

**PROVISIONAL**

# TRANSITION GUIDE

Theme: Atomic Structure  
and the Periodic Table

June 2015

GCSE (9–1) Twenty First  
Century Combined  
Science B



We will inform centres about any changes to the specification. We will also publish changes on our website. The latest version of our specification will always be the one on our website ([www.ocr.org.uk](http://www.ocr.org.uk)) and this may differ from printed versions.

Copyright © 2015 OCR. All rights reserved.

#### Copyright

OCR retains the copyright on all its publications, including the specifications. However, registered centres for OCR are permitted to copy material from this specification booklet for their own internal use.

Oxford Cambridge and RSA Examinations is a Company Limited by Guarantee. Registered in England. Registered company number 3484466.

Registered office: 1 Hills Road  
Cambridge  
CB1 2EU

OCR is an exempt charity.



*This resource is an exemplar of the types of materials that will be provided to assist in the teaching of the new qualifications being developed for first teaching in 2016. It can be used to teach existing qualifications but may be updated in the future to reflect changes in the new qualifications. Please check the OCR website for updates and additional resources being released. We would welcome your feedback so please get in touch.*

# Welcome

Welcome to the KS3–KS4 transition guide for **GCSE (9–1) Twenty First Century Combined Science B**.

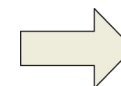
Key Stage 3 to 4 Transition Guides focus on how a particular topic is covered at the different key stages and provide information on:

- Differences in the demand and approach at the different levels;
- Useful ways to think about the content at Key Stage 3 which will help prepare students for progression to Key Stage 4;
- Common student misconceptions in this topic.

Transition guides also contain links to a range of teaching activities that can be used to deliver the content at Key Stage 3 and 4 and are designed to be of use to teachers of both key stages. Central to the transition guide is a Checkpoint task which is specifically designed to help teachers determine whether students have developed deep conceptual understanding of the topic at Key Stage 3 and assess their 'readiness for progression' to Key Stage 4 content on this topic. This checkpoint task can be used as a summative assessment at the end of Key Stage 3 teaching of the topic or by Key Stage 4 teachers to establish their students' conceptual starting point.

Key Stage 3 to 4 Transition Guides are written by experts with experience of teaching at both key stages.

Go to topic comparison



## Key Stage 3 Content

### Key Stage 3 National Curriculum Content

#### Atoms, elements and compounds

- a simple (Dalton) atomic model

#### The Periodic Table

- the varying physical and chemical properties of different elements
- the principles underpinning the Mendeleev Periodic Table
- the Periodic Table: periods and groups; metals and non-metals
- how patterns in reactions can be predicted with reference to the Periodic Table
- the properties of metals and non-metals
- the chemical properties of metal and non-metal oxides with respect to acidity.



## Key Stage 4 Content

### GCSE Content

#### C2.1

- calculate numbers of protons, neutrons and electrons in atoms and ions, given atomic number and mass number of isotopes or by extracting data from the Periodic Table

#### C2.2

- explain how the position of an element in the Periodic Table is related to the arrangement of electrons in its atoms
- describe how Mendeleev organised the elements based on their properties and relative atomic masses
- describe metals and non-metals and explain the differences between them on the basis of their characteristic physical and chemical properties

#### P5.1 and C2.1

- describe the atom as a positively charged nucleus surrounded by negatively charged electrons, with the nuclear radius much smaller than that of the atom and with almost all of the mass in the nucleus
- describe how and why the atomic model has changed over time

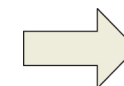
**KS3**



**KS4**

To return to this page at any point click on this button.

Explore the Guide



KS3



KS4

Comment

Possible Teaching  
Activities (**KS3 focus**)

Checkpoint Tasks

Possible Teaching  
Activities (**KS4 focus**)

Possible Extension  
Activities (**KS4 focus**)

Resources, links and  
support

## Comment

At KS3 students present the structure of the atom using Dalton's atomic model. Dalton believed that atoms were tiny indestructible units which were solid particles and this is how it is understood by many students at KS3. At GCSE, students describe the atom as a positively charged nucleus surrounded by negatively charged electrons, with the nuclear radius much smaller than that of the atom and with most of the mass in the nucleus.

A suggested teaching sequence for the beginning of the GCSE course would be to first discuss how the modern model of the atom developed over time as scientists rejected earlier models and proposed new ones to fit the currently available evidence. Stages in the development of the model included ideas by the ancient Greeks (4 element ideas), Dalton (first particle model), Thomson ('plum pudding' model), Rutherford (idea of atomic nucleus) and Bohr (shells of electrons). Each stage relied on Scientists using reasoning to propose models which fitted the evidence available at the time. Models were rejected, modified and extended as new evidence became available. The development of the atomic model involved scientists building on and peer reviewing each other's work, by making explanations and making and checking predictions based on the model.

Once students have grasped the modern model of the atom, they can then start to relate the chemical properties of substances to the atomic structure. At KS3 students begin to recognise the varying physical and chemical properties of different elements. At GCSE, students need to identify why different elements have these varying properties, using the atomic model and ideas about electron shells. This is an abstract context, so it would be ideal to begin this with an illustrative activity, such as demonstrating the group 1 metals reactivity with water. Students can physically see the variation in reactivity between the metals. They can then begin to analyse how this may link with their electron configuration.

The resources provided for GCSE and A Level can be used as class activities for learning, revision or be set as home work. Some are interactive; others can be printed as worksheets. The periodic table from Syngenta would allow for an ideal research activity. Students can use the periodic table to find out about elements, the interactive element of the resource shows students that the table is far more than just a list of symbols. The Quiz could be completed interactively, or the questions can be used to assess learning and misconceptions in the lesson. The KS3 checkpoint activity provided could be used as a standout activity at the end of the KS3 course before beginning GCSE or, it may be more useful to use as individual starters to GCSE lessons to identify misconceptions and bridge gaps.

Other than the model of the atom, much of what is taught at GCSE is an extension of what is learnt at KS3. However, by studying the research behind the atom models and bringing in concepts such as protons and neutron, it makes for an ideal starting point. The activities provided should enable teachers to challenge the learning of students at KS3, preparing them for the GCSE.

**Topic:** Atomic Structure and the Periodic Table

KS3



KS4

Comment

**Possible Teaching  
Activities (KS3 focus)**

Checkpoint Tasks

Possible Teaching  
Activities (**KS4 focus**)

Possible Extension  
Activities (**KS4 focus**)

Resources, links and  
support

## Possible Teaching Activities (KS3 focus)



Click here to  
view page

### Periodic table

Syngeta

This site provides a 'live' periodic table. Students can view the periodic table, but unlike a hard copy of the table they can highlight different groups, research facts about each element and begin to see patterns between groups. It is a much more visual way to view what can seem like just a list of numbers and symbols to a KS3 student.

**Resources:** <http://www.syngentaperiodictable.co.uk/periodic-table.php?keyStage=4>



Click here to  
view page

### Atoms and Elements Quiz

Doc Brown

Students can self assess their understanding of the atoms and elements topic using this interactive quiz. If students do not get the correct answers, the site gives the student the option to visit the 'chemistry clinic' so they can revise.

**Resources:** <http://www.docbrown.info/ks3chemistry/8EmcHP6.htm>



Click here to  
view page

### Don't Stop Learning

Metals and non-metals gap fill task

A simple gap fill exercise with questions about the properties of metals and non-metals. If used interactively, there is a time limit for students with the activity. The students can check their learning. However, it can also be printed as a hand out resource.

**Resources:** [http://www.dontstoplearning.com/ks3science/9Ea\\_Metals\\_Nonmetals.htm](http://www.dontstoplearning.com/ks3science/9Ea_Metals_Nonmetals.htm)

KS3



KS4

Comment

Possible Teaching  
Activities (**KS3 focus**)

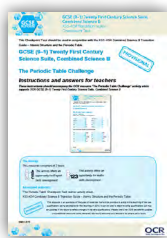
**Checkpoint Tasks**

Possible Teaching  
Activities (**KS4 focus**)

Possible Extension  
Activities (**KS4 focus**)

Resources, links and  
support

## Checkpoint Tasks



Click here to  
view page



Click here to  
view page

The checkpoint activities are a selection of sheets designed to check the key areas from Key Stage 3 before moving forward to Key Stage 4. The activities can be done individually or together.

### Periodic table challenge

The check point task is called the 'periodic table challenge'. There are 5 mini activities that become progressively more intellectually challenging. The task is designed to initially assess student's use of the periodic table with challenge 1 and 2. Challenge 3, 4 and 5 assess students understanding of the table and chemical reactions between elements.

The organisation of the activity will depend on the nature of the group. With motivated high ability, or competitive groups it would be ideal to turn each challenge as a race. Less confident or lower ability groups may prefer to work through it at their own pace. However, as the activity covers a range of skills it would be beneficial to check answers after each challenge. Problems and barriers with the individual challenges can be resolved challenge by challenge. These tasks will enable the class teacher to assess what knowledge and skills can be recalled from the KS3 topic before moving into the GCSE content. Answers are provided in the teachers section.

**Resources:** <http://www.ocr.org.uk/Images/221078-atomic-structure-and-the-period-table-checkpoint-task-checkpoint-instructions.pdf>

<http://www.ocr.org.uk/Images/221079-atomic-structure-and-the-period-table-checkpoint-activity.doc>

KS3



KS4

Comment

Possible Teaching  
Activities (**KS3 focus**)

Checkpoint Tasks

**Possible Teaching  
Activities (KS4 focus)**

Possible Extension  
Activities (**KS4 focus**)

Resources, links and  
support

## Possible Teaching Activities (KS4 focus)



### The atom

PBS Learning

An interactive tutorial about the atom. This activity teaches students about the structure of the atom using simulations. At the end of the tutorial there is a progress test about the structure of the atom.

**Resources:** <http://www.pbslearningmedia.org/resource/lps07.sci.phys.matter.theatom/the-atom/>

Click here to  
view page



### Build an atom

Royal Society of Chemistry and PhET

An interactive simulation where students can use combinations of protons, neutrons and electrons to build atoms and ions. Once they have built an atom the name of the atom will appear. For instance, if they place one neutron, proton and electron the computer will display 'hydrogen'. The class teacher could provide students with the names of elements and challenge them to build their atom. As an extension to this, there are also some atom related games to check understanding.

**Resources:** <http://www.rsc.org/learn-chemistry/resource/res00001433/build-an-atom-simulation>

Click here to  
view page



### Reaction Zone

Syngenta

This activity is particularly useful where experimental resources are not available. For example, if lessons are taught out of lab or work is set for self-study at home. The reaction zone allows students to react many elements with water, oxygen and other substances in a virtual lab. Students can then visualise the outcome through video links, with explanations and word equations. This activity may also be highly useful for an extension activity.

**Resources:** <http://www.syngentaperiodictable.co.uk/reaction-zone.php>

Click here to  
view page

KS3



KS4

Comment

Possible Teaching  
Activities (**KS3 focus**)

Checkpoint Tasks

Possible Teaching  
Activities (**KS4 focus**)

**Possible Extension  
Activities (KS4 focus)**

Resources, links and  
support

## Possible Extension Activities (KS4 focus)



### Atomic Structure – Follow on cards

Teachitscience.co.uk

A loop activity where students match the question with the answer on another card. Here, students should be able to self-correct themselves if the loop cannot be made. As a further extension, students could create their own loop.

**Resources:** <http://www.teachitscience.co.uk/allks3?CurrMenu=2135&resource=19388>



Click here to  
view page



### Reaction Zone

Syngenta

This activity is particularly useful where experimental resources are not available. For example, if lessons are taught out of lab or work is set for self-study at home. The reaction zone allows students to react many elements with water, oxygen and other substances in a virtual lab. Students can then visualise the outcome through video links, with explanations and word equations. This activity may also be highly useful for an extension activity.

**Resources:** <http://www.syngentaperiodictable.co.uk/reaction-zone.php>



Click here to  
view page

KS3



KS4

Comment

Possible Teaching  
Activities (**KS3 focus**)

Checkpoint Tasks

Possible Teaching  
Activities (**KS4 focus**)

Possible Extension  
Activities (**KS4 focus**)

**Resources, links and  
support**

## Resources, links and support



**Additional  
Topic 1**



**Additional  
Topic 2**



**Additional  
Topic 3**

As we develop Transition Guides for further topics we'll update these links, making it easy for you to browse all the guides for your chosen subject.



*Science Spotlight* – Our termly update *Science Spotlight* provides useful information and helps to support our Science teaching community. *Science Spotlight* is designed to keep you up-to-date with Science here at OCR, as well as to share information, news and resources. Each issue is packed full with a series of exciting articles across the whole range of our Science qualifications: [www.ocr.org.uk/qualifications/by-subject/science/science-spotlight/](http://www.ocr.org.uk/qualifications/by-subject/science/science-spotlight/)

Find resources and qualification information through our science page: [www.ocr.org.uk/qualifications/by-subject/science/](http://www.ocr.org.uk/qualifications/by-subject/science/)

Contact the team: [GCSEScience@ocr.org.uk](mailto:GCSEScience@ocr.org.uk)

Continue the discussion on the science community forum: <http://social.ocr.org.uk/> and follow us on Twitter, [@ocr\\_science](https://twitter.com/ocr_science)

To find out more about GCSE and A Level reform please visit: <http://www.ocr.org.uk/qualifications/gcse-and-a-level-reform>



We'd like to know your view on the resources we produce. By clicking on the 'Like' or 'Dislike' button you can help us to ensure that our resources work for you. When the email template pops up please add additional comments if you wish and then just click 'Send'. Thank you.

If you do not currently offer this OCR qualification but would like to do so, please complete the Expression of Interest Form which can be found here: [www.ocr.org.uk/expression-of-interest](http://www.ocr.org.uk/expression-of-interest)

**OCR Resources: *the small print***

OCR's resources are provided to support the teaching of OCR specifications, but in no way constitute an endorsed teaching method that is required by the Board and the decision to use them lies with the individual teacher. Whilst every effort is made to ensure the accuracy of the content, OCR cannot be held responsible for any errors or omissions within these resources. We update our resources on a regular basis, so please check the OCR website to ensure you have the most up to date version.

© OCR 2015 - This resource may be freely copied and distributed, as long as the OCR logo and this message remain intact and OCR is acknowledged as the originator of this work.

OCR acknowledges the use of the following content:  
Thumbs up and down icons: alexwhite/Shutterstock.com

Please get in touch if you want to discuss the accessibility of resources we offer to support delivery of our qualifications: [resources.feedback@ocr.org.uk](mailto:resources.feedback@ocr.org.uk)

[ocr.org.uk/gcsereform](http://ocr.org.uk/gcsereform)

OCR customer contact centre

**General qualifications**

Telephone 01223 553998

Facsimile 01223 552627

Email [general.qualifications@ocr.org.uk](mailto:general.qualifications@ocr.org.uk)

*For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored.*

© OCR 2015 Oxford Cambridge and RSA Examinations is a Company Limited by Guarantee. Registered in England.

Registered office 1 Hills Road, Cambridge CB1 2EU. Registered company number 3484466. OCR is an exempt charity.

