tablet with water	35–36	132–135	Exp. 1 PA 2	86		156–160					
Homework: Conservation of mass Act. 3 LB p. 135												
4	Law of constant composition Investigate the ratio in which the following elements combine to form products: • $AgNO_3$ and NaCl • $Pb(NO_3)_2$ and NaI • $FeCl_3$ and NaOH	36–37	136–137	Exp. 1	88	Exp. pp. 213–214	156–160					
Homework: Law of constant composition Act. 2 LB p. 137												

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 change

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				
Representing chemical change: • Balanced chemical equations represent chemical change and concur with the Law of Conservation of Matter • Balanced chemical equations are fundamentally important for understanding the quantitative basis of chemistry		37										
1&2	• Represent chemical changes using reaction equations, i.e. translate word equations into chemical equations with formulae with subscripts to represent phases (s), (ℓ), (g) and (aq) • Balance reaction equations by – using models – conserving atoms by using coloured circles to represent molecules at sub-microscopic level – inspection using reaction equations	37	138–140		89–90	Act. p. 227 Start Ex. 14.1	Ex. 14.1 p. 161					
Homework: Complete Act. 4 balancing equations LB p. 141												

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Date completed				
						LB pp.	TG pp.					
3	- Test the Law of Conservation of Matter: amount of product is related to amount of reactant	37	142–143	Exp. 5	91	229–236	162					
Homework: Revise chemical reactions Act. 6 LB p. 143												
4	Revision of physical and chemical change to balancing chemical equations LB pp. 145–146	37	145–146	Revision and Extension	91–92	Exp. p. 237	162–167					
Homework: Revision of physical and chemical change LB pp. 145–146; end-of-chapter exercises on chemical equations ES TG pp. 168–176												

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: Magnetism and electricity

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				
Magnetic field of permanent magnets, poles of permanent magnets, attraction and repulsion, magnetic field lines		38–39										
1	• A magnetic field is a region in space where another magnet will experience a force • An electric field is a region in space where an electric charge will experience an electric force • The gravitational field is a region in space where a mass will experience a gravitational force	38	147–149		93	240–241	173–178					
Homework: Prepare for investigation ES p. 242												
2	• A magnet is an object that has a pair of opposite poles, called north and south • Like magnetic poles repel and opposite poles attract **Recommended practical activity for informal assessment:** Determine the pattern and direction of the magnetic field around a bar magnet	38–39	150–151	PA 1	93	241–242 Investigation p. 242	173–178					
Homework: Prepare for investigations ES pp. 245–246												
3	• Compare the magnetic field of the Earth to the magnetic field of a bar magnet using words and diagrams • Explain the difference between the geographical North pole and the magnetic North Pole of the Earth • Give examples of phenomena that are affected by the Earth's magnetic field	39	152–152		93–94	243–245 Investigations pp. 245–246	173–178					
Homework: Start ES p. 252 Ex. 15 No. 1–8												
4	• Give examples of phenomena that are affected by the Earth's magnetic field	39	153		94	245–252	173–178					
Homework: Complete ES p. 252 Ex. 15 No. 9–12												

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: Electrostatics												
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				
Electrostatics: Two kinds of charge, charge conservation, charge quantisation		40–42										
1	• All materials contain positive charges (protons) and negative charges (electrons) • Positively charged objects are electron deficient and negatively charged objects have an excess of electrons • Objects (insulators) can be charged by contact (or rubbing) • Explain how charged objects can attract uncharged insulators because of the polarisation of molecules inside insulators	40	154–155	Prac. Dem 1	94–95	254–257	179–184					
Homework: Act. 2 on electrostatics LB p. 157; ES p. 256 Ex. 1												

<table>
<tr><th rowspan="2">S #</th><th rowspan="2">CAPS concepts, practical activities and assessment tasks</th><th rowspan="2">CAPS pp.</th><th rowspan="2">LB pp.</th><th rowspan="2">LB act.</th><th rowspan="2">TG pp.</th><th colspan="2">Everything Science</th><th colspan="5" rowspan="2">Date completed</th></tr>
<tr><th>LB pp.</th><th>TG pp.</th></tr>
<tr><td>2</td><td>Charge conservation:
• Know that the SI unit for electric charge is the coulomb
• State the principle of conservation of charge as: The net charge of an isolated system remains constant during any physical process
• Apply the principle of conservation of charge</td><td>41</td><td>158–159</td><td>Start Act. 1</td><td>95–96</td><td>258–259</td><td>179–184</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="13">Homework: Complete Act. 1 LB p. 159 on conservation of charge; ES p. 259 Ex. 2, pp. 266–267 Ex. 6–7</td></tr>
<tr><td>3</td><td>Charge quantisation
• State the principle of charge quantisation
• Apply the principle of charge quantisation
• Recall that like charges repel and opposite charges attract
• Explain how charged objects can attract uncharged insulators because of the polarisation of molecules inside insulators</td><td>41–42</td><td>159–160</td><td></td><td>95–96</td><td>260–263</td><td>179–184</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="13">Homework: ES pp. 262–263 Ex. 3–4</td></tr>
<tr><td>4</td><td>Apply the principle of charge quantisation</td><td>41–42</td><td>160</td><td>Start Act. 2</td><td>96–97</td><td>264–271</td><td>179–184</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="13">Homework: Complete Act. 2 on quantisation of charge LB p. 160; ES pp. 264–268 Ex. 5–6, pp. 272–274 end-of-chapter exercises (teacher to choose examples)</td></tr>
<tr><th colspan="13">Reflection</th></tr>
<tr><td colspan="3" rowspan="2">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?</td><td colspan="10">What will you change next time? Why?</td></tr>
<tr><td colspan="7">HOD:</td><td colspan="3">Date:</td></tr>
</table>

Successful Physical Sciences Week 7: Circuit electricity

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				
Electric circuits: emf, terminal pd, current, measurement of voltage and current, resistance		42–44										
1	Terminal pd, emf: • Define potential difference in terms of work done and charge: *V* = *W*/*Q* • Emf and pd are measured in volts (V) • Do calculations using: *V* = *W*/*Q*	42	161–165	Prac. Demo. 1 Start Act. 1	97	275–276	185–191					
Homework: Complete Act. 1 on electric circuits LB p. 162; Act. 2 on pd and emf LB p. 165												
2	Current: Define current, *I*, as the rate of flow of charge • Current is measured in ampere (A), which is the same as coulomb per second • Calculate the current flowing using: *I* = *Q*/*t* • Indicate the direction of the current in circuit diagrams	42	166–167	Start Act. 1	99–100	277–282	185–191					
Homework: Complete Act. 1 on current LB p. 167												
3	Measurement of voltage and current: • Draw diagrams to show how to – correctly connect an ammeter to measure the current – correctly connect a voltmeter to measure the voltage across a given circuit element	43	167		99–100	282	185–191					
Homework: ES pp. 280–282 Ex. 1–3												
4	Resistance: • Define resistance • Explain that resistance is the opposition to the flow of electric current • Define the unit of resistance • One ohm (Ω) is one volt per ampere	44	168–169	Start Act. 1	100–101	282–284	185–191					
Homework: Complete Act. 1 on resistance LB p. 169												

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: Resistors in series and parallel

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				
Resistors in series and parallel												
1	**Resistors in series:** • Current is constant through each resistor in series circuit • Series circuits are called voltage dividers • Calculate the equivalent (total) resistance of resistors connected in series using: $R_S = R_1 + R_2 + \dots$	44	170–171	Exp. 1	103	285–289	185–191					
Homework: Write up Experiment 1 in notebook												
2	**Resistors in series:** • Current is constant through each resistor in series circuit • Series circuits are called voltage dividers • Calculate the equivalent (total) resistance of resistors connected in series using: $R_S = R_1 + R_2 + \dots$ **Prescribed experiment:** Exp. 1 p. 170	44	171–172	Start Act. 2	103–107	289–291	185–191					
Homework: Complete Act. 2 on resistors in series LB p. 172												
3	**Resistors in parallel:** • Voltage is constant across resistors connected in parallel a parallel circuit is called a current divider • Calculate the equivalent (total) resistance of resistors connected in parallel using: $RP = 1/R1 + 1/R2 + \dots$ **Prescribed experiment:** Exp. 1 LB p. 173	45	173–175	Exp. 1 Start Act. 2	107–109	291–299	185–191					
Homework: Act. 2 on resistors in parallel LB p. 175												
4	**Resistors in parallel:** • Voltage is constant across resistors connected in parallel • A parallel circuit is called a current divider • Calculate the equivalent (total) resistance of resistors connected in parallel using: $RP = 1/R1 + 1/R2 + \dots$	45	177–178	177–178	177–178	177–178	177–178					
Homework: LB p. 178 Q. 5–6 on electricity and magnetism												

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 and revision: 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 examinations: 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

Once the tests and the formal practical have been marked and graded, 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 Physical Sciences 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? What can you do to 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? 2
4. Did you cover all the content as prescribed by the 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

CAPS concepts, practical activities and assessment tasks	Additional information and enrichment activities
Week 1–2: Particles substances are made of	
Atoms and compounds **Molecules (molecular substances)** are due to **covalent bonding**: • When atoms **share electrons** they are bonded covalently and the resulting collection of atoms is called a molecule • Give **examples** of molecules based on this description, e.g. oxygen, water, petrol, CO_2, S_8, C_{60} (buckminsterfullerene or bucky balls) • Covalent molecular structures consist of separate molecules • As a general rule molecular substances are almost always composed of non-metallic elements **Ionic substances are due to ionic bonding**: • When the electrons of atoms **are transferred** from one atom to another atom to form positive and negative ions, the ions bond with ionic bonds and the resulting solid is called an ionic substance (or salt or ionic compound) • Give **examples** of ionic substances (solids, salts, ionic compounds) based on this description, e.g. a sodium chloride crystal, a potassium permanganate crystal • As a general rule ionic substances are usually composed of both metallic elements (usually forming positive ions) and non-metallic elements (usually forming negative ions) **A metal is described as follows**: • When metal atoms lose their outer electrons to form a lattice of regularly spaced positive ions and the outer electrons form a delocalized 'pool' of electrons that surround the positive ions, the atoms are bonded by metallic bonding and the resulting collection of atoms is called a metal	Describe matter from the concepts: atoms, elements, symbols, ions, compounds, molecules, ionic substances, chemical formulae, chemical reactions. Both molecules and ionic substances are **compounds**, respectively due to **different** chemical bonding. *See Worksheet 1 on metals and non-metals.* Encourage the learners to investigate different crystal shapes, building models for each shape and presenting or displaying them in the classroom. This should include covalent molecular and network structures. *See Worksheet 2 on valency and bonding.* *See Worksheet 3 on valency and bonding.* *Worksheets 1 to 3* may be considered very simple. However, for learners who may have forgotten past work or who have not yet managed to build the required concepts, these exercises may prove useful.
Alloys are interesting as people have used this technology for thousands of years to make better use of our resources to meet various needs. For this reason, if time permits, one or two lessons could be spent on this topic.	**Additional interesting information** An **alloy** is a **mixture** of a metal with other elements (metals or non-metals). Metals can be mixed together to make alloys to improve the metal's properties to better suit a particular purpose. An alloy mixture often has superior desired properties compared to the pure metal or metals, i.e. the alloy has its own unique properties and can be a more useful metal. Alloys are therefore not compounds but a physical mixing of a metal plus at least one other material. The added material can be another metal, e.g. tin and nickel added to copper to make bronze, or a non-metal, e.g. carbon added to iron to form steel, and its atoms can be bigger or smaller than the main metal's atoms. Many alloys are produced like this to give a stronger metal. The presence of the other atoms (smaller or bigger) disrupts the symmetry of the layers and reduces the 'slip ability' of one layer next to another. The result is a stronger, harder, less malleable metal. *See Worksheet 4 on alloys.*

CAPS concepts, practical activities and assessment tasks	Additional information and enrichment activities
Week 3: Physical and chemical change	
Physical change Define a **physical change** as a change that does not alter the chemical nature of the substance (no new chemical substances are formed): • A **rearrangement** of molecules occurs during physical changes • Energy change is small • Mass, numbers of atoms and molecules are conserved during these physical changes	Learners should be aware that although some properties (like shape, phase, etc.) of the material change, the material itself is the same before and after the change. Some authorities suggest that the change can be 'undone' but this is not always the case, or at least the change cannot be undone immediately, e.g. cutting hair. There are instances of the difference between physical and chemical changes being unclear but this issue will be dealt with at a later stage. However, if learners argue about (for example) dissolving salt in water, encourage their thinking and use the following explanation or one like it: Dissolving salt in water seems like a physical change because we know we can recover the salt from the water. However, if we look at the microscopic level, we see that the two types of atoms in salt, sodium and chlorine, separate from one another. In this example, we don't have a new substance, therefore this salt in solution doesn't fit the microscopic definition of a chemical change; but we also don't have the substance in its original form. Though it has aspects of a chemical change, we still classify the dissolution of salt as a physical change. *See Worksheet 5 on physical and chemical change at this point or after you deal with **chemical change**.*
Chemical change Define a **chemical change** as a change in which the chemical nature of the substances involved changes (new chemical substances are formed). Give examples of a **chemical change** that could include: • The *decomposition* of hydrogen peroxide to form water and oxygen • The *synthesis* reaction that occurs when hydrogen burns in oxygen to form water **Conservation of atoms and mass** • Illustrate the conservation of atoms and non-conservation of molecules during chemical reactions • Describe the energy involved in these chemical changes as much larger than those of physical changes	The challenge for learners is to understand that: • Some substances can co-exist without affecting one another, but some combinations of substances under certain conditions interact and then new substances are formed • After a chemical interaction the chemical elements are still there but in the 'new' substance • After a chemical interaction the original atoms still exist but they are associated in a different way • A new substance forms either when one substance breaks into two or more substances or when two or more substances interact Some **misconceptions** or wrong ideas that learners may hold include the following: • The change just happens (you could reinforce behaviour of electrons) • Matter disappears (you could stress conservation of matter) • The products of the reaction were present in the reactants (you could help learners understand by referring again to concrete examples using marbles or other materials) One of the ways of identifying a chemical reaction is by observing 'fizzing' or effervescence. However, watch out for a common **misconception** that: • When a chemical reaction results in gas, the product is lighter because gas weighs less Emphasise conservation again and again. Learners find it easy to forget this most important law.

CAPS concepts, practical activities and assessment tasks	Additional information and enrichment activities
Week 4: Representing chemical change	
Balanced chemical equations **Represent chemical changes** using reaction equations, i.e. translate word equations into chemical equations with formulae with subscripts to represent phases (s), (ℓ), (g) and (aq). **Balance reaction equations** by: • Using models of reactant molecules (coloured marbles stuck to each other with Prestik) and rearranging the 'atoms' to form the products while conserving atoms • Representing molecules at a sub-microscopic level using coloured circles and simply rearranging the pictures to form the product molecules while conserving 'atoms' • By inspection using reaction equations **Interpret balanced reaction** equations in terms of: • Conservation of atoms • Conservation of mass	Chemical reactions can be very different from one another, giving off different gases, different amounts of energy, and even different smells. At a microscopic scale, hundreds of thousands or even millions of encounters between pairs of particles are responsible for creating the macroscopic changes that we can observe. A chemical reaction occurs when the attractive forces between different particles are strong enough to tear the particles apart from each other. When we bring baking soda (sodium bicarbonate) and vinegar (acetic acid) together, the particle collide. In this case, the attractive forces between two reactants come together and three products are created: *sodium acetate*, which is dissolved in *water*, and *carbon dioxide*. Carbon dioxide is a gas at room temperature, so it bubbles up out of the mixture as the reaction takes place. Although the carbon dioxide may no longer be in the reaction test tube or container, it still exists, somewhere in the universe. This process is consistent with the principle of conservation of matter. This means that atoms and ions can rearrange into different molecules, but **they never just disappear**. *See Worksheet 6 on balancing equations.*
Weeks 5 and 6: Magnetism and electrostatics	
Magnetic fields of permanent magnets • Explain that a magnetic field is a region in space where another magnet will experience a force • Compare magnetic fields with electric and gravitational fields **Poles of permanent magnets, attraction and repulsion, magnetic field lines** • Describe a magnet as an object that has a pair of opposite poles, called north and south • Show the shape of the magnetic field around a bar magnet and a pair of bar magnets placed close together • Sketch magnetic field lines to show the shape, size and direction of the magnetic field of different arrangements of bar magnets **Earth's magnetic field, compasses** • Explain how a compass indicates the direction of a magnetic field • Compare the magnetic field of the Earth to the magnetic field of a bar magnet using words and diagrams • Explain the difference between the geographical North pole and the magnetic North pole of the Earth • Give examples of phenomena that are affected by Earth's magnetic field, e.g. Aurora Borealis and Aurora Australis, magnetic storms • Discuss qualitatively how the Earth's magnetic field provides protection from solar winds	Because magnets are commonly used in the home and playground, it is likely that learners will construct their own explanations for magnetic phenomena. Common **misconceptions** regarding magnetism include: • All metals are attracted to a magnet • All silver-coloured items are attracted to a magnet • All magnets are made of iron • Larger magnets are stronger than smaller magnets • *The magnetic and geographic poles of the Earth are located at the same place* • *The magnetic pole of the Earth in the northern hemisphere is a north pole, and the pole in the southern hemisphere is a south pole* • Only magnets produce magnetic fields • *A magnetic field is a pattern of lines (not a field of force) that surrounds a magnet* • In a magnet, the magnetic field lines exist only outside the magnet The first two misconceptions should have been remediated, if not in the intermediate phase, then certainly in the senior phase. However, if you are unsure of the learners' prior knowledge and understanding, do a quick diagnostic test. The italicised misconceptions should be remediated during this module. Remember to discuss, explain and **model** in three dimensions when dealing with magnetic fields. *continue*

CAPS concepts, practical activities and assessment tasks	Additional information and enrichment activities
Weeks 5 and 6: Magnetism and electrostatics	
	South and North magnetic poles The S-end of a compass points toward the Earth's South magnetic pole and the S-pole of a bar magnet repels the S-end of a compass. However, designating the ends of a compass and bar magnet as N and S has brought about confusion regarding the actual direction of the Earth's magnetic field. The original naming of the south and north poles of magnets has caused confusion. Correctly speaking, the end of a compass or magnet that pointed toward the South magnetic pole was called the south-seeking end of the compass or magnet. Over time we became a bit careless and called the south- and north-seeking poles of magnets simply south and north poles. So learners should remember that the *south* pole of a magnet *points south*, being the south-*seeking* pole and not the south-repelling pole. **Magnetite** is an oxide of **iron**. It is not a component of ordinary rust, although it can form as iron oxidizes in a dry environment. When you see sparks from welding operations or from iron striking a hard surface (as when it is held against a spinning grinder), the sparks are due to the rapid (and exothermic) oxidation of tiny particles of iron into magnetite. Magnetite is a natural magnet, hence the name, giving it a very nice distinguishing characteristic. It is the primary oxide of iron found in meteorites (and thus presumably in asteroids). It is black, dull with opaque crystals. It occurs naturally in South Africa, Germany, Russia and many localities in the United States. The elements iron (**Fe**), nickel (**Ni**), cobalt (**Co**) and gadolinium (**Gd**) are strongly attracted by a magnetic force. The reasons these metals are strongly attracted are because their atoms line up in the same magnetic direction. Alloys of iron with other metals retain magnetism longer than pure iron. *See section on alloys above.*

CAPS concepts, practical activities and assessment tasks	Additional information and enrichment activities
Week 7: Electrostatics	
Two kinds of charge • Know that all materials contain positive charges and negative charges • Know that an object that has an equal number of electrons and protons is neutral (no net charge) • Know that positively charged objects are electron deficient and negatively charged objects have an excess of electrons • Describe how objects (insulators) can be charged **Charge conservation** • Know that the SI unit for electric charge is the coulomb (C) • State the principle of conservation of charge • Apply the principle of conservation of charge • Know that when two identical conducting objects having charges Q1 and Q2 on insulating stands touch, that each has the same final charge on separation **Charge quantisation** • State the principle of charge quantisation • Apply the principle of charge quantisation **Force exerted by charges on each other:** **Attraction between charged and uncharged objects (polarisation)** • Recall that like charges repel and opposite charges attract • Explain how charged objects can attract uncharged insulators because of the polarisation of molecules inside insulators	**Some educators and scientists express the following opinions about teaching this section. It could serve as a discussion point among teachers.** Electrostatics is more important than we commonly assume. Standard 'electric current' circuits are deeply connected with electrostatics. For one thing, it is the electrostatic force that drives electric current! Without electrostatics, there could be no current and no electrical devices. It is totally wrong to build a false wall between 'Static' and 'Current'. For example, your muscles are driven by long-chain molecules which are forced to slide across each other. This sliding is performed by electrostatic attraction and repulsion between parts of the molecule. When uranium atoms are hit by neutrons and their nuclei split, the main source of released energy is the repulsion between alike-charged positive protons in the fragments of the nucleus. Therefore, nuclear reactors release the *electrostatic* energy of uranium nuclei. A plutonium bomb is actually a 'static electric' repulsion bomb! The following section about Benjamin Franklin and his kite makes an important safety point for **all** learners. **Benjamin Franklin's kite was never struck by lightning** Many people believe that Benjamin Franklin's kite was hit by a lightning bolt, and this was how he proved that lightning is electrical. A number of books and even some encyclopaedias say the same thing. They are wrong. What Franklin actually did was to show that a kite would collect a tiny bit of imbalanced electric charge out of the sky during the early parts of a thunderstorm, ***before*** lightning strikes became a danger. The common belief that Franklin easily survived a lightning strike is not just wrong, it is dangerous: it may convince learners that it's quite safe to duplicate the kite experiment as long as they 'protect' themselves by holding a silk ribbon with a key tied in the middle. **Make no mistake, Franklin's experiment was extremely dangerous.** He could have been killed at any moment, and if lightning had actually struck his kite, today he would be regarded as a colonial politician who was killed by stupidity, not as a famous scientist who founded a major new research area.  ***DO NOT TRY THIS EVER!***

F. ASSESSMENT RESOURCES

1. Sample item analysis sheet

PHYSICAL SCIENCES GRADE 10 TERM 2

Learner name	Learner surname	Task 1 Investigation				Task 2 Chemistry Examination								Task 2 Physics Examination							
		Process skills				Questions								Questions							
		A	B	C	D	1	2	3	4	5	6	7	Total	1	2	3	4	5	6	7	Total

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

INSTRUCTIONS AND INFORMATION

1. This question paper consists of 6 pages and 7 questions, a sheet with a Periodic Table, and an answer sheet.
2. Make sure that your question paper is complete.
3. Read the questions carefully.
4. Write legibly and set your work out neatly.
5. **Question 1** consists of 8 multiple-choice questions. There is only one correct answer to each question. 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.
7. Make use the data sheet whenever necessary.
8. Answer **all** questions.
9. **Show all working clearly in all calculations**.
10. Where appropriate round up answers to **two** decimal places.

Question 1

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 Which of the following statements about atomic structure is CORRECT?

- A The nucleus, consisting of protons and neutrons, is neutral.
- B All atoms have at least one proton and one neutron.
- C The electrons are accommodated in the lowest energy levels first.
- D The energy levels are circular tracks on which electrons move.

1.2 The formulae of two substances containing calcium are $CaCO_3$ and CaO.
Which of the following statements is TRUE?

- A They are both mixtures of elements: calcium, carbon and oxygen.
- B The formulae show that the calcium atoms in these substances are isotopes.
- C The calcium element is different in each substance.
- D These two substances are compounds.

1.3 An ionic substance has the formula XY. Which of the following could be the electronic configuration of X and Y atoms?

	X	**Y**
A	$1s^2, 2s^2, 2p^6, 3s^1$	$1s^2, 2s^2, 2p^6, 3s^2, 3p^4$
B	$1s^2, 2s^2, 2p^6, 3s^2$	$1s^2, 2s^2, 2p^6, 3s^2, 3p^6$
C	$1s^2, 2s^2, 2p^6, 3s^2$	$1s^2, 2s^2, 2p^6, 3s^2, 3p^7$
D	$1s^2, 2s^2, 2p^6, 3s^1$	$1s^2, 2s^2, 2p^6, 3s^2, 3p^7$

1.4 A substance Z has a high melting point and is not able to conduct electricity in the solid state but can conduct electricity in the molten state. Which of the following could be Z?

- A sodium chloride
- B iron
- C sugar
- D diamond

1.5 Beryllium bonds with phosphorus to form beryllium phosphide.
What is the formula of beryllium phosphide?

- A Be_3P_2
- B Be_2P_3
- C Be_2P
- D BeP_2

1.6 The atomic number of element E is 16.
What are the Group number and Period number of this element?

	Group number	Period number
A	14	4
B	15	3
C	16	2
D	16	3

1.7 Lithium and caesium are both alkali metals (in Group 1). Lithium has an atomic number of 3 and caesium’s atomic number is 55. Which of the following statements is CORRECT?

A Lithium and caesium are hard metals.
B Caesium reacts more violently and quickly with water than lithium does.
C Lithium burns in oxygen; caesium does not burn in oxygen.
D Both lithium and caesium react with water to form acids.

1.8 Which of the following chemical formulae correctly represents the formula for aluminium sulfate?

A $A\ell SO_4$
B $A\ell_2SO_4$
C $A\ell_2(SO_4)_3$
D $A\ell_3(SO_4)_2$

8 × (2) = **[16]**

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

Question 2

2.1 A home-brewed beer, which contains ethanol and water, is suspected of being contaminated with methanol. A chemist suggests that fractional distillation can be used to detect whether there is any methanol in the beer.

He draws up a table of the boiling points of methanol, ethanol and water.

Table of the boiling points of methanol, ethanol and water

Liquid	Boiling point (°C)
Methanol	65
Ethanol	78
Water	100

2.1.1 Explain what is *fractional distillation*. (2)

2.1.2 When would you know that you are collecting pure methanol? (2)

2.1.3 Assume that all three substances, methanol, ethanol and water, are present in the beer. Sketch a graph of temperature against time on the answer sheet to show the changes that would occur in the pattern of temperature readings as the beer is heated from 30 °C to 110 °C. (5)

2.2 The melting and boiling points of three substances X, Y and Z are given in the table below.

Table of melting and boiling points of substances X, Y and Z

Substance	Melting point (°C)	Boiling point (°C)
X	–5	12
Y	45	120
Z	20	80

2.2.1 What is the phase (state) of each substance X, Y and Z, at 25 °C (room temperature)? (3)

2.2.2 If the temperature of Y is changed from 60 °C to 20 °C, describe the process(es) through which substance Y will go while it is cooling down. (3)

[15]

Question 3

The atomic symbols of sodium and fluorine are ${}^{23}_{11}Na$ and ${}^{19}_{9}Fe$ respectively.

3.1 Draw a diagram to represent the atomic structure of a sodium atom, showing the nucleus, the energy levels and the relevant number of electrons. (4)

3.2 Write down the electronic configuration in terms of the s, p notation of:

3.2.1 A sodium atom. (2)

3.2.2 A fluorine atom. (2)

3.3 A sodium atom can lose one electron to form a sodium ion.

3.3.1 Write an equation to represent this process of a sodium atom forming its sodium ion. (2)

3.3.2 Write down the electronic configuration of a sodium ion in s, p notation. (1)

3.4 A fluorine atom gains an electron to form its ion.

3.4.1 Name the fluorine ion. (1)

3.4.2 Write the chemical symbol for an ion of fluorine. (1)

3.4.3 Write down the electronic configuration of a fluorine ion in s, p notation. (1)

3.5 Compare the sodium and fluorine ions as follows:

3.5.1 Write down one similarity of these two ions. (1)

3.5.2 Write down one difference between these two ions. (1)

3.6 A chemical bond forms between sodium and fluorine.

3.6.1 Name the type of chemical bond that forms between sodium and fluorine. (1)

3.6.2 Explain why this type of bond forms between sodium and fluorine. (2)

[19]

Question 4

Lithium oxide (Li_2O) is produced when lithium burns in oxygen, and fluorine oxide (F_2O) forms when fluorine gas reacts with oxygen gas.

4.1 Name the bond that forms between fluorine and oxygen to produce fluorine oxide. (1)

4.2 Draw a Lewis diagram showing the chemical bonding in a molecule of fluorine oxide. (3)

4.3 Explain **how** fluorine and oxygen bond to form fluorine oxide. (3)

4.4 Lithium oxide is *an ionic compound*. Explain what the phrase *an ionic compound* means, and give two general properties of ionic compounds. (3)

[10]

Question 5

Six substances are listed in the table below.

A	Diamond
B	Graphite
C	Copper
D	Water
E	Carbon dioxide
F	Copper sulfate

Answer these questions by writing down the letters A, B, C, D, E and/or F to indicate your choice.

5.1 Which THREE of these substances contain covalent bonds? (3)

5.2 Which ONE of these substances is a gas at room temperature? (1)

5.3 Which TWO of these substances can conduct electric current in the solid state? (2)

5.4 Which THREE of these substances have high melting points? (3)

5.5 Which TWO of these substances are allotropes? (1)

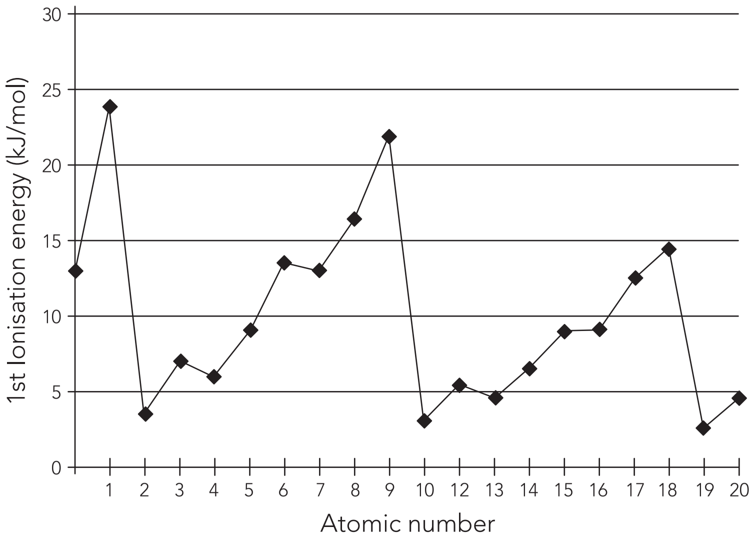
[10]

Question 6

6.1 Define *the first ionisation energy of an element.* (2)

6.2 With reference to the diagram of the first ionisation energy of atoms against atomic number, describe the **general trend** in ionisation energy as atomic number increases across Period 2. (1)

1st Ionisation energies



6.3 Explain why this general trend (described in 6.2) occurs as the atomic number increases across Period 2. (3)

6.4 Explain why neon has a very high first ionisation energy. (2)

6.5 Define the *electronegativity* of an atom of an element. (2)

6.6 How would you rate the electronegativity of lithium atoms? Answer *high* or *low*. Explain why lithium atoms are rated with this electronegativity. (2)

6.7 Define *an isotope of an element.* (2)

6.8 Boron has two naturally occurring isotopes: $^{10}_{5}B$ and $^{11}_{5}B$. In nature 20% of boron exists as $^{10}_{5}B$, and the rest exists as $^{11}_{5}B$. Show that the average relative atomic mass of boron is 10,8. (4)

[18]

Question 7

7.1 Write chemical formulae for the following substances:

7.1.1 iron II sulfide (1)
7.1.2 sodium carbonate (1)
7.1.3 magnesium nitrate (1)
7.1.4 ammonium sulfate (1)
7.1.5 phosphorus V oxide (1)

7.2 Balance the following chemical reaction equations:

7.2.1 $H_2O_2 \rightarrow H_2O + O_2$ (2)

7.2.2 $A\ell(OH)_3 + HC\ell \rightarrow A\ell C\ell_3 + H_2O$ (2)

7.3 Write a balanced chemical equation for this reaction:

sulfuric acid + sodium carbonate → sodium sulfate + carbon dioxide + water (3)

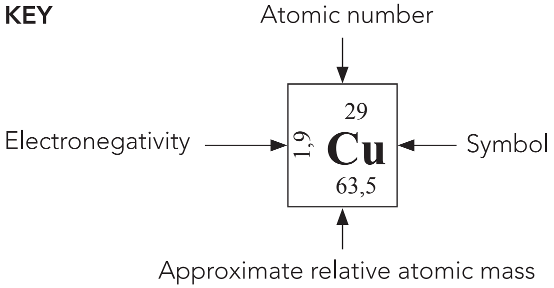
[12]

TOTAL MARKS: 100

TIME: 2 HOURS

END OF TEST

THE PERIODIC TABLE OF ELEMENTS



1 (I)	2 (II)	3	4	5	6	7	8	9	10	11	12	13 (III)	14 (IV)	15 (V)	16 (VI)	17 (VII)	18 (VIII)
1 2,1 **H** 1																	2 **He** 4
3 1,0 **Li** 7	4 1,5 **Be** 9											5 2,0 **B** 11	6 2,5 **C** 12	7 3,0 **N** 14	8 3,5 **O** 16	9 4,0 **F** 19	10 **Ne** 20
11 0,9 **Na** 23	12 1,2 **Mg** 24											13 1,5 **Aℓ** 27	14 1,8 **Si** 28	15 2,1 **P** 31	16 2,5 **S** 32	17 3,0 **Cℓ** 35,5	18 **Ar** 40
19 0,8 **K** 39	20 1,0 **Ca** 40	21 1,3 **Sc** 45	22 1,5 **Ti** 48	23 1,6 **V** 51	24 1,6 **Cr** 52	25 1,5 **Mn** 55	26 1,8 **Fe** 56	27 1,8 **Co** 59	28 1,8 **Ni** 59	29 1,9 **Cu** 63,5	30 1,6 **Zn** 65	31 1,6 **Ga** 70	32 1,8 **Ge** 73	33 2,0 **As** 75	34 2,4 **Se** 79	35 2,8 **Br** 80	36 **Kr** 84
37 0,8 **Rb** 86	38 1,0 **Sr** 88	39 1,2 **Y** 89	40 1,4 **Zr** 91	41 **Nb** 92	42 1,8 **Mo** 96	43 1,9 **Tc**	44 2,2 **Ru** 101	45 2,2 **Rh** 103	46 2,2 **Pd** 106	47 1,9 **Ag** 108	48 1,7 **Cd** 112	49 1,7 **In** 115	50 1,8 **Sn** 119	51 1,9 **Sb** 122	52 2,1 **Te** 128	53 2,5 **I** 127	54 **Xe** 131
55 0,7 **Cs** 133	56 0,9 **Ba** 137	57 **La** 139	72 1,6 **Hf** 179	73 **Ta** 181	74 **W** 184	75 **Re** 186	76 **Os** 190	77 **Ir** 192	78 **Pt** 195	79 **Au** 197	80 **Hg** 201	81 1,8 **Tℓ** 204	82 1,8 **Pb** 207	83 1,9 **Bi** 209	84 2,0 **Po**	85 2,5 **At**	86 **Rn**
87 0,7 **Fr**	88 0,9 **Ra** 226	89 **Ac**															

58 **Ce** 140	59 **Pr** 141	60 **Nd** 144	61 **Pm**	62 **Sm** 150	63 **Eu** 152	64 **Gd** 157	65 **Tb** 159	66 **Dy** 163	67 **Ho** 165	68 **Er** 167	69 **Tm** 169	70 **Yb** 173	71 **Lu** 175
90 **Th** 232	91 **Pa**	92 **U** 238	93 **Np**	94 **Pu**	95 **Am**	96 **Cm**	97 **Bk**	98 **Cf**	99 **Es**	100 **Fm**	101 **Md**	102 **No**	103 **Lr**

Physical Sciences Grade 10: End-of-Term 2 Chemistry Test

ANSWER SHEET

NAME: ______________________________

QUESTION 1

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
1.5	A	B	C	D
1.6	A	B	C	D
1.7	A	B	C	D
1.8	A	B	C	D
				TOTAL

QUESTION 2

2.1.3 Sketch Graph of Temperature against Time a Beer is heated from 30 °C to 110 °C.

3. Physical Sciences Grade 10: End-of-Term 2 Chemistry Test Memorandum

Question 1

1.1	C ✓✓	1.2	D ✓✓	1.3	D ✓✓	1.4	A ✓✓
1.5	A ✓✓	1.6	D ✓✓	1.7	B ✓✓	1.8	C ✓✓

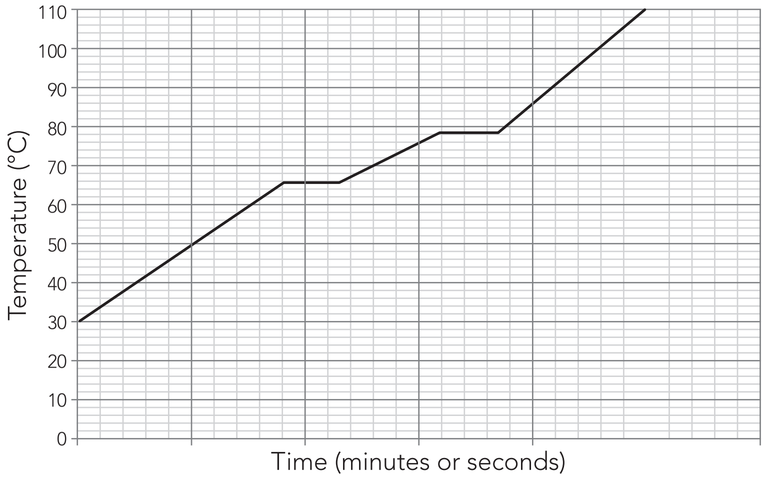
8 × (2) = [16]

Question 2

2.1 2.1.1 The process of boiling a mixture of liquids to separate them ✓ at their (different) boiling points. ✓ (2)

2.1.2 The liquid that boils at 65 °C will be methanol. ✓✓ (2)

2.1.3



✓ Temperature on vertical axis
✓ Time on horizontal axis
✓ Shape of graph – steady increase in temperature between boiling points
✓ Shape of graph – constant temperature at boiling points
✓ Appropriate boiling points (65 °C, 78 °C and 100 °C) (5)

2.2.1 X – gas ✓ (1)

Y – solid ✓ (1)

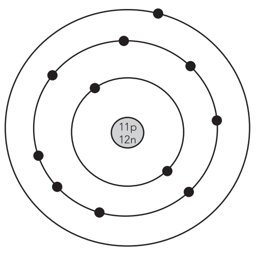
Z – liquid ✓ (1)

2.2.2 At 60 °C, Y is liquid ✓ therefore it will cool down to freeze at 45 °C ✓ to form its solid. ✓ (3)

[15]

Question 3

3.1



✓ central nucleus

✓ consisting of 11 protons and 12 netrons

✓ three energy levels or electrons

✓ 2 electrons in innermost energy level; * electrons in second energy level; one electron is third energy level (4)

3.2.1 Na: $1s^2\ 2s^2\ 2p^6\ 3s^1$
✓ correct number of electrons
✓ correct notation and placement of electrons (2)

3.2.2 F: $1s^2\ 2s^2\ 2p^5$
✓ correct number of electrons
✓ correct notation and placement of electrons (2)

3.3.1 $Na - 1e^- \rightarrow Na^+$ ✓✓ OR

$Na - e^- \rightarrow Na^+$ ✓✓ OR

$Na \rightarrow Na^+ + e^-$ ✓✓ (2)

3.3.2 $1s^2\,2s^2\,2p^6$ ✓ (1)

3.4.1 fluoride ✓ (1)

3.4.2 F^- ✓ (1)

3.4.3 $1s^2\,2s^2\,2p^6$ ✓ (1)

3.5.1 Same electronic configuration (same number of electrons) ✓ (1)

3.5.2 Different number of protons ✓ OR
Different number of neutrons ✓ OR
Different atomic mass ✓ (1)

3.6.1 ionic ✓ (1)

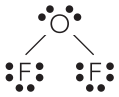
3.6.2 Sodium is a metal ✓ and fluorine is a non-metal ✓ OR
Sodium loses electrons to reach the stable octet of 8 electrons ✓ and fluorine gains one electron to reach the same stable octet of electrons. ✓ (2)

[19]

Question 4

4.1 (polar) covalent bond ✓✓ (1)

4.2



Correct number of electrons in the fluorine atom ✓
Correct number of electrons in the oxygen atom ✓
Two covalent bonds to fluorine atoms ✓ (3)

4.3 Oxygen has two unpaired electrons to form bonds ✓
Fluorine has one unpaired electron ✓
Each of these atoms shares the unpaired electron with the other ✓ (3)

4.4 An ionic compound is formed when a metal bonds with a non-metal with an ionic bond ✓

Any TWO properties of ionic compounds ✓ mark for each correct property:
- High melting points
- High boiling points
- Crystalline solid
- Conducts electric current in aqueous or molten phase; but not as a solid (3)

[10]

Question 5

5.1 Any THREE of A, B, D or E ✓✓✓ (3)

5.2 E ✓ OR D ✓ (since water can exist as water vapour at room temperature) (1)

5.3 B ✓ and C ✓ (2)

5.4 Any THREE of A, B, C or F ✓✓✓ (3)

5.5 A and B ✓ (1)

[10]

Question 6

6.1 The first ionization energy of an element is the amount of energy per mole (of gaseous element) required to remove the first ✓ electron from an atom of the element. ✓ (2)

6.2 Ionization energy increases as the atomic number increases. ✓ (1)

6.3 As the number of protons in the nucleus of the atom increases, the positive charge on the nucleus increases. ✓ The nucleus exerts a stronger attractive force on the electron ✓ therefore it takes more energy to remove the (first) electron from the atom. ✓ (3)

6.4 Neon (is a noble gas so it) has the stable arrangement of 8 electrons in its outermost energy level ✓ and therefore it takes the most energy to remove an electron from neon. ✓ (2)

6.5 The electronegativity of an element is a number that gives a measure of the relative attraction of the nucleus ✓ of the atom on the shared pair of bonding electrons. ✓ (2)

6.6 Lithium atoms have a low value of electronegativity ✓ because they tend to lose their valence electron to form the lithium ion. ✓ (2)

6.7 An isotope of an element has atoms with the same number of protons ✓ (and electrons) but a different number of neutrons. ✓ (2)

6.9 Let there be 100 boron atoms.

20 of these will be $^{10}_{5}B$ and 80 of them will be $^{11}_{5}B$ ✓

Total mass of 100 atoms = (20)(10) + (80)(11) ✓

= 1 080 ✓

Average mass of boron $= \frac{1\,080}{100}$ ✓ = 10,8 (4)

[18]

Question 7

7.1 7.1.1 FeS ✓ (1)

7.1.2 Na_2CO_3 ✓ (1)

7.1.3 $Mg(NO_3)_2$ ✓ (1)

7.1.4 $(NH_4)_2SO_4$ ✓ (1)

7.1.5 P_2O_5 ✓ (1)

7.2 7.2.1 $2\ H_2O_2 \rightarrow 2\ H_2O + O_2$ ✓✓ (2)

7.2.2 $2\ A\ell(OH)_3 + 6\ HC\ell \rightarrow 2\ A\ell C\ell_3 + 3\ H_2O$ ✓✓ (2)

7.3 H_2SO_4 ✓ + Na_2CO_3 ✓ $\rightarrow Na_2SO_4 + CO_2 + H_2O$ ✓ (3)

[12]

TOTAL MARKS: 100

4. Cognitive Analysis for Physical Sciences Grade 10: End-of-Term 2 Chemistry Test

Level 1: Recall
Level 2: Comprehension
Level 3: Analysis, application
Level 4: Evaluation, synthesis

QUESTION	1	2	3	4	Matter & materials	Atomic structure	Periodic Table	Bonding	Describing chemical change	Total (content)	Total (levels)	Total (questions)
TARGET	**15**	**40**	**35**	**10**	**20**	**25**	**20**	**20**	**15**	**100**	**100**	**100**
ACTUAL	**14**	**39**	**34**	**13**	**20**	**23**	**22**	**19**	**16**	**100**	**100**	**100**
1.1		2				2				2	2	
1.2	2				2					2	2	
1.3			2			2				2	2	
1.4		2						2		2	2	
1.5			2						2	2	2	
1.6		5					2			2	2	
1.7			2				2			2	2	
1.8			2						2	2	2	**16**
2.1.1	2				2					2	2	
2.1.2		2			2					2	2	
2.1.3				5	5					5	5	
2.2.1		3			3					3	3	
2.2.2		3			3					3	3	**15**

QUESTION	1	2	3	4	Matter & materials	Atomic structure	Periodic Table	Bonding	Describing chemical change	Total (content)	Total (levels)	Total (questions)
3.1		4				4				4	4	
3.2.1		2				2				2	2	
3.2.2		2				2				2	2	
3.3.1			2			2				2	2	
3.3.2			1			1				1	1	
3.4.1	1					1				1	1	
3.4.2	1					1				1	1	
3.4.3			1			1				1	1	
3.5.1		1				1				1	1	
3.5.2			1			1				1	1	
3.6.1		1				1				1	1	
3.6.2			2			2				2	2	**19**
4.1		1						1		1	1	
4.2			3					3		3	3	
4.3			3					3		3	3	
4.4		1	2					3		3	3	**10**
5.1		3						3		3	3	
5.2	1				1					1	1	
5.3	1	1			2					2	2	
5.4		3						3		3	3	
5.5			1					1		1	1	**10**

QUESTION	1	2	3	4	Matter & materials	Atomic structure	Periodic Table	Bonding	Describing chemical change	Total (content)	Total (levels)	Total (questions)
6.1	2						2			2	2	
6.2			1				1			1	1	
6.3				3			3			3	3	
6.4			2				2			4	2	
6.5	2						2			2	2	
6.6		1		1			2			2	2	
6.7	2						2			2	2	
6.8				4			4			4	4	**18**
7.1.1		1							1	1	1	
7.1.2		1							1	1	1	
7.1.3		1							1	1	1	
7.1.4		1							1	1	1	
7.1.5		1							1	1	1	
7.2.1			2						2	2	2	
7.2.2			2						2	2	2	
7.3			3						3	3	3	**12**
TOTAL												
%												
TARGET	15	40	35	10								

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

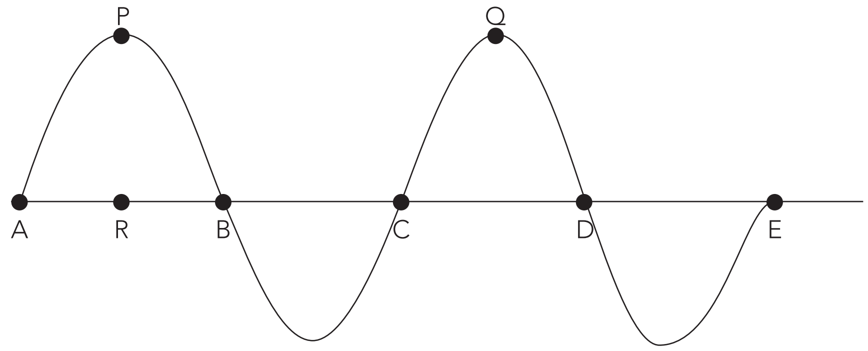
INSTRUCTIONS AND INFORMATION

1. This question paper consists of 6 pages and 7 questions, a sheet of data and formulae, and an answer sheet.
2. Make sure that your question paper is complete.
3. Read the questions carefully.
4. Write legibly and to set your work out neatly.
5. **Question 1** consists of 8 multiple-choice questions. There is only one correct answer to each question. 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.
7. Make use the data sheet whenever necessary.
8. Answer **all** questions.
9. **Show all working clearly in all calculations**.
10. Where appropriate round up answers to **two** decimal places.

Question 1

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.



Study the diagram of a wave shown above. Questions 1.1 and 1.2 refer to this diagram.

1.1 The wavelength of the wave is given by:

A AB
B AC
C AD
D AE

1.2 The amplitude of the wave is given by:

A AP
B AB
C PQ
D PR

1.3 A radio wave has a frequency of 150 000 Hz. Radio waves travel at the speed of light. What is the wavelength of this radio wave?

A 200 m
B 2 000 m
C 4 500 m
D $4,5 \times 10^{13}$ m

1.4 Ultrasound is preferred in medical diagnosis because

A sound waves are longitudinal waves
B ultrasound waves have frequencies above the threshold of human hearing
C it is safer to use ultrasound than to use x-rays for imaging internal organs
D sound waves travel at the speed of light

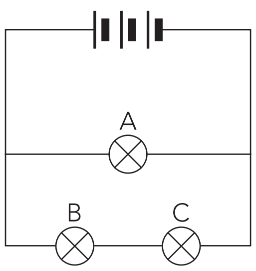
1.5 Which of these materials is NOT ferromagnetic material?

A copper
B iron
C cobalt
D nickel

1.6 Which of the following statements about lightning is FALSE? Lightning…

A is caused by the build-up of electric charge on clouds.
B is caused when there is an electric discharge in the air.
C never strikes the same place more than once.
D can occur from cloud to cloud, without striking the ground.

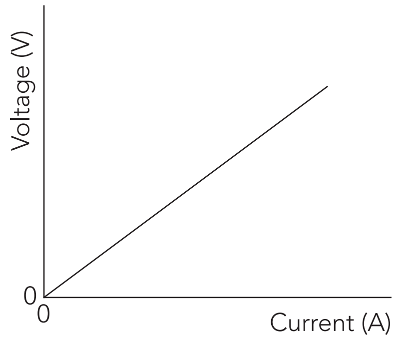
1.7 Three identical light bulbs are connected in a circuit as shown in the diagram.



Which light bulb conducts the greatest current?

A Light bulb A.
B Light bulb B.
C Light bulb C.
D Light bulbs B and C have the same current.

1.8 The graph of voltage against current is shown for a resistor R.



Use the information which this graph gives you.

Which of the following statements, describes the relationship between voltage and current MOST PRECISELY?

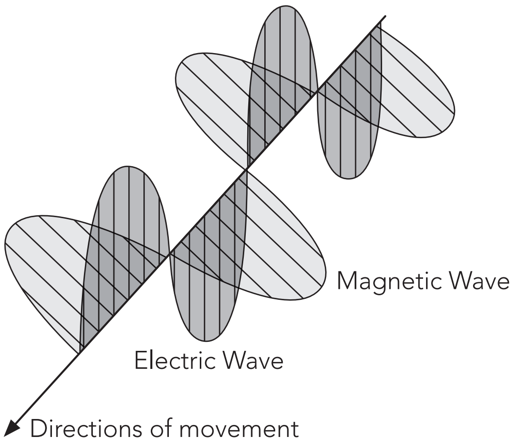
A The current is directly proportional to the voltage.
B The voltage is directly proportional to the current.
C The current increases as the voltage increases.
D The voltage increases as the current increases.

8 × (2) = **[16]**

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

Question 2

Electromagnetic waves are propagated when an electric field vibrating in one plane produces a magnetic field vibrating in a plane at right angles to it. The vibrating magnetic field produces a vibrating electric field, and so on.



NOTE: Image from http://media5.picsearch.com/is?GOYNqPBLEkr-ZasCXLMiHFQe54yHW2kaArRcRSFWb6k&height=299

2.1 At what speed (in m.s^{-1}) do the electric field and the magnetic field travel through a vacuum? (1)

2.2 Replace the word '*propagate*' with another word or short phrase which has the same meaning. (1)

2.3 Replace the word '*vibrate*' with another word or short phrase which has the same meaning. (1)

2.4 The human eye can only detect waves in the visible light region of the spectrum of electromagnetic (EM) radiation. Through technology we make use of the other regions of the EM spectrum in various ways.

Give ONE use for each of the following types of radiation:

	Region of the spectrum		**Give a use for this radiation**	
2.4.1	Infra-red		2.4.1	(1)
2.4.2	X-rays		2.4.2	(1)
2.4.3	Microwaves		2.4.3	(1)

[6]

Question 3

Andile and Boitumelo are measuring the speed of sound in air by standing 50 m away from a smooth concrete wall, and clapping their hands in a rhythmic pattern. They start this pattern by first both clapping their hands once at the same time. Then when they hear the echo of the first sound, they clap again. And they continue in this way, both clapping every time they hear an echo.

Their friend Carl helps them with their measurements by timing how long it takes for 8 echoes to be counted. He takes this measurement 3 times and records the results in a table. These results are shown below.

Here is Carl's table of trial number and time taken for 8 echoes to return from the wall which is 50 m away from him:

Trial number	Time for 8 echoes (s)
1	2,50
2	2,66
3	2,59

3.1 What distance does the sound wave travel from the time Andile and Boitumelo first clapped their hands and then clapped their hands the second time? (1)

3.2 Calculate the average time taken for 8 echoes to return. (3)

3.3 Calculate the average time taken for each echo to return. (2)

3.4 Calculate the speed of sound in air. (3)

3.5 Give TWO suggestions to improve the accuracy or reliability of the results of this experiment. Justify each suggestion briefly. (4)

[13]

Question 4

Young people are able to hear better than older people. In a test to establish the average range of hearing of teenagers it was found that most teenagers can hear sounds with frequencies from 12 Hz to 18 000 Hz, whereas adults over the age of 45 years can only hear sounds that range from 22 Hz to 16 000 Hz.

4.1 The wavelength of a sound with a frequency of 12 Hz is 28,33 m. Calculate the speed of sound in air. (3)

4.2 Calculate the shortest average wavelength which teenagers are able to hear. Give your answer in scientific notation. (3)

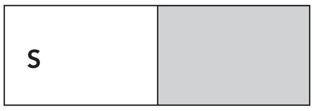
4.3
- 4.3.1 Give a factor that affects the loudness of sound. (2)
- 4.3.2 Describe how this factor is related to the loudness. (2)
- 4.3.3 Describe the relationship between pitch and wavelength of sound. (3)

4.4 Explain how sound waves are carried through the air. (3)

[16]

Question 5

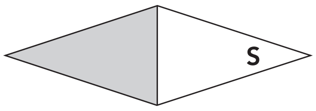
5.1 Copy the diagram of a bar magnet below and draw a diagram of its magnetic field.



(3)

5.2 A compass needle is suspended on a pivot on an insulated stand.

The diagram below shows the compass needle on this stand and at rest in the Earth's magnetic field.



5.2.1 With reference to diagram of the compass needle above, in which direction is the North Pole of the Earth?

Choose one of the following answers: *on the left; on the right; towards the top of the page* or *towards the bottom of the page.* (1)

5.2.2 The south pole of a bar magnet is now brought up close to the south pole of the compass needle as shown below.

a) **Describe how** the compass needle responds when the south pole of the magnet is placed close to it. (2)

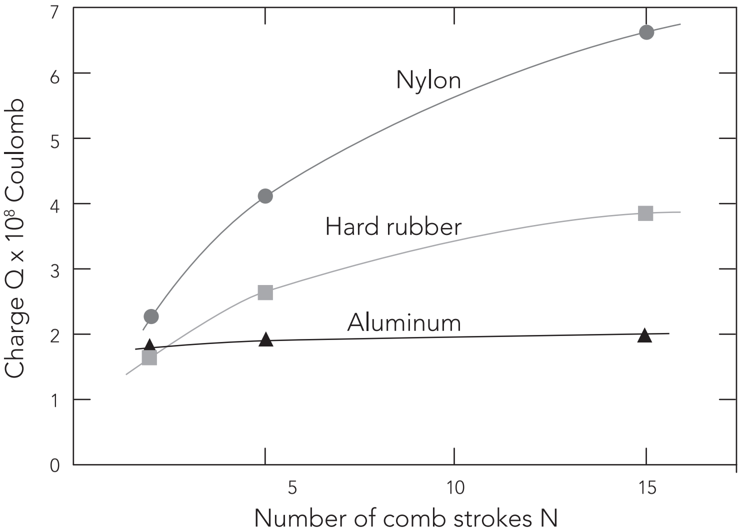
b) **Explain why** the compass needle responds in this way. (4)

[10]

Question 6

Charge on 1 electron = –1.6 × 10^{–19} C

Justin's hair is sticking up. He used a hard rubber comb to comb his hair, and now some of his hair moves away and sticks up and away from other parts of his hair. He decides to carry out an experiment to measure the amount of charge that collects on his hair when he combs it with three different types of comb. Each comb is of exactly the same size with the same number of teeth separated by the same distance.


Graph of charge against number of strokes of the comb for combs made of different materials

6.1 Explain how the rubber comb acquires a negative charge when Justin combs his hair. (2)

6.2 The comb acquires a charge of 2,5 × 10^8 C. The charge on an electron is 1,6 × 10^{-19} C. How many electrons does a charge of 2,5 × 10^8 C represent? (4)

6.3 How many strokes of the comb does 2,5 × 10^8 C represent? (1)

6.4 Explain why Justin's hair sticks up and moves away from other parts of his hair. (2)

6.5 Justin's hair would not stick up as much if he used an aluminium comb. Explain why the aluminium comb does not increase the amount of charge on his hair as much as the hard rubber comb does. (3)

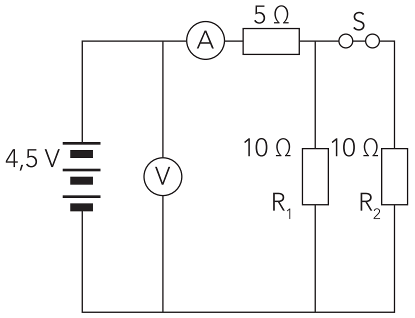
6.6 Study the graph of the charge on the nylon comb and the number of comb strokes. Describe the relationship between the charge on the nylon comb and the number of comb strokes. (2)

6.7 Explain why it is important in this experiment for all the combs to be identical except for the type of material from which they are constructed. (2)

[16]

Question 7

A 4,5 V battery with negligible resistance is connected to a 5 Ω resistor and to two 10 Ω resistors connected to each other in parallel. The resistances of the voltmeter and ammeter are such that they do not affect the readings in the circuit shown below.



7.1 Define the term *'resistance'* in an electric circuit. (2)

7.2 Calculate the effective resistance of the parallel resistors. (4)

7.3 Write down the reading on the voltmeter. (2)

7.4 Calculate the amount of charge passing through the ammeter in 3 minutes. (4)

7.5 Calculate the amount of electrical energy supplied to the circuit in 3 minutes by the battery. (4)

7.6 If R_2 is removed from the circuit by opening switch S, how do the following readings change? Write ONLY *increase, decrease* or *remains the same.*

7.6.1 The reading on the ammeter. (1)
7.6.2 The reading on the voltmeter. (1)
7.6.3 Explain your answers to 7.6.1 and 7.6.2 by carrying out calculations to justify your answers. (5)

[23]

TOTAL MARKS: 100

TIME: 2 HOURS

END OF TEST

DATA FOR PHYSICAL SCIENCES

GRADE 10 TERM 2

PHYSICS

TABLE 1: PHYSICAL CONSTANTS

NAME	SYMBOL	VALUE
Speed of light in a vacuum	c	$3{,}0 \times 10^{8}$ m.s^{-1}
Charge on an electron	e	$-1{,}6 \times 10^{-19}$ C

TABLE 2: FORMULAE

WAVES AND LIGHT

$v = f\lambda$

ELECTRIC CIRCUITS

$Q = I\Delta t$	$V = \frac{W}{Q}$
$R_{series} = r_1 + r_2 + r_3 + \ldots$	$\frac{1}{R_{\text{parallel}}} = \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3} + \ldots$

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

ANSWER SHEET

NAME: ______________________________

QUESTION 1

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
1.5	A	B	C	D
1.6	A	B	C	D
1.7	A	B	C	D
1.8	A	B	C	D
				TOTAL

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

Question 1

1.1	B ✓✓	1.2	D ✓✓	1.3	B ✓✓	1.4	C ✓✓
1.5	A ✓✓	1.6	C ✓✓	1.7	A ✓✓	1.8	B ✓✓

8 × (2) = **[16]**

Question 2

2.1 3×10^8 ✓ $(m.s_{-1})$ [Ignore SI units] (1)

2.2 Any ONE of the following:
- transmit or be transmitted in a particular direction or through a medium
- move
- travel (1)

2.3 Any ONE of the following:
- move or swing from side to side
- oscillate
- regularly alternate from side to side (1)

2.4 Any ONE of the uses shown below for each of 2.4.1, 2.4.2 and 2.4.3.

2.4.1 Infra-red radiation:
- In remote control systems, e.g. for television sets
- For night vision (detecting objects in low light conditions)
- Cooking, e.g. braai, in the oven, etc.
- In RADAR (1)

2.4.2 X-rays:
- Security purposes, e.g. scanning luggage at airports to check what is packed inside the bags
- Medical diagnosis, e.g. by dentists to identify cavities, doctors to detect broken bones, etc.
- To research and identify crystal structures (1)

2.4.3 Microwaves:
- Communication devices, e.g. cell phones send and receive microwaves
- Cooking in a microwave oven (1)

[6]

Question 3

3.1 $(2 \times 50) = 100$ m ✓ [accuracy; SI units] (1)

3.2 Average = $\frac{2,50 + 2,66 + 2,59}{3}$ ✓ [method (adding values) (dividing by 3)]

= 25,6 s ✓ [accuracy; SI units] (3)

3.3 Time for echo to return = 0,32 s ✓✓ (2)

3.4 Speed = $\frac{100}{0,32}$ [method ✓ substitutions ✓]

= $346,67 \text{ m.s}^{-1}$ ✓ [accuracy; SI units] (3)

3.5 Repeat the experiment but change the distance away from the wall ✓✓ so that they can take another set of 3 times, and calculate another value for the speed of sound. ✓✓

OR

Instead of clapping their hands together, each one claps with two pieces of wood, ✓✓ which will give a clearer (sharper) sound for the echo and make it easier to time the echoes more accurately. ✓✓

OR

Instead of only timing 8 series of echoes, time 10, then 12, then 14 ✓✓ so that more results can be compared to make the measurement of the speed of sound more reliable. ✓✓

OR any other valid method. (4)

[13]

Question 4

4.1 $v = f\lambda$ ✓ [method]

$= 12 \times 28{,}33$ ✓ [substitutions]

$= 339{,}96\ \text{m.s}^{-1}$ ✓ [accuracy; SI units] (3)

4.2 $v = f\lambda$

$339{,}96 = 18\,000 \times \lambda$ ✓ [substitutions]

$\lambda = 0{,}019$ ✓ [accuracy]

$= 1{,}9 \times 10^{-3}$ Hz ✓ [scientific notation; SI units] (3)

4.3 4.3.1 Loudness increases when the amplitude ✓ of the wave increases. ✓ (2)

4.3.2 Loudness increases when the energy transmitted per second increases OR when the intensity of the sound increases OR when the sound has a higher decibel level. ✓✓ (2)

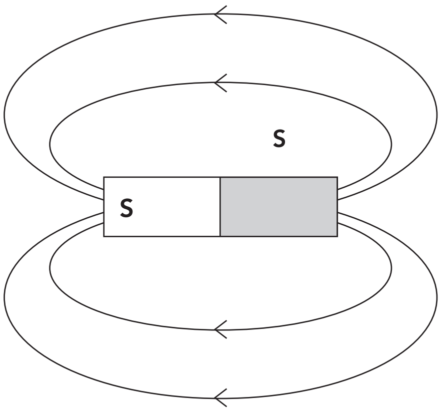
4.3.3 The pitch of sound is higher when its frequency is higher. ✓ If a wave has a high frequency is will have a low (short) wavelength. ✓ Therefore, a sound with a high pitch has a low (short) wavelength. ✓ (3)

4.4 Sound waves travel through the air as pressure waves (longitudinal waves). ✓
Each wave has a region of high pressure (compression) and of low pressure (rarefaction). ✓
The wave propagates through the air setting the air molecules into vibration. ✓ (3)

[16]

Question 5

5.1



✓ P correct pattern of field lines

✓ P correct direction

✓ P lines touch the magnet –1 if not symmetrical

(3)

5.2.1 On the left. ✓ (1)

5.2.2 a) The compass needle switches direction (swings away) ✓ so that the north pole faces the south pole of the magnet. ✓ (2)

b) Like (magnetic) poles repel like poles ✓ therefore the south pole of the compass swings away from the south pole of the bar magnet. ✓ Unlike (magnetic) poles attract each other so the compass needle comes to rest ✓ with its north pole facing the south pole of the bar magnet. ✓ (4)

[10]

Question 6

6.1 Electrons from his hair are rubbed onto the comb ✓ by friction when the comb passes through his hair. ✓ (2)

6.2 Number of electrons $= \frac{Q}{e}$ ✓ [method; dividing Q by charge on electron]

$= \frac{2{,}5 \times 10^{8}\ ✓}{1{,}6 \times 10^{-19}\ ✓}$ [substitutions]

$= 1{,}56 \times 10^{27}$ ✓ [accuracy; SI units] (4)

6.3 5 ✓ (1)

6.4 His hair is negatively charged. Like charge repels like charge, ✓ therefore each strand of hair repels its nearest 'neighbours' so his hair parts. ✓ (2)

6.5 Aluminium is a (metal) conductor, ✓ therefore when combing his hair with a metal comb, charge is distributed over the whole surface of the aluminium comb ✓ and is transferred through his hand down his body to the ground. ✓

OR The rubber comb is only charged in the vicinity of its teeth ✓ – charge cannot flow ✓ through the hard rubber comb and into the ground. ✓ (3)

6.6 The greater the number of strokes of the comb the greater the charge stored on his hair. ✓✓ (2)

6.7 The experiment aims to investigate the relationship between the type of material from which the comb is made and the number of strokes. If the combs were of different dimensions, it may be that the differences in their sizes was also influencing the amount of charge stored. ✓
The scientific method requires the conditions to be fair (for a fair test). ✓ (2)

[16]

Question 7

7.1 Resistance is the opposition to the flow of charge. ✓✓ (2)

7.2 Alternative 1

$\frac{1}{R_p} = \frac{1}{r_1} + \frac{1}{r_2}$ ✓ [method]
$= \frac{1}{10} + \frac{1}{10}$ ✓ [substitutions]
$R_p = \frac{2}{10}$ ✓ [inverting R_p]
$= 5\ \Omega$ ✓ [accuracy; SI units]

Alternative 2

$R_p = \frac{10 \times 10}{10 + 10}$ ✓ ✓ ✓ [method; substitutions]
$= 5\ \Omega$ ✓ [accuracy; SI units] (4)

7.3 V = 4,5 V ✓ (2)

7.4 $Q = \mathrm{I}\Delta t$ ✓ [method]
= (0,45) ✓ (3 × 60) ✓ [substitution; conversion to seconds]
= 81 C ✓ (4)

7.5 $\mathrm{V} = \frac{\mathrm{W}}{Q}$
$\mathrm{W} = \mathrm{VQ} = \mathrm{VI}\Delta t$ ✓ [method]
= (4,5)(81) ✓✓ [c.o.e. from 7.4; substitutions]
= 364,5 J ✓ [accuracy; SI units] (4)

7.6 7.6.1 decrease ✓ (1)

7.6.2 remains the same ✓ (1)

7.6.3 $R_{total} = 5 + 10$ ✓ [resistors in series – method]
$= 15\ \Omega$ ✓ [accuracy; ignore SI units]
V = 4,5 V ✓ [accuracy; SI units]
V = IR
4,5 = I(15) ✓ [substitutions]
I = 0,03 A ✓ [accuracy; S I units] (5)

[23]

TOTAL MARKS: 100

7. Cognitive Analysis for Physical Sciences Grade 10: End-of-Term 2 Physics Test

Level 1: Recall
Level 2: Comprehension
Level 3: Analysis, application
Level 4: Evaluation, synthesis

Question	1	2	3	4	Waves	Magnetism	Electrostatics	Electric circuits	Total (content)	Total (levels)	Total (questions)
TARGET	**13**	**35**	**40**	**10**	**45**	**10**	**20**	**25**	**100**	**100**	**100**
ACTUAL	**13**	**36**	**42**	**9**	**43**	**12**	**18**	**27**	**100**	**100**	**100**
1.1		2			2				2	2	
1.2		2			2				2	2	
1.3		2			2				2	2	
1.4	2				2				2	2	
1.5	2					2			2	2	
1.6							2		2	2	
1.7			2					2	2	2	
1.8			2					2	2	2	**16**
2.1	1				1				1	1	
2.2			1		1				1	1	
2.3			1		1				1	1	
2.4	3				3				3	3	**6**
3.1			1		1				1	1	
3.2			3		3				3	3	
3.3			2		2				2	2	
3.4			3		3				3	3	
3.5		2		2	4				4	4	**13**
4.1		3			3				3	3	
4.2			3		3				3	3	
4.3		2		2	4				4	4	
4.4			3		3				3	3	
4.5		3			3				3	3	**16**
5.1	3					3			3	3	
5.2.1		1				1			1	1	
5.2.2 a			2			2			2	2	
5.2.2 b			4			4			4	4	**10**
6.1		2					2		2	2	
6.2		2	2				4		4	4	
6.3		1					1		1	1	
6.4		2					2		2	2	
6.5				3			3		3	3	
6.6			2				2		2	2	
6.7		2					2		2	2	**16**
7.1	2							2	2	2	
7.2		4						4	4	4	
7.3			4					4	4	4	
7.4		2						2	2	2	
7.5			4					4	4	4	
7.6				2				2	2	2	
7.7		2	3					5	5	5	**23**

G. ADDITIONAL WORKSHEETS

1. Worksheet 1

Determine if the elements in the following compounds are metals or non-metals and describe the type of bonding that occurs in the compound. Complete the table.

Compound	Element 1 (metal or non-metal?)	Element 2 (metal or non-metal?)	Bond type
NO_2	non-metal	non-metal	covalent
NaCℓ			
SO_2			
PO_4^{3-}			
$MgBr_2$			
CaO			
H_2O			
K_2O			
Cu-Zn alloy			
O_2			
$CuCℓ_2$			
NO_2^-			
TiO_2			
HF			
Rb_2S			
Au-Ag mixture			
Fe_2O_3			

2. Answers for Worksheet 1

Compound	Element 1 (metal or non-metal?)	Element 2 (metal or non-metal?)	Bond type
NO_2	non-metal	non-metal	covalent
$NaC\ell$	metal	non metal	ionic
SO_2	non-metal	non-metal	covalent
PO_4^{3-}	non-metal	non-metal	covalent
$MgBr_2$	metal	non metal	ionic
CaO	metal	non metal	ionic
H_2O	non-metal	non-metal	covalent
K_2O	metal	non metal	ionic
Cu-Zn alloy	metal	metal	considered a mixture – like a solution, no chemical bond
O_2	non-metal	non-metal	covalent
$CuC\ell_2$	metal	non metal	ionic
NO_2^-	non-metal	non-metal	covalent
TiO_2	metal	non metal	ionic
HF	non-metal	non-metal	covalent
Rb_2S	metal	non metal	ionic
Au-Ag mixture	metal	metal	no bond in a mixture
Fe_2O_3	metal	non metal	ionic

3. Worksheet 2

In the spaces provided, write the correct answer to each question.

1. Which part of the atom is responsible for chemical bonding?

2. What are valence electrons (be specific)?

3. Where are valence electrons located (be very specific)?

4. Which two elements need only two valence electrons to be stable?

5. How many valence electrons do elements in Group 1, the alkali metals, have?

6. How many valence electrons do elements in Group 2, the alkaline earth metals, have?

7. What is the rule for finding out how many valence electrons elements in Groups 13–18 have?

8. What is an ion?

9. If an element gives away an electron, will it form a positive ion or a negative ion?

10. Why does an ion have a charge (be specific)?

11. How do ionic bonds form?

12. How do covalent bonds form?

4. Answers for Worksheet 2

1. The electrons.
2. Valence electrons are those electrons which occur in the outermost orbital of an atom and can participate in the formation of a chemical bond.
3. Valence electrons are located in the outermost orbital of an atom.
4. Hydrogen and helium.
5. One.
6. Two.
7. In Groups 13–18, subtract 10 from the group number to determine the number of valence electrons.
8. It is an atom or a group of atoms with a charge.
9. It will be a positive ion.
10. It has a charge because it has either gained or lost an electron so that the number of positively charged protons no longer equals the number of negatively charged electrons.
11. These bonds form when atoms either gain or lose an additional electron.
12. These bonds form when atoms share electrons.

5. Worksheet 3

Underline the correct answer in each case.

1. The number of electrons in the outer shell?
   - A) Valence
   - B) Ion
   - C) Atomic mass
   - D) Isotope
2. These elements don't bond with other elements because their outer shell is filled.
   - A) Noble gases
   - B) None of the answers are correct
   - C) Noble solids
   - D) Metals
3. Most atoms adopt one of three simple strategies to achieve a filled shell.
   Which of the following is NOT one of these strategies?
   - A) Share electrons
   - B) Give away electrons
   - C) Accept electrons
   - D) their own electrons
4. Which of the following is NOT a type of chemical bond?
   - A) Ionic
   - B) Metallic
   - C) Covalent
   - D) All of the above are chemical bonds
5. In ionic bonding…
   - A) Electrons are shared
   - B) Two answers are correct
   - C) Electrons are accepted
   - D) Electrons are given away
6. In metallic bonding...
   - A) One atom takes the outer shell electrons from another atom
   - B) A couple of atoms share their electrons with each other
   - C) Bonding takes place between positively charged areas of one atom with a negatively charged area of another atom
   - D) Some electrons are redistributed so they are shared by all the atoms as a whole
7. In covalent bonding…
   - A) One atom takes the outer shell electrons from another atom
   - B) A couple of atoms share their electrons with each other
   - C) Some electrons are shared by all the atoms
   - D) Bonding takes place between positively charged areas of one molecule with a negatively charged area of another molecule
8. O_2 is an example of what type of bonding?
   - A) Ionic
   - B) Hydrogen
   - C) Metallic
   - D) None of the above

6. Answers for Worksheet 3

1. A) Valence
2. A) Noble gases
3. D) Keep their own electrons
4. D) All of the above are chemical bonds
5. B) Two answers are correct (both C and D are correct – electrons are transferred in ionic bonding)
6. D) Some electrons are redistributed so they are shared by all the atoms as a whole
7. B) A couple of atoms share their electrons with each other.
8. D) None of the above (covalent)

7. Worksheet 4

Some common alloys and their uses

There are many different alloys used for many, many different purposes. Use resource material to find out the components of the alloys listed below and complete the table.

Alloys differ widely in their composition, so do not be alarmed if you find that percentage components differ ***slightly*** from one reference to another.

Alloy	**Components**	**Typical uses**
Amalgam		
Brass		
Bronze		
Cast iron		
Cupro-nickel		
Gunmetal		
Nichrome		
Pewter		
Solder		
Steel (carbon)		
Steel (stainless)		
Sterling silver		
White gold (18 carat)		

8. Answers for Worksheet 4

Alloy	**Components**	**Typical uses**
Amalgam	Mercury (45–55%), plus silver, tin, copper, and zinc	Dental fillings
Brass	Copper (65–90%), zinc (10–35%)	Door locks and bolts, brass musical instruments, central heating pipes
Bronze	Copper (78–95%), tin (5–22%), plus manganese, phosphorus, aluminium, or silicon	Decorative statues, musical instruments
Cast iron	Iron (96–98%), carbon (2–4%), plus silicon	Metal structures such as bridges and heavy-duty cookware
Cupro-nickel (copper nickel)	Copper (75%), nickel (25%), plus small amounts of manganese	Coins
Gunmetal	Copper (80–90%), tin (3–10%), zinc (2–3%) and phosphorus	Guns, decorative items
Nichrome	Nickel (80%), chromium (20%)	Firework ignition devices, heating elements in electrical appliances
Pewter	Tin (80–99%) with copper, lead and antimony	Ornaments, used to make tableware before glass became more common
Solder	Varies. Old-fashioned solders contain a mixture of tin (50–70%), lead (30–50%), copper, antimony and other metals. Newer solders dispense with lead for health reasons. A typical modern solder has 99.25% tin and 0.75% copper.	Connecting electrical components into circuits
Steel (carbon)	Iron (80–98%), carbon (0.2–2%), plus other metals such as chromium, manganese and vanadium	Metal structures, car and airplane parts, and many other uses
Steel (stainless)	Iron (50%+), chromium (10–30%), plus smaller amounts of carbon, nickel, manganese, molybdenum and other metals	Jewellery, medical tools, tableware
Sterling silver	Silver (92.5%), copper (7.5%)	Cutlery, jewellery, medical tools, musical instruments
White gold (18 carat)	Gold (75%), palladium (17%), silver (4%), copper (4%)	Jewellery

9. Worksheet 5

In the spaces provided next to each action state whether a physical or chemical change is occurring.

Making glass ____________________

Glass breaking ____________________

Hammering plastic together to build a box ____________________

Melting butter for popcorn ____________________

Breaking up a wooden toy ____________________

Separating sand from gravel ____________________

Mixing sand with cement and water ____________________

Allowing food to rot ____________________

Mixing sugar crystals into water ____________________

Mowing the lawn ____________________

Corroding metal ____________________

Bleaching your hair ____________________

Fireworks exploding ____________________

Squeezing oranges to make orange juice ____________________

Boiling an egg ____________________

Breaking a raw egg ____________________

Cooking maize meal for breakfast ____________________

Pouring milk on your breakfast porridge ____________________

Adding milk to a raw egg and cooking them ____________________

Raking up fallen leaves into a pile ____________________

Burning leaves ____________________

Melting ice cream ____________________

Making ice cream with milk and sugar and peppermint essence ____________________

Placing ice cream in the freezer ____________________

10. Answers for Worksheet 5

Making glass *chemical change*

Glass breaking	*physical change*
Hammering plastic together to build a box	*physical change*
Melting butter for popcorn	*physical change*
Breaking up a wooden toy	*physical change*
Separating sand from gravel	*physical change*
Mixing sand with cement and water	*chemical change*
Allowing food to rot	*chemical change*
Mixing sugar crystals into water	*physical change*
Mowing the lawn	*physical change*
Corroding metal	*chemical change*
Bleaching your hair	*chemical change*
Fireworks exploding	*chemical change*
Squeezing oranges to make orange juice	*physical change*
Boiling an egg	*chemical change*
Breaking a raw egg	*physical change*
Cooking maize meal for breakfast	*chemical change*
Pouring milk on your breakfast porridge	*physical change*
Adding milk to a raw egg and cooking them	*chemical change*
Raking up fallen leaves into a pile	*physical change*
Burning leaves	*chemical change*
Melting ice cream	*physical change*
Making ice cream with milk, sugar and peppermint essence	*chemical change*
Placing ice cream in the freezer	*physical change*

11. Worksheet 6

Balance the following chemical equations. Write the correct numbers in the spaces provided.

Remember not to write '1' if only one atom or molecule is required – just leave a blank.

1. ___ $CuO(s) + O_2\ (g) \rightarrow$ ___ $CuO(s)$
2. ___ $H_2O(\ell) \rightarrow$ ___ $H_2(g) + O_2(g)$
3. ___ $Fe(s) +$ ___ $H_2O(g) \rightarrow$ ___ $H_2(g) + Fe_3O_4(s)$
4. ___ $AsC\ell_3(aq) +$ ___ $H_2S(aq) \rightarrow$ ___ $As_2S_3(s) +$ ___ $HC\ell(aq)$
5. ___ $CuSO_4 + 5\ H_2O(s) \rightarrow$ ___ $CuSO_4(s) +$ ___ $H_2O(g)$
6. ___ $Fe_2O_3(s) +$ ___ $H_2(g) \rightarrow$ ___ $Fe(s) +$___ $H_2O(\ell)$
7. $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$
8. ___ $Fe(s) + S_8(s) \rightarrow$ ___ $FeS(s)$
9. $H_2S(aq) +$ ___ $KOH(aq) \rightarrow$ ___ $H_2O(\ell) + K_2S(aq)$
10. ___ $C\ell_2H_{26}(\ell) +$ ___ $O_2(g) \rightarrow$ ___ $CO_2(g) +$ ___ $H_2O(g)$
11. ___ $A\ell(s) +$ ___ $H_2SO_4(aq) \rightarrow$ ___ $H_2(g) + A\ell_2(SO_4)_3(aq)$
12. ___ $H_3PO_4(aq) +$ ___ $NH_4OH(aq) \rightarrow$ ___ $H_2O(\ell) + (NH_4)_3PO_4(aq)$
13. $C_3H_8(g) +$ ___ $O_2(g) \rightarrow CO_2\ (g) +$ ___ $H_2O(\ell)$
14. $K_2SO_4(aq) + BaC\ell_2(aq) \rightarrow$ ___ $KC\ell(aq) + BaSO_4(s)$
15. $C_5H_{12}(\ell) +$ ___ $O_2(g) \rightarrow$ ___ $CO_2(g) +$ ___ $H_2O(g)$

12. Answers for Worksheet 6

1. $2\ CuO(s) + O_2\ (g) \rightarrow 2\ CuO(s)$
2. $2\ H_2O(\ell) \rightarrow 2\ H2(g) + O_2(g)$
3. $3\ Fe(s) + 4\ H_2O(g) \rightarrow 4\ H_2(g) + Fe_3O_4(s)$
4. $2\ AsC\ell_3(aq) + 3\ H_2S(aq) \rightarrow As_2S_3\ (s) + 6\ HC\ell(aq)$
5. $CuSO_4 + 5\ H_2O(s) \rightarrow CuSO_4(s) + H_2O(g)$
6. $Fe_2O_3(s) + 3\ H_2(g) \rightarrow 2\ Fe(s) +3\ H_2O(\ell)$
7. $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$
8. $8\ Fe(s) + S_8(s) \rightarrow 8\ FeS(s)$
9. $H_2S(aq) + 2\ KOH(aq) \rightarrow 2\ H_2O(\ell) + K_2S(aq)$
10. $2\ Cl_2H_{26}(\ell) + 37\ O_2(g) \rightarrow 24\ CO_2(g) + 26\ H_2O(g)$
11. $2\ A\ell(s) + 3\ H_2SO_4(aq) \rightarrow 3\ H_2(g) + A\ell_2(SO_4)_3(aq)$
12. $H_3PO_4(aq) + 3\ NH_4OH(aq) \rightarrow 3\ H_2O(\ell) + (NH_4)_3PO_4(aq)$
13. $C_3H_8(g) + 5\ O_2(g) \rightarrow CO_2\ (g) + 2\ H_2O(\ell)$
14. $K_2SO_4(aq) + BaC\ell_2(aq) \rightarrow 2\ KC\ell(aq) + BaSO_4(s)$
15. $C_5H_{12}(\ell) + 8\ O_2(g) \rightarrow 5\ CO_2(g) + 6\ H_2O(g)$