CL Education

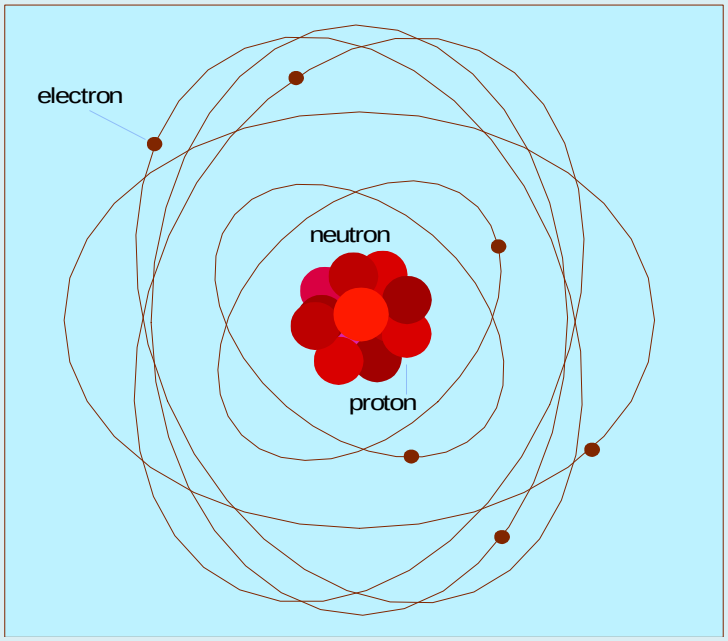
IGCSE Physical Science - Core

Welcome

Congratulations on choosing to complete your **IGCSE Physical Science** through C*L Education.* Not only is the course one of the finest distance education courses available but being based on the Cambridge International Examinations syllabus, IGCSE Physical Science and the other subjects offered by C*L Education* are recognised and accepted at tertiary institutions around the globe.

IGCSE Physical Science further explores the fascinating world of the Physical Sciences. We at C*L Education* hope you will enjoy the journey through the course as much as we enjoyed putting it together for you. Do remember that the course is a full science and as such will require you to have a detailed knowledge of the course content as well as to be able to interpret new information and draw conclusions based on scientific methodology. Have fun and work hard, that way you will get the best out of yourself and the course.

The C*L Education* team



How to use this course

This **IGCSE Physical Science** course is designed to be completed in thirty weeks and allow entry to the IGCSE **Physical Science** Extended theory and Alternative to practical examinations. This should also allow plenty time to do the required revision.

The course is based on the text books;

Chemistry for IGCSE
Roger Norris and Roger Stanbridge
ISBN 9781408500187

Physics for IGCSE
Jim Breithaupt and Viv Newman
ISBN 9781408500194

Both are printed by Nelson Thornes and **fully endorsed** by University of Cambridge International Examinations for use with their syllabus.
You will need to have a copy of these books. Follow this link to purchase the texts from Kalahari.net.
Chemistry http://www.kalahari.net/books/Chemistry-for-IGCSE/632/33137604.aspx and
Physics http://www.kalahari.net/books/Physics-for-IGCSE/632/33634434.aspx

The work you need to do is split up into week by week sections so that you are aware of where you are in the course and what is required. Try to stick to this but remember it is a guideline. You may find that you may need more or less time in different weeks but don't rush it. Complete the tasks thoroughly and give yourself enough time to assimilate the work – there is a great deal of it!

You should be doing approximately three hours per week on this subject. You will probably struggle if you do less but work smart rather than long. Plan your time carefully.

Follow the course in the sequence given to you in the work programme details. This sequence is based on what ***Cambridge International Examinations*** (CIE) recommends, the textbook and many years of teaching AS Biology. The work does also build on previous knowledge that may be lacking if done out of sequence.

In addition to the web sites, blogs and links given in the course details, you should also go online to find your own information on the various topics. Read magazines such as New Scientist, Nature, Focus and National Geographic if you can. CIE expects a wider knowledge than just that given in the syllabus and these are excellent publications that will help with this.

When answering the assignments make use of all the resource available to you and take as much time as you need. These are meant as a learning exercise, so research your answers and then write them down. Also bear in mind that CIE expects you to be able to apply your knowledge as well as know the detail.

A syllabus as issued by CIE can be found and downloaded from http://www.cie.org.uk/qualifications/academic/middlesec/igcse/subject?assdef_id=837 . You should refer to it often so that you are sure that all the required areas have been covered and that you know what CIE expects of you. There are also a number of good ideas and suggestions in the syllabus as well as past papers and mark schemes!

If you are having a problem with any part of the course please contact your course tutor.

Course Overview for IGCSE Physical Science

Chemistry

- Week 1 – Particles and Purification
- Week 2 – Atoms, Elements and Compounds / Structure and Bonding
- Week 3 – Assignment 1

Assignment 1: due by end of Week 3

- Week 4 – Formulae and Equations
- Week 5 – Chemical Changes / Speed of Reactions
- Week 6 – Speed of Reaction Continued
- Week 7 - Chemical Reactions / Acids and Bases
- Week 8 – Assignment 2

Assignment 2: due by end of Week 8

- Week 9 – Making and Identifying Salts
- Week 10 – The Periodic Table
- Week 11 – Metals and Reactivity / Metal Extraction
- Week 12 – Assignment 3

Assignment 3: due by end Week 12

- Week 13 – Air and Water / The Chemical Industry
- Week 14 – Organic Chemistry and Petrochemicals / The Variety of Organic Chemicals
- Week 15 – Assignment 4

Assignment 4: due end of Week 15

Physics

- Week 16 – Motion
- Week 17 – Forces and Their Effects / Forces in Equilibrium W
- Week 18 – Assignment 5

Assignment 5: due by end of Week 18

- Week 19 – Energy
- Week 20 and 21 – Thermal Physics
- Week 22 – Assignment 6

Assignment 6: due by end of Week 22

- Week 23 – Waves and Light
- Week 24 - Sound and Magnetism
- Week 25 – Electrical Charge and Electrical Energy
- Week 26 - Assignment 7

Assignment 7: due by end of Week 26

- Week 27 – Electrical Circuits
- Week 28 – Electromagnetism
- Week 29 - Radioactivity
- Week 30 – Assignment 8

Assignment 8: due by end of Week 30

Assignment 8 Past Papers P1, P2 (core) or P3 (extended) and P6

Nov 2010 for June / November 2011 examination

Assignment 9: ***Done under exam conditions*** due by mid September for October/November or Mid April for May/June Exam session

CL Education

IGCSE Physical Science

Chemistry

Study Programme

Tips on Making Notes– please read this!

With every first reading of the text, make sure that you understand what is being presented; some text may need a second reading before the content is fully understood.
The purpose of making notes is to have a user friendly summary of all the content that is to be examined.

You will need to develop a method of recording the content from each lesson - do not merely copy the text, you are wasting your time.

Here are some suggestions for note making to try, as you progress in developing a method that works for you:

- For each lesson, make a list of the terms in bold print and learn their meanings (the glossary at the end of the textbook gives all the bold printed terms and their meanings)

- Make use of sub headings to highlight the different aspects of the topic you are studying

- Under the subheadings record the main points in ways that make it easy to pick out the facts and show how the facts relate to each other. Use a combination of techniques, such as, bullets, point-form, mind maps, flow diagrams, labelled line drawings and tables.

- The Learning Objectives at the beginning of each lesson state clearly what you should master in that lesson. For example, you must be able to state or define or describe or explain, and so on. Keep these objectives in mind as you make your notes and make sure that by studying your notes (and the text) you achieve these objectives.

- The diagrams convey important information and should be thoroughly inspected; you will be required to reproduce certain diagrams in the exams. References to these diagrams are given in the Guide Notes.

Particles and Purification *(pages 2-17)*

Preview of Unit 1

We look at how theory explains the *three states of matter* and
between the three states.
Diffusion happens because particles are in motion.
We find out how coloured substances can be separated, in a process called *chromatography.*

The concepts of *pure substances* and *mixtures* are introduced as well as the common methods for *separating mixtures* to produce pure substances.
We are introduced to *apparatus for measuring* common physical quantities, such as, mass, time, temperature and volume.

Guide Notes to Unit 1

1.1 Solids, Liquids and Gases (Pages 2-3)

- Before reading the text, take note of the learning outcomes. You must be able to carry out the tasks (describe… and explain…) at the end of the lesson.
- Read the text once before continuing with these guide notes.
- Work through the text again, making notes of the concepts and terms dealt with. Develop a summary –type method of note making, using bullet- and point- form, labelled diagrams, flow diagrams and mind maps.
- Read the captions in Fig. 1.1.1, highlighting the distinguishing physical features of each state.
- Fig 1.1.2 compares the particles' behaviour and condition.
- Fig 1.1.3 relates energy changes to the changes in state.
- Fig 1.1.4 is called a heating curve and shows an interesting effect - while changing between states, the temperature of a substance remains constant. Thus, the reading on a thermometer held in a kettle of boiling water, remains at 100 ºC.
- Have you have grasped the key points on pg 3? If you have, well done! If not, then look over those aspects again that were not made clear.

Activities **Solids, Liquids and Gases**

1. Answer the summary questions, pg 3; all the answer are in the text.

2. Draw a table, comparing the physical properties, particles' behaviour and condition of particles of the three different states. The vertical columns are headed with the states and the horizontal rows are headed with the properties, behaviour and conditions; - I can locate 7 separate headings for the rows.

3. Without consulting the text, try to redraw fig 1.1.3, starting with the gas state on the left, and the solid state on the right. Include the energy changes.

4. The graph shows a heating curve. Can you guess the shape of a cooling curve? (Hint: The curve begins with the substance at a high temperature in the gas state, and as time passes the temperature drops.)

5. Answer exam-style question 3(a), (b), page 16. See unit-end for answers.

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1.2 Diffusion (Pages 4-5)

- Before reading the text, note the learning outcomes.
- Read the text once before continuing with these guide notes; omit the extension content.
- Read the caption to fig 1.2.1, which shows the diffusion process.
- Aspects of the demonstration with hydrochloric acid and ammonia are frequently dealt with in exams.
- The last sentence of paragraph 3 (pg 4) and the Examiner Says, stress the fact that diffusion is a random event.
- Make sure that you have grasped the Key Points.

Activities **Diffusion**

1. Follow this link to a video clip on Brownian motion, showing smoke particles seen under a microscope; http://www.youtube.com/watch?v=iB7Eu7U73qg Their haphazard motion is due to the random motion of the invisible air particles bumping into them from all directions. Find out why this demonstration of diffusion is called Brownian motion.

2. Answer the summary questions on page 5.

3. The first 2 paragraphs on pg 4 are reproduced below. Without consulting the textbook, try to guess the missing words/phrases.

In liquids and gases the particles are constantly moving and changing [ ] as they hit other particles. They seem to move in any direction – they move in a **random** way. The idea that particles are constantly moving is called the **kinetic particle theory**. In the last unit you used the kinetic particle theory to explain the properties of [ ].

The random movement of different particles so they get [ ] up is called **diffusion**. Diffusion results in the particles [ ] throughout the space available. The overall direction of the movement is from where the particles are more concentrated to where the particles are less concentrated. However, the particles are moving randomly, so some are moving from less concentrated to more concentrated regions as well!

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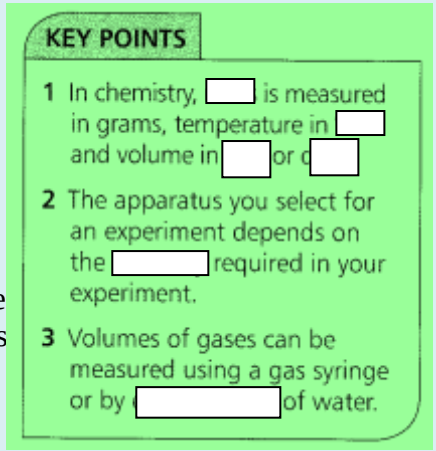
1.3 Apparatus for Measuring (pg 6-7)

- Read and reflect on the learning outcomes.
- Read the text before continuing with these guide notes. Make sure you understand what is been discussed.
- Four different measurable quantities are being discussed. Reflect on the four quantities, noting the symbol for each quantity and their common units.
- Make sure you can recognize each item of volume measuring apparatus; which are used for liquids, and how gas volumes may be measured. (Textbook error: Can you spot the measurement labelling error of the burette in fig. 1.3.1? A clue is given in the text, where the use of a burette is noted.)
- Note the caption of fig. 1.3.2
- Take in the apparatus arrangement in fig. 1.3.3, for measuring gas volume.
- Note the meaning of the word accuracy, and the three conditions for ensuring accurate results.

Activities

Apparatus for Measuring

1. Fill in the words missing from the Key Points for this lesson, shown alongside.



2. Using a red pencil crayon, underline the four different measurable quantities discussed in this lesson. Underline their symbols, using a blue pencil crayon, and underline the units in green.
   Record this data in a table with headings – quantity, symbol, units.

3. The author has mentioned at least one precaution/ condition when taking measurements for each quantity. Alongside each quantity record the precaution/condition.

4. From memory, draw a neat, labelled diagram of the apparatus set up for measuring gas volume by water displacement.

5. Answer exam-style questions, 1, page 16.

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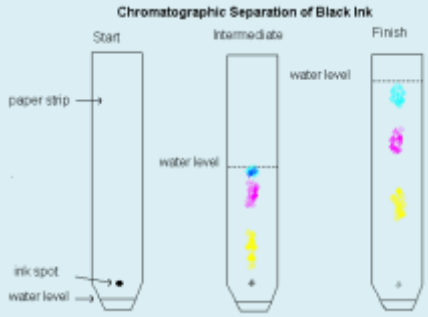
1.4 Paper Chromatography (Pages 8-9)

- Take note of the learning outcomes.
- Read the text; include the extension text but not the calculations.
- In the second paragraph, the principles on which chromatography works is mentioned, namely, differences in solubilities and differences in attraction between substances.
- Make sure you can describe step-wise, the making of a chromatogram.
- You will need to recall the two uses of chromatography.

Activities **Paper Chromatography**

1. Read the key points.
2. Answer the summary questions.
3. See how you cope with the exam-style question on page 17; question 5.



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1.5 Is that Chemical Pure (Pages 10-11)

- Take note of the learning outcomes.
- Read the text before continuing with the guide notes.
- Note the meaning of the term purity.
- Pure substances melt and boil at definite temperatures.
- Note how impurities affect melting and boiling points; they raise the boiling points and lower melting points of substances.
- Have you noted the various ways of purifying mixtures.

Activities **Is that Chemical Pure**

1. Read the key points.
2. Answer the summary questions.
3. List 6 methods that can be used to separate mixtures.
4. Answer exam-style question 4 on page 17.

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1.6 Methods of Purification **(**Pages 12-13)

- This lesson describes two methods of separation, *filtration* and *crystallisation*. They are often used in chemistry so make certain that you learn the steps of each method and how to use the terms.
- The lesson also describes a separation method named *solvent extraction*; this too you must learn.
- Read the text carefully, as you must understand the content, know the meaning of the terms and use them correctly.
- You should be able to draw and correctly label the apparatus as it is used in figures 1.6.1 to 1.6.3.

Activities **Methods of Purification**

1. Read the key points.
2. Answer the summary questions.
3. Take information from the text and make a table, summarising separating methods. Use the following headings:
   Separating method; Type of mixture; Steps; Conditions. (An example of a condition for decanting would be …solids must have heavy particles).
   Please attempt this type of question; it helps with the sorting and memorising of facts.

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1.7 More about Purification (pages 14-15)

- This lesson continues the study of separating substances. Read the learning objectives on page 14. You are expected to describe a process, namely, distillation, and to make a choice between different separating methods. The choice you make depends upon the physical features of the substances in the mixture, their states, solubilities or boiling points.
- Carefully read the text before continuing with these guide notes.
- In brief, make notes about simple distillation: when it's used; how it works; the purpose of the condenser. **Distillate** is a new term to record and know.
- Make a neat simple drawing with labels, of the apparatus for simple distillation and pay careful attention to the design of the condenser. Cold water entering, surrounds the inner tube which contains the hot liquid vapours.
- What two changes in state occur during distillation?
- In brief make notes on fractional distillation: when it's used; how it works.
- View the animated clip showing fractional distillation of crude oil: http://www.wwnorton.com/college/chemistry/gilbert2/tutorials/interface.asp?chapter=chapter_12&folder=distillation

- Record the two important points to keep in mind when choosing the appropriate separating method – to know about the different separating methods and to know about the properties of the mixed substances.

Activities

More about Purification

1. Read the key points. Are they clear to you? If not, work through the guide notes again.

2. Answer the summary questions. For a clue to 2(d), refer to a method dealt with in lesson 1.4.

3. Answer exam-style question 2, 3(c),

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Work through Unit 1 Summary Questions on page 16.

These end of unit Summary Questions serve as an indicator of how you are progressing with the course – your study techniques and grasp of the content. If you can correctly complete THIS exercise in 20 minutes it means you are making good progress.
If you have to refer back to the text for most of the answers and it takes you longer than 20 minutes to complete, then you need to reflect on and adjust how you are tackling the course material. There is still time to improve.

Answers to exam- style questions: Particles and Purification (pages 16-17)

1. *C*
2. *D*
3. *(a)* *(i) The red dye has spread throughout the water*
   (ii) The water would have evaporated, leaving behind red coloured crystals.
   (b) *(i) Closely packed and vibrating about fixed positions.*
   (ii) Closely packed and bumping and sliding over each other.
   (c) *Gently heat the red solution in an evaporating dish. At regular intervals, test for the crystallisation point by placing a drop of the solution onto a cold tile. The point is reached if crystals form immediately. Allow the solution to cool, when crystals begin forming. Filter and dry the crystals with filter paper.*
4. *(a)* *(i) Melting*
   (ii) Boiling
   (iii) Condensing
   (b) *Melting and boiling. The particles gain enough energy to overcome attractive forces holding them together.*
   (c) *Particle have total freedom of movement with no fixed positions.*
   (d) *(i) Nitrogen and oxygen*
   (ii) Iron and salt
   (e) *It is a mixture of water, sugar, colouring agents, orange flavourants.*
5. *(a)* *See page, fig 1.4.2*
   (b) *(i) On the base line.*
   (ii) C
   (iii) B
   (iv) A
6. *(a)* *(i) The particles gain enough energy to overcome all attractive forces and move freely into the atmosphere.*
   (ii) The particles of air continually collide from all directions with these particles, causing them to spread apart and move along the tube.
   (b) and (c) *Extension content – leave out.*
7. *(a)* *Four*
   (b) *The dye spot highest on the filter paper is the most soluble in this solvent.*
   (c) *Extension content –*
   (d) *Try other solvents, such as, propanone.*
   (e) *Extension content –*