GRADE 11

Physical Sciences

Teacher Toolkit: CAPS Planner and Tracker

2018 TERM 2

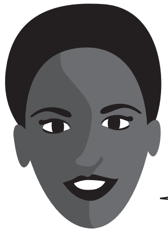
CONTENTS

A. ABOUT THE PLANNER AND TRACKER

1. Your quick guide to using this planner and tracker

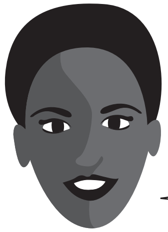
What is the NECT and where do I fit in?

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.



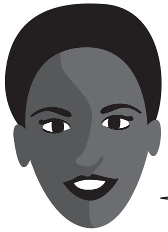
But who will help me?

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 11 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 11 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 four 60 minute sessions per week, except for the first week which has only has three. 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 ten weeks, with a four-day first week. Eight weeks are allocated for covering the set curriculum. This leaves 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 revision and 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 second 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 tracker plan consists of the following columns 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 11:

Term 1 – Physics: Mechanics
Chemistry: Matter and materials
Term 2 – *Physics: Waves, sound and light*
Geometrical optics
2D and 3D wavefronts
Chemistry: Matter and materials
Ideal gases and thermal properties
Chemical change
Quantitative aspects of chemical change
Term 3 – Chemistry: Chemical change
Physics: Electricity and magnetism
Term 4 – Chemistry: Chemical change and chemical systems

Overview of Term 2 Topics

Physics: Waves, sound and light

The Physics topics studied in Term 2 should help develop your learners' basic skills and give them the opportunity to explore topics that are the basis of modern technology used daily by millions of people around the world.

The first topic is **refraction**. This property of waves results in some very unusual optical illusions including mirages of water in the desert and the 'bending' of a straw or stick when placed in a glass of water. Refraction is also very useful to us as the lenses in our eyes and in spectacles help us see. When introducing this topic, it is important to revise reflection, which was studied in Grade 10. It is particularly important to focus on terminology that is the same, such as incident ray, angle of incidence and the normal. Learners need to recall that the angle of incidence is always measured between the incident ray and the normal. They should be familiar with the word 'normal', as they used this in Term 1 in the context of calculating friction. The concept of the normal is an important one and is examined in Grade 12.

There is a common misconception that refraction is 'the bending of a wave when moving from one medium, e.g. air into another medium, e.g. glass'. This is not totally correct even though many Learner's Books indicate that refraction is bending of waves. Refraction is actually the change of speed of a wave when moving from one medium to another, while the frequency remains constant. In most cases, we observe a change in direction or the wave front bends as a consequence of the change of speed. However, if a beam of light strikes a surface at 90° to the surface (angle of incidence is equal to zero), there will still be a change of speed, but no change in direction – refraction still takes place!

The Physics content covered in Term 2 is not examined directly in Grade 12 but it is important to develop the many different skills associated with this topic. One of these is the skill of drawing diagrams. Encourage learners to use a sharp pencil, a ruler and a protractor. Accurate measurement is very important. These skills are used and examined in other sections of Physics including vectors, mechanics, electricity and magnetism.

Another very important skill is the mathematical skill of using a given formula to solve problems. In Physical Sciences, we demonstrate how these formulae are derived by investigating the relationships between variables. It is important to teach learners to recognise the relevant formula for each topic. They must also be sure to remember to convert all measurements to SI units. After converting to SI units, learners must substitute into the given formula without changing the subject of the formula. They must remember to provide the SI unit in the final answer, where appropriate. It is not required to substitute with units. The topic of refraction gives learners the opportunity to use trigonometry again. In this section, the calculations are straightforward, but your learners should gain confidence in using their scientific calculators to get the correct answer.

In the topic of refraction, learners will need to verify and apply Snell's Law as one of the options for a project that is recorded as a formal assessment in Term 3. There are various approaches you can take in giving your learners the opportunity to complete this project. Although all the Learner's Books give guidelines on how to conduct the investigation, learners should be encouraged to find alternative methods. A project is not as prescriptive as a formal practical investigation. Encourage learners to manage their own work under supervision.

The phenomenon of **total internal reflection** gives rise to amazing optical illusions and has been used extensively in fibre optics. Fibre optics has changed the telecommunications industry and given rise to micro-surgery. The study of relevant modern physics should develop scientific curiosity and can motivate learners to study the sciences or engineering beyond Grade 12.

The phenomenon of **diffraction** can only be explained when using the wave model developed by Huygens. It is easy to see diffraction in water waves but it is really amazing that light also has a diffraction pattern. This means that light can be thought of a wave, which is not surprising since light clearly can be reflected and undergoes refraction too.

In Grade 12, learners will revisit the nature of light and discover that light has also has a particle nature. The debate about whether light is a wave or a particle has persisted for many years and should help learners understand a little of the history of physics and the contested nature of science. This means that a theory or model is accepted until new evidence is found that contradicts the older theory or model. Sometime a combination of different theories is adopted. This is the case for light. Our current theory of light is that it has a dual nature – both a wave nature and particle nature.

Chemistry: Matter and materials, chemical change

The topic of the **ideal gas law** is examined in Chemistry but in tertiary studies this topic is covered in both Physics as part of thermodynamics and in Physical Chemistry. The topic illustrates how the relationship between different variables can be explored and represented in graphs and equations. These relationships are relevant and easily observed in daily life.

This topic also illustrates the nature of science in that the mathematical relationships between the amount of gas, the volume of gas, temperature of the gas and the pressure of the gas, describes a model of an ideal gas. We show that under most conditions, the ideal gas model perfectly describes the behaviour of real gases such as nitrogen, oxygen or helium. However, we recognise that there are conditions where real gases do not follow the predicted model. We examine and explain these deviations, which occur mainly at low temperature and high pressure because real gas molecules have mass and volume and there are intermolecular forces present between real gas molecules. In addition, we use the kinetic theory of matter to explain the behaviour of real gases. This theory is used to explain how elements combine to form compounds and will be studied in more detail in Grade 12 when studying the topic of rate and extent of reactions. The essential feature of studying the ideal gas law is to show learners how observations, investigations and theory combine to give us an appreciation of the world around us. This reveals the nature and philosophy of science.

As in the study of geometrical optics, the topic of the ideal gas law also teaches learners essential science skills. In particular, the gas law experiments give learners the opportunity to develop a clear understanding of the mathematical relationships ‘directly proportional’ and ‘inversely proportional’. By studying the graphs from experiments, your learners will discover that when two variables are directly proportional we can draw a straight line that passes through the origin. We also show that the inversely proportional relationship can best be shown when a graph of the reciprocal of the one variable is plotted against the dependent variable. The result is a straight line drawn through the origin. Hence, when we say that pressure of a fixed mass of gas is inversely proportional to its volume at constant temperature, it is the same as saying that the pressure of the gas is directly proportional to the reciprocal of volume (one over volume). These relationships, their graphs and the formula derived are found in almost every topic of both Physics and Chemistry. The ideal gas law topic gives learners the chance to build and test their understanding of these crucial relationships.

The ideal gas equation, $PV = nRT$, provides a link to one of the most important concepts in Chemistry, namely, the mole concept. Although this was introduced in Grade 10, learners need to be reminded of the relationship between mass, molar mass and moles. The topic extends this definition to show the relationship between moles, the number of particles and Avogadro’s number, as well as the relationship between moles, the volume of a gas and molar volume under standard conditions.

These relationships are crucially linked to balanced chemical equations as we explore quantitative aspects of chemical change. The topic is generally called **stoichiometry** and all the different aspects and calculations studied in Grade 11 are examined at the end of Grade 12. It is therefore very important to give learners enough opportunity to practice these calculations. It is equally important to show that they have real application in analytical chemistry and can be used to accurately predict the outcome of a chemical reaction.

Stoichiometry is not confined only to gas reactions but can be used for reactions with solids and liquids. We explore important **solution chemistry** too, and define concentration of a solution. This is a critical concept that is required in almost all Grade 12 topics. There is also an opportunity to master **precipitation** and **acid-base titration**

calculations. This will provide a good foundation when acids and bases are studied in Term 3 and in Grade 12.

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.

3. Plan for required assessment tasks

In Term 2 of Grade 11, 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, optional project and examination 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, it 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	Mid-year examination * Use for practice, not for formal assessment
Study and Master Physical Sciences	**Investigate the effects of intermolecular forces on various physical properties** **Term 1 Week 10:** (Required by Term 2 schedule) LB pp. 118–121; TG D35–D38 **From Week 2:** (Only required in Term 3) **Project: Verify and apply Snell's Law** LB pp. 145; TG D51–D52	**Week 10:** * Control Test suitable for revision only as it mixes Physics and Chemistry TG B15–B18 Exemplar tests provided in Section F

Name of book	Formal practical assessment	Mid-year examination * Use for practice, not for formal assessment
Platinum Physical Sciences	**Investigate the effects of intermolecular forces on various physical properties** **Term 1 Week 10:** (Required by Term 2 schedule) LB pp. 83–85; TG pp. 47–50 **From Week 2:** (Only required in Term 3) **Project: Verify and apply Snell's Law**	**Week 10:** * Test 2 in Control Test Book suitable for revision only as it mixes Chemistry and Physics pp. 6–9 Memo in TG pp. 21–23 Exemplar tests provided in Section F
Successful Physical Sciences	**Investigate the effects of intermolecular forces on various physical properties** **Term 1 Week 10:** (Required by Term 2 schedule) LB pp. 105–112; TG pp. 97–102 **From Week 2:** (Only required in Term 3) **Project: Verify and apply Snell's Law**	**Week 10:** * Exemplar Test given in LB p. 334 and on CD – suitable for revision Memo in TG pp. 263–268 Exemplar tests provided in Section F

C. DAILY LESSON PLANNING AND PREPARATION

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

1. Check your own knowledge of the content

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

2. Prepare the conceptual framework for the lesson topic

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

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

While preparing 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 11 lessons. It is vital that you are familiar with the Grade 12 Examination Guides for Physical Sciences as many of the topics taught in Grade 11 are examined in the final Grade 12 exam. 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.

The mid-year examination for Grade 11 learners is the first step in preparing learners to write the matric examination. It is crucial that learners develop good study skills and exam technique. One of the ways you can assist learners is to identify areas of strength and weakness. Section F *Assessment Resources* contains examples of analysis sheets. You could use these tables to analyse trends for a class or grade or to highlight an individual learner's performance.

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 writing down and explaining 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 11 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 will do two prescribed experiments for formal assessment – one Chemistry and one Physics experiment. 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 complete a formal practical assessment by investigating the effects of intermolecular forces on various physical properties. You probably would have taught this topic in Term 1 and may even have completed this assessment in the last weeks of Term 1. You should also note that for Term 3, learners are required to submit a project for a formal practical assessment. One of the options for the project, verifying Snell's Law, is dealt with in Term 2. After teaching the topic of refraction, you may decide to give learners this project to complete. The aim of the project is to encourage learners to work more independently and to take responsibility for their own learning. You could give learners between 6 and 8 weeks to complete their investigation. You will need to provide some support for learners while they do their project. For example, you could ask your learners to provide weekly progress reports so that they can hand in a completed project on time. You could also provide learners with apparatus and give them time to work in a Science classroom or laboratory under supervision.

It is important to give learners more opportunities to develop and improve their practical skills. We recommend that you plan for your learners to do at least one experiment to be assessed informally as suggested in CAPS. Depending on the amount of apparatus you have, you could get learners to determine the critical angle of a rectangular glass (clear) block or verify Boyle's Law or prepare lead (IV) oxide (PbO_2) from lead (II) nitrate ($Pb(NO_3)_2$).

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. Discuss safety rules with your learners regularly. Refer to the following websites 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 the teacher with an 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 at all 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 work places 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
LB	Learner’s Book
No.	Number
p.	Page
PA	Practical activity
PT	Periodic table
pp.	Pages
Q.	Question
S #	Hour session
Sect.	Section
TG	Teacher’s Guide
TYS	Test Yourself
WS	Worksheet
*	Additional/alternative activity provided
#	Examined in Grade 12

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

Study and Master Week 1: Geometrical optics

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	**Review Term 1 Assessment**											
2	**Refraction** • Revision: explain reflection • Revision: state the law of reflection • Define the normal • Define angle of incidence	76	133–137	136 TYS1 1a–j	D49	194–199	174–174					
Homework				136 TYS 1 2	D49	199–201 Ex. 5.1 1–13	175–179					
3	**Refraction** • Define the speed of light as being constant when passing through a given medium and having a maximum value of: $c = 3 \times 10^8 m.s^{-1}$ *in a vacuum* • Define refraction • Define refractive index as $n = c \div v$ • Define optical density • Know that the refracted index is related to the optical density	76	137–142	139 TYS2 1a–b 140 TYS3	D49 D49	201–206						
Homework				139 TYS2 2	D49	205 Ex. 5.2 1 & 2	180–181					

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: Geometrical optics

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	**Refraction** • Explain that refraction is a change of wave speed in different media, while the frequency remains constant • Define the normal • Define angle of incidence • Define angle of refraction • Sketch ray diagrams to show the path of a light ray through different media	76	142–144	142 PA Act. 1 Exp. 1 Exp. 2	D50–D51	206–211						
Homework: Prepare for Snell's Law investigation				158 4–6	D57	210 5.3 1–7	181–183					
2	**Snell's Law** • State the relationship between the angles of incidence and refraction and the refractive indices of the media when light passes from one medium into another (Snell's Law): $n_1 sin\theta_1 = n_2 sin\theta_2$ • Apply Snell's Law to problems involving light rays passing from one medium into another • Draw ray diagrams showing the path of light when it travels from a medium with a higher refractive index to one of lower refractive index and vice versa	77	144–145	158 4–6 145 Act. 2	D57 D51–D52	211–212, 215–219						
Homework: Prepare for Snell's Law investigation				145 Act. 2	D51–D52	219–220 Ex. 5–4 1–6	183–185					
3	**Snell's Law** • Verify Snell's Law (introduction to project) • Apply Snell's Law to problems involving light rays passing from one medium into another • Draw ray diagrams showing the path of light when it travels from a medium with a higher refractive index to one of lower refractive index and vice versa	77 12	145	145 Act. 2	D51–D52							
Homework				158 8	D57	220–221 Ex. 5.4 7–12	186–189					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Date completed				
						LB pp.	TG pp.					
4	**Consolidation: Reflection, refraction and Snell's Law** Revision and extension	76–77	133–145	158 8	D57	229						
Homework				158 7	D57	230 Ex. 5.6 3–6	193–196					

Reflection

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

What will you change next time? Why?

HOD: **Date:**

Study and Master Week 3: Geometrical optics, 2D and 3D wavefronts

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	**Critical angles and total internal reflection** • Explain the concept of critical angle • List the conditions required for total internal reflection • Use Snell's Law to calculate the critical angle at the surface between a given pair of media	77	146–148	147 TYS 4 1 & 2	D52	222–226						
Homework				147 TYS 4 3	D52–D53	227 Ex. 5.5 1–7	189–191					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Date completed				
						LB pp.	TG pp.					
2	**Critical angles and total internal reflection** • Use Snell's Law to calculate the critical angle at the surface between a given pair of media	77	146–148	148 Act. 3	D53	223–224						
Homework: Complete report on Act. 3				148 Act. 3	D53	227 Ex. 5.5 8–11	191–193					
3	**Critical angles and total internal reflection** • Explain the use of optical fibres in endoscopes and telecommunications	77	148–150	150 TYS 5 1	D54	226–227						
Homework				150 TYS 5 2	D54	230 Ex. 5.6 1, 2, 7	193, 196–197					
4	**Diffraction** • Define a wavefront as an imaginary line that connects waves that are in phase (e.g. all at the crest of their cycle) • Define diffraction as the ability of a wave to spread out in wavefronts as they pass through a small aperture or around a sharp edge	78	151–154	153 PA Demo.		237–241	200					
Homework				159 9–11	D57–D58							

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: 2D and 3D wavefronts, ideal gases and thermal properties

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	**Diffraction** • State Huygens' principle • Apply Huygens' principle to explain diffraction qualitatively • Light and dark areas can be described in terms of constructive and destructive interference of secondary wavelets • Sketch the diffraction pattern for a single slit • Understand that: *degree of diffraction* $\propto \lambda \div w$, *where* w = *slit width*	78	151–154	154 TYS 6 1	D55	234–242						
Homework				154 TYS 6 2	D55	244 Ex. 6.1 1 & 2	201					
2	**Diffraction** • Understand that diffraction of light demonstrates the wave nature of light	78	154–155	155 Act. 4	D55–D56	242–244						
Homework				155 TYS7 1 & 2	D55	244 Ex. 6.1 3	201–202					
3	**Consolidation: Waves and light** • Progress check on Snell's Law project • Selected questions from Module 3: Summative assessment		157–159	155 TYS8 a & b 157 1–3, 12	D56 D56, D58	248 Ex. 6.2 1–4	202–204					
4	**Motion of particles, kinetic theory of gases:** • Describe the motion of individual molecules: – collisions with each other and the walls of the container – molecules in a sample of gas move at different speeds • Explain the idea of 'average speeds' in the context of molecules of a gas • Describe an ideal gas in terms of the motion of molecules • Explain how a real gas differs from an ideal gas • State the conditions under which a real gas approaches ideal gas behaviour	79	160–162	178 4	D65	252–254	206–207					
Homework: Preparation for Boyle's Law experiment		80	162–165	162 Act. 9	D58–D60	254 Ex. 7.1 1	207					

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: Ideal gases and thermal properties

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	**Ideal gas law** • Describe the relationship between volume and pressure for a fixed amount of a gas at constant temperature (Boyle's Law): – practically using an example – by interpreting a typical table of results – using relevant graphs	80	162–165	162 Act. 9	D58–D60	255–258						
Homework: Complete report on Act. 9				162 Act. 9	D58–D60	255–258						
2	**Ideal gas law** • Describe the relationship between volume and pressure for a fixed amount of a gas at constant temperature (Boyle's Law): – practically using an example – by interpreting a typical table of results – using relevant graphs (including the use of the Kelvin scale of temperature) – using symbols ('∝' and '1/∝') and the words 'directly proportional' and 'inversely proportional' as applicable – writing a relevant equation • Give the conditions under which the ideal gas law does not apply to a real gas	80–81		178 5	D65	258–262						

S #	**CAPS concepts, practical activities and assessment tasks**	**CAPS pp.**	**LB pp.**	**LB act.**	**TG pp.**	***Everything Science***		**Date completed**				
						LB pp.	**TG pp.**					
Homework: Boyle's Law calculations Preparation for Charles's Law experiment				178 5 167–169 Act. 10	D65 D60–D61	262 Ex. 7.2 1–5 262–265	208–210					
3	**Ideal gas law** • Describe the relationship between volume and temperature for a fixed amount of a gas at constant pressure (Charles's Law): – practically using an example – by interpreting a typical table of results – using relevant graphs	80	165–169	167–169 Act. 10	D60–D61	262–265						
Homework: Complete report on Act. 10				167–169 Act. 10	D60–D61	262–265 268 Ex. 7.3 1–4	210–212					
4	**Ideal gas law** • Describe the relationship between pressure and temperature for a fixed amount of a gas at constant temperature (Gay-Lussac's Law): – practically using an example – by interpreting a typical table of results – using relevant graphs (using the Kelvin scale of temperature) – using symbols ('∝' and '1/∝') and the words 'directly proportional' and 'inversely proportional' as applicable – writing a relevant equation • Give the conditions under which the ideal gas law does not apply to a real gas and explain why • Convert Celsius to Kelvin for use in ideal gas law	80–81	169–171	169 Act. 11	D61–D62							
Homework				169 Act. 11	D61–D62	271–274 Ex. 7.4 1–5	212–214					

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: Ideal gases and thermal properties

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	**Ideal gas law** • Describe the relationship between pressure and temperature for a fixed amount of a gas at constant temperature (Gay-Lussac's Law): – practically using an example – by interpreting a typical table of results – using relevant graphs (using the Kelvin scale of temperature) – using symbols ('∝' and '1/∝') and the words 'directly proportional' and 'inversely proportional' as applicable – writing a relevant equation • Give the conditions under which the ideal gas law does not apply to a real gas and explain why • Convert Celsius to Kelvin for use in ideal gas law	80–81	169–171	170 Act. 12	D62–D63	268–272						
Homework				170 Act. 12	D62–D63	271–274 Ex. 7.4 1–5	212–214					
2	**Ideal gas law** • Combine the three gas laws into the ideal gas law: $PV = nRT$ • Use the gas laws to solve problems: $P_1V_1 \div T_1 = P_2V_2 \div T_2$ • Give the conditions under which the ideal gas law does not apply to a real gas and explain why • Convert Celsius to Kelvin for use in ideal gas law • Explain how a real gas differs from an ideal gas • State the conditions under which a real gas approaches ideal gas behaviour	80–81	171–173	175 Act. 14 1–3	D63–D64	272–277						
Homework				175 Act. 14 4–7	D64–D65	277 Ex. 7.5 1–3	214–215					

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	**Ideal gas law** • Combine the three gas laws into the ideal gas law: $PV = nRT$ • Give the conditions under which the ideal gas law does not apply to a real gas and explain why • Convert Celsius to Kelvin for use in ideal gas law **Motion of particles, kinetic theory of gases:** • Use kinetic theory to explain the gas laws **Temperature and heating, pressure:** • Explain the temperature of a gas in terms of the average kinetic energy of the molecules of the gas • Explain the pressure exerted by a gas in terms of the collision of the molecules with the walls of the container	80–81	173–177	175 Act. 14 4–7	D64–D65	277–283						
Homework				179 7–13	D66–D67	282 Ex. 7.6 1–5	217–219					
4	**Ideal gas law** Consolidation and remediation	79–81		179 7–13 178 1–3	D66–D67	284–288						
Homework				178 1–3	D65	285–288 Ex. 7.7 1–13	220–227					

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 7: Quantitative aspects of 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	**Stoichiometric calculations (Revision Grade 10) #** • Definition of the mole and Avogadro's constant • Formula mass, relative atomic mass and molar mass **Molar volume of gases, concentration of solutions #** • 1 mole of gas occupies 22.4 dm^3 at 0 °C (273 K) and 1 atmosphere (101.3 kPa) • Interpret balanced reaction equations in terms of volume relationships for gases under the same conditions of temperature and pressure (volume of gases is directly proportional to the number of particles of the gases)	82	181–183	182 Act. 1 1–3	D69	290–293						
Homework				182 Act. 1 4–6	D69	293 Ex. 8.1 1 297 Ex. 8.2 1	231–232 232					
2	**Molar volume of gases, concentration of solutions #** • Molar concentration of a solution • Do titration calculations	82	183–188	188 PA Act. 2 188 Act. 3 1–3	D69 D69–D70	293–298						
Homework				188 Act. 3 1–3	D70	297 Ex. 8.2 2a & 2b	232–234					
3	**More complex stoichiometric calculations #** • Do calculations to determine empirical formula and molecular formula of compounds • Revise empirical formula calculations done in Grade 10	82	189–1991	191 TYS 1 1 & 2	D70	301–310						
Homework				191 TYS 1 3	D71	304 Ex. 8.5 1 306 Ex. 8.6 1	238 239					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Date completed				
						LB pp.	TG pp.					
4	**More complex stoichiometric calculations #** • Do stoichiometric calculations to determine the percent yield of a chemical reaction • Perform stoichiometric calculations using balanced equations that may include limiting reagents	82	191–196	196 TYS 2 1 & 2	D72	298–302						
Homework: Prepare for Act. 4				196 TYS 2 3 & 4	D72–D73	301 Ex. 8.3 1 302 Ex. 8.4 1	235–236 237					

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: Quantitative aspects of 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	**More complex stoichiometric calculations #** Determine the mass of PbO_2 prepared from a certain mass of $Pb(NO_3)_2$	82	195–196	195 PA Act. 4	D71–D72	307–308						
Homework: Complete Act. 4 report				195 PA Act. 4	D71–D72	309 Ex. 8.7 1	240					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Date completed				
						LB pp.	TG pp.					
2	**More complex stoichiometric calculations #** • Determine the percent $CaCO_3$ in an impure sample of sea shells (purity or percent composition)	82	194	194 Example		308–309						
Homework				194 Example		309 Ex. 8.7 2–5	241–243					
3	**Volume relationships in gaseous reactions #** • Do stoichiometric calculations with explosions as reactions during which a great many molecules are produced in the gas phase so that there is a massive increase in volume, e.g. ammonium nitrate in mining or petrol in a car cylinder: $2HN_4NO_3(s) \rightarrow 2N_2(g) + 4H_2O(g) + O_2(g)$ $2C_8H_{18} + 25O_2 \rightarrow 16CO_2 + 18H_2O$ Give the reaction and use it in stoichiometric calculations • Do as application the functioning of airbags • Sodium azide reaction: $2NaN_3(s) \rightarrow 2Na(s) + 3N_2(g)$ Reaction must be given when used in calculations	83	197–200	200 TYS 3 1 & 2	D73	310–312						
Homework				200 TYS 3 1 & 2	D73	312 Ex. 8.8 1 & 2	243–244					
4	**More complex stoichiometric calculations #** Consolidation and remediation	82–83		201 Unit 1 4–9	D74–D75	312–313						
Homework				201 Unit 1 1–3	D74	314 Ex. 8.9 1–13	244–253					

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 9: Catch up, consolidation 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	**Revision** Control Test				B15–B18							
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: Mid-year 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	**Revision** Control Test				B15–B18							
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: Geometrical optics												
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	**Review of Term 1 Assessment**											
2	**Refraction** • Revision: explain reflection • Revision: state the law of reflection • Define the normal • Define angle of incidence	76	104–105	105 Ex. 5.1	62–64	194–199	174–174					
Homework				120 1–6	71	199–201 Ex. 5.1 1–13	175–179					
3	**Refraction** • Define the speed of light as being constant when passing through a given medium and having a maximum value of: $c = 3 \times 10^8 m.s^{-1}$ *in a vacuum* • Define refraction • Define refractive index as: $n = c \div v$ • Define optical density • Know that the refracted index is related to the optical density	76	105–106	105 PA Exp. 5.1	64	201–206						
Homework				106 Ex. 5.2 1 & 2	64	205 Ex. 5.2 1 & 2	180–181					

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: Geometrical optics

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	**Refraction** • Explain that refraction is a change of wave speed in different media, while the frequency remains constant • Define the normal • Define angle of incidence • Define angle of refraction • Sketch ray diagrams to show the path of a light ray through different media	76	107–109	107 PA Exp. 5.2 108 Act. 5.1	64 64–65	206–211						
Homework				109 Act. 5.2 1 & 2	65	210 5.3 1–7	181–183					
2	**Snell's Law** • State the relationship between the angles of incidence and refraction and the refractive indices of the media when light passes from one medium into another (Snell's Law): $n_1 sin\theta_1 = n_2 sin\theta_2$ • Apply Snell's Law to problems involving light rays passing from one medium into another • Draw ray diagrams showing the path of light when it travels from a medium with a higher refractive index to one of lower refractive index and vice versa	77	110–111	110 PA Exp. 5.3 111 Ex. 5.3 1.1–1.3	65 66	211–212, 215–219						
Homework				111 Ex. 5.3 2 & 3	66	219–220 Ex. 5.4 1–6	183–185					
3	**Snell's Law** • Verify Snell's Law (introduction to project) • Apply Snell's Law to problems involving light rays passing from one medium into another • Draw ray diagrams showing the path of light when it travels from a medium with a higher refractive index to one of lower refractive index and vice versa	77 12	112	112 PA Verify and apply Snell's Law	66–68							
Homework				113 Ex. 5.4 1 & 2	68–69	220–221 Ex. 5.4 7–12	186–189					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Date completed				
						LB pp.	TG pp.					
4	**Consolidation: Reflection, refraction and Snell's Law** Revision and extension	76–77	150–151	120 7–16	71–72	229						
Homework				121 17–21	72–73	230 Ex. 5.6 3–6	193–196					

Reflection

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

What will you change next time? Why?

HOD: **Date:**

Platinum Physical Sciences Week 3: Geometrical optics, 2D and 3D wavefronts

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	**Critical angles and total internal reflection** • Explain the concept of critical angle • List the conditions required for total internal reflection • Use Snell's Law to calculate the critical angle at the surface between a given pair of media	77	114–117	114 PA Act. 5.3 115 Act. 5.4	69	222–226						
Homework				117 Ex. 5.5 1 & 2	70	227 Ex. 5.5 1–7	189–191					
2	**Critical angles and total internal reflection** • Use Snell's Law to calculate the critical angle at the surface between a given pair of media	77		116 PA Exp. 5.4	69	223–224						
Homework: Complete report on Exp. 5.4				121 22–23	73	227 Ex. 5.5 8–11	191–193					

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	**Critical angles and total internal reflection** Explain the use of optical fibres in endoscopes and telecommunications	77	118–119	121 24	70	226–227						
Homework: Exam practice				134 3–5	78–79	230 Ex. 5.6 1, 2, 7	193, 196–197					
4	**Diffraction** • Define a wavefront as an imaginary line that connects waves that are in phase (e.g. all at the crest of their cycle) • Define diffraction as the ability of a wave to spread out in wavefronts as they pass through a small aperture or around a sharp edge • Understand that: *degree of diffraction* $\propto \lambda \div w$ *where* w *= slit width*	78	122–126	123 PA Exp. 6.1 124 Exp. 6.2	74 75 75	237–241	200					
Homework: Exam practice				133 1 & 2	78							

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: 2D and 3D wavefronts, ideal gases and thermal properties

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	**Diffraction** • State Huygens' principle • Apply Huygens' principle to explain diffraction qualitatively • Light and dark areas can be described in terms of constructive and destructive interference of secondary wavelets • Sketch the diffraction pattern for a single slit • Understand that *degree of diffraction* $\propto \lambda \div w$ *where* w *= slit width*	78	126–127	126 Ex. 6.1	75	234–242						
Homework				130 1–9	77	244 Ex. 6.1 1 & 2	201					
2	**Diffraction** • Understand that diffraction of light demonstrates the wave nature of light	78	127–130	127 Act. 6.1 128 Exp. 6.3	75 76	242–244						
Homework				130 10–13 134 6	77 79	244 Ex. 6.1 3	201–202					
3	**Consolidation: waves and light** • Progress check on Snell's Law project • Topic 3: Basic Target Worksheet		131–132		179 201	248 Ex. 6.2 1–4	202–204					
Homework: Topic 3: Advanced Target Worksheet					180 202							
4	**Motion of particles, kinetic theory of gases:** • Describe the motion of individual molecules: – collisions with each other and the walls of the container – molecules in a sample of gas move at different speeds • Explain the idea of 'average speeds' in the context of molecules of a gas • Describe an ideal gas in terms of the motion of molecules • Explain how a real gas differs from an ideal gas • State the conditions under which a real gas approaches ideal gas behaviour	79	136–138	138 Act. 7.1	80–81	252–254	206–207					
Homework: Preparation for Boyle's Law experiment		80		139–142	82–83	254 Ex. 7.1 1	207					

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

Platinum Physical Sciences Week 5: Ideal gases and thermal properties

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	**Ideal gas law** • Describe the relationship between volume and pressure for a fixed amount of a gas at constant temperature (Boyle's Law): – practically using an example – by interpreting a typical table of results – using relevant graphs	80	139–142	140 PA Exp. 7.1	82–83	255–258						
Homework: Complete report on Exp. 1				140 PA Exp. 7.1	82–83	255–258						
2	**Ideal gas law** • Describe the relationship between volume and pressure for a fixed amount of a gas at constant temperature (Boyle's Law): – practically using an example – by interpreting a typical table of results – using relevant graphs (including the use of the Kelvin scale of temperature) – using symbols ('∝' and '1/∝') and the words 'directly proportional' and 'inversely proportional' as applicable – writing a relevant equation	80–81	142–144	144 Ex. 7.1 1–3	83	258–262						
Homework: Boyle's Law calculations; preparation for Charles's Law experiment				154 9 & 10 145–146	85–86 84	262 Ex. 7.2 1–5 262–265	208–210					

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	**Ideal gas law** • Describe the relationship between volume and temperature for a fixed amount of a gas at constant pressure (Charles's Law): – practically using an example – by interpreting a typical table of results – using relevant graphs (introducing the Kelvin scale of temperature) – using symbols ('$\propto$' and '$1/\propto$') and the words 'directly proportional' and 'inversely proportional' as applicable – writing a relevant equationa • Convert Celsius to Kelvin for use in ideal gas law	80	144–146	145–146	84	262–268						
Homework: Complete report on Exp. 1; revision exercise				154 11	86	262–265 268 Ex. 7.3 1–4	210–212					
4	**Ideal gas law** • Describe the relationship between pressure and temperature for a fixed amount of a gas at constant temperature (Gay-Lussac's Law): – practically using an example – by interpreting a typical table of results – using relevant graphs (using the Kelvin scale of temperature) – using symbols ('$\propto$' and '$1/\propto$') and the words 'directly proportional' and 'inversely proportional' as applicable – writing a relevant equation • Give the conditions under which the ideal gas law does not apply to a real gas and explain why • Convert Celsius to Kelvin for use in ideal gas law • Combine the three gas laws into the ideal gas law: $PV = nRT$ • Use the gas laws to solve problems: $P_1V_1 \div T_1 = P_2V_2 \div T_2$	80–81	147–150	154 12	86	268–272						
Homework				153–154 1–8	85	271–274 Ex. 7.4 1–5 277 Ex. 7.5 1–3	212–214 214–215					

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: Ideal gases and thermal properties

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	**Ideal gas law** • Give the conditions under which the ideal gas law does not apply to a real gas **Motion of particles, kinetic theory of gases:** • Use kinetic theory to explain the gas laws **Temperature and heating, pressure:** • Explain the temperature of a gas in terms of the average kinetic energy of the molecules of the gas • Explain the pressure exerted by a gas in terms of the collision of the molecules with the walls of the container	80–81	151–152			253–254						
Homework				156–157 Sect. A 1 & 2	87	282 Ex. 7.6 1–5	217–219					
2	**Ideal gas law** Consolidation and remediation	79–81		157 Sect. B 3–6	87–88	284–288						
Homework				158 Sect. B 7–9	88	285–288 Ex. 7.7 1–13	220–227					
3	**Ideal gas law** Basic Target Worksheet (Topic 4)	79–81			181 202							
Homework: Complete worksheet					181 202	285–288 Ex. 7.7 1–13	220–227					
4	**Ideal gas law** Advanced Target Worksheet (Topic 4)	79–81			182 203							

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: Quantitative aspects of 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	**Stoichiometric calculations (Revision Grade 10) #** • Formula mass, relative atomic mass and molar mass • Definition of the mole and Avogadro's constant **Molar volume of gases, concentration of solutions #** • 1 mole of gas occupies 22.4 dm^3 at 0 °C (273 K) and 1 atmosphere (101.3 kPa)	82	160–162	160 Ex. 8.1 1 & 2 162 Ex. 8.2 1	89–91 91	290–293						
Homework				162 Ex. 8.2 2	91	293 Ex. 8.1 1 297 Ex. 8.2 1	231–232 232					
2	**Molar volume of gases, concentration of solutions #** • Interpret balanced reaction equations in terms of volume relationships for gases under the same conditions of temperature and pressure (volume of gases is directly proportional to the number of particles of the gases) • Molar concentration of a solution	82	162–165	164 Ex. 8.3 1 166 Ex. 8.4 1 & 2	91 92	293–298						
Homework				164 Ex. 8.3 2 & 3	92	297 Ex. 8.2 2a & 2b	232–234					
3	**More complex stoichiometric calculations #** • Perform stoichiometric calculations using balanced equations that may include limiting reagents	82	169–173	170 Act. 8.2 1 & 2	93	298–301						
Homework: Prepare for Exp. 8.2				171 Ex. 8.5 1–3 179	93–94 97–98	301 Ex. 8.3 1	235–236					
4	**More complex stoichiometric calculations #** Determine the mass of PbO$_2$ prepared from a certain mass of Pb(NO$_3$)$_2$	82	179	179 PA Exp. 8.2	97–98	307–308						
Homework: Complete report on Exp. 8.2						309 Ex. 8.7 1	240					

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: Quantitative aspects of 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	**More complex stoichiometric calculations #** • Perform stoichiometric calculations using balanced equations that may include limiting reagents	82	171–173	172 Ex. 8.6 1 & 2	94	298–301						
Homework				172 Ex. 8.6 3	94	309 Ex. 8.7 1	240					
2	**Volume relationships in gaseous reactions #** • Do stoichiometric calculations with explosions as reactions during which a great many molecules are produced in the gas phase so that there is a massive increase in volume, e.g. ammonium nitrate in mining or petrol in a car cylinder: $2HN_4NO_3(s) \rightarrow 2N_2(g) + 4H_2O(g) + O_2(g)$ $2C_8H_{18} + 25O_2 \rightarrow 16CO_2 + 18H_2O$ Give the reaction and use it in stoichiometric calculations • Do as application the functioning of airbags • Sodium azide reaction: $2NaN_3(s) \rightarrow 2Na(s) + 3N_2(g)$ Reaction must be given when used in calculations	83	180–181	181 Ex. 8.12	98	310–312						
Homework				182 Revision 5	99	312 Ex. 8.8 1 & 2	243–244					

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	**Molar volume of gases, concentration of solutions #** • Molar concentration of a solution • Do titration calculations • Precipitation calculations, e.g. calculate the mass of the precipitate	82	164–168	166–167 Exp. 8.1 168 Act. 8.1 1 & 2	92	293–297						
Homework				185 6–8	101–102	297 Ex. 8.2 3–5	233–235					
4	**More complex stoichiometric calculations #** • Do stoichiometric calculations to determine the percent yield of a chemical reaction • Do calculations to determine empirical formula and molecular formula of compounds (revise empirical formula calculations done in Grade 10)	82	173–177	174–175 Ex. 8.7 1–3 176 Ex. 8.8 1 & 2 176 Ex. 8.9 1 & 2 177 Ex. 8.10 1 & 2	95 96–97	301–310						
Homework				182 Revision 1–4	99	302 Ex. 8.4 1 304 Ex. 8.5 1 306 Ex. 8.6 1	237 238 239					

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:**

Platinum Physical Sciences Week 9: Catch up, consolidation 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	**More complex stoichiometric calculations # (optional)** • Determine the percent $CaCO_3$ in an impure sample of sea shells (purity or percent composition)	82	177–178	177 Act. 8.3 178 Ex. 8.11 1 & 2	97	308–309						
Homework: Exam practice				184 1–5	100–101	309 Ex. 8.7 2–5	241–243					
2	**More complex stoichiometric calculations # (optional)** Exam practice Basic Target Worksheet (Topic 5)	82–83		185 9–12	102–103 183 204	312–313						
Homework: Advanced Target Worksheet (Topic 5)					184 205	314 Ex. 8.9 1–13	244–253					
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: Mid-year examination: 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: Geometrical optics**

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	**Review of Term 1 Assessment**											
2	**Refraction** • Revision: explain reflection • Revision: state the law of reflection • Define the normal • Define angle of incidence	76	128–129	129 Act. 1 1 & 2	114	194–199	174–174					
Homework				129 Act. 1 3 & 4	114	199–201 Ex. 5.1 1–13	175–179					
3	**Refraction** • Define the speed of light as being constant when passing through a given medium and having a maximum value of: $c = 3 \text{ x } 10^{8}\ m.s^{-1}$ *in a vacuum* • Define refraction • Define refractive index as $n = c \div v$ • Define optical density • Know that the refracted index is related to the optical density	76	130–131	131 Act. 1 3–5	115	201–206						
Homework				131 Act. 1 1, 2, 6	115	205 Ex. 5.2 1 & 2	180–181					

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: Geometrical optics												
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	**Refraction** • Explain that refraction is a change of wave speed in different media, while the frequency remains constant • Define the normal • Define angle of incidence • Define angle of refraction • Sketch ray diagrams to show the path of a light ray through different media	76	132–135	132 PA Exp. 1	115–116	206–211						
Homework				135 Act. 2 1–5	116–117	210 5.3 1–7	181–183					
2	**Snell's Law** • State the relationship between the angles of incidence and refraction and the refractive indices of the media when light passes from one medium into another (Snell's Law): $n_1 sin\theta_1 = n_2 sin\theta_2$ • Apply Snell's Law to problems involving light rays passing from one medium into another • Draw ray diagrams showing the path of light when it travels from a medium with a higher refractive index to one of lower refractive index and vice versa	77	136–137, 139	139 Act. 2 1 & 2	117, 119–120	211–212, 215–219						
Homework						219–220 Ex. 5–4 1–6	183–185					
3	**Snell's Law** • Verify Snell's Law (introduction to project) • Apply Snell's Law to problems involving light rays passing from one medium into another • Draw ray diagrams showing the path of light when it travels from a medium with higher refractive index to one of lower refractive index and vice versa	77 12	137–138	117–119	212–215							
	Homework			139 Act. 2 3 & 4	120–121	220–221 Ex. 5.4 7–12	186–189					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Date completed				
						LB pp.	TG pp.					
4	**Consolidation: Reflection, refraction and Snell's Law** Revision and extension	76–77	150–151	151 1–3 and 1–4	130–131	229						
Homework				151 1–3 and 1–4	130–131	230 Ex. 5.6 3–6	193–196					

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

Successful Physical Sciences Week 3: Geometrical optics, 2D and 3D wavefronts

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	**Critical angles and total internal reflection** • Explain the concept of critical angle • List the conditions required for total internal reflection • Use Snell's Law to calculate the critical angle at the surface between a given pair of media	77	140–141	141 Act. 2 2.1–2.3	122–123	222–226						
Homework				141 Act. 2 1, 3	122–123	227 Ex. 5.5 1–7	189–191					
2	**Critical angles and total internal reflection** • Use Snell's Law to calculate the critical angle at the surface between a given pair of media	77		140 PA Exp. 1	121–122	223–224						
Homework: Complete report on Exp. 1; revision and extension				152 1–5	131–133	227 Ex. 5.5 8–11	191–193					

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	**Critical angles and total internal reflection** • Explain the use of optical fibres in endoscopes and telecommunications	77	142–143	143 Act. 1 7	124	226–227						
Homework				143 Act. 1 1–6	123–124	230 Ex. 5.6 1, 2, 7	193, 196–197					
4	**Diffraction** • Define a wavefront as an imaginary line that connects waves that are in phase (e.g. all at the crest of their cycle) • Define diffraction as the ability of a wave to spread out in wavefronts as they pass through a small aperture or around a sharp edge	78	144–145	144–145 PA Demo. 1 Part 1 & 2	124–127	237–241	200					
Homework				145 Act. 2 1–4	128							

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: 2D and 3D wavefronts, ideal gases and thermal properties

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	**Diffraction** • State Huygens' principle • Apply Huygens' principle to explain diffraction qualitatively • Light and dark areas can be described in terms of constructive and destructive interference of secondary wavelets • Sketch the diffraction pattern for a single slit • Understand that: *degree of diffraction* $\propto \lambda \div w$ *where* w *= slit width*	78	146–147	147 Act. 2 4–7	128	234–242						
Homework				147 Act. 2 1–3	128	244 Ex. 6.1 1 & 2	201					
2	**Diffraction** • Understand that diffraction of light demonstrates the wave nature of light	78	148–149	149 PA Demo. 1	129	242–244						
Homework				149 Act. 2 1–3	129–130	244 Ex. 6.1 3	201–202					
3	**Consolidation: waves and light** • Progress check on Snell's Law project • Revision and extension			152 1–5	133	248 Ex. 6.2 1–4	202–204					
4	**Motion of particles, kinetic theory of gases:** • Describe the motion of individual molecules: – collisions with each other and the walls of the container – molecules in a sample of gas move at different speeds • Explain the idea of 'average speeds' in the context of molecules of a gas • Describe an ideal gas in terms of the motion of molecules • Explain how a real gas differs from an ideal gas • State the conditions under which a real gas approaches ideal gas behaviour	79	153–155	154 PA Demo. 1	134–135	252–254	206–207					
Homework: Preparation for Boyle's Law experiment		80		157 PA Exp. 1	135–137	254 Ex. 7.1 1	207					

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: Ideal gases and thermal properties

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	**Ideal gas law** • Describe the relationship between volume and pressure for a fixed amount of a gas at constant temperature (Boyle's Law): • practically using an example • by interpreting a typical table of results • using relevant graphs	80	156–157	157 PA Exp. 1	135–137	255–258						
Homework: Complete report on Exp. 1				157 PA Exp. 1	135–137	255–258						
2	**Ideal gas law** • Describe the relationship between volume and pressure for a fixed amount of a gas at constant temperature (Boyle's Law): – practically using an example – by interpreting a typical table of results – using relevant graphs (including the use of the Kelvin scale of temperature) – using symbols ('∝' and '1/∝') and the words 'directly proportional' and 'inversely proportional' as applicable – writing a relevant equation • Give the conditions under which the ideal gas law does not apply to a real gas **Motion of particles, kinetic theory of gases:** • Use kinetic theory to explain the gas laws	80–81	158–159	159 Act. 2 1–3	137–138	258–262						

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Date completed				
						LB pp.	TG pp.					
Homework: Boyle's Law calculations; preparation for Charles's Law experiment				159 Act. 2 4 & 5 161–162 Exp. 1	138–139 139–140	262 Ex. 7.2 1–5 262–265	208–210					
3	**Ideal gas law** • Describe the relationship between volume and temperature for a fixed amount of a gas at constant pressure (Charles's Law): – practically using an example – by interpreting a typical table of results – using relevant graphs	80	160–162	161–162 Exp. 1	139–140	262–265						
Homework: Complete report on Exp. 1				161–162 Exp. 1	139–140	262–265						
4	**Ideal gas law** • Describe the relationship between volume and temperature for a fixed amount of a gas at constant pressure (Charles's Law): – practically using an example – by interpreting a typical table of results – using relevant graphs (introducing the Kelvin scale of temperature) – using symbols ('∝' and '1/∝') and the words 'directly proportional' and 'inversely proportional' as applicable – writing a relevant equation • Give the conditions under which the ideal gas law does not apply to a real gas • Convert Celsius to Kelvin for use in ideal gas law **Motion of particles, kinetic theory of gases:** • Use kinetic theory to explain the gas laws **Temperature and heating, pressure:** • Explain the temperature of a gas in terms of the average kinetic energy of the molecules of the gas	80–81	162–163	162 Act. 2 1–4	140–141	265–268						
Homework				162 Act. 2 5 & 6	141	268 Ex. 7.3 1–4	210–212					

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: Ideal gases and thermal properties

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	**Ideal gas law** • Describe the relationship between pressure and temperature for a fixed amount of a gas at constant temperature (Gay-Lussac's Law) – practically using an example – by interpreting a typical table of results – using relevant graphs (using the Kelvin scale of temperature) – using symbols ('∝' and '1/∝') and the words 'directly proportional' and 'inversely proportional' as applicable – writing a relevant equation • Give the conditions under which the ideal gas law does not apply to a real gas and explain why • Convert Celsius to Kelvin for use in ideal gas law **Motion of particles, kinetic theory of gases:** • Use kinetic theory to explain the gas laws **Temperature and heating, pressure:** • Explain the temperature of a gas in terms of the average kinetic energy of the molecules of the gas • Explain the pressure exerted by a gas in terms of the collision of the molecules with the walls of the container	80–81	164–166	165 Act. 1 1–5	142–143	268–272						
Homework				166 Act. 1 6 & 7	143–144	271–274 Ex. 7.4 1–5	212–214					
2	**Ideal gas law** • Combine the three gas laws into the ideal gas law: $PV = nRT$ • Use the gas laws to solve problems: $P_1V_1 \div T_1 = P_2V_2 \div T_2$ • Give the conditions under which the ideal gas law does not apply to a real gas and explain why • Convert Celsius to Kelvin for use in ideal gas law	80–81	167–169	168 Act. 1 1.1–1.3	145–146	272–277						
Homework				168 Act. 1 2 & 3	146	277 Ex. 7.5 1–3	214–215					
3	**Ideal gas law** Combine the three gas laws into the ideal gas law: $PV = nRT$ Give the conditions under which the ideal gas law does not apply to a real gas and explain why Convert Celsius to Kelvin for use in ideal gas law	80–81	168–169	169 Act. 2 1–3	146–147	277–283						

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Date completed				
						LB pp.	TG pp.					
Homework				169 Act. 2 4 & 5	147–148	282 Ex. 7.6 1–5	217–219					
4	**Ideal gas law** Consolidation and remediation	79–81	170–172	171–172 1–4	148–149	284–288						
Homework				172 5 & 6	149	285–288 Ex. 7.7 1–13	220–227					

Reflection

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

Successful Physical Sciences Week 7: Quantitative aspects of 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	**Molar volume of gases, concentration of solutions #** • 1 mole of gas occupies 22.4 dm^3 at 0 °C (273 K) and 1 atmosphere (101.3 kPa) • Interpret balanced reaction equations in terms of volume relationships for gases under the same conditions of temperature and pressure (volume of gases is directly proportional to the number of particles of the gases)	82	182–184	182 Act. 1 1–7 184 Act. 2 1–3	155 155	290–293						
Homework				184 Act. 2 4–6	155–156	293 Ex. 8.1 1 297 Ex. 8.2 1	231–232 232					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Date completed				
						LB pp.	TG pp.					
2	**Stoichiometric calculations (Revision Grade 10) #** • Definition of the mole and Avogadro's constant • Formula mass, relative atomic mass and molar mass **Molar volume of gases, concentration of solutions #** • Molar concentration of a solution	82	173–177	177 Act. 1 1–5	150–151	293–298						
Homework				177 Act. 1 6 & 7	151–152	297 Ex. 8.2 2a & 2b	232–234					
3	**More complex stoichiometric calculations #** • Perform stoichiometric calculations using balanced equations that may include limiting reagents	82	185–188	188 Act. 2 1–4	158–159	298						
Homework: Prepare for Exp. 1 (see TG for worksheet)				188 Act. 2 5–7 186–188	160–161 156–158							
4	**More complex stoichiometric calculations #** • Determine the mass of PbO2 prepared from a certain mass of $Pb(NO_3)_2$	82	186–188	186–188 PA Exp. 1	156–158	307–308						
Homework: Complete Exp. 1 worksheet					157	309 Ex. 8.7 1	240					

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: Quantitative aspects of 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	**More complex stoichiometric calculations #** • Perform stoichiometric calculations using balanced equations that may include limiting reagents	82	196–197	197 Act. 1 1 & 2	167–168	298–301						
Homework				197 Act. 1 3	168–169	301 Ex. 8.3 1						
2	**Volume relationships in gaseous reactions #** • Do stoichiometric calculations with explosions as reactions during which a great many molecules are produced in the gas phase so that there is a massive increase in volume, e.g. ammonium nitrate in mining or petrol in a car cylinder: $2HN_4NO_3(s) \rightarrow 2N_2(g) + 4H_2O(g) + O_2(g)$ $2C_8H_{18} + 25O_2 \rightarrow 16CO_2 + 18H_2O$ Give the reaction and use it in stoichiometric calculations • Do as application the functioning of airbags • Sodium azide reaction: $2NaN_3(s) \rightarrow 2Na(s) + 3N_2(g)$ Reaction must be given when used in calculations	83	198–199	199 Act. 1 1 & 2	169	310–312						
Homework				199 Act. 1 3 & 4	170	312 Ex. 8.8 1 & 2	243–244					
3	**Molar volume of gases, concentration of solutions #** • Molar concentration of a solution • Do titration calculations • Precipitation calculations, e.g. calculate the mass of the precipitate	82	192–195	193 PA Exp. 1 195 Act. 2 1–3	164–165 166	293–297						
Homework				195 Act. 2 4	166–167	297 Ex. 8.2 3–5	233–235					
4	**More complex stoichiometric calculations #** • Do stoichiometric calculation to determine the percent yield of a chemical reaction • Do calculations to determine empirical formula and molecular formula of compounds (revise empirical formula calculations done in Grade 10)	82	178–181	181 Act. 1 1–5	152–153	301–310						

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Date completed				
						LB pp.	TG pp.					
Homework						302 Ex. 8.4 1 304 Ex. 8.5 1 306 Ex. 8.6 1	237 238 239					

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:**

Successful Physical Sciences Week 9: Catch up, consolidation 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	**More complex stoichiometric calculations # (optional)** • Determine the percent $CaCO_3$ in an impure sample of sea shells (purity or percent composition)	82	189–191	190 PA Exp. 1 191 Act. 2	161 162	308–309						
Homework				191 Act. 3 1–4	162–163	309 Ex. 8.7 2–5	241–243					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Date completed				
						LB pp.	TG pp.					
2	**More complex stoichiometric calculations # (Optional)** Consolidation and remediation	82–83	200–202	201 1–4 201–202 1–4	171 172	312–313						
Homework				201 5–9 201–202 5–10	171 172	314 Ex. 8.9 1–13	244–253					
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: Mid-year examination: 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 ideas for extension
Geometrical optics	
Refraction - Revision: explain reflection - Revision: state the law of reflection - Define the speed of light as being constant when passing through a given medium and having a maximum value of: *$c = 3 x 10^{8} m.s^{-1}$ in a vacuum* - Define refraction - Define refractive index as: $n = c \div v$ - Define optical density - Know that the refracted index is related to the optical density - Explain that refraction is a change of wave speed in different media, while the frequency remains constant - Define the normal - Define angle of incidence - Define angle of refraction - Sketch ray diagrams to show the path of a light ray through different media	**Videos and printable notes:** http://learn.mindset.co.za/resources/physical-sciences/grade-11/geometric-optics **Simulations:** https://phet.colorado.edu/en/simulation/legacy/geometric-optics https://phet.colorado.edu/en/simulation/legacy/bending-light
Snell's Law - State the *relationship between the angles of incidence and refraction and the refractive indices of the media* when light passes from one medium into another (Snell's Law): $n_1 sin\theta_1 = n_2 sin\theta_2$ - Apply Snell's Law to problems involving light rays passing from one medium into another - Draw ray diagrams showing the path of light when it travels from a medium with a higher refractive index to one of lower refractive index and vice versa	**Videos and printable notes:** http://learn.mindset.co.za/resources/physical-sciences/grade-11/geometric-optics **Simulations:** https://phet.colorado.edu/en/simulation/legacy/geometric-optics https://phet.colorado.edu/en/simulation/legacy/bending-light
Critical angles and total internal reflection - Explain the concept of critical angle - List the conditions required for total internal reflection - Use Snell's Law to calculate the critical angle at the surface between a given pair of media - Explain the use of optical fibres in endoscopes and telecommunications	**Videos and printable notes:** http://learn.mindset.co.za/resources/physical-sciences/grade-11/geometric-optics/06-total-internal-reflection **Simulations:** https://phet.colorado.edu/en/simulation/legacy/geometric-optics https://phet.colorado.edu/en/simulation/legacy/bending-light
2D and 3D wavefronts	
Diffraction - Define a wavefront as an imaginary line that connects waves that are in phase (e.g. all at the crest of their cycle) - State Huygens' principle - Define diffraction as the ability of a wave to spread out in wavefronts as they pass through a small aperture or around a sharp edge - Apply Huygens' principle to explain diffraction qualitatively - Light and dark areas can be described in terms of constructive and destructive interference of secondary wavelets - Sketch the diffraction pattern for a single slit - Understand that: *degree of diffraction* $\propto \lambda \div w$ *where* w *= slit width* - Understand that diffraction of light demonstrates the wave nature of light	**Virtual ripple tank activities:** https://phet.colorado.edu/en/contributions/view/2918 **Videos and printable notes:** http://learn.mindset.co.za/resources/physical-sciences/grade-11/2d-and-3d-wave-fronts

CAPS concepts, practical activities and assessment tasks	Additional information and ideas for extension
Ideal gases and thermal properties	
Motion of particles, kinetic theory of gases • Describe the motion of individual molecules: – collisions with each other and the walls of the container – molecules in a sample of gas move at different speeds • Explain the idea of 'average speeds' in the context of molecules of a gas • Describe an ideal gas in terms of the motion of molecules • Explain how a real gas differs from an ideal gas • State the conditions under which a real gas approaches ideal gas behaviour • Use kinetic theory to explain the gas laws	**Simulations:** https://phet.colorado.edu/en/simulation/legacy/states-of-matter-basics **Videos and notes:** http://learn.mindset.co.za/resources/physical-sciences/grade-11/ideal-gases-and-thermal-properties
Ideal gas law • Describe the relationship between volume and pressure for a fixed amount of a gas at constant temperature (Boyle's Law) • Describe the relationship between volume and temperature for a fixed amount of a gas at constant pressure (Charles's Law) • Describe the relationship between pressure and temperature for a fixed amount of a gas at constant temperature (Gay-Lussac's Law): – practically using an example – by interpreting a typical table of results – using relevant graphs (introducing the Kelvin scale of temperature where appropriate) – using symbols ('$\propto$' and '$1/\propto$') and the words 'directly proportional' and 'inversely proportional' as applicable – writing a relevant equation • Combine the three gas laws into the ideal gas law: $PV = nRT$ • Use the gas laws to solve problems: $P_1V_1 \div T_1 = P_2V_2 \div T_2$ • Give the conditions under which the ideal gas law does not apply to a real gas and explain why • Convert Celsius to Kelvin for use in ideal gas law	**Simulations:** https://phet.colorado.edu/en/simulation/legacy/gas-properties **Videos and notes:** http://learn.mindset.co.za/resources/physical-sciences/grade-11/ideal-gases-and-thermal-properties
Temperature and heating, pressure • Explain the temperature of a gas in terms of the average kinetic energy of the molecules of the gas • Explain the pressure exerted by a gas in terms of the collision of the molecules with the walls of the container	**Videos and notes:** http://learn.mindset.co.za/resources/physical-sciences/grade-11/ideal-gases-and-thermal-properties
Quantitative aspects of chemical change	
Molar volume of gases, concentration of solutions • 1 mole of gas occupies 22.4 dm^3 at 0 °C (273 K) and 1 atmosphere (101.3 kPa) • Interpret balanced reaction equations in terms of volume relationships for gases under the same conditions of temperature and pressure (volume of gases is directly proportional to the number of particles of the gases) • Calculate molar concentration of a solution	**Videos and notes:** http://learn.mindset.co.za/resources/physical-sciences/grade-11/quantitative-aspects-chemical-change **Simulation:** https://phet.colorado.edu/en/simulation/concentration
More complex stoichiometric calculations • Do stoichiometric calculations using balanced equations that may include limiting reagents • Do stoichiometric calculations to determine the percent yield of a chemical reaction • Do calculations to determine the empirical formula and molecular formula of compounds (revise empirical formula calculations done in Grade 10) • Determine the percent $CaCO_3$ in an impure sample of sea shells (purity or percent composition)	**Videos and notes:** http://learn.mindset.co.za/resources/physical-sciences/grade-11/quantitative-aspects-chemical-change **Simulations:** https://phet.colorado.edu/en/simulation/reactants-products-and-leftovers

CAPS concepts, practical activities and assessment tasks	Additional information and ideas for extension
Volume relationships in gaseous reactions - Do stoichiometric calculations with explosions as reactions during which a great many molecules are produced in the gas phase so that there is a massive increase in volume, e.g. ammonium nitrate in mining or petrol in a car cylinder: $2NH_4NO_3(s) \rightarrow 2N_2(g) + 4H_2O(g) + O_2(g)$ $2C_8H_{18} + 25O_2 \rightarrow 16CO_2 + 18H_2O$ Give the reaction and use it in stoichiometric calculations - Do as application the functioning of airbags - Sodium azide reaction: $2NaN_3(s) \rightarrow 2Na(s) + 3N_2(g)$ Reaction must be given when used in calculations	**Videos and notes:** http://learn.mindset.co.za/resources/physical-sciences/grade-11/quantitative-aspects-chemical-change

F. ASSESSMENT RESOURCES

1. Sample item analysis sheets

PHYSICAL SCIENCES TERM 2 GRADE 11

SUGGESTED ITEM ANALYSIS RECORD SHEET FOR FORMAL ASSESSMENT

PHYSICS TEST									
		Questions							
		1	2	3	4	5	6	7	Total
Learner name	Learner surname	Multiple choice	Forces in equilibrium	Newton's 2nd Law	Components of force, acceleration, friction	Universal gravitation	Refraction	Diffraction	

SUGGESTED ITEM ANALYSIS RECORD SHEET FOR FORMAL ASSESSMENT

CHEMISTRY TEST							
		Questions					
		1	2	3	4	5	Total
Learner name	Learner surname	Multiple choice	Atomic combinations	Intermolecular forces (water)	Ideal gas laws	Quantitative aspects of chemical change	

SUGGESTED ITEM ANALYSIS RECORD SHEET FOR FORMAL ASSESSMENT

PRACTICAL ASSESSMENT								
		Practical skills						
		1	2	3	4	5	6	Total
Learner name	Learner surname	Pre-practical preparation	Setting up equipment Conducting experiment	Collection of data	Tabulation and calculations	Graphing	Analysis and conclusion	

2. Physical Sciences Grade 11: End-of-Term 2 Physics Test

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions:

1. This question paper consists of 7 questions, an information sheet and an answer sheet. The information sheet may be detached for easy use.
2. Answer **all** the questions.
3. Start each question on a new page.
4. Number the questions exactly as they are numbered in the paper.
5. Write neatly and legibly.
6. **Question 1** consists of 10 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. You may use non-programmable calculators.
8. The diagrams in the question paper are not necessarily drawn to scale.
9. Give brief motivations, discussions, etc. where required.
10. **Show all working clearly in all calculations.**
11. Round off to **two** decimal places where necessary.

Question 1

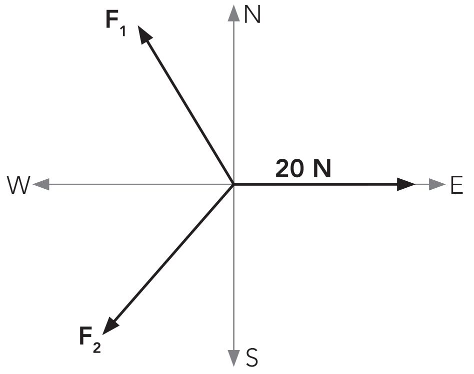
Multiple choice questions

There are four possible options for each answer in the following 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 correct answer to each question.

1.1 Which ONE of the following pairs contains one vector and one scalar quantity?

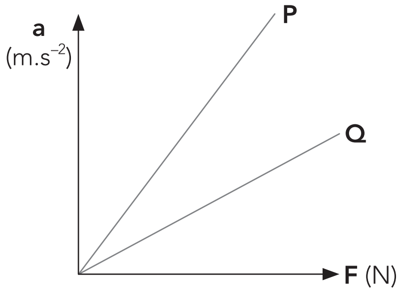
A. Speed and distance
B. Velocity and acceleration
C. Displacement and force
D. Distance and acceleration (2)

1.2 Three forces are in equilibrium and act at a point, as shown in the diagram.The components of force F_2 are 15 N south and 13 N west. The components of force F_1 are:



A. 15 N north and 13 N east
B. 13 N north and 13 N west
C. 15 N north and 7 N west
D. 13 N north and 20 N west (2)

1.3 In an investigation of the relationship between acceleration (a) and force (F) for two objects (P and Q) moving on a frictionless surface, the graph on the right was obtained.



Which ONE of the following statements is TRUE?

A. Object Q has a smaller mass than object P
B. Object Q has a bigger mass than object P
C. The gradient of the graph is not affected by the mass of the objects
D. Objects P and Q have equal mass (2)

1.4 The objects below are all identical and resting on frictionless surfaces. Which object will experience the greatest acceleration?

A.


B.


C.

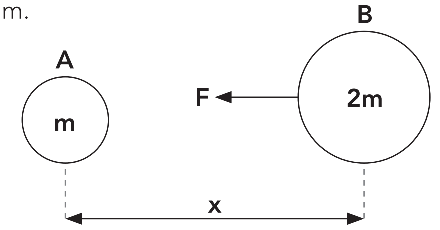

D.


(2)

1.5 A boy with a mass of 50 kg stands on a newton scale in an elevator. If the reading on the scale is greater than 490 N we could conclude that the elevator is:

A. Accelerating downwards
B. Accelerating upwards
C. Moving downwards at constant velocity
D. Moving upwards at constant velocity (2)

1.6 Two objects, **A** and **B**, of masses **m** and **2m** respectively are placed a distance **x** from their centres. **A** exerts an attractive force **F** on **B** to the left as shown in the diagram.



What forces does **B** exert on **A**?

- A. $\frac{1}{2}$F to the right
- B. F to the right
- C. 2F to the right
- D. 3F to the right

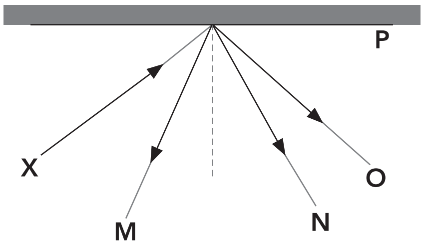
(2)

1.7 Which one of the following phenomena explains why a pencil in a glass of water looks bent?

- A. Reflection
- B. Interference
- C. Diffraction
- D. Refraction

(2)

1.8 The diagram shows the path of a light ray, X, directed at a plane mirror.



The correct reflected ray is:

- A. M
- B. N
- C. O
- D. P

(2)

1.9 A ray of light passing from glass into ice is refracted away from the normal. The refractive indices of the two substances compare as follows:

- A. glass > ice
- B. ice > glass
- C. glass = ice
- D. too little information to know

(2)

1.10 Endoscopes are used to examine inside the body of a patient. The principle on which the endoscope operates is:

- **A.** Total internal reflection
- B. Real and apparent depth
- C. Lateral inversion
- D. Refraction

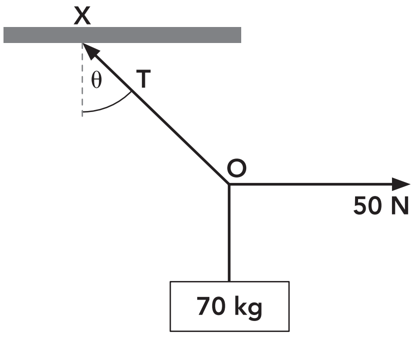
(2)

10 ×(2) = **[20]**

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

Question 2

A light string is suspended from the ceiling. A body of mass 70 kg is tied to the string at **O**. A horizontal force of 50 N is exerted at O, causing the string OX to experience a tension T as shown in the sketch. The system is in equilibrium.



2.1 Calculate the magnitude of the tension in the string (T). (5)

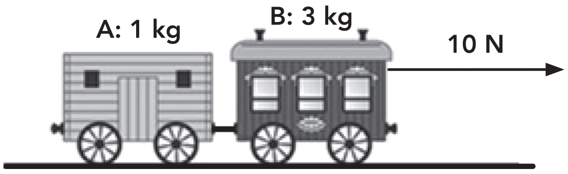
2.2 Calculate the magnitude of angle θ. (2)

2.3 If the angle θ is increased, how does the magnitude of tension (T) change?
Write only *increase, decrease* or *remains the same.* (2)

[9]

Question 3

A child pulls a toy train of two cars with a horizontal force of 10 N. The mass of the string connecting the two cars, as well the friction, is negligibly small.



3.1 Calculate the acceleration of the train. (4)

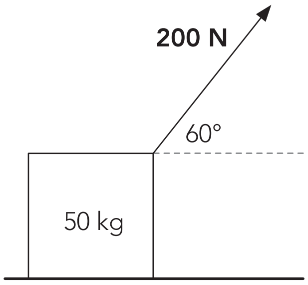
3.2 Calculate the tension in the string between the two cars. (2)

3.3 How will the acceleration of the train be affected if the mass of the connecting string is not negligible? Write only *increase, decrease or remains the same.* (2)

[8]

Question 4

A force of 200 N, acting at 60° to the horizontal, accelerates a body of mass 50 kg along a horizontal plane.



4.1 Calculate the component of the 200 N force that accelerates the body along the horizontal plane. (2)

4.2 If it is found the magnitude of the body's acceleration is 1,5 $m.s^{-2}$, calculate the magnitude of the frictional force acting on the body. (4)

4.3 Calculate the normal force experienced by the body. (4)

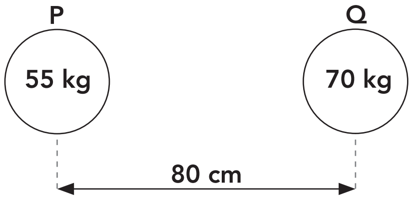
4.4 Calculate the coefficient of kinetic friction. (3)

[13]

Question 5

5.1 State Newton's Law of Universal Gravitation in words. (2)

5.2 The distance between the centres of two metal balls, P and Q, of mass 55 kg and 70 kg respectively, is 80 cm.



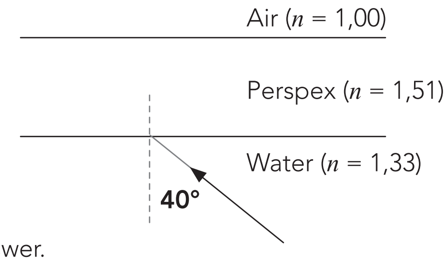
5.2.1 Calculate the gravitational force between the two metals balls. (4)

5.2.2 If Q is replaced by a ball with half the mass and at twice the distance from P, determine the **factor** by which the magnitude of the force between them changes. (You do not have to calculate the gravitational force between them again.) (3)

[9]

Question 6

A ray of light from the water is incident on a perspex surface at an angle of incidence of 40°. The refractive indexes of each of the materials – water, perspex and air – are shown in the diagram.



6.1 Define the term refraction. (2)

6.2 Will the ray of light experience total internal reflection at the water to perspex surface? Explain your answer. (3)

6.3 Calculate the speed of light in perspex. (3)

6.4 Show that the critical angle of perspex when light travels from perspex to air is 43,2°. (3)

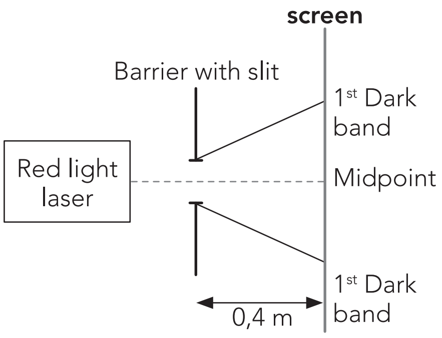
6.5 Determine if the ray of light will experience total internal reflection as it moves from perspex to air. (4)

6.6 Redraw the diagram above in your answer book. Complete the diagram by indicating the path the ray of light will take when it passes from the water to perspex and then to air. Correctly label all the light rays and angles. (4)

[19]

Question 7

Red light from a narrow slit reaches a large white screen, as shown in the diagram.



7.1 State Huygens' principle in words. (2)

7.2 What type of interference occurs at the central bright band? Write only *constructive* or *destructive*. (1)

7.3 If the width of the slit is increased, how will the pattern observed on the screen change? (1)

7.4 Explain your answer to **Question 7.3.** (1)

7.5 The red light is now replaced by a blue light. Describe how the observed pattern will change. (2)

7.6 Explain your answer to **Question 7.5.** (2)

[9]

TOTAL MARKS: 85

TIME: 1 HOUR 40 MINUTES

END OF TEST

Physical Sciences Grade 11: End-of-Term 2 Physics Test

DATA SHEET

GRADE 11 TERM 2

TABLE 1: PHYSICAL CONSTANTS

Name	Symbol	Value
Acceleration due to gravity	g	9,8 m·s^{-2}
Speed of light in a vacuum	c	3,0 x 10^8 m·s^{-1}
Mass of the Earth	M	5,98 x 1 024 kg
Radius of the Earth	R_E	6,38 x 106 m

TABLE 2: FORMULAE

MOTION

$v_f = v_i + a\Delta t$	$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$ or $\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$
$v_f^2 = v_i^2 + 2a\Delta x$ or $v_f^2 = v_i^2 + 2a\Delta y$	$\Delta x = (\frac{v_i + v_f}{2})\Delta t$ or $\Delta y = (\frac{v_i + v_f}{2})\Delta t$

FORCE

$F_{net} = ma$	$F_g = mg$
$F = \frac{Gm_1m_2}{d^2}$	$g = G\frac{M}{d^2}$
$f_k = \mu_k N$	$f_s^{max} = \mu_s N$

WAVES, LIGHT AND SOUND

$n = \frac{c}{v}$	$n_i \sin\theta_i = n_r \sin\theta_r$

Physical Sciences Grade 11: 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
1.9	A	B	C	D
1.10	A	B	C	D
				TOTAL

3. Physical Sciences Grade 11: End-of-Term 2 Physics Test Memorandum

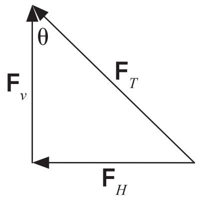
Question 1

1.1 D ✓✓ (2) 1.2 C ✓✓ (2) 1.3 B ✓✓ (2) 1.4 C ✓✓ (2)

1.5 B ✓✓ (2) 1.6 B ✓✓ (2) 1.7 D ✓✓ (2) 1.8 B ✓✓ (2)

1.9 A ✓✓ (2) 1.10 A ✓✓ (2) **[20]**

Question 2



2.1 $F_g = mg$
$= (70)(9,8)$ ✓
$= 68,6\ N$ ✓

$F_v = F_g$
$F_H = 50\ N$
$F_T^2 = F_v^2 + F_H^2$ ✓
$= (68,6)^2 + (50)^2$ ✓
$F_T = 84,89\ N$ ✓ (5)

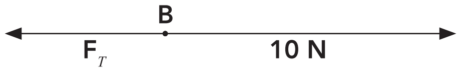
2.2 $\tan\theta = \frac{F_H}{F_v}$ ✓
$\tan\theta = \frac{50}{68,6}$
$\therefore\ \theta = 36,09°$ ✓ (2)

2.3 Increase (or greater than) ✓✓ (2)

[9]

Question 3

3.1



$F_{net} = ma$
$F_T = (1)a$ ✓

$F_{net} = ma$ ✓ (for both equations)
$10 - F_T = (3)a$ ✓

(1) + (2)
$$\begin{aligned} F_T &= 1a \\ \underline{10 - F_T} &\underline{= 3a} \\ 10 &= 4a \\ \therefore a &= 2,5\ m.s^{-2} \end{aligned}$$ ✓ (4)

3.2 $F_T = 1a$ ✓
$= 2,5\ N$ ✓ (2)

3.3 Decrease ✓✓ (2)

[8]

Question 4

4.1 $F_H = F\cos\theta$
$= (200)(\cos 60°)$ ✓
$= 100\ N$ ✓ (2)

4.2 $F_{net} = ma$ ✓
$F_H - F_f = ma$
$100 - F_f$ ✓ $= (50)(1,5)$ ✓
$F_f = 25\ N$ ✓ (4)

4.3 $F_g = F_N + F_V$ ✓
$(50)(9,8)$ ✓ $= F_N + (200)(\sin 60°)$ ✓
$F_N = 316,79$ N ✓ (4)

4.4 $f_k = \mu_k F_N$ ✓
$25 = \mu_k(316,79)$ ✓
$\therefore \mu_k = 0,079$ ✓ (3)

[13]

Question 5

5.1 Every object in the universe attracts every other object ✓ with a force that is directly proportional to the products of their masses and inversely proportional to the square of the distance between their centres. ✓ (2)

5.2 $f = \frac{Gm_Q m_p}{r^2}$ ✓
$= \frac{(6,67 \times 10^{-11})(55)(70)}{(0,8)^2}$ ✓ ✓
$= 4,01 \times 10^{-7}$ N ✓ (4)

5.3 $F_{\text{new}} = \frac{Gm_1 m_p}{r^2}$
$= \frac{G(0,5m_Q) ✓ (m_p)}{(2r)^2 ✓}$
$= (\frac{0,5}{4})(\frac{Gm_Q m_p}{r^2})$
$= 0,125(\frac{Gm_Q m_p}{r^2})$
$\therefore F_{\text{new}} = 0,125$ F ✓ (3)

Alternative solution

$m_Q = \frac{1}{2} m_{\text{original}}$
$r = 2r_{\text{original}}$
$\therefore F_{\text{new}} = \frac{(\frac{1}{2})F}{(2)^2}$ ✓ ✓
$= \frac{1}{8}$F ✓or 0,125 F (3)

[9]

Question 6

6.1 Refraction is the changing in speed of light ✓ as it moves from one medium to another of different optical density. ✓ (2)

6.2 No ✓
The light is moving from a less optically dense medium to another more optically dense medium, therefore internal reflection cannot happen. ✓✓ (3)

6.3 $n = \frac{c}{v}$ ✓
$1,51 = \frac{3 \times 10^8}{v}$ ✓
$\therefore v = 1,99 \times 10^8$ m.s^{-1} ✓ (3)

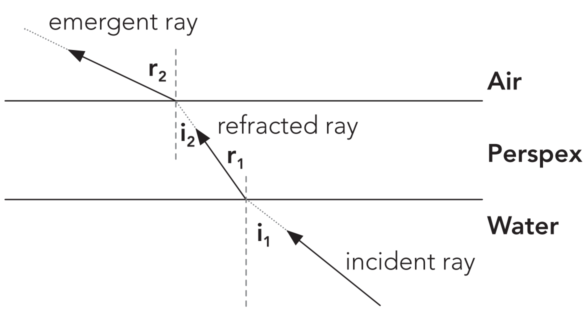
6.4 $n_i \sin\theta_i = n_r \sin\theta_r$ ✓
$(1,51)(\sin\theta_i) = (1)(\sin 90°)$ ✓
$\therefore \theta_i = 41,4°$ ✓ (3)

6.5 $n_i \sin\theta_i = n_r \sin\theta_r$
$(1,33)(\sin 40°) = (1,51)(\sin\theta_r)$ ✓
$\therefore \theta_r = 32,4°$ ✓

θ_r at water and perspex < θ_i at perspex and air ✓

$\therefore$ no internal reflection: θ_l < critical angle ✓ (4)

6.6



✓ correct path through media

✓ arrows and normal shown

✓ rays labelled correctly

✓ angles labelled correctly (4)

[19]

Question 7

7.1 All points on a wavefront act like a point source. ✓ Each one of these point sources produces small circular waves moving forwards with the same speed as the waves. ✓ (2)

7.2 Constructive ✓ (1)

7.3 The central band will be narrower. ✓ (1)

7.4 The amount of diffraction is inversely proportional to the width of the slit. ✓

OR When the width of the slit increases, the amount of diffraction decreases. ✓ (1)

7.5 The pattern will be blue. ✓

The central band is narrower. ✓ (2)

7.6 Blue has a shorter wavelength. ✓

The amount of diffraction is directly proportional to the wavelength. ✓ (2)

[9]

TOTAL MARKS: 85

4. Cognitive Analysis for Physical Sciences Grade 11: End-of-Term 2 Physics Test

There are no guidelines for the weightings of content for the Grade 11 End-of-Term 2 Test. The target weightings given in the tables below for the June exams are largely based on the weighting of time given to a topic. The actual marks allocated are fairly close to the targets but there was more emphasis on Geometric Optics because this is taught in Term 2 and the Mechanics topics were examined in the Term 1 control test.

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

QUESTION	1	2	3	4	Vectors in two dimensions	Newton's laws	Geometrical optics	2D and 3D wavefronts	Total (content)	Total (levels)	Question totals
TARGET (%)	**15**	**35**	**40**	**10**	**10**	**57,5**	**25**	**7,5**	**100**	**100**	
TARGET (marks)	**13**	**30**	**34**	**8**	**9**	**50**	**20**	**6**	**85**	**85**	**85**
ACTUAL (marks)	14	30	33	8	12	37	38	9	**85**	**85**	**85**
Question 1											**20**
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	2	
1.7		2					2		2	2	
1.8		2					2		2	2	
1.9		2					2		2	2	
1.10	2						2		2	2	
Question 2											**8**
2.1	2	3			5				5	5	
2.2		2			2				2	2	
2.3				1	2				1	1	
Question 3											**7**
3.1	1		3			4			4	4	
3.2		2				2			2	2	
3.3				1		2			1	1	
Question 4											**13**
4.1						2			2	2	
4.2						4			4	4	
4.3						4			4	4	
4.4						3			3	3	
Question 5											**9**
5.1	2					2			2	2	
5.2.1		1	3			4			4	4	
5.2.2			2	1		3			3	3	
Question 6											**19**
6.1	2						2		2	2	
6.2			2	1			3		3	3	

QUESTION	1	2	3	4	Vectors in two dimensions	Newton's laws	Geometrical optics	2D and 3D wavefronts	Total (content)	Total (levels)	Question totals
6.3		3					3		3	3	
6.4			3				3		3	3	
6.5			2	2			4		4	4	
6.6		4					4		4	4	
Question 7											**9**
7.1	2							2	2	2	
7.2		1						1	1	1	
7.3			1					1	1	1	
7.4				1				1	1	1	
7.5			2					2	2	2	
7.6				2				2	2	2	

5. Physical Sciences Grade 11: End-of-Term 2 Chemistry Test

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions:

1. This question paper consists of 7 questions, an information sheet and an answer sheet. The information sheet may be detached for easy use.
2. Answer **all** the questions.
3. Start each question on a new page.
4. Number the questions exactly as they are numbered in the paper.
5. Write neatly and legibly.
6. **Question 1** consists of 5 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. You may use non-programmable calculators.
8. You may use appropriate mathematical instruments.
9. The diagrams in the question paper are not necessarily drawn to scale.
10. Give brief motivations, discussions, etc. where required.
11. **Show all working clearly in all calculations.**
12. Round off to **two** decimal places where necessary.

Question 1

Multiple choice questions

1.1 Which one of the following molecules is NOT polar?

A. NH_3

B. CO_2

C. H_2O

D. HF (2)

1.2 The boiling point of hydrogen sulphide (H_2S) is much lower than that of water (H_2O). Which ONE of the following **best** explains this difference in their boiling points?

A. H_2S molecules are more polar than H_2O molecules.

B. H_2O molecules are more polar than H_2S molecules.

C. There are dipole-dipole forces between H_2S molecules.

D. There are hydrogen bonds between H_2O molecules. (2)

1.3 If you had 10 g of each of the following compounds, which sample would have the greatest number of moles of compound?

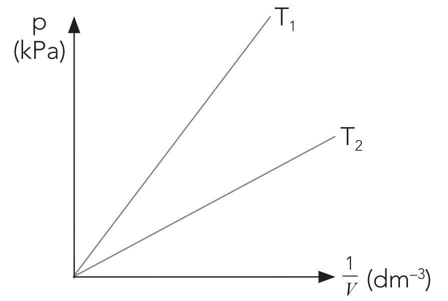
A. methane

B. ammonia

C. carbon dioxide

D. hydrogen disulphide (2)

1.4 A pupil investigated Boyle's Law for two different temperatures and represented his results graphically:



Which of the following statements can correctly be deduced from the graph?

A. The pressure of a fixed mass of gas is directly proportional to the volume of gas.

B. The pressure of a fixed mass of gas is directly proportional to the temperature of gas.

C. The temperature T_1 is less than T_2.

D. The temperature T_1 is greater than T_2 (2)

1.5 12 moles of hydrogen gas (H_2) and 5 moles of nitrogen gas (N_2) are mixed and allowed to react to form ammonia (NH_3) according to the following balanced equation:

$3H_2(g) + N_2(g) \rightarrow 2NH_3(g)$

During the reaction, before completion, 6 moles of NH_3(g) are formed.

What are the number of moles of H_2(g) and N_2(g) that remain unreacted in the container at this stage?

	Moles of H_2(g)	**Moles of N_2(g)**
A	3 mol	0 mol
B	3 mol	1 mol
C	3 mol	2 mol
D	9 mol	3 mol

(2)

5 × (2) =**[10]**

Question 2

Consider the following list of substances:

I_2 NH_3 $NaC\ell$ $HC\ell$ N_2

2.1 Which molecule(s):

2.1.1 Has a triple covalent bond present?

2.1.2 Can form a dative covalent bond?

2.1.3 Have bonds that have a difference of electronegativity equal to zero? (4)

2.2 In which substance(s) are the intermolecular forces …

2.2.1 Dipole-dipole

2.2.2 London forces

2.2.3 Hydrogen bonds (5)

2.3 Draw Lewis structures of the following molecules:

2.3.1 NH_3 (3)

2.3.2 N_2 (2)

2.3.3 Identify the shape of the NH_3 and N_2 molecules (4)

[18]

Question 3

Water has unique properties which are essential to life and living organisms on Earth.

Answer the questions which follow with reference to the forces between molecules.

3.1 3.1.1 Explain why the boiling point of water is much higher than the boiling point of H_2S. (3)

3.1.2 The high boiling point of water results in most water on Earth being found in the liquid state. Give a reason why the presence of water in the liquid state is essential to promoting life on Earth. (1)

3.2 3.2.1 Explain why ice floats on water, with reference to the structure of ice and that of water, and the forces between their molecules. (3)

3.2.2 Explain why the fact that ice floats on water contributes to promoting life in the oceans and lakes. (2)

3.3 Water has high capillary action. It travels up a thin glass tube or up a thin plastic straw.

3.3.1 Explain how water is able to travel up a thin glass tube or a thin plastic straw, in terms of the forces between molecules. (2)

3.3.2 Give an example of capillary action from nature, which demonstrates how water promotes life and living systems. (1)

[12]

Question 4

4.1 Carbon (IV) oxide (CO_2) and helium are both gases at 273 K.

4.1.1 What is meant by the term 'ideal gas'? (2)

4.1.2 State three assumptions that are made about the molecules of an ideal gas. (3)

4.1.3 Which of the gases mentioned above will deviate most from the ideal gas behaviour? Explain why. (3)

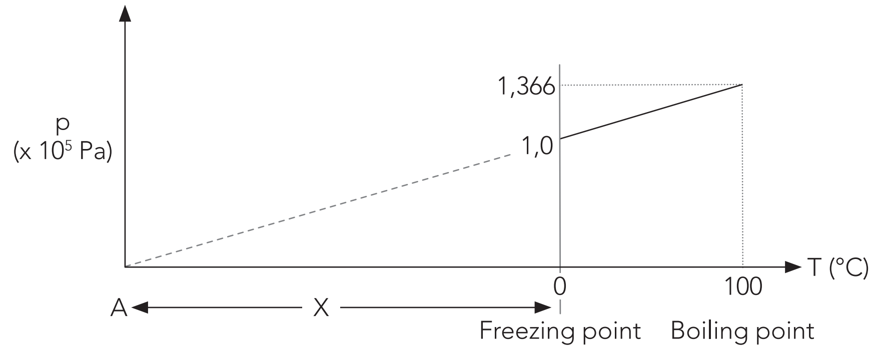
4.1.4 Under what conditions of temperature and pressure do real gases behave most like an ideal gas? (2)

4.1.5 Draw a sketch graph to show the relationship between pV (J) and T (K) for a fixed sample of molecules of ideal gas where pV (J) is on the vertical axis and T (K) is on the horizontal axis. (2)

4.1.6 Describe in words the relationship between pV (J) and T (K) for an ideal gas. (2)

4.1.7 What does the gradient of the sketch graph of pV (J) and T (K) represent? (1)

4.2 The pressure of 6,4 g of oxygen gas, at constant volume, was measured at the freezing point and at the boiling point of water during an experiment. The results of this experiment are graphically given below. If the graph is lengthened, it cuts the temperature axis at A.



4.2.1 Name the law that describes the relationship between the pressure and temperature of a fixed mass of gas at constant volume. (2)

4.2.2 Make use of the given results and calculate the temperature interval, X. (6)

4.2.3 Calculate the volume of the sample of oxygen used. (6)

4.3 The volume capacity of a steel gas cylinder is 20 dm^3. It contains helium at a pressure of 1,4 x 10^3 kPa and a temperature of 7 °C. The helium is to be used to fill balloons for a fête. If each balloon is to contain 10 dm^3 of helium at 100 kPa and 27 °C, how many balloons can theoretically be filled with the available gas? (6)

[35]

Question 5

5.1 The chemical reaction for the production of the drug aspirin from two compounds, **X** and **Y**, is represented by the balanced equation below.

$2C_7H_6O_3 + C_4H_6O_3 \rightarrow 2C_9H_8O_4 + H_2O$

X **Y** **aspirin**

A chemist reacts 14 g of compound **X** with 10 g of compound **Y**.

5.1.1 Define the term *limiting reactant* in a chemical reaction. (2)

5.1.2 Perform the necessary calculations to determine which one of compound **X** or compound **Y** is the limiting reactant. (5)

5.1.3 The actual mass of aspirin obtained is 11,5 g. Calculate the percentage yield of the aspirin. (5)

5.2 Vinegar is a dilute form of acetic acid. A sample of acetic acid has the following percentage composition:

39,9% carbon

6,7% hydrogen

53,4% oxygen

5.2.1 Determine the empirical formula of acetic acid. (5)

5.2.2 If the molar mass of acetic acid is 60 g·mol^{-1}, what is the molecular formula? (2)

5.3 A chemist dissolves 120g of Na_2SO_4 in 250 cm^3 of distilled water to make a standard solution.

5.3.2 Define, in words, the term *standard solution*. (2)

5.3.2 Calculate the concentration of the Na_2SO_4 solution. (4)

[25]

TOTAL MARKS: 100

TIME: 2 HOURS

END OF TEST

Physical Sciences Grade 11: End-of-Term 2 Chemistry Test

DATA SHEET

GRADE 11 TERM 2

TABLE 1: PHYSICAL CONSTANTS

Name	Symbol	Value
Universal Gas Constant	R	8,31 J.K^{-1}.mol^{-1}
Molar volume of gas at STP	V_m	22,4 dm^3

TABLE 2: FORMULAE

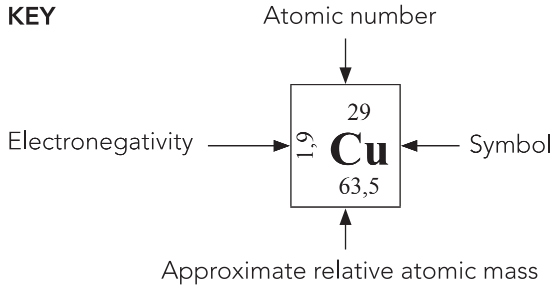
GAS LAWS

$\frac{p_1V_1}{T_1} = \frac{p_2V_2}{T_2}$	$pV = nRT$

QUANTITATIVE CHEMISTRY

$n = \frac{m}{M}$	$c = \frac{n}{V}$

TABLE 3: 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 11: 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
				TOTAL

6. Physical Sciences Grade 11: End-of-Term 2 Chemistry Test Memorandum

Question 1

1.1 B ✓✓ 1.2 D ✓✓ 1.3 A ✓✓ 1.4 D ✓✓ 1.5 C ✓✓

5 × (2) =**[10]**

Question 2

2.1 2.1.1 N_2 ✓

2.1.2 NH_3 ✓

2.1.3 I_2 ✓ and N_2 ✓ (4)

2.2 2.2.1 NH_3 ✓ and HCℓ ✓

2.2.2 N_2 ✓ and I_2 ✓

2.2.3 NH_3 ✓ (5)

2.3 2.3.1

✓✓ Three shared pairs (bonds)

✓ One lone pair of electrons on N (3)

2.3.2

✓One triple bond

✓Two pairs of lone pairs (one on each N) (2)

2.3.3 NH_3 – bent/tetrahedral ✓✓

N_2 – linear ✓✓ (4)

[18]

Question 3

3.1 3.1.1 Water molecules have strong hydrogen bonds between their molecules, ✓ but H_2S molecules only have dipole-dipole van der Waals forces between their molecules. ✓ It takes more energy to separate water molecules from each other to form their vapour than it does to boil H_2S. ✓ (3)

3.1.2 Any one of the following or other valid reasons:

- Minerals dissolve in water (essential to plant growth). ✓
- Animal and plant cells require water for their processes. ✓
- Animals and plants require water in order to live. ✓ (1)

3.2 3.2.1 Ice floats on water because it is less dense than water. ✓ It is less dense because the hydrogen bonds between the molecules are in specific directions ✓ pushing the water molecules further apart than they are in the liquid state. ✓ (3)

3.2.2 Water freezes from the top down leaving liquid water underneath the ice. ✓ Aquatic life can continue to live in water even through winter. ✓ (2)

3.3.1 Water molecules are strongly attracted to the glass (or plastic) ✓ therefore they are able to adhere to the glass (plastic). ✓ (2)

3.3.2 Water moves upward to the top branches and leaves enabling a flow of fluid through the plants. ✓ (1)

[12]

Question 4

4.1 4.1.1 A gas which obeys the gas laws at all temperatures and pressures. ✓✓ (2)

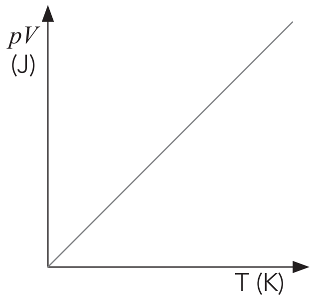
4.1.2 Any three of the following:

- The particles are all identical and in constant motion. ✓
- The particles have no volume. ✓
- There are no intermolecular forces between the particles. ✓
- All collisions are elastic. ✓ (3)

4.1.3 Carbon (IV) oxide OR CO_2 ✓
The particles are large ✓ and the intermolecular forces are relatively strong. ✓ (3)

4.1.4 High temperatures (e.g. room temperature) ✓ and low pressures. ✓ (2)

4.1.5



✓ Straight line graph

✓ Through the origin (2)

4.1.6 The product of pressure and volume of a fixed sample of ideal gas molecules is directly proportional to the temperature of the gas measured in Kelvin. ✓✓ (2)

4.1.7 Gradient = nR ✓
where n = moles of sample and R = 8,31 J.K^{-1}.mol^{-1} (Universal Gas Constant) (1)

4.2 4.2.1 Gay-Lussac's law ✓✓ (2)

4.2.2 gradient = $\frac{p_1 - p_2}{t_1 - t_2}$ ✓ (method)

$= \frac{1{,}366 - 1{,}0}{100 - 0}$ ✓✓ (accuracy)

$= 0{,}00366$

gradient = $\frac{p_1 - p_A}{t_2 - t_A}$

$= \frac{1{,}0 - 0}{0 - t_A} = 0{,}0036$ (method) ✓ (calculating gradient) ✓

$1{,}0 = -(0{,}00366)t_a$

$\therefore t_A = -273{,}22\ °C$ ✓ (accuracy, SI units) (6)

4.2.3 $n(O_2) = \frac{m}{M}$ ✓ $= \frac{6{,}4}{32}$ ✓ = 0,2 mol

$pV = nRT$ ✓

$(1{,}366 \times 10^5)(V)$ ✓ = (0,2)(8,31)(373) ✓

$V = \frac{(0{,}2)(8{,}31)(373)}{(1{,}366 \times 10^5)} = 0{,}0045\ m^3 = 4{,}5\ dm^3$ ✓ (6)

4.3 $p_1 = 1{,}4 \times 10^3$ kPa

$V_1 = 20\ dm^3$

$T_1 = 7\ °C$

= 280 K

$p_2 = 100$ kPa

$V_2 =$

$T_2 = 27\ °C$

= 300 K

$\frac{p_1V_1}{T_1} = \frac{p_2V_2}{T_2}$ ✓

$\frac{(1{,}4 \times 10^3)(20)}{280}$ ✓ $= \frac{(100)V_2}{300}$ ✓

$V_2 = \frac{(1{,}4 \times 10^3)(20)\ (300)}{(280)(100)}$

$= 300\ dm^3$ ✓

$\therefore V$ to fill balloons = 300 – 20

$= 280\ dm^3$ ✓

$\therefore$ 28 balloons can be filled ✓ (6)

[35]

Question 5

5.1 5.1.1 A reactant whose amount limits/determines the amount of product obtained in a chemical reaction. ✓✓ (2)

5.1.2 $n(X) = m \div M = 138 \div 14$ ✓ = 0,10 mol

$n(Y) = m \div M = 102 \div 10$ ✓ = 0,10 mol

From balanced equation, 2 mol X reacts with 1 mol Y ✓

$\therefore$ 0,1 mol of X needs 0,05 mol of Y ✓

X is the limiting reactant ✓ (5)

5.1.3 n(aspirin produced) = n(X) = 0,10 mol

n(aspirin) = $m \div M$ ✓

$\therefore$ 0,1 = $m \div 180$ ✓

m = 18,26 g

% yield = actual yield ÷ theoretical yield × 100

= 11,5 ✓ ÷ 18,26 ✓ x 100 = 62,98% ✓ (5)

5.2 5.2.1 In 100 g:

$n = \frac{m}{M}$ ✓ $= \frac{39,9}{12}$ = 3,325 mol C ✓

$n = \frac{m}{M} = \frac{6,7}{1}$ = 6,7 mol H ✓

$n = \frac{m}{M} = \frac{53,4}{16}$ = 3,3375 mol O ✓

Simplest ratio: C:H:O = 1:2:1

Empirical formula: CH_2O ✓ (5)

5.2.2 M(CH_2O) = 12 + 2(1) + 16 = 30 g·mol^{-1} ✓

Molecular mass ÷ mass of empirical formula = 60 ÷ 30 = 2

Molecular formula: $C_2H_4O_2$ ✓ (2)

5.3 5.3.1 A solution of known concentration ✓✓ (2)

5.3.2 $n = \frac{m}{M} = \frac{120}{142}$ ✓ = 0,85 mol ✓

$c = \frac{n}{V} = \frac{0,85}{0,25}$ ✓ = 3,4 mol ✓ (4)

[25]

TOTAL MARKS: 100

7. Cognitive Analysis for Physical Sciences Grade 11: 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**	**Total (levels)**	**Atomic combinations**	**Intermolecular forces**	**Ideal gases**	**Quantitative aspects of chemical change**	**Total (content)**	**Question totals**
%	**15**	**35**	**40**	**10**	100	**17**	**28**	**22**	**33**	100	**100**
Actual	15	36	39	10	100	20	14	37	29	300	100
Question 1					**10**					**10**	**10**
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**	
Question 2					**4**					**18**	**18**
2.1.1			1		**1**	1				**1**	
2..1.2			1		**1**	1				**1**	
2.1.3			2		**2**	2				**2**	
2.2.1			2		**2**	2				**2**	
2.2.2			2		**2**	2				**2**	
2.2.3			1		**1**	1				**1**	
2.3.1	1		2		**3**	3				**3**	
2.3.2			2		**2**	2				**2**	
2.3.3	2		2		**4**	4				**4**	
Question 3					**12**					**12**	**12**
3.1			2		**2**		2			**2**	
3.2				1	**1**		1			**1**	
3.3			2		**2**		2			**2**	
3.4				1	**1**		1			**1**	
3.5			2		**2**		2			**2**	
3.6				1	**1**		1			**1**	
3.7			2		**2**		2			**2**	
3.8				1	**1**		1			**1**	
Question 4					**35**					**35**	**35**
4.1.1	2				**2**			2		**2**	
4.1.2	3				**3**			3		**3**	
4.1.3		3			**3**			3		**3**	
4.1.4		2			**2**			2		**2**	
4.1.5			2		**2**			2		**2**	
4.1.6		2			**2**			2		**2**	
4.1.7			1		**1**			1		**1**	
4.2.1	2				**2**			2		**2**	
4.2.2		2	4		**6**			6		**6**	
4.2.3			3	3	**6**			6		**6**	
4.3		2	3	1	**6**			6		**6**	
Question 5					**25**					**25**	**25**
5.1.1	2				**2**				2	**2**	
5.1.2		2			**5**				5	**5**	
5.1.3		2	3		**5**				5	**5**	
5.2.1	1		3		**5**				5	**5**	
5.2.2		2	4		**2**				2	**2**	
5.3.1	2				**2**				2	**2**	
5.3.2		2	2		**4**				4	**4**	