GRADE 11

Physical Sciences

Teacher Toolkit: CAPS Planner and Tracker

2019 Term 1

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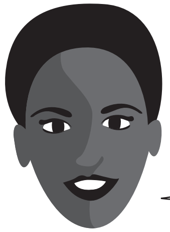
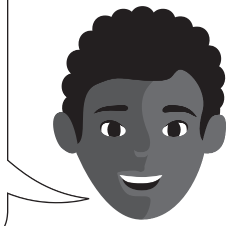
A. ABOUT THE PLANNER AND TRACKER

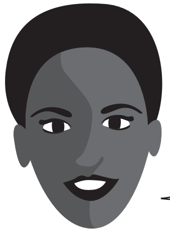
1. Your quick guide to using this planner and tracker



What is the NECT and where do I fit in?

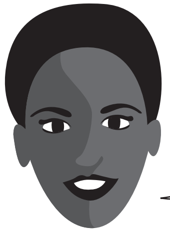


What you do matters! What you do every day as a teacher can change the life-chances of every child that you teach. The NECT supports teachers by providing CAPS planners and trackers so that teachers can plan to cover the curriculum, track progress, and seek help when they are falling behind.

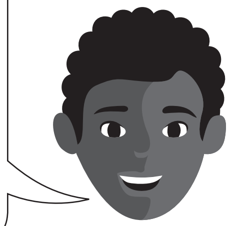


But who will help me?

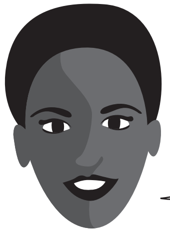
The NECT will work with your school management team (SMT) and assist them to have supportive and professional conversations with you about curriculum coverage that will be orientated to identifying and solving problems.



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



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



How do I use the planner and tracker?

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

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

1. Find the textbook that YOU are using.

2. Use the planning page each week to plan your teaching for the week. It will help you link the CAPS content and skills to relevant material in the textbook, the teacher's guide, and other materials such as the DBE workbook.

3. Keep a record of the date when you were able to complete the topic. It may be different from the date you planned, and for different classes. Write this date in the column on the right for your records.

4. At the end of the week, reflect and check if you are up to date. Make notes in the blank space.

5. Be ready to have a professional and supportive curriculum coverage conversation with your HoD (or subject or phase head).

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

2. Purpose of the tracker

The Curriculum and Assessment Planner and Tracker is a tool to support you in your role as a professional teacher. Its main purpose is to help you keep pace with the time requirements and the content coverage of the CAPS by providing the details of what should be taught each day of the term; and of when formal assessments should be done. Each of the sessions for Physical Sciences in Grade 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 35 one-hour sessions, organised into four 60-minute sessions per week. Depending on your school's timetable, you may use two of these sessions in one double period. You might also need to adjust the work prescribed for a session to meet other demands of your timetable. However, the content that needs to be covered in a week, should always be covered in a week. If for some reason you do not complete the work set for the week, you need to find a way to get back on track.

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

Please note: The tracker has been planned for a first term of 10 weeks with a short first week of 3 sessions rather than 4. The content should be completed in the first 8 weeks, leaving Weeks 9 and 10 for you to complete any work you have not managed to cover in this time, review assignments and tests, do remediation work with your learners, and for learners to write the term test. If the year in which you are using it has a longer or shorter first term, you will need to adjust the pace of work accordingly. It is important that you take note of this at the start of the year.

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

6. Links to assessment

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

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

7. Resource list

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

8. Columns in the tracker

The tracker plan consists of the following columns for each set of LTSMs:

1. Session number
2. CAPS content, concepts and skills for the day
3. Relevant CAPS page number
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**
  Vectors, forces, Newton's laws
  Chemistry: Matter and materials
  Chemical bonding, molecular shapes, intermolecular forces and the chemistry of water
- Term 2 – Physics: Waves, sound and light
  Chemistry: Matter and materials
- Term 3 – Chemistry: Chemical change
  Physics: Electricity and magnetism
- Term 4 – Chemistry: Chemical change and chemical systems

Overview of Term 1 Topics

Mechanics

This is an extremely important area of Physics, both in terms of preparing learners for the Grade 12 examination and for learners who will proceed to study Physics at tertiary institutions. Research also shows that many learners have misconceptions about forces and many will therefore struggle to master the concepts and skills required to succeed.

The first topic of mechanics is vectors. Vectors were introduced to learners at the end of Grade 10. Although the concept of a vector quantity is not difficult, learners need to be able to use Pythagoras' theorem and trigonometry to solve most problems in mechanics. Learners who take Mathematical Literacy rather than Mathematics will need special attention as they will not have been taught these mathematical tools. Even learners who are doing Mathematics may have forgotten how to use trigonometric ratios, although this is part of the Grade 10 Mathematics curriculum. To ensure that learners have a good understanding of vector calculations you should encourage them to always start by drawing a graphic representation before attempting a calculation. Please note that the CAPS does not allow for a long time to be spent on vectors (four hours only). It may be tempting to spend more than the four hours allocated to this section but this is not advisable. Rather see the section on vectors as an overview and revision of Grade 10 and move on quickly to the next topic on Newton's laws as this second topic will provide many natural opportunities to use vectors in a relevant Physics context without getting too stuck on the mathematical procedures.

Newton's laws of motion and universal gravitation are classic examples of how scientists use observations of real-world phenomena and develop laws and theories to describe their observations. The power of this body of knowledge is that it allows us to predict what will happen to objects under various conditions. This theoretical knowledge has many practical consequences and has been the reason for many advances in technology. Indeed, scientists in the 1960s used Newton's laws originally developed in the late 1600s to send spacecraft and astronauts into orbit around the Earth and then onwards to the moon!

The topic of Newton's laws relates directly to the work learners did on motion in one dimension in Grade 10. You will need to remind learners of the definition of terms like displacement, velocity and acceleration. They will need to work with equations of motion, as well as graphs of motion. It is not necessary to re-teach the Grade 10 work but you need to infuse these concepts and skills into your teaching. The concepts related to motion will be examined in Grade 12, too.

When teaching Newton's laws you need to use concrete everyday activities as a foundation for developing the essential concepts. By asking questions and asking learners to explain observations, you can help them to develop and formulate the concepts before telling them the particular law that Newton formulated. Once you have laid the conceptual foundation, it is essential to get learners to critically interrogate each of Newton's laws. In this way you can help mediate the language and meaning of the formal statement. Finally, you need to encourage learners to learn and recall the statements of the laws. There is a large percentage of marks allocated for recall in all examinations. In most cases, the marking memoranda indicate that there are no part marks for the statement of laws and definitions, so it is very important that learners have these committed to memory.

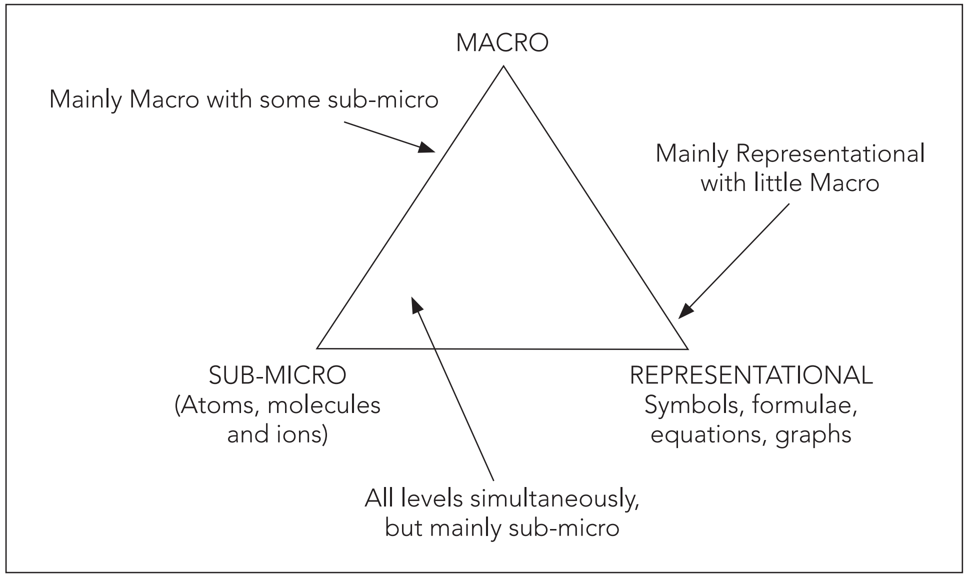
There are many excellent resources available to assist you in teaching this topic, including worksheets, videos and simulations. There are also many excellent research articles that you should consider reading to improve both your own content knowledge, as well as your pedagogic knowledge (knowledge of how to teach a particular concept). Some of these are listed in Section E *Additional Information and Enrichment Activities*. Keep in mind that many learners will not fully grasp all the concepts in this section the first time they encounter them. You will need to plan to give them revision activities throughout the year. Use questions from previous Grade 12 examinations for this purpose. The more opportunities learners have to practice mechanics questions in their own time, the better they will cope with formal assessments such as exams and control tests. It is particularly important that you give learners feedback about this section and give them the opportunity to redo exam and test questions that they don't get right.

Matter and materials

The Chemistry topics for Term 1 provide the foundation for Chemistry in Grade 12 and for learners who will go on to study Chemistry at tertiary level. The content builds on concepts studied in Grade 10. Research shows that many learners struggle with more advanced Chemistry because they do not have a clear understanding of the basic concepts. For this reason, we encourage a revision session before each section is handled. It is also helpful to administer a few diagnostic tests where time permits. In this way, you can become aware of learners' misunderstandings and remediate these.

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

Figure 1: JOHNSTONE'S TRIANGLE



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

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

Learners need to recognise that the type of chemical bond in a compound determines the physical and chemical properties of that compound. Through studying the structures of atoms, molecules and ions, and the bonding in elements and compounds, learners will acquire knowledge of important chemical principles. By learning the properties of metals, giant ionic substances, simple molecular substances and giant covalent substances, they should be able to appreciate the interrelation between bonding, structures and properties of substances. In this way, you are helping learners see the links between the macro and sub-micro views and show them how chemists represent these concepts in symbolic forms. The topic of intermolecular forces, which emphasises these links, is particularly important as it is directly examined in Grade 12 in the context of organic molecules.

The section on water chemistry, which is scheduled in the last weeks of Term 1, should not be ignored even though it is not directly examinable in Grade 12. This topic provides an opportunity for learners to explore and revise all the ideas, concepts and skills required. When examining the chemistry of water, you can revise the following sub-micro topics: nature of covalent bonds, electronegativity, the shape of molecules, the polar nature of the water molecule and intermolecular forces (hydrogen bonds). You can link these sub-micro concepts to the macro view of water and explore how the sub-micro model of a water molecule can be used to explain the many unique physical properties of water such as melting point, boiling point, surface tension, capillarity, heat capacity and ability to be a universal solvent.

We recommended that the formal practical assessment for Chemistry be completed at the end of Term 1, during the time many schools set aside for formal testing, even though this will be recorded in the Term 2 schedule. This will assist in better time management in Term 2.

2. Prepare resources

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

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

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

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

3. Plan for required assessment tasks

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

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

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

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

Name of book	Formal practical assessment	Control test
Study and Master Physical Sciences	**Verification of Newton's second law** **Week 4:** LB pp. 55–57; TG D13–D17 *Investigate the effects of intermolecular forces on various physical properties* **Week 9:** LB pp. 118–121; TG D35–D38	**Week 10:** Mechanics, Matter and materials TG B11 **or** exemplar test in Section F
Platinum Physical Sciences	**Verification of Newton's second law** **Week 4:** LB pp. 30–31, Exp. 2.1; TG pp. 18–20 *Investigate the effects of intermolecular forces on various physical properties* **Week 9:** LB pp. 83–85; TG pp. 47–50	**Week 10:** Control Test Book Test 1 **or** exemplar test in Section F
Successful Physical Sciences	**Verification of Newton's second law** **Week 4:** LB Unit 12 pp. 44–46; TG pp. 53–54 *Investigate the effects of intermolecular forces on various physical properties* **Week 9:** LB pp. 105–112; TG pp. 97–102	**Week 10:** Exemplar Test given in LB p. 324 and on CD Memo in TG p. 255 **or** exemplar test 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.

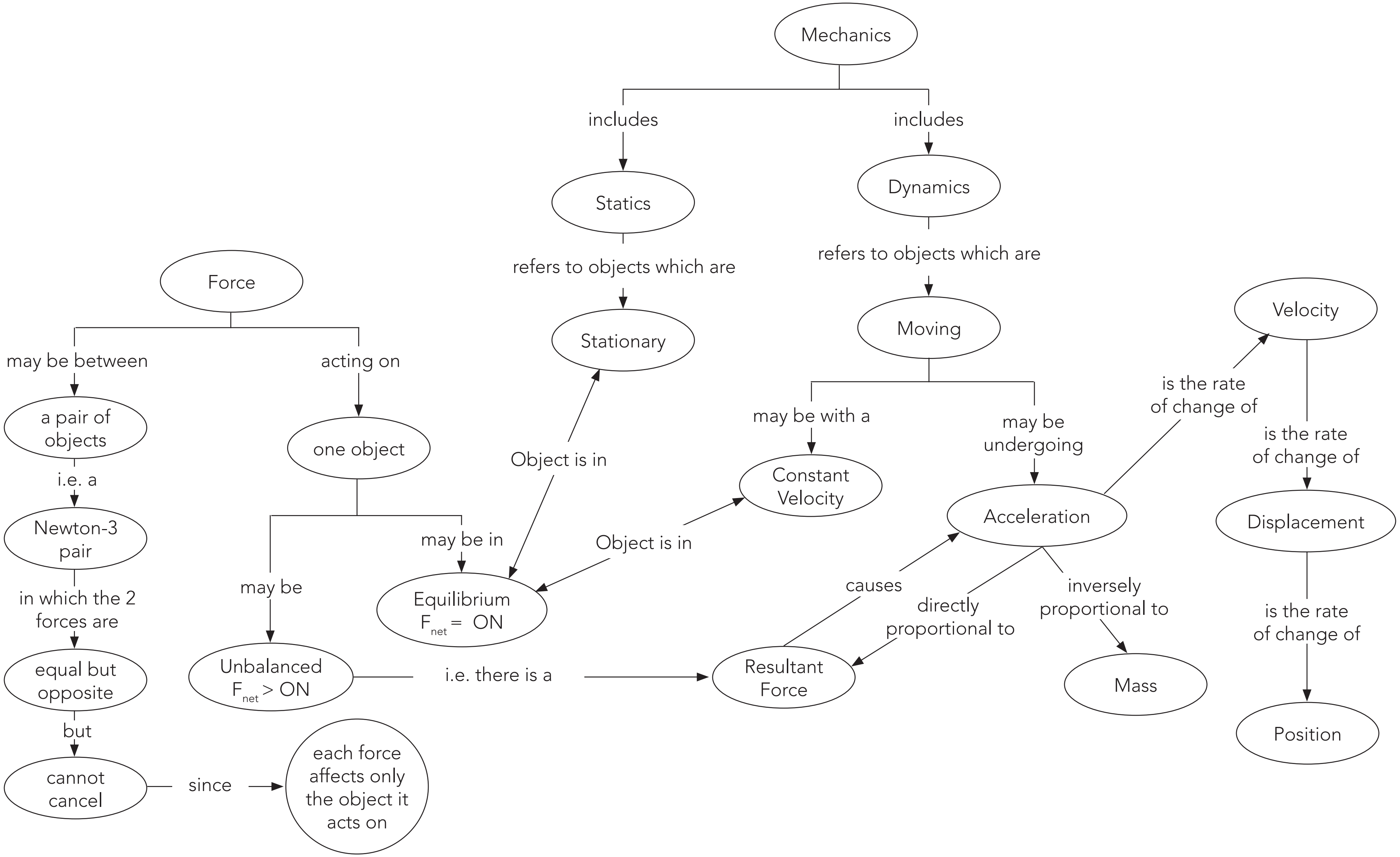
2. Prepare the conceptual framework for the lesson topic

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.

Figure 2: CONCEPT MAP OF MECHANICS



3. Baseline assessment and remediation of misconceptions

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

4. Learner activities

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

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

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

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

5. Informal assessment

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

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

6. Learners with special needs

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

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

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

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

- Directorate Inclusive Education, Department of Basic Education (2010) *Guidelines for inclusive teaching and learning. Education White Paper 6. Special needs education: Building an inclusive education and training system.* Pretoria. www.education.gov.za, www.thutong.doe.gov.za/InclusiveEducation

7. Enrichment

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

8. Homework

It is essential for Grade 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 the each lesson to provide homework instructions. Homework can be a useful consolidation exercise and need not take learners very long. If well planned in advance, learners can sometimes be given a longer homework exercise to be handed in within a week. This arrangement allows for flexibility.

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

9. Practical work

Practical work must be integrated with theory to strengthen the concepts being taught. This may take the form of simple practical demonstrations or an experiment or practical investigation. Some of these practical activities will be done as part of formal assessment and others can be done as part of informal assessment. Learners 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 1, learners are required to investigate the relationship between force and acceleration (verification of Newton's second law) as the formal assessment for Physics. To prepare learners for this assessment, give them opportunities to complete other Physics experiments and investigations. It is recommended that learners investigate the relationship between normal force and maximum static friction or the effect of different surfaces on maximum static friction by keeping the object the same as in one of the informal assessments.

Term 1 also provides the opportunity for learners to complete practical assessments in Chemistry. The recommended formal assessment for Chemistry is to investigate the effect intermolecular forces have on physical properties of different substances. Although this is recorded in Term 2, there may be time to complete these practical investigations in the last weeks of Term 1. Learners will be best prepared for these formal assessments by doing other informal Chemistry investigations.

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

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

Safety is critical whenever doing practical work. 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 and assessment tasks
3. Relevant CAPS page number
4. Learner's Book page number
5. Learner's Book activity/task
6. Teacher's Guide page number
7. *Everything Science* Learner's Book page number
8. *Everything Science* Teacher's Guide page number
9. 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
TG	Teacher's Guide
WS	Worksheet
*	Additional/alternative activity provided
#	Examined in Grade 12
TYS	Test Yourself

Endnote

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

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

Study and Master Physical Sciences

Week 1: Vectors in two dimensions

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	**Resultant of perpendicular vectors #** • Draw a sketch of the vectors (parallel and perpendicular) on the Cartesian plane • Add co-linear vectors along the parallel and perpendicular direction to obtain the net parallel component (Rx) and a net perpendicular component (Ry) • Sketch Rx and Ry • Sketch the resultant (R) using either the tail-to-head or tail-to-tail method • Determine the magnitude of the resultant using the theorem of Pythagoras	61	22–26	p. 24 TYS 1	D6	4–21	34–60					
	Homework Complete Test Yourself 2			p. 26 TYS 2	D6	17 Ex. 1–3 Q. 1–4	45–50					
2	**Resultant of perpendicular vectors #** • Find resultant vector graphically using the tail-to-head method, as well as by calculation (by component method) for a maximum of four force vectors in both one dimension and two dimensions • Understand what a closed vector diagram is • Determine the direction of the resultant using simple trigonometric ratios	61	26–33	p. 31 TYS 3	D6–D7	13–36	35–60					
	Homework Read through Activity 1 Test Yourself 6 Q. 3a–d		33–34 38	PA Act. 1 TYS 6 Q. 3	D8 D9 –D10	35–36 Ex. 1–5 Q. 1–4	56–60					
3	**Resultant of perpendicular vectors #** **Informal assessment** Experiment: Determine the resultant of three non-linear force vectors (Activity 1)	61	33–34	PA	D8	48–49						

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	Resources for informal assessment **Experiment: Determine the resultant of three non-linear force vectors** Force board, assortment of weights (10 g to 200 g), gut or string, two pulleys	61	33–34	PA pp. 33–34 Act. 1	D8							
	Homework Complete Test Yourself 4 Test Yourself 6 Q. 4 and 5a–d	61	32	p. 32 TYS 4 pp. 38–39 TYS 6 Q. 4 & 5	D7 D10	50–53 Ex. 1–7 Q. 1–19	65–87					

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

Study and Master Physical Sciences

Week 2: Newton's laws and application of Newton's laws

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	**Resolution of a vector into its parallel and perpendicular components #** • Draw a sketch of the vector on the Cartesian plane showing its magnitude and the angle θ between the vector and the x-axis • Use Rx = Rcos θ for the resultant x-component • Use Ry = Rsin θ for the resultant y-component	61	34–37	p. 37 TYS 6 Q. 1	D9	36–48	60–65					
	Homework Test Yourself 6 Q. 1 and 2			p. 37 TYS 6 Q. 2	D9	50–53 Ex. 1–7 Q. 1–19	65–87					
2	**Different kinds of forces: weight, normal force, frictional force, applied (push, pull), tension (strings or cables) #** • Define normal force, N, as the force exerted by a surface on an object in contact with it • Know that the normal force acts perpendicular to the surface irrespective of whether the plane is horizontal or inclined • Define frictional force, f, as the force that opposes the motion of an object and acts parallel to the surface the object is in contact with • Distinguish between static and kinetic friction forces • Explain what is meant by the maximum static friction, f_s max	62	39–43	p. 42 Ex. 1 & 2	D11 (Demo.)	56–66	90					
	Homework Test Yourself 7a–d			p. 44	D11	67 Ex. 2.1 Q. 1–3	91–93					
3	**Different kinds of forces: weight, normal force, frictional force, applied (push, pull), tension (strings or cables) #** • Calculate the value of the maximum static frictional force for objects at rest on a horizontal and inclined planes using: f_s max $= \mu_s N$ • Know that static friction $f_s < \mu_s N$ • Calculate the value of the kinetic friction force for moving objects on horizontal and inclined planes using: $f_k = \mu_k N$	62		p. 44	D11	56–66	90					

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				
	Homework					67 Ex. 2.1 Q. 1–3	91–93					
4	**Force diagrams, free body diagrams #** • Know that a force diagram is a picture of the object(s) of interest with all the forces acting on it (them) drawn in as arrows • Know that in a free-body diagram, the object of interest is drawn as a dot and all the forces acting on it are drawn as arrows pointing away from the dot • Resolve two-dimensional forces (such as the weight of an object with respect to the inclined plane) into its parallel (x) and perpendicular (y) components • The resultant or net force in the x-direction is a vector sum of all the components in the x-direction • The resultant or net force in the y-direction is a vector sum of all the components in the y-direction	63	44–47			68–74 71 Ex. 2.2 Q. 1 & 2	93–94					
	Homework Prepare for practical activity – read pp. 47–49			PA pp. 47–49	D11–D13	74 Ex. 2.3 Q. 1 & 2	94–96					

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

Study and Master Physical Sciences

Week 3: Newton's laws and application of Newton's laws

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	**Different kinds of forces: weight, normal force, frictional force, applied (push, pull), tension (strings or cables) #** **Experiment: Investigate the relationship between normal force and force of dynamic friction**	62		PA pp. 47–49	D11–D13	66–67						
	Resources Spring balance, several blocks (of the same material) of varying sizes with hooks attached on one end; different textures: rough, smooth surfaces; various surfaces at various angles of inclination	62										
	Homework Write up report on the practical investigation											
2	Consolidation lesson on vectors and forces Q. 1–10					50–53 Ex. 1–7 Q. 1–10	65–87					
	Homework Complete Exercise 1.7 Q. 11–19					50–53 Ex. 1–7 Q. 1–19	65–87					
3	**Newton's first, second and third laws #** State Newton's first law: *An object continues in a state of rest or uniform (moving with constant) velocity unless it is acted upon by an unbalanced (net or resultant) force* • Discuss why it is important to wear seatbelts using Newton's first law	64	49–52	p. 52 TYS 8	D13	74–77 77 Ex. 2.4 Q. 1 & 2	96–97					
	Homework **Consolidation**					118–120 Ex. 2.10 Q. 1–8 pp. 122, 128 Ex. 2.10 Q. 11 & 31	118–120 121, 131–132					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
4	**Newton's first, second and third laws #** State Newton's second law: *When a net force, Fnet, is applied to an object of mass, m, it accelerates in the direction of the net force; the acceleration, a, is directly proportional to the net force and inversely proportional to the mass Fnet = ma* **Feedback on informal practical assessment**	64	52–55	PA pp. 55–57	D13–D17	77–80						
	Homework Prepare for practical activity (Complete pre-practical questions)			PA pp. 55–57	D13–D17	97 Ex. 2.5 Q. 1–8	97–99					
	Remediation/consolidation (forces)					130–131 Ex. 2.10 Q. 36–39	135–138					

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

Study and Master Physical Sciences

Week 4: Newton's laws and application of Newton's laws

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	**Newton's first, second and third laws #** Recommended experiment for formal assessment Investigate the relationship between force and acceleration (Verification of Newton's second law)	64		PA pp. 55–57	D13–D17	78–80 97–98 Ex. 2.5 Q. 1–8	97–99					
	Resources Trolleys, different masses, incline plane, rubber bands, meter rule, ticker tape apparatus, ticker timer and graph paper					78–80						
	Homework Complete Ex. 2.5 (Applications of Newton's second law)	65				98–101 Ex. 2.5 Q. 9–24	99–108					
2	**Newton's first, second and third laws #** • Draw force diagrams for objects that are in equilibrium (at rest or moving with constant velocity) and accelerating (non-equilibrium) • Draw free body diagrams for objects that are in equilibrium (at rest or moving with constant velocity) and accelerating (non-equilibrium) • Apply Newton's laws to a variety of equilibrium and non-equilibrium problems including a single object moving on a horizontal/inclined plane (frictionless and rough), vertical motion (lifts, rockets etc.) and also two-body systems such as two masses joined by a light (negligible mass) string • Understand apparent weight	64 65	57–63	p. 62 TYS 9 Q. 1	D17	80–97 112–114						
	Homework Test Yourself 9 Q. 2			p. 62 TYS 9 Q. 2	D17	122–123 Ex. 2.10 Q. 9 10, 12–13	120–122					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
3	**Newton's first, second and third laws #** • Apply Newton's laws to a variety of equilibrium and non-equilibrium problems including a single object moving on a horizontal/inclined plane (frictionless and rough), vertical motion (lifts, rockets etc.) and also two-body systems such as two masses joined by a light (negligible mass) string	65	57–63	p. 62 TYS 9 Q. 3	D18	80–97 112–114						
	Homework			p. 62 TYS 9 Q. 4	D18	123–130 Ex. 2.10 Q. 10–34	122–135					
4	**Newton's first, second and third laws #** Consolidation State Newton's third law: *When object A exerts a force on object B, object B simultaneously exerts an oppositely directed force of equal magnitude on object A* • Identify action-reaction pairs, e.g. donkey pulling a cart, a book on a table • List the properties of action-reaction pairs **Feedback on practical assessment**	65	49–63 63–66	pp. 84–85 Q. 4–7	D24–D25	101–108						
	Homework			p. 66 TYS 10 Q. 1 & 2		107–108 Ex. 2.6 Q. 1 & 2 pp. 123, 127 Ex. 2.10 Q. 14, 26	108–109 122 127					

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

Study and Master Physical Sciences

Week 5: Newton's laws and application of Newton's laws

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	**Newton's Law of Universal Gravitation #** • State Newton's Law of Universal Gravitation • Use the equation for Newton's Law of Universal Gravitation to calculate the force two masses exert on each other: $F = \frac{G.M_1M_2}{d^2}$ • Describe weight as the gravitational force the Earth exerts on any object on or near its surface • Calculate the acceleration due to gravity on Earth using the equation: $g_{Earth} = \frac{G.M_{Earth}}{d^2}$ N.B. This formula can be used to calculate g on any planet using the appropriate planetary data • Distinguish between mass and weight • Know that the unit of weight is the newton (N) and that of mass is the kilogram (kg) • Calculate weight using the expression W = mg, where g is the acceleration due to gravity • Calculate the weight of an object on other planets with different values of gravitational acceleration	66	67–73	p. 70 TYS 11 Q. 1 & 2 p. 73 TYS 12 Q. 1	D19 D19	107–112						
	Homework Complete Test Yourself 12 Read Activity 4			p. 73 TYS 12 Q. 2 & 3	D19–D20	111 Ex. 2.7 Q. 1–6	109–112					
2	**Newton's Law of Universal Gravitation #** • Calculate weight using the expression W = mg, where g is the acceleration due to gravity • Near the earth the value is approximately $9.8\ m.s^{-2}$	66		PA p. 74 Act. 4	D20–21							
	Resources **Experiment: Verify the value for g** Mass pieces, meter rule, ticker tape apparatus, ticker timer and graph paper	66										

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				
	Homework Complete practical activity report			PA p. 74 Act. 4	D20–21	114 Ex. 2.8 Q. 1 & 2	112–114					
3	**Newton's first, second and third laws #** • Apply Newton's laws to a variety of equilibrium and non-equilibrium problems including a single object moving on a horizontal/inclined plane (frictionless and rough), *vertical motion (lifts, rockets etc.)* and also two-body systems such as two masses joined by a light (negligible mass) string • Understand apparent weight **Newton's Law of Universal Gravitation #** • Understand weightlessness	65	75–77	p. 77 TYS 13 Q. 1	D21	112–117						
	Homework Consolidation: Complete Test Yourself 13 and Q. 8			p. 77 TYS 13 Q. 2, 3 p. 85 Q. 8	D21 D25	117–118 Ex. 2.9 Q. 1–7	114–117					
4	**Newton's first, second and third laws #** **Newton's Law of Universal Gravitation #** Consolidation/remediation Extension		82–84 78–80	Q. 1–3 pp. 80–82 Acts. 5, 6	D23–D24 D21–23	119–120						
	Homework Prepare for Mechanics Test					119 Ex. 2.9 Q. 8–10 pp. 120–132 Ex. 2.10 Q. 1–39 pp. 132–134 Ex. 2.11 Q. 1–14	117–118 118–138 138–144					

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

Study and Master Physical Sciences												
Week 6: Atomic combinations: Molecular structure												
S #	**CAPS concepts, practical activities and assessment tasks**	**CAPS pp.**	**LB pp.**	**LB act.**	**TG pp.**	***Everything Science***		**Class**				
						LB pp.	**TG pp.**					
								Date completed				
1	Mechanics Test (Informal assessment – class test)	61–66	***Worksheet 1**									
2	**A chemical bond (is seen as the net electrostatic force two atoms sharing electrons exert on each other)** • Recall the role of models in science and describe the explanations of chemical bonding in this course as an application of a model • Deduce the number of valence electrons in an atom of an element • Represent atoms using Lewis diagrams • Explain, referring to diagrams showing electrostatic forces between protons and electrons, and in terms of energy considerations, why two H atoms form an H_2 molecule, but He does not form an He_2 molecule	67	87–91	p. 91 TYS 1	D28–D29	136–140	146–147					
	Homework **Learners to investigate one of the following activities in groups:** Activities 4, 5, 6, 7, 8			p. 121 p. 124 p. 125 p. 128 p. 128	D38–40 D40 D41 D42 D43	140 Ex. 3.1 Q. 1–5 pp. 187–188	147–148					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.	Date completed				
3	**A chemical bond (is seen as the net electrostatic force two atoms sharing electrons exert on each other)** • Draw a Lewis diagram for the hydrogen molecule • Describe a covalent chemical bond as a shared pair of electrons • Describe and apply simple rules to deduce bond formation: – different atoms, each with an unpaired valence electron can share these electrons to form a chemical bond – different atoms with paired valence electrons called lone pairs of electrons, cannot share these four electrons and cannot form a chemical bond – different atoms, with unpaired valence electrons can share these electrons and form a chemical bond for each electron pair shared (multiple bond formation) – atoms with an incomplete complement of electrons in their valence shell can share a lone pair of electrons from another atom to form a co-ordinate covalent or dative covalent bond (e.g. NH_4^+, H_3O^+) • Draw Lewis diagrams, given the formula and using electron configurations, for – simple molecules (e.g. F_2,H_2O, NH_3, HF, OF_2, $HOC\ell$) – molecules with multiple bonds (e.g. N_2, O_2 and HCN)	68	91–95	p. 95 TYS 2 1 & 2	D29	140–147 143 Ex. 3.2 Q. 1–2 p. 144 Ex. 3.3 Q. 1 & 2 p. 146 Ex. 3. 4 Q. 1 & 2	148–149 149 149–150					
	Homework Test Yourself 2 Q. 3 and 4			p. 95 TYS 2 3 & 4	D29–30	147–148 Ex. 3.5 Q. 1–5	150–152					
4	**Feedback on Mechanics Test** Remediation/consolidation by reviewing homework											
	Homework Complete checklist and corrections					147–148 Ex. 3.5 Q. 1–5						
	Homework **Learners to investigate one of the following activities in groups:** Activities 4, 5, 6, 7, 8			p. 121 p. 124 p. 125 p. 128 p. 128	D38–40 D40 D41 D42 D43	187–188						

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

Study and Master Physical Sciences

Week 7: Atomic combinations: Molecular structure/intermolecular forces

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	**Molecular shape as predicted using the Valence Shell Electron Pair Repulsion (VSEPR) theory** • State the major principles used in the VSEPR • The five ideal molecular shapes according to the VSEPR model: – linear shape AX_2 (e.g. CO_2 and $BeCl_2$) – trigonal planar shape AX_3 (e.g. BF_3) – tetrahedral shape AX_4 (e.g. CH_4) – trigonal bipyramidal shape AX_5 (e.g. PCl_5) – octahedral shape AX_6 (e.g. SF_6) • Ideal shapes are found when there are **no** lone pairs on the central atom only bond pairs • A is always the central atom and X the terminal atoms	69	96–98	pp. 100–101 PA 1 1–6	D30	148–152						
	Homework Test Yourself 3 Q. 1			p. 101 TYS 3 Q. 1	D30–31	153 Ex. 3.6 1–8	153–155					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
2	**Molecular shape as predicted using the Valence Shell Electron Pair Repulsion (VSEPR) theory** • Molecules with lone pairs on the central atom **cannot** have one of the ideal shapes, e.g. water molecule • Using VSEPR theory deduce the shape of molecules from their Lewis diagrams: – CH_4, NH_3, H_2O, BeF_2 and BF_3 – molecules with more than four bonds like $PC\ell_5$ and SF_6 – molecules with multiple bonds like CO_2, SO_2 and C_2H_2	69	98–101	pp. 100–101 PA 1 7		148–152						
	Homework Test Yourself 3 Q. 2			p. 101 TYS 3 Q. 2	D31	153 Ex. 3.6 1–8	153–155					
3	**Electronegativity of atoms to explain the polarity of bonds** • Explain the concepts: – Electronegativity – Non-polar bond, with examples, e.g. H–H – Polar bond, with examples, e.g. H–Cℓ • Show polarity of bonds using partial charges $\delta+$ H–Cl $\delta-$ • Compare the polarity of chemical bonds using a table of electronegativities: – with an electronegativity difference $\Delta EN > 2.1$ electron transfer will take place and the bond would be ionic – with an electronegativity difference $\Delta EN > 1$ the bond will be covalent and polar – with an electronegativity difference $\Delta EN < 1$ the bond will be covalent and very weakly polar – with an electronegativity difference $\Delta EN = 0$ the bond will be covalent and non-polar • Show how polar bonds do not always lead to polar molecules	70	101–104	p. 104 PA 2 Q. 1 & 2	D31–D32	153–158 154 Ex. 3.7 Q. 1	155					
	Homework Test Yourself 4 Q. 1–4			p. 104 TYS 4 Q. 1–4	D32 –D33	158 Ex. 3.8 Q. 1 & 2	156–157					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
4	**Bond energy and length** • Give a definition of bond energy • Give a definition of bond length • Explain what is the relationship between bond energy and bond length • Explain the relationship between the strength of a bond between two chemically bonded atoms and: – the length of the bond between them – the size of the bonded atoms – the number of bonds (single, double, triple) between the atoms	71	105–106	p. 106 TYS 5 Q. 1	D33 –D34	159–160						
	Homework Test Yourself 5 Q. 2 and 3			p. 106 TYS 5 Q. 2 & 3	D34	161–163 Ex. 3.9 Q. 1–11	157–162					
	Homework **Learners to investigate one of the following activities in groups or as individuals:** Activities 4, 5, 6, 7, 8			p. 121 p. 124 p. 125 p. 128 p. 128	D38–40 D40 D41 D42 D43	187–188						

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

Study and Master Physical Sciences

Week 8: Intermolecular forces

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	**Intermolecular and interatomic forces #** • Name and explain the different intermolecular forces: – ion-dipole forces – ion-induced dipole forces – dipole-dipole forces (hydrogen bonds are a special case of dipole-dipole forces) – dipole-induced dipole forces – induced dipole forces • The last three forces (involving dipoles) are also called Van der Waals forces • Explain hydrogen bonds (dipole-dipole) • Revise the concept of a covalent molecule • Describe the difference between intermolecular forces and inter-atomic forces using a diagram of a group of small molecules, and in words	72	107–112	pp. 110–111 TYS 6 Q. 1 & 2	D34	166–172	164–165					
	Homework Test Yourself 6			p. 112 TYS 7 Q. 1–2	D34–D35	172 Ex. 4.1 Q. 1–4	166					
2	**Physical state and density explained in terms of these forces** • Represent a common substance, made of small molecules, like water, using diagrams of the molecules, to show microscopic representations of ice $H_2O(s)$, water liquid $H_2O(\ell)$ and water vapour $H_2O(g)$ • Illustrate the proposition that intermolecular forces increase with increasing molecular size with examples, e.g. He, O_2, C_8H_{18} (petrol), $C_{23}H_{48}$ (wax) (only for van der Waals forces) • Explain density of material in terms of the number of molecules in a unit volume, e.g. compare gases, liquids and solids **Particle kinetic energy and temperature** • Describe thermal expansion of a substance and how it is related to the motion of molecules in a substance composed of small molecules, e.g. alcohol in a thermometer	72–73	112–118	p. 118 TYS 8 Q. 1–2	D35	172–183						

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				
	• Explain the differences between thermal conductivity in non-metals and metals											
	Homework **Learners to prepare feedback one of the following activities in groups:** Activities 4, 5, 6, 7, 8			p. 121 p. 124 p. 125 p. 128 p. 128	D38–40 D40 D41 D42 D43	187–188						
3	**The chemistry of water (macroscopic properties of the three phases of water related to their sub-microscopic structure)** • Describe the shape of the water molecule and its polar nature • Water's unique features are due to the hydrogen bonding in solid, liquid and gaseous water • Indicate the number of H_2O molecules in 1 litre of water	74	122–123	p. 124 TYS 9 Q. 1	D40	184–185						
	Homework **Learners to prepare feedback one of the following activities in groups or as individuals:** Activities 4, 5, 6, 7, 8			p. 121 p. 124 p. 125 p. 128 p. 128	D38–40 D40 D41 D42 D43	187–188						
4	**The chemistry of water (macroscopic properties of the three phases of water related to their sub-microscopic structure)** • The hydrogen bonds require a lot of energy to break, therefore water can absorb a lot of energy before the water temperature rises • The hydrogen bonds formed by the water molecules enable water to absorb heat from the Sun • The sea acts as reservoir of heat and is able to ensure the Earth has a moderate climate • Explain that due to its polar nature and consequent hydrogen bonding there are strong forces of attraction between water molecules that cause a high heat of vaporisation (water needs a lot of energy before it will evaporate) and an unusually higher than expected boiling point when compared to other hydrides • A decrease in density when the water freezes helps water moderate the temperature of the Earth and its climate	74–75	123–125			185–187						

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	- The density of the ice is less than the density of the liquid, so ice floats on water forming an insulating layer between water and the atmosphere, keeping the water from freezing and preserving aquatic life (the only liquid which freezes from the top down)											
	Homework Consolidation	67–75		pp. 129–131 (Units 1 & 2) Q. 1–20	D43–D47	189–190 190–192 Ex. 4.4 Q. 1–8	169–172					

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

Study and Master Physical Sciences

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

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
1	**Experiment: (formal assessment)** Investigate intermolecular forces and their effects • Evaporation • Surface tension • Solubility • Capillarity			pp. 118–121 PA Act. 3	D35 –D38	173–179						
2 and 3	**Consolidation of Physics** Section F Worksheet 1*					119 Ex. 2.9 Q. 8–10 pp. 120–132 Ex. 2.10 Q. 1–39 pp. 132–134 Ex. 2.11 Q. 1–14	117–118 118–138 138–144					
4	**Consolidation of Chemistry** Section F Worksheet 2*					161–163 Ex. 3.9 Q. 1–11 pp. 190–192 Ex. 4.4 Q. 1–8	157–162 169–172					

Reflection

Think about and make a note of: Were you able to complete all the work for the term? Did the revision seem to help learners understand the work better?	What did learners’ responses to the revision you did suggest about how to approach the same work next year?

HOD:

Date:

Study and Master Physical Sciences

Week 10: Revision and assessment: Plan your week

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
1	**Control test** **Exemplar in Section F Part 2 or in TG**											
2												
3												
4												

End-of-term reflection

Think about and make a note of:

1. Was the learners' performance during the term what you had expected and hoped for? Which learners need particular support with science in the next term? What strategy can you put in place for them to catch up with the class? Which learners would benefit from extension activities? How can you help them?
2. With which specific topics did the learners struggle the most? How can you adjust your teaching to improve their understanding of this section of the curriculum in the future?
3. What ONE change should you make to your teaching practice to help you teach more effectively next term?
4. Did you cover all the content as prescribed by 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: Vectors in two dimensions

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	**Resultant of perpendicular vectors #** • Draw a sketch of the vectors (parallel and perpendicular) on the Cartesian plane • Add co-linear vectors along the parallel and perpendicular direction to obtain the net parallel component (Rx) and the net perpendicular component (Ry) • Sketch Rx and Ry • Sketch the resultant (R) using either the tail-to-head or tail-to-tail method	61	2–5	p. 4 Ex. 1.1	3–4 4	4–21	34–60					
	Homework Exercise 1.2 Q. 1 and 2			5 Ex. 1.2 Q. 1 & 2	4	17 Ex. 1–3 Q. 1–4	45–50					
2	**Resultant of perpendicular vectors #** • Determine the magnitude of the resultant using the theorem of Pythagoras • Find resultant vector graphically using the tail-to-head method as well as by calculation (by component method) for a maximum of four force vectors in both one and two dimensions • Understand what a closed vector diagram is • Determine the direction of the resultant using simple trigonometric ratios	61	5–8	p. 6 Ex. 1.3 p. 7 Ex. 1.4	4–5 5	13–36	35–60					
	Homework Review practical activity Complete Chapter 1 Revision Q. 8–10			pp. 8–9 Exp. 1.1 Act. 1.1 p. 13 Q. 8–10	5 7	35–36 Ex. 1–5 Q. 1–4	56–60					
3	**Resultant of perpendicular vectors #**	61										

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.	Date completed				
	Resources for informal assessment **Experiment: Determine the resultant of three non-linear force vectors** Force board, assortment of weights (10 g to 200 g), gut or string, two pulleys			pp. 8–9 Exp. 1.1 Act. 1.1	5	48–49						
	Homework Complete Chapter 1 Revision Q. 11–13			p. 13 Q. 11–13	7–8							
4	**Resolution of a vector into its parallel and perpendicular components #** • Draw a sketch of the vector on the Cartesian plane showing its magnitude and the angle θ between the vector and the x-axis • Use $Rx = R\cos\theta$ for the resultant x-component • Use $Ry = R\sin\theta$ for the resultant y-component	61	10–13	p. 12 Ex. 1.5 p. 13 Ex. 1.6	6	36–48	60–65					
	Homework Complete Chapter 1 Revision Q. 14–18			p. 14 Q. 14–18	8	50–53 Ex. 1–7 Q. 1–19	65–87					

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: Newton's laws and application of Newton's laws

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	**Resolution of a vector into its parallel and perpendicular components #** • Draw a sketch of the vector on the Cartesian plane showing its magnitude and the angle θ between the vector and the x-axis • Use Rx = Rcos θ for the resultant x-component • Use Ry = Rsin θ for the resultant y-component	61	10–13	p. 12 Ex. 1.5 p. 13 Ex. 1.6	6	36–48	60–65					
	Homework Complete Chapter 1 Revision Q. 14–18			p. 14 Q. 14–18	8	50–53 Ex. 1–7 Q. 1–19	65–87					
2	**Different kinds of forces: weight, normal force, frictional force, applied (push, pull), tension (strings or cables) #** • Define normal force, N, as the force exerted by a surface on an object in contact with it • Know that the normal force acts perpendicular to the surface irrespective of whether the plane is horizontal or inclined • Define frictional force, f, as the force that opposes the motion of an object and acts parallel to the surface the object is in contact with • Distinguish between static and kinetic friction forces • Explain what is meant by the maximum static friction, f_s max	62	15–18	p. 16 Act. 2.1 p. 17 Ex. 2.1	9–10	56–66	90					
	Homework Complete Activity 2.2 Review practical demonstration			p. 18 Act. 2.2 p. 19	10–11							
3	**Different kinds of forces: weight, normal force, frictional force, applied (push, pull), tension (strings or cables) #** Experiment 1: Investigate the effect of different surfaces on maximum static friction by keeping the object the same Experiment 2: Investigate the relationship between normal force and maximum static friction force	62	19–22	PA p. 19 PA p. 22	11 11–12	66–67 66–67						

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
	Resources Experiment 1: Spring balance, several blocks (of the same material) of varying sizes with hooks attached on one end; different textures (rough, smooth surfaces); various surfaces at various angles of inclination Experiment 2: Spring balance, a container, a rough horizontal surface, mass pieces, string, scale	62										
	Homework Write up practical investigation Complete Activity 2.3			p. 20 Act. 2.3	11							
4	**Different kinds of forces: weight, normal force, frictional force, applied (push, pull), tension (strings or cables) #** • Calculate the value of the maximum static frictional force for objects at rest on a horizontal and inclined planes using: f_s max = $\mu_s N$ • Know that static friction $f_s < \mu_s N$ • Calculate the value of the kinetic friction force for moving object on horizontal and inclined planes using: $f_k = \mu_k N$	62	20–22	p. 21 Ex. 2.2 Q. 1	11	56–66	90					
	Homework Complete Ex. 2.2 Chapter 2 Revision Q. 1–5			p. 21 Ex. 2.2 Q. 2 p. 45 No. 1–5	11 25	67 Ex. 2.1 Q. 1–3	91–93					

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: Newton's laws and application of Newton's laws

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	**Force diagrams, free body diagrams #** • Know that a force diagram is a picture of the object(s) of interest with all the forces acting on it (them) drawn in as arrows • Know that in a free-body diagram, the object of interest is drawn as a dot and all the forces acting on it are drawn as arrows pointing away from the dot • Resolve two-dimensional forces (such as the weight of an object with respect to the inclined plane) into its parallel (x) and perpendicular (y) components • The resultant or net force in the x-direction is a vector sum of all the components in the x-direction • The resultant or net force in the y-direction is a vector sum of all the components in the y-direction	63	23–26	p. 24 Ex. 2.3	14	68–74 71 Ex. 2.2 Q. 1 & 2	93–94					
	Homework Complete Exercise 2.4			p. 26 Ex. 2.4 p. 45 No. 7	15 25	74 Ex. 2.3 Q. 1 & 2 50–53 Ex. 1–7 Q. 1–19	94–96 65–87					
2	**Newton's first, second and third laws#** • State Newton's first law: *An object continues in a state of rest or uniform (moving with constant) velocity unless it is acted upon by an unbalanced (net or resultant) force* • Discuss why it is important to wear seatbelts using Newton's first law **Feedback on informal practical assessment**	64	27–28	p. 27 Act. 2.4	16	74–77						
	Homework Complete Exercise 2.5	64		p. 28 Ex. 2.5 1–4	16	74 Ex. 2.4 Q. 1 & 2	96–97					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
3	**Newton's first, second and third laws #** • State Newton's second law: *When a net force, F_{net}, is applied to an object of mass, m, it accelerates in the direction of the net force. The acceleration, a, is directly proportional to the net force and inversely proportional to the mass $F_{net} = ma$* • Draw force diagrams for objects that are in equilibrium (at rest or moving with constant velocity) and accelerating (non-equilibrium) • Draw free body diagrams for objects that are in equilibrium (at rest or moving with constant velocity) and accelerating (non-equilibrium)	64	28–29	p. 29 Act. 2.5	17	77–80						
	Homework Complete Exercise 2.6 Review Experiment 2.1			p. 29 Ex. 2.6 30–31	17	97 Ex. 2.5 Q. 1–8	97–99					
4	**Newton's first, second and third laws #** Recommended experiment for formal assessment Investigate the relationship between force and acceleration (Verification of Newton's second law)	64	30–31	pp. 30–31 Exp. 2.1	18–20	78–80 97–98 Ex. 2.5 Q. 1–8	97–99					
	Resources Trolleys, different masses, incline plane, rubber bands, meter rule, ticker tape apparatus, ticker timer and graph paper					78–80						
	Homework Consolidation of vectors, forces and Newton's laws					98–99 Ex. 2.5 Q. 9–16 pp. 50–53 Ex. 1–7 Q. 1–19 pp. 118–120, 122, 128 Ex. 2.10 Q. 1–8, 11, 31	99–103 65–87 118–121, 131–132					

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: Newton's laws and application of Newton's laws

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	**Newton's first, second and third laws #** • Apply Newton's laws to a variety of equilibrium and non-equilibrium problems including a single object moving on a horizontal/inclined plane (frictionless and rough), vertical motion (lifts, rockets etc.) and also two-body systems such as two masses joined by a light (negligible mass) string	65	31–34	p. 32 Ex. 2.7	20	112–114						
	Homework Complete Exercise 2.8			p. 34 Ex. 2.8	21	122–123 Ex. 2.10 Q. 9,10, 12–13	120–122					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
2	**Newton's first, second and third laws #** • State Newton's third law: *When object A exerts a force on object B, object B simultaneously exerts an oppositely directed force of equal magnitude on object A* • Identify action-reaction pairs, e.g. donkey pulling a cart, a book on a table • List the properties of action-reaction pairs	65	34–36	p. 36 Act. 2.6	22	101–108						
	Homework Complete Exercise 2.9			p. 35 Ex. 2.9	21	107–108 Ex. 2.6 Q. 1 & 2 pp. 123, 127 Ex. 2.10 Q. 14, 26	108–109 122 127					
2	**Newton's first, second and third laws #** • Apply Newton's laws to a variety of equilibrium and non-equilibrium problems including a single object moving on a horizontal/inclined plane (frictionless and rough), vertical motion (lifts, rockets etc.) and also two-body systems such as two masses joined by a light (negligible mass) string	65	37–38	p. 38 Ex. 2.10	22	80–97 112–114						
	Homework Complete Chapter 2 Revision No. 5, 8			p. 45	25–26	123–127 Ex. 2.10 Q. 10–25	122–126					
3	**Newton's first, second and third laws #** • Apply Newton's laws to a variety of equilibrium and non-equilibrium problems including a single object moving on a horizontal/inclined plane (frictionless and rough), vertical motion (lifts, rockets etc.) and also two-body systems such as two masses joined by a light (negligible mass) string • Understand apparent weight	65	38–39	p. 39 Ex. 2.11	22	127–128 Ex. 2.10 Q. 27–30	127–131					
	Homework Complete Chapter 2 Revision No. 9, 10			p. 46	26–28	129–131 Ex. 2.10 Q. 33–39	133–138					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
4	**Newton's first, second and third laws #** Consolidation Feedback on practical assessment					120–132 Ex. 2.10 Q. 1–39						
	Homework Review forces and Newton's laws of motion Topic 1 Basic Target Worksheet				174							

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: Newton's laws and application of Newton's laws

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	**Newton's Law of Universal Gravitation #** • State Newton's Law of Universal Gravitation • Use the equation for Newton's Law of Universal Gravitation to calculate the force two masses exert on each other: $F = \frac{G.M_1M_2}{d^2}$ • Describe weight as the gravitational force the Earth exerts on any object on or near its surface • Calculate the acceleration due to gravity on Earth using the equation: $g_{Earth} = \frac{G.M_{Earth}}{d^2}$ N.B. This formula can be used to calculate g on any planet using the appropriate planetary data	66	40–42	p. 42 Ex. 2.12	23	107–112						
	Homework Review Experiment 2.2			pp. 44–45	24	111 Ex. 2.7 Q. 1–6	109–112					
2	**Newton's Law of Universal Gravitation #** • Calculate weight using the expression W = mg, where g is the acceleration due to gravity • Near the earth the value is approximately 9.8 $m.s^{-2}$	66	44–45	pp. 44–45 Exp. 2.2	24							
	Resources **Experiment: Verify the value for g** Small toy car, meter rule, a smooth plank, bricks or thick books, stop watch and graph paper	66										
	Homework Complete practical activity report			pp. 44–45 Exp. 2.2	24	114 Ex. 2.8 Q. 1 & 2	112–114					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
3	**Newton's Law of Universal Gravitation #** • Calculate weight using the expression W = mg, where g is the acceleration due to gravity. • Calculate the weight of an object on other planets with different values of gravitational acceleration • Distinguish between mass and weight • Know that the unit of weight is the newton (N) and that of mass is the kilogram (kg) • Understand weightlessness	66	42–43	p. 43 Ex. 2.13 1–2	23	112–117						
	Homework Complete Exercise 2.13			p. 43 Ex. 2.13 3–4	23	117–118 Ex. 2.9 Q. 1–7	114–117					
4	**Newton's Law of Universal Gravitation #** Consolidation/remediation		46–47	p. 46 11 & 12	28	119–120						
	Homework Prepare for Mechanics Test **Topic 1 Advanced Target Worksheet**				175	119 Ex. 2.9 Q. 8–10 pp. 120–132 Ex. 2.10 Q. 1–39 pp. 132–134 Ex. 2.11 Q. 1–14	117–118 118–138 138–144					

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: Atomic combinations: Molecular structure

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
1	Mechanics Test (Informal assessment – class test)	61–66	***Worksheet 1**									
	Homework Activity 3.1			p. 53 Act. 3.1 Q. 1–3	35							
2	**A chemical bond (is seen as the net electrostatic force two atoms sharing electrons exert on each other)** • Recall the role of models in science and describe the explanations of chemical bonding in this course as an application of a model • Deduce the number of valence electrons in an atom of an element • Represent atoms using Lewis diagrams • Explain, referring to diagrams showing electrostatic forces between protons and electrons, and in terms of energy considerations, why two H atoms form an H_2 molecule, but He does not form an He_2 molecule	67	52–56		33–35	136–140	146–147					
	Homework			p. 54 Ex. 3.1	35	140 Ex. 3.1 Q. 1–5	147–148					
3	**A chemical bond (is seen as the net electrostatic force two atoms sharing electrons exert on each other)** • Draw a Lewis diagram for the hydrogen molecule • Describe a covalent chemical bond as a shared pair of electrons • Describe and apply simple rules to deduce bond formation: – different atoms, each with an unpaired valence electron can share these electrons to form a chemical bond – different atoms with paired valence electrons called lone pairs of electrons, cannot share these four electrons and cannot form a chemical bond	68	56–61	p. 56 Act. 3.2 p. 58 Ex. 3.2 Ex. 3.3 p. 61 Ex. 3.4	36 36 36 36	140–147 143 Ex. 3.2 Q. 1–2 p. 144 Ex. 3.3 Q. 1 & 2 p. 146 Ex. 3. 4 Q. 1 & 2	148–149 149 149–150					

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				
	– different atoms, with unpaired valence electrons can share these electrons and form a chemical bond for each electron pair shared (multiple bond formation) – atoms with an incomplete complement of electrons in their valence shell can share a lone pair of electrons from another atom to form a co-ordinate covalent or dative covalent bond (e.g. NH_4^+, H_3O^+) • Draw Lewis diagrams, given the formula and using electron configurations, for: – simple molecules (e.g. F_2, H_2O, NH_3, HF, OF_2, HOCℓ) – molecules with multiple bonds (e.g. N_2, O_2 and HCN)											
	Homework			p. 61 Act. 3.3	36	147–148 Ex. 3.5 Q. 1–5	150–152					
4	**Feedback on Mechanics Test** Remediation/consolidation				Mechanics Questions CD							
	Homework Complete checklist and corrections					147–148 Ex. 3.5 Q. 1–5						
	Investigate the physical properties of water **(Group work/self study)**			pp. 96–97	55–57	187–188						

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: Atomic combinations: Molecular structure/intermolecular forces

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	**Molecular shape as predicted using the Valence Shell Electron Pair Repulsion (VSEPR) theory** • State the major principles used in the VSEPR • The five ideal molecular shapes according to the VSEPR model: – linear shape AX_2 (e.g. CO_2 and $BeCl_2$) – trigonal planar shape AX_3 (e.g. BF_3) – tetrahedral shape AX_4 (e.g. CH_4) – trigonal bipyramidal shape AX_5 (e.g. PCl_5) – octahedral shape AX_6 (e.g. SF_6) • Ideal shapes are found when there are **no** lone pairs on the central atom only bond pairs • A is always the central atom and X the terminal atoms	69	62–64	p. 64 Act. 3.4	37	148–152						
	Homework Chapter 3 Revision Q. 5 Draw Lewis Diagrams and suggest shape of molecules using VSEPR theory			p. 76 Q. 5.1–5.5	44	153 Ex. 3.6 1–8	153–155					
2	**Molecular shape as predicted using the Valence Shell Electron Pair Repulsion (VSEPR) theory** • Molecules with lone pairs on the central atom **cannot** have one of the ideal shapes, e.g. water molecule • Using VSEPR theory deduce the shape of molecules from their Lewis diagrams: – CH_4, NH_3, H_2O, BeF_2 and BF_3 – molecules with more than four bonds like $PC\ell_5$ and SF_6 – molecules with multiple bonds like CO_2, SO_2 and C_2H_2	69	65–66	p. 65 Act. 3.5 p. 66 Ex. 3.5 Q. 1–3	37 38	148–152						
	Homework Chapter 3 Revision Q. 6			p. 76 Q. 6.1–6.4	44	153 Ex. 3.6 1–8	153–155					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
3	**Electronegativity of atoms to explain the polarity of bonds** • Explain the concepts: – electronegativity – non-polar bond, with examples, e.g. H–H – polar bond, with examples, e.g. H–Cℓ • Show polarity of bonds using partial charges $\delta+$ H–Cl $\delta-$ • Compare the polarity of chemical bonds using a table of electronegativities: – with an electronegativity difference $\Delta EN > 2.1$ electron transfer will take place and the bond would be ionic – with an electronegativity difference $\Delta EN > 1$ the bond will be covalent and polar – with an electronegativity difference $\Delta EN < 1$ the bond will be covalent and very weakly polar – with an electronegativity difference $\Delta EN = 0$ the bond will be covalent and non-polar • Show how polar bonds do not always lead to polar molecules	70	67–71	p. 69 Ex. 3.6 p. 71 Act. 3.7	39 40–41	153–158 154 Ex. 3.7 Q. 1	155					
	Homework			p. 70 Ex. 3.7 Q. 1–4 p. 76 Q. 4.1–4.4	40 44	158 Ex. 3.8 Q. 1 & 2	156–157					
4	**Bond energy and length** • Give a definition of bond energy • Give a definition of bond length • Explain what is the relationship between bond energy and bond length • Explain the relationship between the strength of a bond between two chemically bonded atoms and: – the length of the bond between them – the size of the bonded atoms – the number of bonds (single, double, triple) between the atoms	71	72–75	p. 72 Ex. 3.8 Extension Activity p. 75 Act. 3.8	42 43 43	159–160						

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				
	Homework			p. 74 Ex. 3.9 p. 76 1–3	42 44	161–163 Ex. 3.9 Q. 1–11	157–162					
	Investigate the physical properties of water **(Group work/self study)**			pp. 96–97	55–57	187–188						

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: Intermolecular forces

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	**Intermolecular and interatomic forces #** • Name and explain the different intermolecular forces: – ion-dipole forces – ion-induced dipole forces – dipole-dipole forces (hydrogen bonds are a special case of dipole-dipole forces) – dipole-induced dipole forces – induced dipole forces • The last three forces (involving dipoles) are also called Van der Waals forces • Explain hydrogen bonds (dipole-dipole) • Revise the concept of a covalent molecule • Describe the difference between intermolecular forces and inter-atomic forces using a diagram of a group of small molecules, and in words • Represent a common substance, made of small molecules, like water, using diagrams of the molecules, to show microscopic representations of ice $H_2O(s)$, water liquid $H_2O(\ell)$ and water vapour $H_2O(g)$	72	77–82	p. 78 Ex. 4.1 p. 79 Ex. 4.2 p. 82 Ex. 4.4	45–46 46 46	166–172	164–165					
	Homework Complete Exercise 4.3 Review Experiment 4.1			p. 82 Ex. 4.3	46	172 Ex. 4.1 Q. 1–4	166					
2	**Physical state and density explained in terms of these forces** • Illustrate the proposition that intermolecular forces increase with increasing molecular size with examples e.g. He, O_2, C_8H_{18} (petrol), $C_{23}H_{48}$ (wax) (only for van der Waals forces) **Particle kinetic energy and temperature** • Explain the relationship between the strength of intermolecular forces and melting points and boiling points of substances composed of small molecules • Contrast the melting points of substances composed of small molecules with those of large molecules where bonds must be broken for substances to melt	72–73	83–87	pp. 83–85 Exp. 4.1	47–50	172–183						

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				
	Homework			pp. 83–85 Exp. 4.1	47–50	183 Ex. 4.2 Q. 1–4	166–168					
2	**Physical state and density explained in terms of these forces** • Explain density of material in terms of the number of molecules in a unit volume, e.g. compare gases, liquids and solids **Particle kinetic energy and temperature** • Describe thermal expansion of a substance and how it is related to the motion of molecules in a substance composed of small molecules, e.g. alcohol in a thermometer • Explain the differences between thermal conductivity in non-metals and metals	73	87–88	p. 88 Act. 4.1	51							
	Homework			p. 98 Q. 1–3	57							
3	**The chemistry of water (macroscopic properties of the three phases of water related to their sub-microscopic structure)** • Describe the shape of the water molecule and its polar nature • Water's unique features are due to the hydrogen bonding in solid, liquid and gaseous water • Indicate the number of H_2O molecules in 1 litre of water • The hydrogen bonds require a lot of energy to break, therefore water can absorb a lot of energy before the water temperature rises • The hydrogen bonds formed by the water molecules enable water to absorb heat from the Sun • The sea acts as reservoir of heat and is able to ensure the Earth has a moderate climate • Explain that because of its polar nature and consequent hydrogen bonding that there are strong forces of attraction between water molecules that cause a high heat of vaporisation (water needs a lot of energy before it will evaporate) and an unusually higher than expected boiling point when compared to other hydrides	74	90–92	p. 90 Ex. 4.5 Act. 4.4 Act. 4.5 p. 92 Act. 4.6 PA pp. 92–93 Exp. 4.2		184–187						

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				
	Homework Complete Activity 4.6 **Consolidation** Topic 2: Advanced Target Worksheet			p. 92 Act. 4.6	177	187–188 190–192 Ex. 4.4 Q. 1–8	169–172					
4	**The chemistry of water (macroscopic properties of the three phases of water related to their sub-microscopic structure)** • A decrease in density when the water freezes helps water moderate the temperature of the Earth and its climate • The density of the ice is less than the density of the liquid and ice floats on water forming an insulating layer between water and the atmosphere keeping the water from freezing and preserving aquatic life (the only liquid which freezes from the top down)	74–75	94–96	p. 95 Ex. 4.7								
	Homework **Consolidation** (Preparation for control test)	74–75		pp. 100–102 Exam Practice Topic 2	59–61	189–190						

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

Platinum Physical Sciences

Week 9: Completion of work, revision and assessment

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	**Formal practical assessment** Investigate the effect of intermolecular forces on physical properties	83–85 Exp. 4.1	47–50	pp. 173–179								
2 and 3	**Consolidation of Physics Target Worksheets** Section F Worksheet 1*				174–175	119 Ex. 2.9 Q. 8–10 pp. 120–132 Ex. 2.10 Q. 1–39 pp. 132–134 Ex. 2.11 Q. 1–14	117–118 118–138 138–144					
4	**Consolidation of Chemistry Target Worksheet** Section F Worksheet 2*				176–177 100–102 Exam Practice Topic 2	161–163 Ex. 3.9 Q. 1–11 pp. 190–192 Ex. 4.4 Q. 1–8	157–162 169–172					

Reflection

Think about and make a note of: Were you able to complete all the work for the term? Did the revision seem to help learners understand the work better?	What did learners' responses to the revision you did suggest about how to approach the same work next year?

HOD: **Date:**

Platinum Physical Sciences

Week 10: Revision and assessment

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	**Control Test** *Section F				Control Test Book Test 1							
2												
3												
4												

End-of-term reflection

Think about and make a note of:

1. Was the learners' performance during the term what you had expected and hoped for? Which learners need particular support with science in the next term? What strategy can you put in place for them to catch up with the class? Which learners would benefit from extension activities? How can you help them?
2. With which specific topics did the learners struggle the most? How can you adjust your teaching to improve their understanding of this section of the curriculum in the future?
3. What ONE change should you make to your teaching practice to help you teach more effectively next term?
4. Did you cover all the content as prescribed by 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: Vectors in two dimensions											
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	**Resultant of perpendicular vectors #** • Draw a sketch of the vectors (parallel and perpendicular) on the Cartesian plane • Sketch the resultant (R) using either the tail-to-head or tail-to-tail method	61	19–21 (Unit 1)	p. 21 Act. 1 Q. 1–2	26–27	4–20	34–60				
	Homework Complete Activity 1			p. 21 Act. 1 Q. 3–4	28	7 Ex. 1–1 Q. 1–4 p. 12 Ex. 1–2 Q. 1–5 p. 17 Ex. 1–3 Q. 1–4 p. 19 Ex. 1–5 Q. 1–3	35–37 37–45 45–50 50–56				
2	**Resultant of perpendicular vectors #** • Determine the magnitude of the resultant using the theorem of Pythagoras • Determine the direction of the resultant using simple trigonometric ratios	61	22–23 (Unit 2)	p. 23 Act. 1 Q. 1–3	29–30	20–23 32–35					
	Homework Complete Activity 1			p. 23 Act. 1 Q. 4	30–31	35–36 Ex. 1–5 Q. 1–2	56–57				

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
3	**Resultant of perpendicular vectors #** • Add co-linear vectors along the parallel and perpendicular direction to obtain the net parallel component (Rx) and a net perpendicular component (Ry) • Sketch Rx and Ry • Understand what a closed vector diagram is		24–25 (Unit 3) p. 27 (Unit 4)	p. 25 Act. 1 Q. 1 & 2	31–36	36–39 24–32 19–20						
	Homework Complete Activity 1 (Unit 3) Review Experiment 1			p. 25 Act. 1 Q. 3 p. 26	36	35–36 Ex. 1–5 Q. 3–4	57–60					

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: Vectors in two dimensions and Newton's laws and application of Newton's laws

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	**Resultant of perpendicular vectors #** • Find resultant vector graphically using the tail-to-head method, as well as by calculation (by component method) for a maximum of four force vectors in both one and two dimensions	61	26–27 (Unit 4)	pp. 26–27 Exp. 1	36–37	48–49						
	Resources for informal assessment **Experiment: Determine the resultant of three non-linear force vectors** Force board, assortment of weights (10 g to 200 g), gut or string, two pulleys	61	26–27	pp. 26–27 Exp. 1								
	Homework Complete report on Experiment 1 Complete Activity 2			p. 27 Act. 2 Q. 1 & 2	37–38							
2	**Resolution of a vector into its parallel and perpendicular components #** • Draw a sketch of the vector on the Cartesian plane showing its magnitude and the angle θ between the vector and the x-axis • Use Rx = Rcos θ for the resultant x-component • Use Ry = Rsin θ for the resultant y-component	61	28–29 (Unit 5)	p. 29 Act. 1 Q. 1–4	39–41	39–48						
	Homework Revision and extension questions on vectors in two dimensions			p. 68 Q. 1–3	69	50–52 Ex. 1–7 Q. 1–15	65–85					
3	**Force diagrams, free body diagrams #** • Know that a force diagram is a picture of the object(s) of interest with all the forces acting on it (them) drawn in as arrows • Know that in a free-body diagram, the object of interest is drawn as a dot and all the forces acting on it are drawn as arrows pointing away from the dot	63	30–31 (Unit 6)	p. 31 Act. 1 Q. 1–3	42–43	68–69						
	Homework Revision and extension questions on vectors in two dimensions			p. 68 Q. 4	69–70	53 Ex. 1–7 Q. 16–19	85–87					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
4	**Different kinds of forces: weight, normal force, frictional force, applied (push, pull), tension (strings or cables) #** • Define normal force, N, as the force exerted by a surface on an object in contact with it • Know that the normal force acts perpendicular to the surface irrespective of whether the plane is horizontal or inclined **Force diagrams, free body diagrams #** • Resolve two-dimensional forces (such as the weight of an object with respect to the inclined plane) into its parallel (x) and perpendicular (y) components • The resultant or net force in the x-direction is a vector sum of all the components in the x-direction • The resultant or net force in the y-direction is a vector sum of all the components in the y-direction	62 63	32–33 (Unit 7)	p. 33 Act. 1 Q. 1	43–44	56–60 PA 66–67 69–71	90					
	Homework Complete Activity 1			p. 33 Act. 1 Q. 2	44	71 Ex. 2.2 Q. 1 & 2	93–94					

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: Newton's laws and application of Newton's laws

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	**Different kinds of forces: weight, normal force, frictional force, applied (push, pull), tension (strings or cables) #** • Define frictional force, f, as the force that opposes the motion of an object and acts parallel to the surface the object is in contact with • Distinguish between static and kinetic friction forces • Explain what is meant by the maximum static friction, f_s max **Experiment: Investigate the relationship between normal force and maximum static friction** Investigate the effect of different surfaces on maximum static friction by keeping the object the same	62	34–35 (Unit 8)	pp. 34–35 Exp. 1		59–67						
	Resources Spring balance, several blocks (of the same material) of varying sizes with hooks attached on one end; different textures (rough, smooth surfaces); various surfaces at various angles of inclination	62		pp. 34–35 Exp. 1	44–45							
	Homework Complete Activity 2 Complete report on Experiment 1			p. 35 Act. 2 Q. 1–3	45–46	67 Ex. 2.1 Q. 1–3	91–93					
2	**Different kinds of forces: weight, normal force, frictional force, applied (push, pull), tension (strings or cables) #** • Distinguish between static and kinetic friction forces • Explain what is meant by the maximum static friction, f_s max **Experiment: Investigate the relationship between normal force and force of dynamic friction**	62	36–39 (Unit 9)	p. 36 Prac. 1 p. 38 Prac. 2	46–47 47	66–67						
	Resources Spring balance, several blocks (of the same material) of varying sizes with hooks attached on one end; different textures (rough, smooth surfaces); various surfaces at various angles of inclination			p. 36 Prac. 1 p. 38 Prac. 2	46–47 47							

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				
	Homework Complete report on practical investigations Activity 3 Q. 1–5			p. 36 Prac. 1 p. 38 Prac. 2 p. 39 Act. 3 Q. 1–5	46–47 47 47–48	50–53 Ex. 1–7 Q. 1–10	65–87					
3	**Different kinds of forces: weight, normal force, frictional force, applied (push, pull), tension (strings or cables) #** • Calculate the value of the maximum static frictional force for objects at rest on a horizontal and inclined planes using: f_s max = $\mu_s N$ • Know that static friction: $f_s < \mu_s N$ • Calculate the value of the kinetic friction force for moving object on horizontal and inclined planes using: $f_k = \mu_k N$	62	36–39 (Unit 9)	p. 39 Act. 3 Q. 7–9	48–50	50–53 Ex. 1–7 Q. 1–19	65–87					
	Homework Complete Activity 3			p. 39 Act. 3	48–50							
4	**Force diagrams, free body diagrams #** • Know that a force diagram is a picture of the object(s) of interest with all the forces acting on it (them) drawn in as arrows • Know that in a free-body diagram, the object of interest is drawn as a dot and all the forces acting on it are drawn as arrows pointing away from the dot • The resultant or net force in the x-direction is a vector sum of all the components in the x-direction • The resultant or net force in the y-direction is a vector sum of all the components in the y-direction **Newton's first, second and third laws #** • State Newton's first law: *An object continues in a state of rest or uniform (moving with constant) velocity unless it is acted upon by an unbalanced (net or resultant) force*	63 64	40–41	p. 41 Act. 1 Q. 1 & 2	50–51	72–74 74–75						

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				
	Homework Complete Activity 1 (Unit 10) Revision and extension questions on vectors in two dimensions			p. 41 Act. 1 Q. 1 & 2 p. 68–69 Q. 1–2	50–51 69	74 Ex. 2.3 Q. 1 & 2	94–96					

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: Newton’s laws and application of Newton’s laws

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	**Force diagrams, free body diagrams #** • Resolve two-dimensional forces (such as the weight of an object with respect to the inclined plane) into its parallel (x) and perpendicular (y) components • The resultant or net force in the x-direction is a vector sum of all the components in the x-direction • The resultant or net force in the y-direction is a vector sum of all the components in the y-direction **Newton’s first, second and third laws #** • Discuss why it is important to wear seatbelts using Newton’s first law	63 64	42–43	p. 43 Act. 1 Q. 1–4	51–53	72–74 75–77						
	Homework Complete Activity 1 (Unit 11) Complete Revision and extension questions on vectors in two dimensions Prepare for formal practical assessment Complete Activity 2 in preparation of formal assessment (pre-practical questions)		44–46	p. 43 Act. 1 Q. 1–4 pp. 68–69 Q. 3–4 Act. 2 Q. 1–5	51–53 69–70 54	77 Ex. 2.4 Q. 1 & 2 pp. 74–77 Ex. 2.4 Q. 1 & 2	96–97 96–97					
2	**Newton’s first, second and third laws #** Recommended experiment for formal assessment **Investigate the relationship between force and acceleration (verification of Newton’s second law)**	64	44 (Unit 12)	pp. 44–46 Exp. 1	53–54							
	Resources Trolleys, different masses, incline plane, rubber bands, meter rule, ticker tape apparatus, ticker timer and graph paper		44 (Unit 12)	pp. 44–46 Exp. 1	53–54							
3	**Newton’s first, second and third laws #** • State Newton’s second law: *When a net force, F_{net}, is applied to an object of mass m it accelerates in the direction of the net force. The acceleration, a, is directly proportional to the net force and inversely proportional to the mass $F_{net} = ma$*	64	47–49	p. 49 Act. 1 Q. 1–2	55							

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				
	Homework Complete Activity 1 (Unit 13)			p. 49 Act. 1 Q. 3	55–56	97 Ex. 2.5 Q. 1–8	97–99					
4	**Newton's first, second and third laws #** • Draw force diagrams for objects that are in equilibrium (at rest or moving with constant velocity) and accelerating (non-equilibrium) • Draw free-body diagrams for objects that are in equilibrium (at rest or moving with constant velocity) and accelerating (non-equilibrium) • Apply Newton's laws to a variety of equilibrium and non-equilibrium problems including a single object moving on a horizontal/inclined plane (frictionless and rough)	64 65	50–51 (Unit 14)	p. 56 Act. 1 Q. 1–3	56–58							
	Homework Revision and extension questions on Newton's first, second and third laws			p. 69 Q. 4–7	72–74	78–80 99–101 Ex. 2.5 Q. 17–24	103–108					

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: Newton's laws and application of Newton's laws

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	**Newton's first, second and third laws #** • Apply Newton's laws to a variety of equilibrium and non-equilibrium problems including vertical motion (lifts, rockets etc.) • Understand apparent weight	65	50–52 (Unit 14) p. 56	Act. 1 Q. 4 Act. 1 Q. 7 & 8	58–60 62							
	Homework Revision and extension questions on Newton's first, second and third laws			p. 69 Q. 8–10	74–76	78–80 99–101 Ex. 2.5 Q. 17–24	103–108					
2	**Newton's first, second and third laws #** • Apply Newton's laws to a variety of equilibrium and non-equilibrium problems including two-body systems such as two masses joined by a light (negligible mass) string	65	52–56	p. 57 Act. 1 Q. 5 & 6								
	Homework Revision and extension questions on Newton's first, second and third laws			p. 69 Q. 11–13	76–77							
3	**Newton's first, second and third laws #** • State Newton's third law: *When object A exerts a force on object B, object B simultaneously exerts an oppositely directed force of equal magnitude on object A* • Identify action-reaction pairs e.g. donkey pulling a cart, a book on a table • List the properties of action-reaction pairs	65	58–59	p. 59 Act. 1 Q. 1–5	62–63	80–97 112–114						
	Homework Complete Activity 1 (Unit 15) Complete Revision and extension questions on Newton's first, second and third laws			p. 59 Act. 1 Q. 1–5 pp. 69–70 Q. 1, 2, 3, 14	72 78	122–123 Ex. 2.10 Q. 9 10, 12–13	120–122					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
4	**Newton's Law of Universal Gravitation #** • State Newton's Law of Universal Gravitation • Use the equation for Newton's Law of Universal Gravitation to calculate the force two masses exert on each other: $F = \frac{G.M_1M_2}{d^2}$	66	60–61 (Unit 16)	p. 61 Act. 1 Q. 7–8	63–64	107–112						
	Homework Complete Activity 1 (Unit 16) Review Experiment 1: Verify the value of g			p. 61 Act. 1 Q. 1–8 pp. 63–64	64–65 66	111 Ex. 2.7 Q. 1–6	109–112					

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: Newton's laws and application of Newton's laws and Atomic combinations: Molecular structure

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
1	**Newton's Law of Universal Gravitation #** • Calculate weight using the expression W = mg, where g is the acceleration due to gravity • Near the earth the value is approximately 9.8 $m.s^{-2}$ **Experiment: Verify the value of g**		62–64 (Unit 17)	PA pp. 63–64 Exp. 1	65–66							
	Resources Mass pieces, meter rule, ticker tape apparatus, ticker timer and graph paper	66		pp. 63–64 Exp. 1	65–66							
	Homework Complete Activity 2 (Unit 17)			p. 64 Act. 2 Q. 1–4	66–67	114 Ex. 2.8 Q. 1 & 2	112–114					
2	**Newton's Law of Universal Gravitation #** • Describe weight as the gravitational force the Earth exerts on any object on or near its surface • Calculate the acceleration due to gravity on Earth using the equation: $g_{Earth} = \frac{G.M_{Earth}}{d^2}$ • N.B. This formula can be used to calculate g on any planet using the appropriate planetary data • Calculate the weight of an object on other planets with different values of gravitational acceleration • Distinguish between mass and weight • Know that the unit of weight is the newton (N) and that of mass is the kilogram (kg) • Understand weightlessness	66	65–66 (Unit 18)	p. 66 Act. 1 Q. 1 & 2	67–68							
	Homework Complete Activity 1 (Unit 18) Complete Revision and extension questions on Newton's Law of Universal Gravitation			p. 66 Act. 1 Q. 1 & 2 p. 70 Q. 1–6	67–68 78–79	117–118 Ex. 2.9 Q. 1–7 pp. 123–127 Ex. 2.10 Q. 10–25	114–117 122–126					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.	Date completed				
3	**A chemical bond (is seen as the net electrostatic force two atoms sharing electrons exert on each other)** • Recall the role of models in science and describe the explanations of chemical bonding in this course as an application of a model • Deduce the number of valence electrons in an atom of an element • Represent atoms using Lewis diagrams **Bond energy and length** • Give a definition of bond energy • Give a definition of bond length	67 71	71–74 (Unit 1)	p. 74 Act. 1 Q. 1–4	81	136–140	146–147					
	Homework Review all Mechanics – Exemplar Control Test: Term 1 *Worksheet 1			pp. 324–326 Q. 1.1–1.4 Q. 2.1–2.4 Q. 3–6	255–257	127–128 Ex. 2.10 Q. 27–30 p. 140 Ex. 3.1 Q. 1–5	147–148 127–131					
4	**A chemical bond (is seen as the net electrostatic force two atoms sharing electrons exert on each other)** • Explain, referring to diagrams showing electrostatic forces between protons and electrons, and in terms of energy considerations, why two H atoms form an H_2 molecule, but He does not form an He_2 molecule • Draw a Lewis diagram for the hydrogen molecule • Describe a covalent chemical bond as a shared pair of electrons • Describe and apply simple rules to deduce bond formation: – different atoms, each with an unpaired valence electron can share these electrons to form a chemical bond – different atoms with paired valence electrons called lone pairs of electrons, cannot share these four electrons and cannot form a chemical bond – different atoms, with unpaired valence electrons can share these electrons and form a chemical bond for each electron pair shared (multiple bond formation)	68	75–79 (Unit 2)	p. 79 Act. 1 Q. 1–7	82	140–147 143 Ex. 3.2 Q. 1–2 p. 144 Ex. 3.3 Q. 1 & 2 p. 146 Ex. 3. 4 Q. 1 & 2	148–149 149 149–150					

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				
	– atoms with an incomplete complement of electrons in their valence shell can share a lone pair of electrons from another atom to form a co-ordinate covalent or dative covalent bond (e.g. NH_4^+, H_3O^+)											
	Homework Review all Mechanics – Exemplar Control Test: Term 1			pp. 324–326 Q. 1.1–1.4 Q. 2.1–2.4 Q. 3–6	255–257	147–148 Ex. 3.5 Q. 1–5	150–152					

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: Atomic combinations: Molecular structure

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
1	**A chemical bond (is seen as the net electrostatic force two atoms sharing electrons exert on each other)** • Draw Lewis diagrams, given the formula and using electron configurations, for – simple molecules (e.g. F_2, H_2O, NH_3, HF, OF_2, $HOC\ell$) – molecules with multiple bonds (e.g. N_2, O_2 and HCN)	68	80–83 (Unit 3)	p. 83 Act. 1 Q. 1–3	82–84	147–148 Ex. 3.5 Q. 1–5						
	Homework Review all Mechanics – Exemplar Control Test: Term 1			pp. 324–326 Q. 1.1–1.4 Q. 2.1–2.4 Q. 3–6	255–257	147–148 Ex. 3.5 Q. 1–5	150–152					
2	**Molecular shape as predicted using the Valence Shell Electron Pair Repulsion (VSEPR) theory** • State the major principles used in the VSEPR • The five ideal molecular shapes according to the VSEPR model: – linear shape AX_2 (e.g. CO_2 and $BeCl_2$) – trigonal planar shape AX_3 (e.g. BF_3) – tetrahedral shape AX_4 (e.g. CH_4) – trigonal bipyramidal shape AX_5 (e.g. PCl_5) – octahedral shape AX_6 (e.g. SF_6) • Ideal shapes are found when there are **no** lone pairs on the central atom only bond pairs • A is always the central atom and X the terminal atoms • Molecules with lone pairs on the central atom **cannot** have one of the ideal shapes, e.g. water molecule • Using VSEPR theory deduce the shape of molecules from their Lewis diagrams: – CH_4, NH_3, H_2O, BeF_2 and BF_3 – molecules with more than four bonds like $PC\ell_5$ and SF_6 – molecules with multiple bonds like CO_2, SO_2 and C_2H_2	69	84–89 (Unit 4 & 5)	p. 85 Act. 1 Q. 1 & 2 p. 87 Act. 1 Q. 1–5	84–86 86–87	148–152						

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				
	Homework			p. 89 Act. 2 Q. 1–3	87–88	153 Ex. 3.6 1–8	153–155					
3	**Electronegativity of atoms to explain the polarity of bonds** • Explain the concepts: – electronegativity – non-polar bond, with examples, e.g. H–H – polar bond, with examples, e.g. H–Cℓ • Show polarity of bonds using partial charges δ+ H–Cl δ- • Compare the polarity of chemical bonds using a table of electronegativities: – with an electronegativity difference ΔEN > 2.1 electron transfer will take place and the bond would be ionic – with an electronegativity difference ΔEN > 1 the bond will be covalent and polar – with an electronegativity difference ΔEN < 1 the bond will be covalent and very weakly polar – with an electronegativity difference ΔEN = 0 the bond will be covalent and non-polar • Show how polar bonds do not always lead to polar molecules	70	90–92 (Unit 6)	p. 92 Act. 1 Q. 1 & 2 p. 95 Act. 2 Q. 1 & 2		153–160 154 Ex. 3.7 Q. 1	155					
	Homework Revision and extension questions: Covalent bonds and Lewis diagrams Complete Activity 2 (Unit 6)			p. 123 Q. 1–5 p. 95 Act. 2 Q. 3 & 4		158 Ex. 3.8 Q. 1 & 2 pp. 161–163 Ex. 3.9 Q. 1–11	156–157 157–162					
4	**Bond energy and length** • Give a definition of bond energy • Give a definition of bond length • Explain what the relationship between bond energy and bond length is • Explain the relationship between the strength of a bond between two chemically bonded atoms and: – the length of the bond between them – the size of the bonded atoms – the number of bonds (single, double, triple) between the atoms	71	96–97	p. 97 Act. 1 Q. 1–3		159–160						

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				
	Homework Revision and extension questions: Shapes of molecules, polar and non-polar molecules			p. 123 Q. 1–6		161–163 Ex. 3.9 Q. 1–11	157–162					

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:**

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Week 8: Atomic combinations: Molecular structure/intermolecular forces

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	**Intermolecular and interatomic forces #** • Revise the concept of a covalent molecule • Describe the difference between intermolecular forces and inter-atomic forces using a diagram of a group of small molecules, and in words • Name and explain the different intermolecular forces: – ion-dipole forces – ion-induced dipole forces – ipole-dipole forces (hydrogen bonds are a special case of dipole-dipole forces) – dipole-induced dipole forces – induced dipole forces • The last three forces (involving dipoles) are also called Van der Waals forces • Explain hydrogen bonds (dipole-dipole)	72	98–99 Unit 8 pp. 100–104 Unit 9	p. 99 Act. 1 Q. 1 & 2 p. 104 Act. 1 Q. 1–3		166–172	164–165					
	Homework Complete Activity 1 (Unit 9)			p. 104 Act. 1 Q. 4–6		172 Ex. 4.1 Q. 1–4	166					
2	**Physical state and density explained in terms of these forces** • Represent a common substance, made of small molecules, like water, using diagrams of the molecules, to show microscopic representations of ice $H_2O(s)$, water liquid $H_2O(\ell)$ and water vapour $H_2O(g)$ • Illustrate the proposition that intermolecular forces increase with increasing molecular size with examples, e.g. He, O_2, C_8H_{18} (petrol), $C_{23}H_{48}$ (wax) (only for van der Waals forces) **Particle kinetic energy and temperature** • Explain the relationship between the strength of intermolecular forces and melting points and boiling points of substances composed of small molecules • Contrast the melting points of substances composed of small molecules with those of large molecules where bonds must be broken for substances to melt	72–73	105, 109–113	p. 111 Act. 5 Q. 1 & 2	110–111	173–179						

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.	Date completed				
	Physical state and density explained in terms of these forces • Explain density of material in terms of the number of molecules in a unit volume, e.g. compare gases, liquids and solids **Particle kinetic energy and temperature** • Describe thermal expansion of a substance and how it is related to the motion of molecules in a substance composed of small molecules, e.g. alcohol in a thermometer • Explain the differences between thermal conductivity in non-metals and metals											
	Homework Revision and extension questions: Bond energy and bond strength Revision and extension questions: Intermolecular forces and physical properties *Worksheet 2			pp. 124–125 Q. 1–8	109–110	183 Ex. 4.2 Q. 1–4	166–168					
3	**The chemistry of water (macroscopic properties of the three phases of water related to their sub-microscopic structure)** • Describe the shape of the water molecule and its polar nature • Water's unique features are due to the hydrogen bonding in solid, liquid and gaseous water • Indicate the number of H_2O molecules in 1 litre of water • The hydrogen bonds require a lot of energy to break; therefore water can absorb a lot of energy before the water temperature rises • The hydrogen bonds formed by the water molecules enable water to absorb heat from the Sun • Explain that because of its polar nature and consequent hydrogen bonding that there are strong forces of attraction between water molecules that cause a high heat of vaporisation (water needs a lot of energy before it will evaporate) and an unusually higher than expected boiling point when compared to other hydrides	74	114–118	p. 115 Act. 1 Q. 1–3 p. 116 Exp. 1 p. 117 Exp. 2 p. 118 Exp. 3	103	184–185						
	Homework Review Experiments 1–3 Complete Activity 4 (Unit 12)			pp. 116–118 Act. 4 Q. 1–7	104 105	187–188 Ex. 4.3 Q. 1–3	168–169					

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
4	**The chemistry of water (macroscopic properties of the three phases of water related to their sub-microscopic structure)** • The sea acts as reservoir of heat and is able to ensure the Earth has a moderate climate • A decrease in density when the water freezes helps water moderate the temperature of the Earth and its climate • The density of the ice is less than the density of the liquid and ice floats on water forming an insulating layer between water and the atmosphere keeping the water from freezing and preserving aquatic life (the only liquid which freezes from the top down)	74–75	119–121 (Unit 13)	p. 121 Act. 1 Q. 1 & 2	106	189–190						
	Homework			p. 126 Q. 1–5	111–112	189–190 190–192 Ex. 4.4 Q. 1–8	169–172					
	Chemistry consolidation			p. 123–126	107–112	190–192 Ex. 4.4 Q. 1–8						
	Exemplar Control Test: Term 1			pp. 324, 326–328 Q. 1.5 Q. 2.5 Q. 7–9	255 255 257–258							

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:**

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

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.	Date completed				
1	**Experiments for formal assessment** Investigate the effects of intermolecular forces on various physical properties	73	105–112	p. 106 Exp. 1 p. 107 Exp. 2 p. 108 Exp. 3 p. 110 Exp. 4 p. 112 Exp. 6	97–102							
	Resources Select the experiment(s) based on the resources you have available in your school You can use different solvents such as water, methylated spirits, paraffin, cooking oil or glycerine Take note of safety precautions especially when heating flammable liquids		105–112	p. 106 Exp. 1 p. 107 Exp. 2 p. 108 Exp. 3 p. 110 Exp. 4 p. 112 Exp. 6	97–102							
2 and 3	**Physics consolidation** Exemplar Test Section F Worksheet 1*		324	p. 255	119 Ex. 2.9 Q. 8–10 pp. 120–132 Ex. 2.10 Q. 1–39 pp. 132–134 Ex. 2.11 Q. 1–14	117–118 118–138 138–144						

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
4	**Chemistry consolidation** Exemplar Test Section F Worksheet 2*		324	p. 255	161–163 Ex. 3.9 Q. 1–11 pp. 190–192 Ex. 4.4 Q. 1–8	157–162 169–172						

Reflection	
Think about and make a note of: Were you able to complete all the work for the term? Did the revision seem to help learners understand the work better?	What did learners' responses to the revision you did suggest about how to approach the same work next year?
HOD:	**Date:**

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Week 10: Revision and assessment: Plan your week

S #	CAPS concepts, practical activities and assessment tasks	CAPS pp.	LB pp.	LB act.	TG pp.	*Everything Science*		Class				
						LB pp.	TG pp.					
								Date completed				
1	**Control Test** Provincial Papers Section F (Part 2)*											
2												
3												
4												

End-of-term reflection

Think about and make a note of:

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

HOD:

Date:

E. ADDITIONAL INFORMATION AND ENRICHMENT ACTIVITIES

CAPS concepts, practical activities and assessment tasks	Additional information and enrichment activities
Week 1–2: Vectors in two dimensions	
Resultant of perpendicular vectors • Draw a sketch of the vectors (parallel and perpendicular) on the Cartesian plane • Add co-linear vectors along the parallel and perpendicular direction to obtain the net parallel component (Rx) and a net perpendicular component (Ry) • Sketch Rx and Ry • Sketch the resultant (R) using either the tail-to-head or tail-to-tail method • Determine the magnitude of the resultant using the theorem of Pythagoras • Find resultant vector graphically using the tail-to-head method as well as by calculation (by component method) for a maximum of four force vectors in both one and two dimensions • Understand what a closed vector diagram is • Determine the direction of the resultant using simple trigonometric ratios	Begin this section by revising Grade 10 concepts of what a vector is, how to measure direction, Pythagoras' equation and trig ratios. Refer to Grade 10 Learner's Books for additional exercises. You could use these as a baseline assessment task so you get feedback of what your learners know. Please emphasise that although this section focuses on forces, the principles we learn in this context can be applied to other vector quantities too. **Teaching tools** Make cardboard arrows with your class to represent vectors of different magnitude. **Misconception:** Resultant force/net force is a new vector. **Remediation:** Place two or more arrows head to tail and mark the tail of the first arrow and the head of the last on a piece of paper. Then get your learners to pick up the arrows and place them in one straight line starting at the point they marked as the start of vector 1. The head of the last vector will land at the point they marked as the head of the last arrow. This shows that the resultant vector is an equivalent replacement of the original vectors. Using cardboard arrows you can show that the order of adding vectors doesn't change the resultant. Many vectors can be replaced by one vector and one vector can be broken up into two equivalent parts (introduction to components). Use the arrows to show that when vectors are arranged head to tail and they form a closed shape the resultant is zero. This represents a system in equilibrium.
Resolution of a vector into its parallel and perpendicular components • Draw a sketch of the vector on the Cartesian plane showing its magnitude and the angle (θ) between the vector and the x-axis • Use $Rx = R\cos(\theta)$ for the resultant x-component • Use $Ry = R\sin(\theta)$ for the resultant y-component	Use the cardboard arrows to show that a single vector can be replaced by two arrows that are perpendicular to each other. Explain to your learners that we use components to make calculations easier. Trigonometric ratios and Pythagoras' theorem require vectors to be at 90° to each other. Show how to add two vectors that are not at 90° to each other by using cardboard arrows. Then show that you get the same result if you resolve the forces into components and then add the components together to find a resultant.
Week 2–6: Newton's laws and application of Newton's laws	
Different kinds of forces: weight, normal force, frictional force, applied (push, pull), tension (strings or cables) • Define normal force, N, as the force exerted by a surface on an object in contact with it • Know that the normal force acts perpendicular to the surface irrespective of whether the plane is horizontal or inclined	**Teaching tools** Computer simulations http://phet.colorado.edu/en/simulation/the-ramp Emphasise that the force of friction always acts in the direction opposite to the motion of an object.

CAPS concepts, practical activities and assessment tasks	Additional information and enrichment activities
• Define frictional force, f, as the force that opposes the motion of an object and acts parallel to the surface the object is in contact with • Distinguish between static and kinetic friction forces	Draw force diagrams or use cardboard arrows to show the normal force, the applied force and the frictional force acting on an object. Some textbooks introduce free-body diagrams in this week too.
Different kinds of forces: weight, normal force, frictional force, applied (push, pull), tension (strings or cables) • Explain what is meant by the maximum static friction, f_s max • Calculate the value of the maximum static frictional force for objects at rest on a horizontal and inclined planes using: f_s max = $\mu_s N$ • Know that static friction: $f_s < \mu_s N$ • Calculate the value of the kinetic friction force for moving object on horizontal and inclined planes using: $f_k = \mu_k N$	**Teaching tools** Computer simulations http://phet.colorado.edu/en/simulation/ramp-forces-and-motion Emphasise that the force of friction always acts in the direction opposite to the motion of an object.
Force diagrams, free-body diagrams • Know that a force diagram is a picture of the object(s) of interest with all the forces acting on it (them) drawn in as arrows • Know that in a free-body diagram, the object of interest is drawn as a dot and all the forces acting on it are drawn as arrows pointing away from the dot • Resolve two-dimensional forces (such as the weight of an object with respect to the inclined plane) into its parallel (x) and perpendicular (y) components	It is important to give learners the opportunity to draw force diagrams to show all the forces acting on an object. Make sure that learners do not draw the force and its components in the same diagram. Make sure that learners know that for a free-body diagram the object is represented by a dot. All forces acting on the object need to start from the dot. All forces must be draw in proportion to each other. All forces must be labelled.
• The resultant or net force in the x-direction is a vector sum of all the components in the x-direction • The resultant or net force in the y-direction is a vector sum of all the components in the y-direction	
Newton's first, second and third laws • State Newton's first law: *An object continues in a state of rest or uniform (moving with constant) velocity unless it is acted upon by an unbalanced (net or resultant) force* • Discuss why it is important to wear seatbelts using Newton's first law • State Newton's second law: *When a net force, Fnet, is applied to an object of mass m, it accelerates in the direction of the net force. The acceleration, a, is directly proportional to the net force and inversely proportional to the mass Fnet = ma*	**Teaching tools** Videos Newton's first law http://learn.mindset.co.za/resources/physical-sciences/grade-11/newtons-laws-and-applications-1st-2nd-3rd-laws/02-newtons-first-law-motion Newton's second law http://learn.mindset.co.za/resources/physical-sciences/grade-11/newtons-laws-and-applications-1st-2nd-3rd-laws/03-newtons-second-law-motion Before doing the formal practical assessment on Newton's second law, make sure that your learners can analyse a ticker tape.
Newton's first, second and third laws • Draw force diagrams for objects that are in equilibrium (at rest or moving with constant velocity) and accelerating (non-equilibrium) • Draw free body diagrams for objects that are in equilibrium (at rest or moving with constant velocity) and accelerating (non-equilibrium)	**Teaching tools** Videos Applications of Newton's second law http://learn.mindset.co.za/resources/physical-sciences/grade-11/newtons-laws-and-applications-1st-2nd-3rd-laws/04-applying-newtons-second-law Computer simulation Forces and motion http://phet.colorado.edu/en/simulation/forces-and-motion

CAPS concepts, practical activities and assessment tasks	**Additional information and enrichment activities**
- Apply Newton's laws to a variety of equilibrium and non-equilibrium problems including a single object moving on a horizontal/inclined plane (frictionless and rough), vertical motion (lifts, rockets etc.) and also two-body systems such as two masses joined by a light (negligible mass) string - Understand apparent weight	Emphasise that equilibrium means that the net force is zero and that this occurs when objects are at rest or moving at constant velocity. Whenever learners do these type of problems, get them to draw a force diagram or free-body diagram with all the given information on the diagram even if this is not required in the question.
Newton's first, second and third laws - State Newton's third law: *When object A exerts a force on object B, object B simultaneously exerts an oppositely directed force of equal magnitude on object A* - Identify action-reaction pairs, e.g. donkey pulling a cart, a book on a table - List the properties of action-reaction pairs	**Teaching tools** Videos Newton's third law http://learn.mindset.co.za/resources/physical-sciences/grade-11/newtons-laws-and-applications-1st-2nd-3rd-laws/01-newton%E2%80%99s-third-law
Newton's Law of Universal Gravitation - State Newton's Law of Universal Gravitation - Use the equation for Newton's Law of Universal Gravitation to calculate the force two masses exert on each other: $F = \frac{G.M_1M_2}{d^2}$ - Describe weight as the gravitational force the Earth exerts on any object on or near its surface	**Teaching tools** Videos http://learn.mindset.co.za/resources/physical-sciences/grade-11/newtons-laws-and-applications-universal-gravitation It is critical that learners are shown that force is directly proportional to the product of the masses and inversely proportional to the square of the distances between the centres of the masses. They must know how to find the new force without substitution when the masses and/or the distance is changed, e.g. double the mass and half the distance.
- Calculate the acceleration due to gravity on Earth using the equation: $g_{Earth} = \frac{G.M_{Earth}}{d^2}$ N.B. This formula can be used to calculate g on any planet using the appropriate planetary data - Calculate weight using the expression W = mg, where g is the acceleration due to gravity - Near the Earth the value is approximately $9.8\ m.s^{-2}$ - Calculate the weight of an object on other planets with different values of gravitational acceleration - Distinguish between mass and weight. - Know that the unit of weight is the newton (N) and that of mass is the kilogram (kg) - Understand weightlessness	Emphasise that acceleration due to gravity is not dependent on mass. For extension, use computer simulation. Forces and motion http://phet.colorado.edu/en/simulation/forces-and-motion Select other planets. Use the example of buoyancy as extension: See https://phet.colorado.edu/en/simulation/buoyancy Video of astronauts on International Space Station http://www.nasa.gov/mission_pages/station/main/suni_iss_tour_prt.htm
Week 6–7: Atomic combinations: Molecular structure	
A chemical bond (is seen as the net electrostatic force two atoms sharing electrons exert on each other) - Recall the role of models in science and describe the explanations of chemical bonding in this course as an application of a model	Begin this section by asking learners what they know about atoms, molecules, elements and compounds. The language of chemistry is different to everyday language and learners need to explain their ideas clearly. Without clear explanation misconceptions arise easily. A baseline assessment may be useful to give you feedback on knowledge gaps.

CAPS concepts, practical activities and assessment tasks	Additional information and enrichment activities
• Deduce the number of valence electrons in an atom of an element • Represent atoms using Lewis diagrams • Explain, referring to diagrams showing electrostatic forces between protons and electrons, and in terms of energy considerations, why two H atoms form an H_2 molecule, but He does not form He_2 • Draw a Lewis diagram for the hydrogen molecule • Describe a covalent chemical bond as a shared pair of electrons • Describe and apply simple rules to deduce bond formation: – different atoms, each with an unpaired valence electron can share these electrons to form a chemical bond – different atoms with paired valence electrons called lone pairs of electrons, cannot share these four electrons and cannot form a chemical bond – different atoms, with unpaired valence electrons can share these electrons and form a chemical bond for each electron pair shared (multiple bond formation) – atoms with an incomplete complement of electrons in their valence shell can share a lone pair of electrons from another atom to form a co-ordinate covalent or dative covalent bond (e.g. NH_4^+, H_3O^+)	**Teaching tools** Make sure you refer to the Periodic Table often. Learners need to be very familiar with the Periodic Table and should have access to a copy of one whenever doing Chemistry. Learners need to draw diagrams or build models using clay, sweets and sticks or toothpicks. Drawing Lewis diagrams is an essential skill.

CAPS concepts, practical activities and assessment tasks	Additional information and enrichment activities
• Draw Lewis diagrams, given the formula and using electron configurations, for; – simple molecules (e.g. F_2,H_2O, NH_3, HF, OF_2, HOCℓ) – molecules with multiple bonds (e.g. N_2, O_2 and HCN)	
Molecular shape as predicted using the Valence Shell Electron Pair Repulsion (VSEPR) theory • State the major principles used in the VSEPR • The five ideal molecular shapes according to the VSEPR model: – linear shape AX_2 (e.g. CO_2 and $BeCl_2$) – trigonal planar shape AX_3 (e.g. BF_3) – tetrahedral shape AX_4 (e.g. CH_4) – trigonal bipyramidal shape AX_5 (e.g. PCl_5) – octahedral shape AX_6 (e.g. SF_6) • Ideal shapes are found when there are **no** lone pairs on the central atom only bond pairs • A is always the central atom and X the terminal atoms • Molecules with lone pairs on the central atom **cannot** have one of the ideal shapes, e.g. water molecule • Using VSEPR theory deduce the shape of molecules from their Lewis diagrams: – CH_4, NH_3, H_2O, BeF_2 and BF_3 – molecules with more than four bonds like $PCℓ_5$ and SF_6 – molecules with multiple bonds like CO_2, SO_2 and C_2H_2	Although this section is not examined in Grade 12, it is essential that learners grasp that the shape of molecules influences their physical properties.

CAPS concepts, practical activities and assessment tasks	Additional information and enrichment activities
Week 7–8: Intermolecular forces	
Electronegativity of atoms to explain the polarity of bonds • Explain the concepts: – electronegativity – non-polar bond with examples, e.g. H-H – polar bond with examples e.g. H-Cℓ • Show polarity of bonds using partial charges $\delta+$ H–Cl $\delta-$ • Compare the polarity of chemical bonds using a table of electronegativities: – with an electronegativity difference $\Delta EN > 2.1$ electron transfer will take place and the bond would be ionic – with an electronegativity difference $\Delta EN > 1$ the bond will be covalent and polar – with an electronegativity difference $\Delta EN < 1$ the bond will be covalent and very weakly polar – with an electronegativity difference $\Delta EN = 0$ the bond will be covalent and non-polar • Show how polar bonds do not always lead to polar molecules	Use the values on the Periodic Table to show learners how to calculate the electronegativity number difference. Molecules that have a symmetrical shape will be non-polar even if the bonds are polar, e.g. tetrachloromethane (CCl_4). The net forces on the shared electrons is zero, which results in an even distribution of electrons around the molecule.

CAPS concepts, practical activities and assessment tasks	Additional information and enrichment activities
Bond energy and length • Give a definition of bond energy • Give a definition of bond length • Explain what the relationship between bond energy and bond length is • Explain the relationship between the strength of a bond between two chemically bonded atoms and – the length of the bond between them – the size of the bonded atoms – the number of bonds (single, double, triple) between the atoms	Make sure your learners can read off information from tables or graphs to describe the relationships in this section.
Intermolecular and interatomic forces (chemical bonds) • Name and explain the different intermolecular forces: – ion-dipole forces – ion-induced dipole forces – dipole-dipole forces (hydrogen bonds are a special case of dipole-dipole forces) – dipole-induced dipole forces – induced dipole forces • The last three forces (involving dipoles) are also called Van der Waals forces • Explain hydrogen bonds (dipole-dipole) • Revise the concept of a covalent molecule • Describe the difference between intermolecular forces and inter-atomic forces using a diagram of a group of small molecules, and in words	This is a critical section and is directly examined in Grade 12 in the context of the physical properties of organic molecules. Learners must be able to identify the type of intermolecular substances present in different substances. **Teaching tools** Videos on Intermolecular forces http://learn.mindset.co.za/resources/physical-sciences/grade-11/intermolecular-forces

CAPS concepts, practical activities and assessment tasks	Additional information and enrichment activities
Physical state and density explained in terms of these forces • Represent a common substance, made of small molecules, like water, using diagrams of the molecules, to show microscopic representations of ice $H_2O(s)$, water liquid $H_2O(\ell)$ and water vapour $H_2O(g)$ • Illustrate the proposition that intermolecular forces increase with increasing molecular size with examples, e.g. He, O_2, C_8H_{18} (petrol), $C_{23}H_{48}$ (wax) (only for van der Waals forces) • Explain density of material in terms of the number of molecules in a unit volume, e.g. compare gases, liquids and solids **Particle kinetic energy and temperature** • Explain the relationship between the strength of intermolecular forces and melting points and boiling points of substances composed of small molecules • Contrast the melting points of substances composed of small molecules with those of large molecules where bonds must be broken for substances to melt • Describe thermal expansion of a substance and how it is related to the motion of molecules in a substance composed of small molecules, e.g. alcohol in a thermometer • Explain the differences between thermal conductivity in non-metals and metals	**Teaching tools** Videos on intermolecular forces http://learn.mindset.co.za/resources/physical-sciences/grade-11/intermolecular-forces **Extension** Ask your learners to investigate the solubility of different solutes in various solvents. Establish the rule that like dissolves like. **Formal practical assessment: Investigate the effects of intermolecular forces on various physical properties** The required formal practical assessment recorded in the schedule for Term 2 is based on this section of work. It is recommended that you complete this practical assessment during the last two weeks of the first term while the work is still fresh in learners' minds. Request that this formal assessment be timetabled in the Term 1 testing cycle. Alternatively, you may need to organise for groups of learners to complete this assessment when they are not writing control tests in other subjects or after the tests are finished for the day.

CAPS concepts, practical activities and assessment tasks	Additional information and enrichment activities
The chemistry of water (macroscopic properties of the three phases of water related to their sub-microscopic structure) • Describe the shape of the water molecule and its polar nature • Water's unique features are due to the hydrogen bonding in solid, liquid and gaseous water • Indicate the number of H_2O molecules in 1 litre of water • The hydrogen bonds require a lot of energy to break; therefore water can absorb a lot of energy before the water temperature rises • The hydrogen bonds formed by the water molecules enable water to absorb heat from the Sun • The sea acts as a reservoir of heat and is able to ensure the Earth has a moderate climate • Explain that because of its polar nature and consequent hydrogen bonding there are strong forces of attraction between water molecules that cause a high heat of vaporisation (water needs a lot of energy before it will evaporate) and an unusually higher than expected boiling point when compared to other hydrides • A decrease in density when the water freezes helps water moderate the temperature of the Earth and its climate • The density of the ice is less than the density of the liquid and ice floats on water forming an insulating layer between water and the atmosphere keeping the water from freezing and preserving aquatic life (the only liquid which freezes from the top down)	The topic of water can be studied as an informal research project, as the concepts required are not new but a type of case study of the previous section. By encouraging independent or group self-study you can save time for assessment.

F. ASSESSMENT RESOURCES

1. Sample item analysis sheets

PHYSICAL SCIENCES TERM 1 GRADE 11

SUGGESTED ITEM ANALYSIS RECORD SHEET FOR FORMAL ASSESSMENT

Control test									
		Questions							
		1	2	3	4	5	6	7	Total
Learner name	Learner surname	Multiple choice	Vectors Application of Newton's laws	Free-body diagrams Equilibrium	Newton's 2nd law Calculation of tension (horizontal)	Newton's 2nd law Calculation of tension (vertical)	Newton's Law of Universal Gravitation	Chemical bonding, ENND IMF Molecular shape Physical properties Water	

Control test

		Questions							
		1	2	3	4	5	6	7	Total
Learner name	Learner surname	Multiple choice	Vectors Application of Newton's laws	Free-body diagrams Equilibrium	Newton's 2nd law Calculation of tension (horizontal)	Newton's 2nd law Calculation of tension (vertical)	Newton's Law of Universal Gravitation	Chemical bonding, ENND IMF Molecular shape Physical properties Water	

SUGGESTED ITEM ANALYSIS RECORD SHEET FOR FORMAL ASSESSMENT

Practical assessment
Verifying Newton’s second law

		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	

Practical assessment
Verifying Newton’s second law

		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 1 Test

INSTRUCTIONS AND INFORMATION

1. This question paper consists of 7 questions. Answer ALL the questions.
2. You may use a non-programmable calculator.
3. You may use appropriate mathematical instruments.
4. For calculations, unless otherwise stated, give your final answer correct to two decimal places.
5. YOU ARE ADVISED TO USE THE ATTACHED DATA SHEETS.
6. Number the answers correctly according to the numbering system used in this question paper.
7. Write neatly and legibly.

Question 1

Multiple choice questions

Various options are provided as possible answers to the following questions. Each question has only ONE correct answer. Write only the letter (A–D) next to the question number e.g. 1.12 A

1.1 Which of the following are vectors?

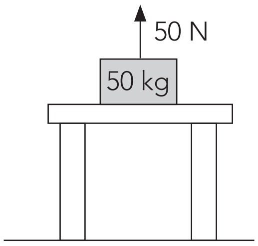
A 50 kg
B 50 s
C 5 m.s^{-1}
D 5 m.s^{-1} East (2)

1.2 A boy walks 6 km East then turns around and runs 8 km in the opposite direction. What is his resultant displacement?

A 14 km
B 2 km
C –2 km
D 2 km West (2)

1.3 A 50 kg box is placed on a table.
A force of 50 N upwards is exerted on the box.
What would you observe happening to the box?

A The box would remain stationary on the table.
B The box would lift off the table for a short time and then fall down again.
C The box would move upwards.
D The box would move downwards. (2)

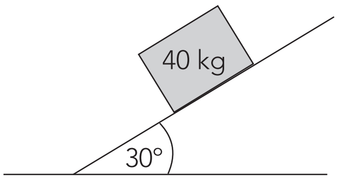


1. 4 For a smooth surface (frictionless), the coefficient of dynamic friction is …

A less than the coefficient of static friction.
B equal to the coefficient of static friction.
C greater than the coefficient of static friction.
D zero. (2)

1.5 A 40 kg brick is at rest on a surface inclined at 30° to the horizontal. What is the magnitude of the normal force acting on the brick?

A 392 N
B 339.47 N
C 196 N
D 40 N (2)



1.6 An object of mass 2 kg is pulled across a rough surface at constant velocity. Which of the following statements is true?

A. The object has zero acceleration.
B. The applied force causes the object to accelerate.
C. The object moves further in the 1st second than in the 5th second.
D. The applied force is greater than the frictional force. (2)

1.7 Two objects of mass *m1* and *m2* experience a force of attraction, *F* when placed a distance *r* away from each other. What will the force be if the mass of *m1* is doubled and the distance *r* is doubled?

A ¼F
B ½F
C F
D 2F (2)

1.8 Which of the following single covalent bonds has the highest electronegativity difference?

A H–F
B H–Cl
C H–C
D H–O (2)

1.9 What shape best describes a molecule of ammonia (NH_3)?

A linear
B tetrahedral
C pyramidal
D planar (2)

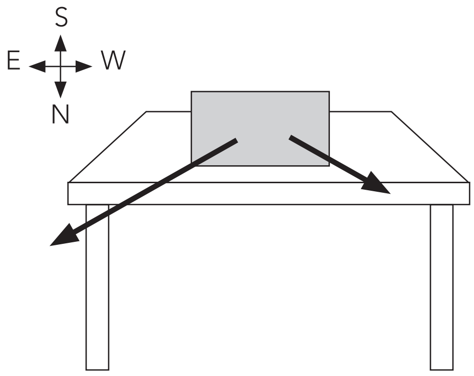
1.10 How many bonding pairs and lone pairs are present in a water molecule?

A 2 bond pairs and 2 lone pairs
B 2 bond pairs and 1 lone pair
C 1 bond pair and 2 lone pairs
D 1 bond pair and 1 lone pair (2)

[20]

Question 2

A box rests on the smooth frictionless surface of a table. Trevor exerts a force of 12 N on a box on a bearing of 35° along the surface of the table. At the same time, Thulani exerts a force of 5 N on a bearing of 305° along the surface of the table.



2.1 Calculate the resultant force acting on the box along the surface of the table. (6)

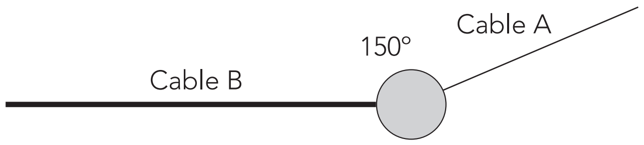
2.2 Describe the motion of the box due to the forces exerted on it. (2)

2.3 Identify which one of Newton's laws predicts the motion of the box. (1)

[9]

Question 3

A large metal sphere with a mass of 500 kg is suspended by cables on a construction site as shown in the sketch below.



3.1 Draw a free-body diagram to show all the forces acting on the metal sphere. (5)

3.2 Draw a sketch, using the forces labelled in your free-body diagram drawn in 3.1, to show how the net force acting on the sphere is found:

3.2.1 When the sphere is suspended. (3)

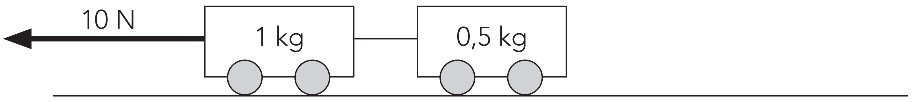
3.2.2 If Cable A breaks. (2)

3.3 The tension in Cable B is 2 500 N at the moment Cable A breaks. Calculate the magnitude of the resultant of the forces acting on the sphere. (3)

[13]

Question 4

A 10 N force is used to pull dynamics trolley A along a frictionless horizontal surface. Trolley A is attached by a light, non-elastic string to trolley B. Trolley A has a mass of 1 kg and trolley B has a mass of 0,5 kg.



4.1 Draw a diagram for each trolley showing the horizontal forces acting on it. (2)

4.2 Calculate the acceleration of Trolley A. (6)

4.3 Calculate the tension (F_T) in the string that joins Trolley A to Trolley B. (3)

[11]

Question 5

A helicopter lifts a load vertically off the ground. It accelerates at 4,9 m.s^{-2} vertically upwards.

5.1 Draw a labelled free-body diagram to show the forces acting on the load. (4)

5.2 Calculate the lifting force exerted by the rope on the load, if the mass of the load is 120 kg. (6)

[10]

Question 6

The chain holding a large metal sphere of a wrecking ball breaks and the ball falls from the second floor of a building. Ignore the effects of air resistance.

6.1 State Newton's Law of Universal Gravitation. (2)

6.2 Show that the magnitude of the acceleration of the metal ball as it falls is 9,8 m.s^{-2} on Earth. (6)

6.3 Without further calculation, compare the acceleration of the metal ball to:

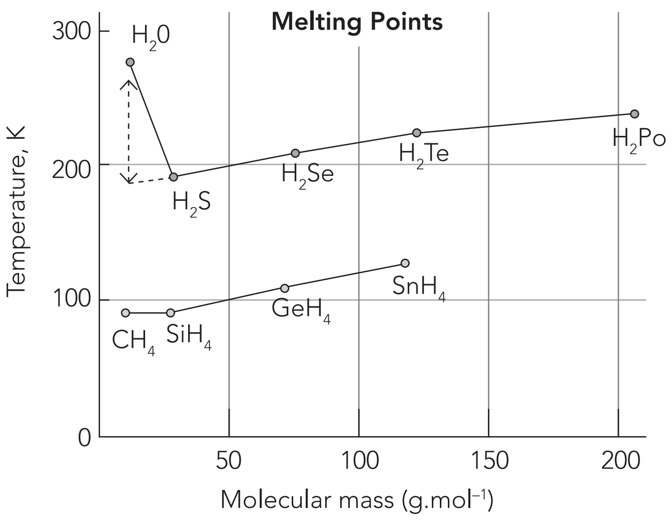
6.3.1 A tennis ball dropped from the same height. (2)

6.3.2 A concrete block dropped from a height of 6,38 x 10^6 m above the Earth's surface. (2)

[12]

Question 7

Consider the following graph of the melting points of Group 14 and Group 16 hydrides.



7.1 Draw Lewis diagrams of the following molecules:

7.1.1 A methane molecule (CH_4). (2)

7.1.2 A hydrogen sulphide molecule. (2)

7.2 Use the VSEPR theory to predict the shape of:

7.2.1 The methane molecule. (2)

7.2.2 The hydrogen sulphide molecule. . (2)

7.3 Identify the type of intermolecular force present between molecules of:

7.3.1 Methane. (2)

7.3.2 Hydrogen sulphide. (2)

7.4 Use the graph above to describe the general trend in the melting points of Group 14 hydrides in terms of increasing molecular mass of molecules. (2)

7.5 Give two reasons why the Group 16 hydrides generally have higher melting points than the Group 14 hydrides. (4)

7.6 One of the hydrides of Group 16 does not follow the general trend in melting points.

7.6.1 Name the hydride of Group 16 that does not follow the general trend. (1)

7.6.2 Refer to molecular mass, molecular shape, intermolecular forces and energy to explain why one of the hydrides of group 16 deviates from the general trend. (4)

7.6.3 Name one other unique physical property of the hydride identified in 7.6.1. (2)

[25]

TOTAL MARKS: 100

TIME: 2 HOURS

END OF TEST

DATA FOR PHYSICAL SCIENCES

GRADE 11 TERM 1

TABLE 1: PHYSICAL CONSTANTS

NAME	SYMBOL	VALUE
Acceleration due to gravity	g	$9,8\ m{\cdot}s^{-2}$
Speed of light in a vacuum	c	$3,0 \times 10^{8}\ m{\cdot}s^{-1}$
Planck's constant	h	$6,63 \times 10^{-34}\ J{\cdot}s$
Coulomb's constant	k	$9,0 \times 10^{9}\ N{\cdot}m^{2}{\cdot}C^{-2}$
Charge on electron	e	$-1,6 \times 10^{-19}\ C$
Electron mass	m_e	$9,11 \times 10^{-31}\ kg$
Mass of Earth	M	$5,98 \times 10^{24}\ kg$
Radius of Earth	R_E	$6,38 \times 10^{6}\ m$

TABLE 2: FORMULA

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

FORCE

$F_{net} = ma$	$p = mv$
$F_{net}\Delta t = \Delta p$ $\Delta p = mv_f - mv_i$	$w = mg$

TABLE 3: THE PERIODIC TABLE OF ELEMENTS

KEY

Atomic number

Electronegativity

29
1,9 Cu
63,5

Symbol

Approximate relative atomic mass

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

3. Physical Sciences Grade 11: End-of-Term 1 Test Memorandum

Question 1

1.1 D ✓✓

1.2 D ✓✓

1.3 C ✓✓

1.4 D ✓✓

1.5 B ✓✓

1.6 C ✓✓

1.7 B ✓✓

1.8 A ✓✓

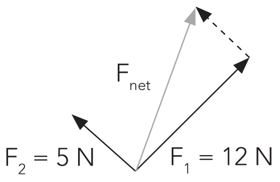
1.9 C ✓✓

1.10 A ✓✓

[20]

Question 2

2.1



$(F_{Res})^2 = F_1^2 + F_2^2$ ✓ (method)

$= (12)^2 + (5)^2$ ✓(sub)

$\theta = 169$

$F_{Res} = 13$ N

$\tan\theta = 5 \div 12$ ✓ $= 0{,}4167$

$\theta = 22{,}62°$ ✓ (method)

Bearing = 35° – 22,62° ✓ (method)

= 12,38°

$F_{Res} = 13$ N on a bearing of 12,38° ✓ (accuracy) (6)

2.2 The box will accelerate ✓ in the direction of the resultant force/on a bearing of 12,38° ✓

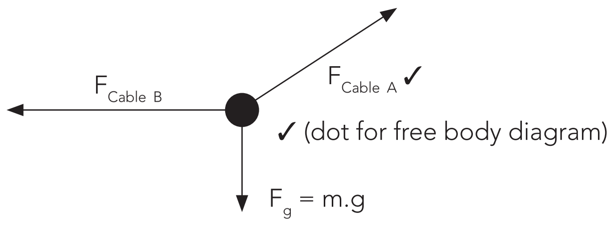
(Carry over error) (2)

2.3 Newton's second law ✓ (1)

[9]

Question 3

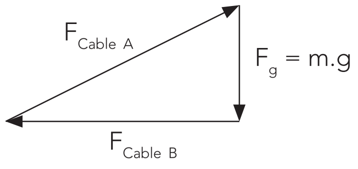
3.1



✓ for each correctly labelled force (1 x 3)

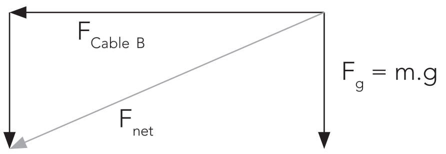
✓✓ magnitude of the forces need to be in proportion (5)

3.2.1



✓✓ the three forces form a closed triangle arranged head to tail so $F_{net} = 0$ N ✓ (no F_{net} shown) (3)

3.2.2



✓ correct two remaining forces arranged head to tail or tail to tail

✓ the resultant force/net force labelled (2)

3.3 $F_g = mg = (500)(9,8) = 4900$ N ✓

$(F_{Res})^2 = Fg^2 + (F_{Cable\ B})^2$

$= (4900)^2 + (2500)^2$ ✓

$= 30260000$

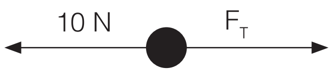
Magnitude of $F_{Res} = 5\ 500,91$ N ✓ (3)

[13]

Question 4

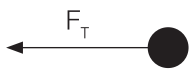
4.1

Trolley A



✓

Trolley B



✓

(2)

4.2 $F_{net} = ma$ ✓

$10 - F_T = (1)a$ ✓ …. (1)

(1) + (2) $10 - F_T = 1a$✓

$F_T = 0,5a$

$\therefore\ 10 = 1,5a$

$a = 6,67\ m.s^{-2}$ ✓ forward ✓ (6)

$F_{net} = ma$

$F_T = (0,5)a$ ✓ …. (2)

4.3 Substitute a into equation (1)

$10 - F_T = (1)a$ ✓

$10 - F_T = (1)(6,67)$ ✓

$10 - 6,67 = F_T$

$\therefore\ F_T = 3,33$ N ✓

OR

$F_T = 0,5a$ ✓

$= (0,5)(6,67)$ ✓

$= 3,34$ N ✓

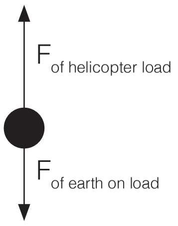
The answer for F_T is different by 0,01 N due to the rounding off of the acceleration in first question

(3)

[11]

Question 5

5.1



✓ label upward force

✓ upward force greater than weight

✓ label on downward force

✓ dot for object (4)

5.2 $F_{net} = ma$ ✓

$F_{app.} - F_g = ma$

$F_{app.} - mg = ma$

$F_{app.} - (120)(9,8)$ ✓✓ $= (120)(4,9)$ ✓✓

$F_{app.} - 1176 = 588$

$F_{app.} = 1\,764$ N upward ✓ (6)

[10]

Question 6

6.1 The force of attraction between any two objects is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centres. ✓✓ (2)

6.2 $F = \frac{Gm_1M_E}{r^2}$ ✓

$m_1g = \frac{Gm_1M_E}{r^2}$ ✓

$g = \frac{(6,67 \times 10^{-11})(5,98 \times 10^{24}) ✓}{(6,38 \times 10^{6})^2 ✓}$

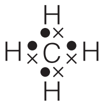
$= 9,80\ m.s^{-2}$ ✓ towards the Earth/downwards ✓ (6)

6.3.1 The acceleration of the tennis ball is the same ✓✓ as the metal sphere (2)

6.3.2 The acceleration of the concrete block is a quarter ✓✓ of the acceleration of the sphere (2)

[12]

Question 7

7.1.1 

C at centre 4 H at 90° ✓ four single bonds (4 pairs of crosses and dots) ✓

7.1.2 

S at centre 2 H at 90° to each other ✓
✓ 2 single bonds (2 pairs of crosses and dots)/2 lone pairs (4)

7.2.1 Tetrahedral ✓✓ (2)

7.2.2 Bent ✓✓ (2)

7.3.1 London forces ✓✓ (2)

7.3.2 Van der Waals forces ✓✓ (2)

7.4 The melting points of the Group 14 hydrides increase with increasing molecular mass ✓✓ (2)

7.5 The molecules of Group 16 have a higher molecular mass than the corresponding molecules of Group 14 ✓✓

The molecules of Group 16 are dipoles ✓ due to their molecular shape and the intermolecular forces are stronger ✓ (4)

7.6.1 Water ✓ (1)

7.6.2 Even though the molecular mass of the water molecule is smaller ✓ than the other hydrides of Group 14, the molecule has a bent shape due to the polar covalent O-H bond and the presence of two lone pairs which makes the molecule a strong dipole. ✓ These factors mean that there are strong hydrogen bonds ✓ present between the molecules which means that more energy ✓ is required to cause a change in phase and hence the melting point is much higher than the trend. (4)

7.6.3 Capillarity, high surface tension, solid floats in the liquid/density of solid is less than liquid ✓✓ (2)

[25]

TOTAL MARKS: 100

4. Cognitive Analysis for Physical Sciences Grade 11: End-of-Term 1 Test

	L1	L2	L3	L4
Question	Recall	Comprehension	Analysis Application	Evaluation Synthesis
Question 1				
1.1		2		
1.2			2	
1.3				2
1.4		2		
1.5				2
1.6			2	
1.7				2
1.8			2	
1.9	2			
1.10	2			
Question 2				
2.1	1	1	3	1
2.2			1	1
2.3		1		
Question 3				
3.1	1	2	2	
3.2.1		1	2	
3.2.2	1		1	
3.3	1	1	1	
Question 4				
4.1	1	1		
4.2		1	4	1
4.3		1	2	
Question 5				
5.1		2	1	1
5.2		3	3	
Question 6				
6.1	2			
6.2		2	4	
6.3.1		1	1	
6.3.2			2	
Question 7				
7.1.1	1	1		
7.1.2	1	1		
7.2.1	1	1		
7.2.2	1	1		
7.3.1		1	1	
7.3.2		1	1	
7.4		1	1	
7.5		2	2	
7.6.1		1		
7.6.2		2	2	
7.6.3		2		
%	**15**	**35**	**40**	**10**
CAPS %	**15**	**35**	**40**	**10**

G. ADDITIONAL WORKSHEETS

1. Worksheet 1 or Mechanics Class Test

INSTRUCTIONS AND INFORMATION

Read the following carefully before answering the questions that follow:

1. Write your name, class and teacher's name on the top of each page.
2. This question paper has 5 questions. Answer **ALL** the questions.
3. Number the answers exactly as the questions are numbered.
4. Write neatly and legibly.
5. Non-programmable calculators can be used.
6. The information sheet is attached to the last page of the question paper.

Question 1

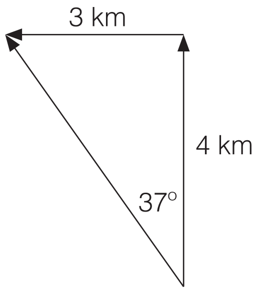
Multiple choice questions

Four possible options are provided as answers to the following questions.

Each question has only ONE correct answer.

Choose the answer and write the letter next to the question number (1.1–1.5) on the folio paper.

1.1 A student walks 4 km due north in one hour and 3 km due west in the next hour, as shown in the diagram. What is her resultant displacement after two hours?



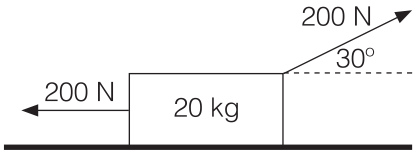
A. 7 km
B. 7 km; 37° west of north
C. 5 km; bearing 37°
D. 5 km; bearing 323° (2)

1.2 If a stationary body is subjected to a constant resultant force it will:

A. move at a constant velocity in the direction of the resultant force.
B. accelerate uniformly in the direction of the resultant force.
C. move at a constant speed in the direction of the resultant force.
D. accelerate at a rate directly proportional to its mass. (2)

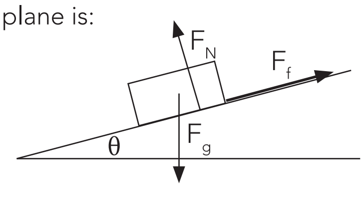
1.3 A box of mass 20 kg rests on a smooth horizontal surface. What will happen to the box, if two forces each of magnitude 200 N are applied simultaneously to the box as shown in the diagram?

The box will …



A. be lifted off the surface.
B. move to the left.
C. move to the right.
D. remain at rest. (2)

1.4 The diagram represents a stationary object of weight F_g on a rough inclined plane. The magnitude of the friction force F_f between the block and the plane is:



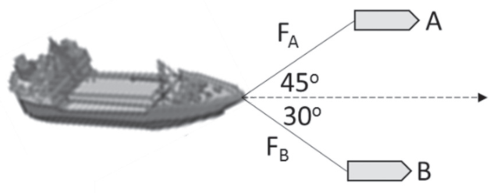
A. F_g
B. $F_g \sin \theta$
C. $F_g \cos \theta$
D. $F_N \cos \theta$ (2)

1.5 A boy with a mass of 50 kg stands on a newton scale in a lift. If the reading on the scale is 450 N, the lift must be moving:

A. upwards with increasing speed.
B. downwards with constant speed.
C. upwards with constant speed.
D. downwards with increasing speed. (2)

[10]

Question 2



Two tugboats, A and B, tow a larger boat in an **easterly** direction. The cables which are connected to A and B respectively, make angles of 45° north of east and 30° south of east to the direction of motion.

If the tension F_A is equal to 10 000 N, calculate:

2.1 The component of the force that F_A exerts in a northerly direction. (3)

2.2 The magnitude of the southern component of F_B. (1)

2.3 The magnitude of F_B. (3)

2.4 The resultant force that A and B exert on the larger boat in an easterly direction. (6)

[13]

Question 3

Malcolm wants to determine the maximum static friction between a rubber sole sneaker and wood.

He assembles the apparatus as shown in the diagram.

To carry out his investigation, Malcolm uses the following method:

Step 1: Malcolm places a heavy object in the sneaker and determines the mass of the sneaker and the object.
Step 2: He places the sneaker with the heavy object inside it on a wooden plane, which is resting on a flat workbench.
Step 3: A spring balance is hooked to the sneaker by means of a rope. The spring balance is pulled and the reading on the spring balance is taken when the sneaker starts to move.
Step 4: He repeats the procedure twice more to obtain another two readings.

3.1 Give an investigative question for this investigation. (2)

3.2 Draw a fully labelled free-body diagram showing all the forces acting on the sneaker. (4)

Malcolm obtained the following results:

	Mass of sneaker and object inside (kg)	Frictional force (N)
Reading 1	1,25	3,7
Reading 2	1,25	3,65
Reading 3	1,25	3,8

3.3 Use the information given and calculate the average frictional force experienced. (1)

3.4 Now calculate the coefficient of friction between the rubber sole sneaker and wood. (4)

Linda argues that the spring balance readings are not accurate, and that it can influence the values of the frictional force and thus also the coefficient of friction. She decides on an easier method, with less apparatus, to determine the coefficient between the sneaker and wood.

Linda proceeds as follows:

Step 1: Linda places an identical rubber sole sneaker with a heavy object in it, on the plank on a work bench and raises the plank gradually until the sneaker starts to slide down the plank.

Step 2: She measures the angle between the plank and the horizontal plane of the work bench with a protractor just before the sneaker starts to slide.

3.5 Calculate the coefficient of static friction from Linda's experiment. (3)

[14]

Question 4

A pencil lies on the dashboard of a car travelling at a constant velocity.

4.1 What happens to the pencil when the car suddenly stops? (1)

4.2 Name and state the law that describes the behaviour of the pencil. (3)

4.3 Name the property of the pencil that causes the behaviour. (1)

[5]

Question 5

A helicopter on a fire-fighting mission lifts a bag of water with the help of a rope vertically upwards at a constant acceleration of 0,4 $m.s^{-2}$. The mass of the water and the bag together is 750 kg.

5.1 State Newton's second law of motion in words. (2)

5.2 Calculate the magnitude of the force of gravity on the bag of water. (2)

5.3 Calculate the magnitude of the force which the rope exerts on the bag of water while it is accelerating upwards. (4)

[8]

TOTAL MARKS: 50

TIME: 1 HOUR

END OF TEST

2. Answers for Worksheet 1

Question 1

1.1 D ✓✓ (2)

1.2 B ✓✓ (2)

1.3 B ✓✓ (2)

1.4 B ✓✓ (2)

1.5 D ✓✓ (2)

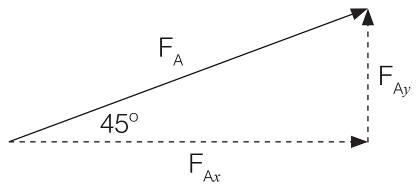
[10]

Question 2

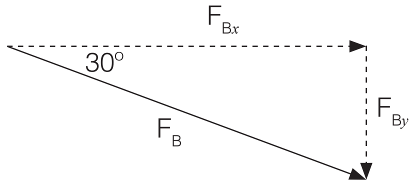
2.1 $F_{Ay} = F_A \sin\theta$ ✓

$= (10\ 000)(\sin 45°)$ ✓

$= 7\ 071{,}07$ N ✓(3)



2.2 $F_{By} = 7\ 071{,}07$ N ✓ (1)



2.3 $F_{By} = F_B \sin\theta$ ✓

$7\ 071{,}07 = F_B \sin 30°$ ✓

$F_B = 14\ 142{,}14$ N ✓ (3)

2.4 $F_{Ax} = F_A \cos\theta$

$= (10\ 000)(\cos 45°)$

$= 7\ 071{,}07$ N

$F_R = F_{Ax} + F_{Bx}$

$= 7071{,}07 + 12\ 247{,}45$

$= 19\ 318{,}52$ N ✓

$F_{Bx} = F_B \cos\theta$ ✓ for both equations

$= (14\ 142{,}14)(\cos 30°)$ ✓

$= 12\ 247{,}45$ N ✓

OR

$\tan\theta = \frac{F_{By}}{F_{Bx}}$

$\therefore F_{Bx} = \frac{7\ 071{,}07}{\tan 30°}$ ✓

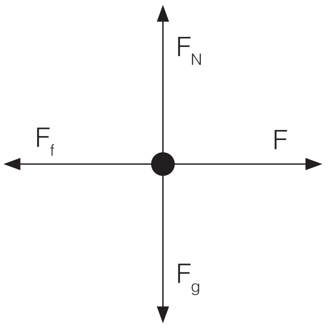
$= 12\ 247{,}45$ N ✓ (6)

[13]

Question 3

3.1 What is the <u>maximum static friction</u> ✓ between a <u>rubber sole sneaker and a wooden plank</u> ✓? (2)

3.2



F_N/N = normal force

F_g = force of gravity/weight

$F_f/f/f_s$ = force of friction

$F/F_{app.}/F_T$ = force of spring balance/pulling force/applied force

✓ for every arrow **with** label

(-1 for extra forces – max ¾) (4)

3.3 $F_f\text{ave} = \frac{(3{,}7+3{,}65+3{,}8)}{3}$

$= 3{,}72$ N ✓ (1)

3.4 $f_{s(max)} = \mu_s N$ ✓

$3{,}72 = \mu_s\ (12{,}25)$ ✓

$\therefore \mu_s = 0{,}30$ ✓

$F_N = F_g = mg$

$= (1{,}25)(9{,}8)$ ✓

$= 12{,}25$ N (4)

3.5 $\mu_s = \tan\theta$ ✓
$= \tan 16°$ ✓
$= 0{,}29$ ✓ (3)

[14]

Question 4

4.1 The pencil will continue to move forward ✓ (1)

4.2 Newton's first law ✓
An object will remain at rest or constant velocity ✓ unless acted upon by a net external force ✓ (3)

4.3 Inertia ✓ (1)

[6]

Question 5

5.1 When a net force acts on an object, the object will accelerate in the direction of the net force. ✓ The acceleration of the object will be directly proportional to the net force and inversely proportional to the mass of the object. ✓ (2)

5.2 $F_g = mg$
$= (750)(9{,}8)$ ✓
$= 7\ 350$ N ✓ If no equation then max ½ (2)

5.3 $F_{net} = ma$
$F_T - F_g = ma$ ✓
$F_T - 7350$ ✓ $= (750)(0{,}4)$ ✓
$F_T = 7650$ N ✓ (4)

[8]

TOTAL MARKS: 50

3. Worksheet 2: Atomic bonding and intermolecular forces

Question 1

1.1 Give an example of:

  1.1.1 A substance in which there are only ionic bonds.

  1.1.2 A molecule with pure covalent bonds.

1.2 The characteristics of some bond lie in between that of ionic and pure covalent bonding.

  1.2.1 Name a molecule with such a bond.

  1.2.2 Explain why this molecule is polar.

Question 2

Explain how two atoms of fluorine combine to form the fluorine molecule under the following headings:

2.1 Attractive and repulsive forces between the atoms.

2.2 Energy changes as the atoms approach each other to form the molecule (a graph may be used in your answer).

2.3 Representation of the bonding in Lewis dot notation.

Question 3

3.1 State two factors that cause the ammonia molecule to be polar.

3.2 Write down the equation for the reaction when ammonia gas dissolves in water.

3.3 Explain the formation of the dative covalent bond in the reaction in **3.2** above.

3.4 Sketch the Lewis structure of the ammonium ion.

3.5 What is the shape of the ammonium ion?

Question 4

4.1 The boiling point of water is 100°C, whereas the boiling points of some other hydrides of Group VI have values of -62°C, -32°C, -4°C, etc. Explain why the boiling point of water is 'abnormally' high.

4.2 Give the name of the ion that is formed when a water molecule combines with a hydrogen ion.

4.3 Name the kind of bonding between the oxygen atom and the hydrogen ion in the ion that was formed in **4.2**.

4.4 Name a molecule having the same shape as the ion formed by the reaction in **4.2** above.

Question 5

Carbon and oxygen form well known compounds when combined with hydrogen.

5.1 Give the Lewis structure for the compound formed with hydrogen and a single:

  5.1.1 carbon atom.

  5.1.2 oxygen atom.

5.2 What is the name of each of these compounds?

5.3 What is the shape of the molecule of each compound?

5.4 By means of which forces are the molecules of these two compounds respectively kept together? Which force would you consider to be the strongest? Why?

Question 6

From the following substances, select one which is referred to in the following statements. For each statement select one substance only.

H_2O; C; KCl; CH_4

6.1 Consists of polar covalent molecules.

6.2 Has polar covalent bonds, but the molecule as a whole is non-polar.

6.3 Mainly hydrogen bonding in the solid and the liquid phase.

6.4 Particles are held together by covalent bonding in the solid phase.

6.5 Dissociates in water.

Question 7

7.1 Write down the Lewis structure for a compound formed between phosphorus and hydrogen.

7.2 Will this compound have weaker or stronger permanent dipoles than a compound formed between nitrogen and hydrogen? Explain.

Question 8

Molecules tend to exert a force of attraction on each other.

8.1 What are these forces called?

8.2 In which two aspects do these forces differ from those of covalent bonds?

8.3 Name the bond type that causes the high boiling point of water.

4. Answers for Worksheet 2

Question 1

1.1.1 NaCl (any ionic compound – metal and non-metal).

1.1.2 H_2 (any diatomic element).

1.2.1 H_2O (any polar covalent bond, non-metal and non-metal).

1.2.2 The molecule is not symmetrical in shape.

Question 2

2.1 The electrons in each atom is attracted to the nuclei of their own atom and the nuclei of the other atom.

The electrons in each atom are repelled away from the electrons in the other atom.

The nuclei of each atom also repel each other.

When the forces of attraction are greater than the forces of repulsion the two atoms will bond.

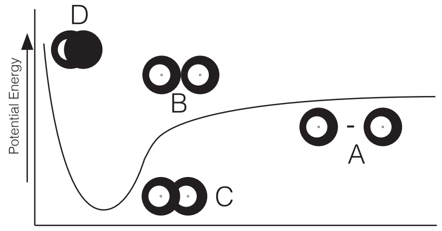
The atoms are held together by the electrostatic attraction between the positive charges on their nuclei and the negative charge on the shared electrons.

2.2 **A.** When the atoms are far apart there is no attraction between them, so the potential energy is zero.

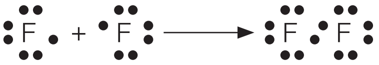
B. As the two atoms approach each other the potential energy decreases.

C. The molecule is then formed when the potential energy is at the lowest point.

D. As the atom then move closer together, the force of repulsion increases and the potential energy increases.



Change in potential energy when two F atoms approach each other

2.3 

Question 3

3.1 The polar bond between N and H.

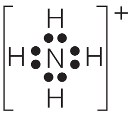
The non-symmetrical shape of the molecule.

3.2 $NH_3 + H_2O \rightarrow NH_4^+ + OH^-$

3.3 An H^+ ion (from the H_2O) requires an electron pair.

The lone pair on the NH_3 molecule becomes the shared pair between the H^+ ion and the NH_3 molecule.

Thus forming the dative covalent bond.

3.4 

3.5 Tetrahedral

Question 4

4.1 There are hydrogen bonds between water molecules.

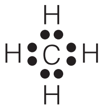
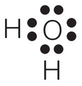
There are very strong intermolecular forces which increase the boiling point as these bonds require more energy to break.

4.2 Hydronium

4.3 Dative covalent bond

4.4 Ammonia

Question 5

5.1.1		**5.1.2** 
5.2	Methane	Water
5.3	Tetrahedral	Angular
5.4	Van der Waals	Hydrogen bonding

Hydrogen bonding is the strongest because it is shorter and directional.

Question 6

6.1 H_2O

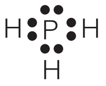
6.2 CH_4

6.3 H_2O

6.4 C

6.5 KCl

Question 7

7.1 

7.2 Weaker.

Between P and H the ΔEN = 0; but between N and H the ΔEN = 0,9.

Question 8

8.1 Intermolecular forces.

8.2 They are between molecules (not the atoms).

They are weaker than covalent bonds.

8.3 Hydrogen bonds.