The Energy Re-Revolution

Key Stage 4 Programme – 2016-2017

Teacher Name Dr Hughes

Pupil Name_____

Timetable and Assignment Submission

Fill this in with your teacher.

Timetable – Tutorials

Tutorial	Date	Time	Location
1			
2			
3			
4			
5			
6			

Timetable – Homework Assignments

Homework Assignment	Description	Due Date
Tutorial 1		
Tutorial 2		
Tutorial 3		
Tutorial 4		
Tutorial 5		

Assignment Submission – Lateness and Plagiarism

Lateness	
Submission after 4.00pm on **Put date here**	10 marks deducted
Plagiarism	
Some plagiarism	10 marks deducted
Moderate plagiarism	20 marks deducted
Extreme plagiarism	Automatic fail

KS4 Programme 2016-17 – Pupil Feedback Report

Grade	Marks	What this means
1st	70+	Performing to an excellent standard at A-Level
2:1	60-69	Performing to a good standard at A-Level
2:2	50-59	Performing to an excellent standard at current key stage
3rd	40-49	Performing to a good standard at current key stage
Working towards a pass	0-39	Performing below a good standard at current key stage
Did not submit	DNS	No assignment received by The Brilliant Club

Lateness	
Any lateness	10 marks deducted
Plagiarism	
Some plagiarism	10 marks deducted
Moderate plagiarism	20 marks deducted
Extreme plagiarism	Automatic fail

Name of RIS Teacher			
Title of Assignment			
Name of Pupil			
Name of School			
ORIGINAL MARK / 100		**FINAL MARK / 100**	
DEDUCTED MARKS		**FINAL GRADE**	

If marks have been deducted (e.g. late submission, plagiarism) the teacher should give an explanation in this section:

Learning Feedback Comment 1 - *Enter Key Learning Priority Here*	
What you did in relation to this Key Learning Priority *Enter feedback here*	**How you could improve in the future** *Enter feedback here*
Learning Feedback Comment 2 – *Enter Key Learning Priority Here*	
What you did in relation to this Key Learning Priority *Enter feedback here*	**How you could improve in the future** *Enter feedback here*
Learning Feedback Comment 3 – *Enter Key Learning Priority Here*	
What you did in relation to this Key Learning Priority *Enter feedback here*	**How you could improve in the future** *Enter feedback here*
Resilience Comment	
How you showed learning resilience during the course *Enter feedback here*	**How you could build learning resilience in the future** *Enter feedback here*

Example

Contents

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Glossary of Keywords

The Energy Conversion Problem

The answer is hydrogen

Nano Size me

Let's bond – hydrogen style

Thermodynamics

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Course Rationale

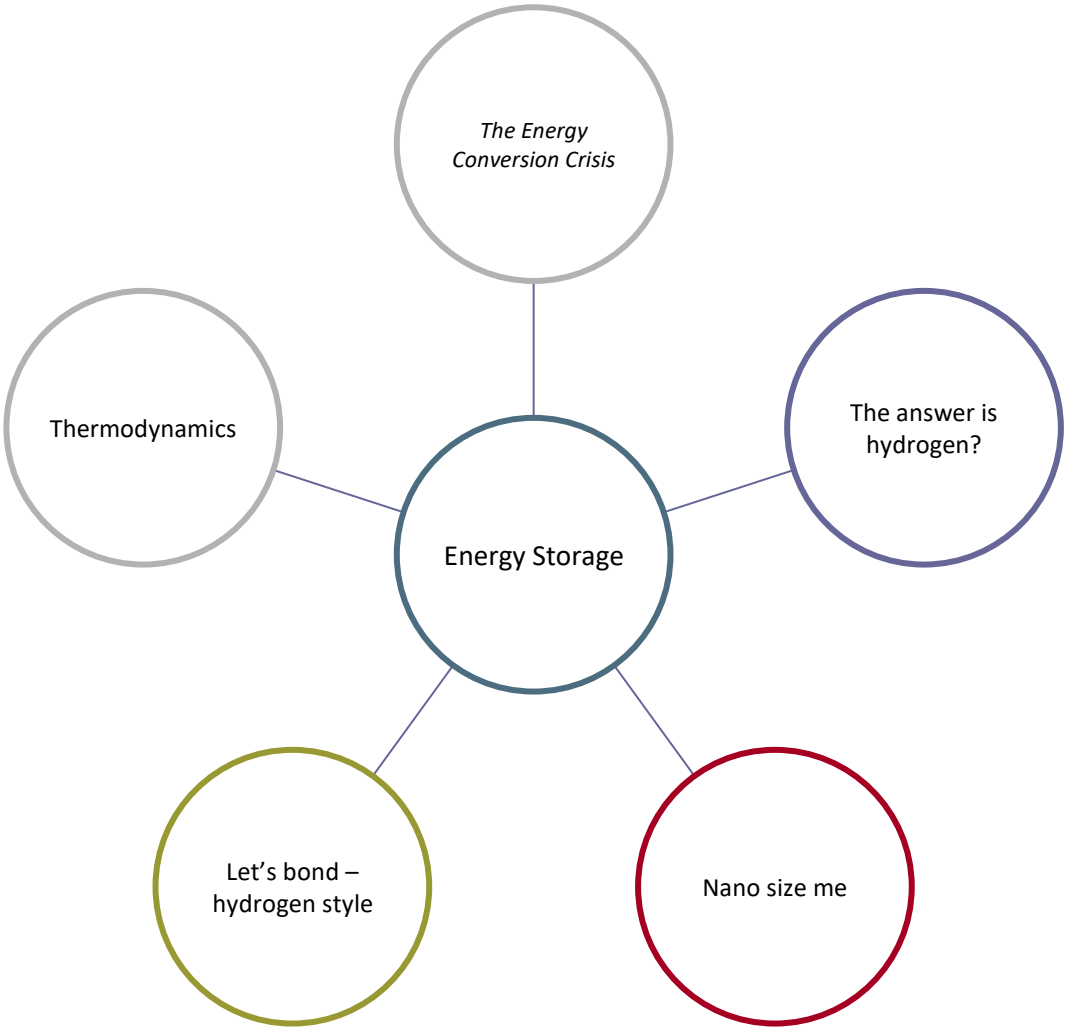
Pupils will learn to appreciate the scale of the energy industry, it's importance to the economy, to climate change and the future of human kind. They will learn to evaluate the best and worst aspects of many future technologies as well as suggesting a way forwards.

Energy use, transfer and efficiency are at the heart of once of the main concepts of the physics curriculum and so this course builds directly upon that.

This course is designed to promote students understanding of the energy industry but more importantly to develop their own ideas of surrounding the past and the future of energy security and critical thinking towards the development of new technology.

At a high level, the course is easy to understand and conceptualise.However, with the tutorials, all parties will be able to see the challenges present in the energy revolution and why it's such an exciting area of research.

Course Map


The Energy Conversion Crisis
Thermodynamics
The answer is hydrogen?
Energy Storage
Let's bond – hydrogen style
Nano size me

Mark Scheme

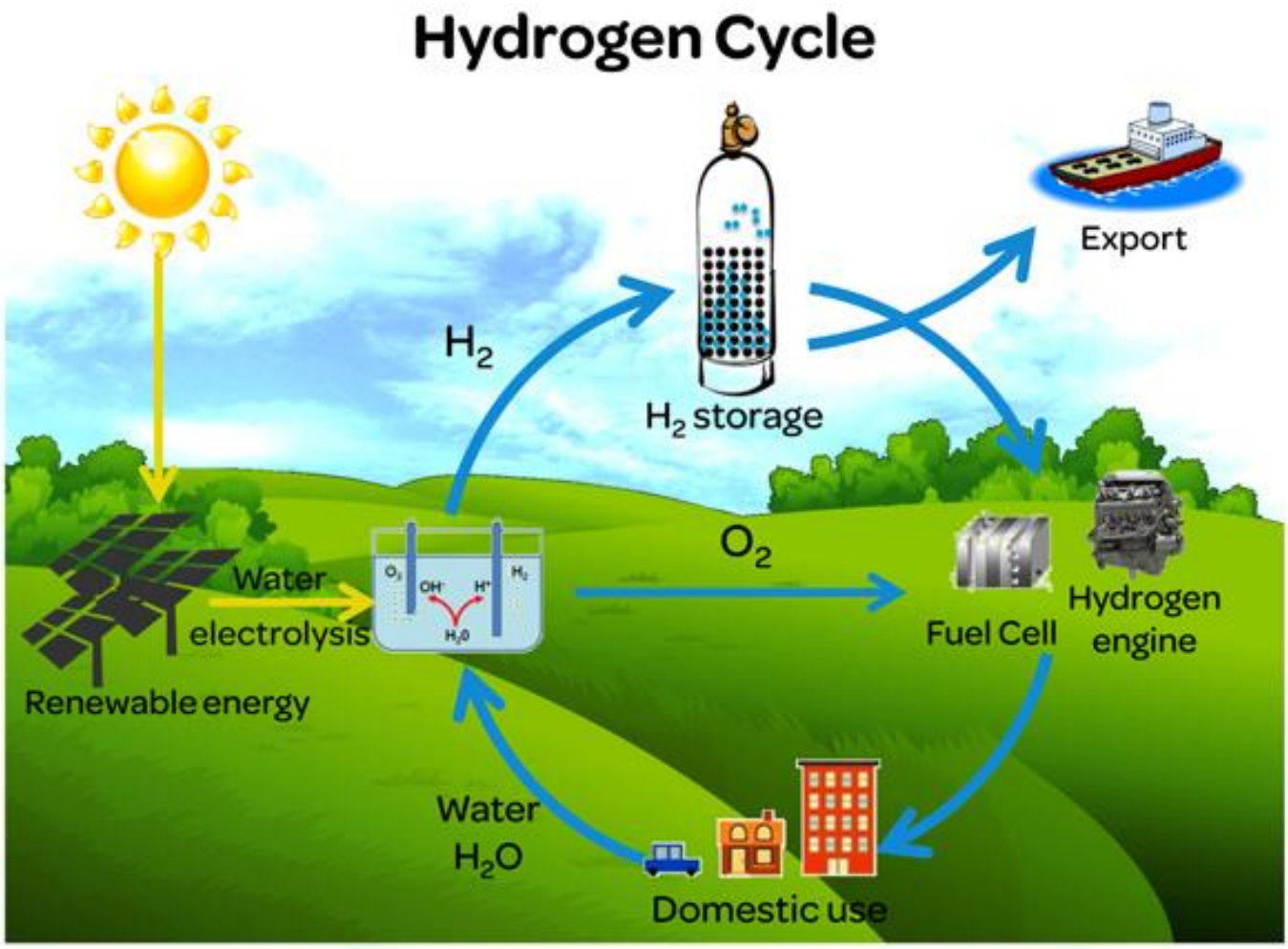
Key Skill	1st	2.2
Understanding	• Pupils clearly demonstrate understanding of the key issues within the energy industry transition, especially with thought to automation • Arguments balanced and thought out • Difference in vehicle sizes and requirements considers • Evidence of outward reading an subject knowledge	• Pupils demonstrate some understanding of the issues at a high level but can't go into too much comparative detail. • Arguments may be biased due to lack of understanding of some areas
Application of research	• Students clearly grasp the concept of the importance of scientific research with regards to development of a new economy • Technical knowledge of metal structure and interaction of hydrogen is mentioned	• Students know that there are technical details to overcome but do not provide much insight • Hydrogen storage is mentioned as a problem
Communication	• Technical terms are used throughout • Quantitative information given where appropriate • Arguments are expressed coherently	• Some technical terms used • Generally only qualitative information • Arguments slightly blurred

Glossary of Keywords

Word	Definition	In a sentence…
Hydrogen		
Energy density		
Volumetric		
Gravimetric		
Thermodynamics		
Enthalpy		
Entropy		
Efficiency		
Renewable		
Sustainable		
Fossil fuel		
Interstitial		
Physisorption		
Chemisorption		
Nano		
Micro		
Tera		

Notes page:

Tutorial 1 – The Energy Conversion Problem



An area of just 100×100 km (10,000 km^2) of solar panels with an efficiency of 10 % - for example in the Great Sandy in Western Australia - would produce enough energy for 1 billion people with an average consumption of 5kW per person.

Today's Key Question(s):

- What are our problems with energy?
- How might we go about solving this question?

What is the Purpose of Tutorial 1?

- To understand that all energy on earth is derived from the sun
- To be able to understand the scale of the energy problem
- To understand the motivation for moving towards other energy systems

Today's Homework is:

- Baseline Assessment and key word definitions

Homework 1 – Baseline Test

The homework assignment for the first tutorial is a baseline test to see your initial level of attainment in this subject area. The assignment will test for some or all of the subject specific skills that are required later in the final assignment. However, it is shorter than the final assignment and is will be an introduction to the subject as well as a challenge!

Do not worry too much about doing 'well' or 'badly' on the baseline test, it takes into account the fact that you may not be familiar with the subject area. It is designed to help you and your PhD tutor identify where you are at the start of the programme and to help you measure your progress along the way.

Tutorial 2 – The Hydrogen solution

Today's Key Question(s):

- Why is hydrogen a good solution to the energy crisis?
- What are the problems with using hydrogen as an energy carrier?

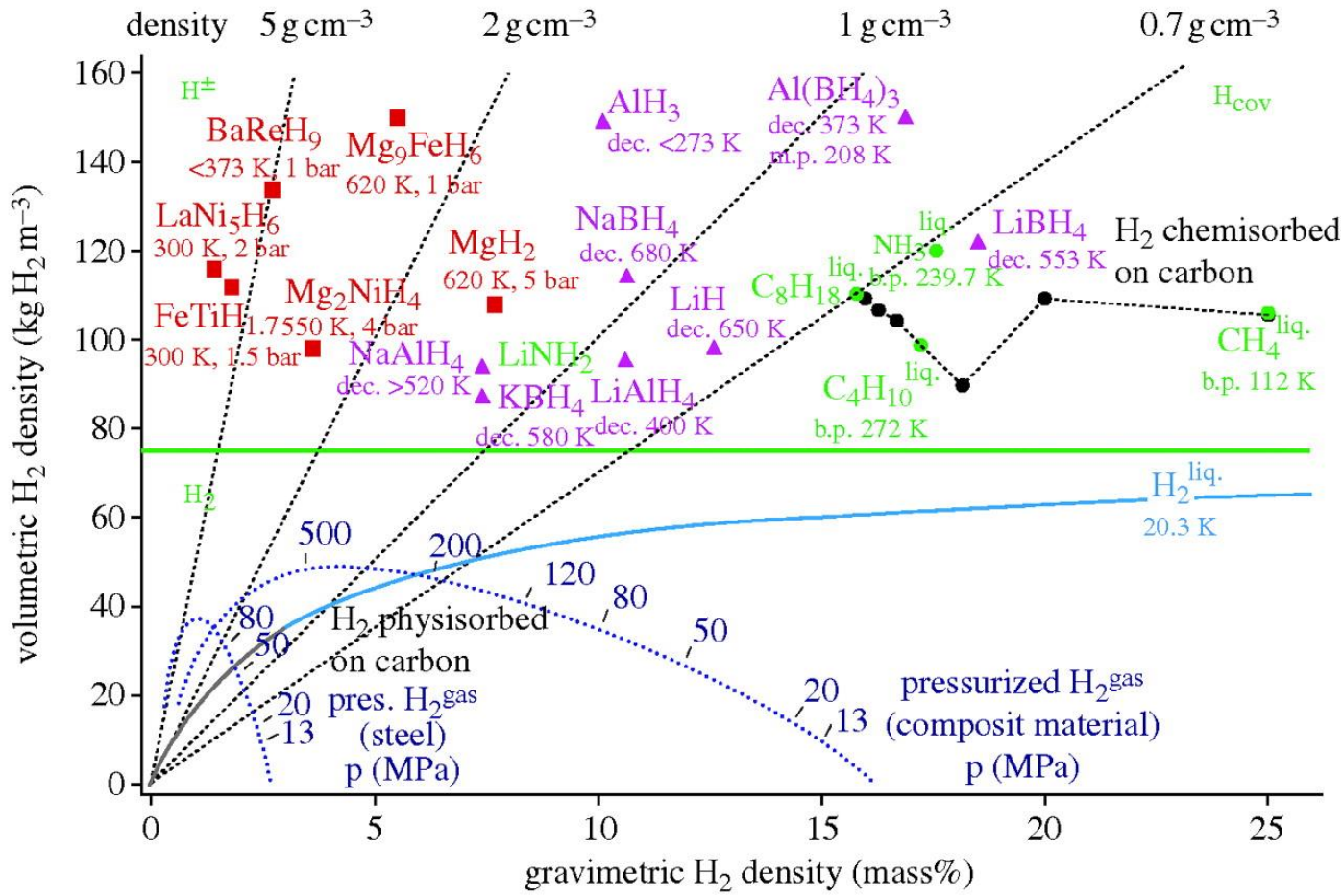
What is the Purpose of Tutorial 2?

- Introduce the terms gravimetric and volumetric
- Introduce energy density
- Introduce a primitive phase diagram

Today's Homework is:

- Read Zuttel et al – Hydrogen storage in mobile applications – a link will be emailed to you
- Catch up on areas that are unfamiliar to you

Tutorial 3 – The hydrogen storage conundrum



Today's Key Question(s):

- What is the problem with the hydrogen storage materials we have today?
- What can be done to improve these materials?

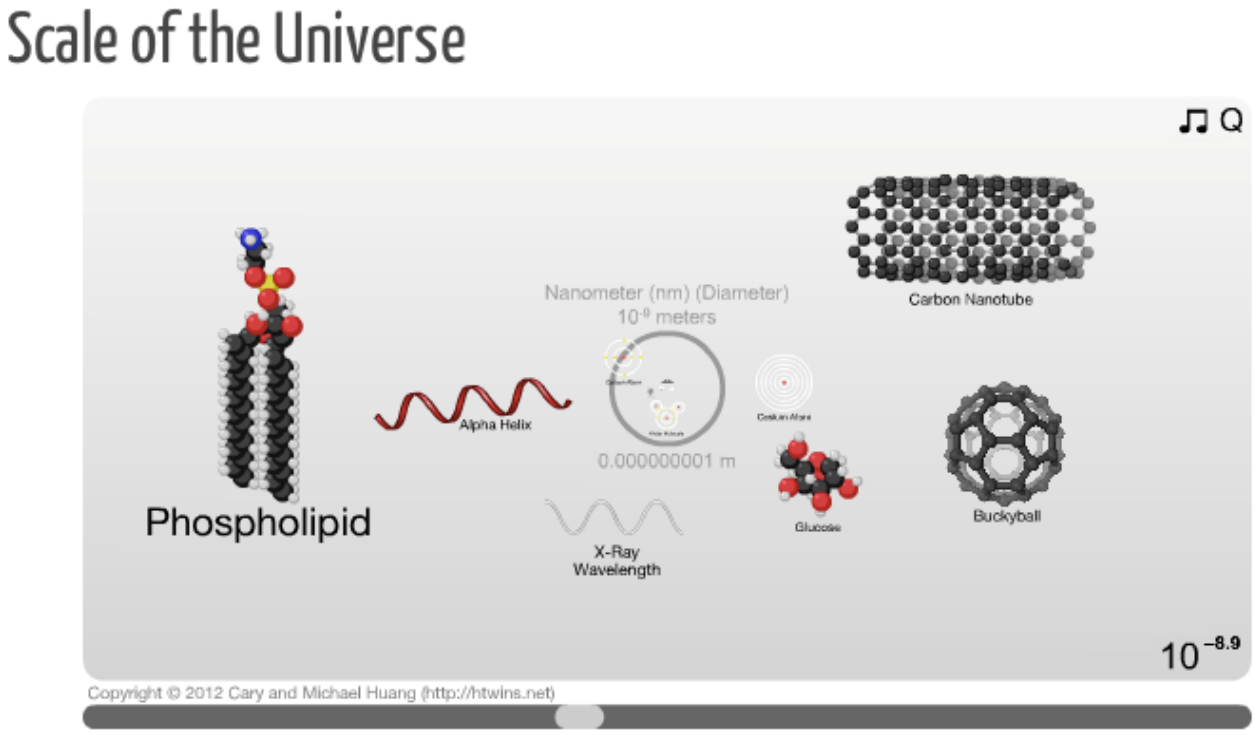
What is the Purpose of Tutorial 3?

- To understand the different types of bonding chemistries
- To understand how certain techniques are used to improve the properties of these materials
- To debate the issues around powder technology

Today's Homework is:

- Find out about some applications of nano - engineering

Tutorial 4 – Nano Size me



Today's Key Question(s):

- Describe the advantages of nano sizing for hydrogen storage
- Discuss the problems with nanosizing

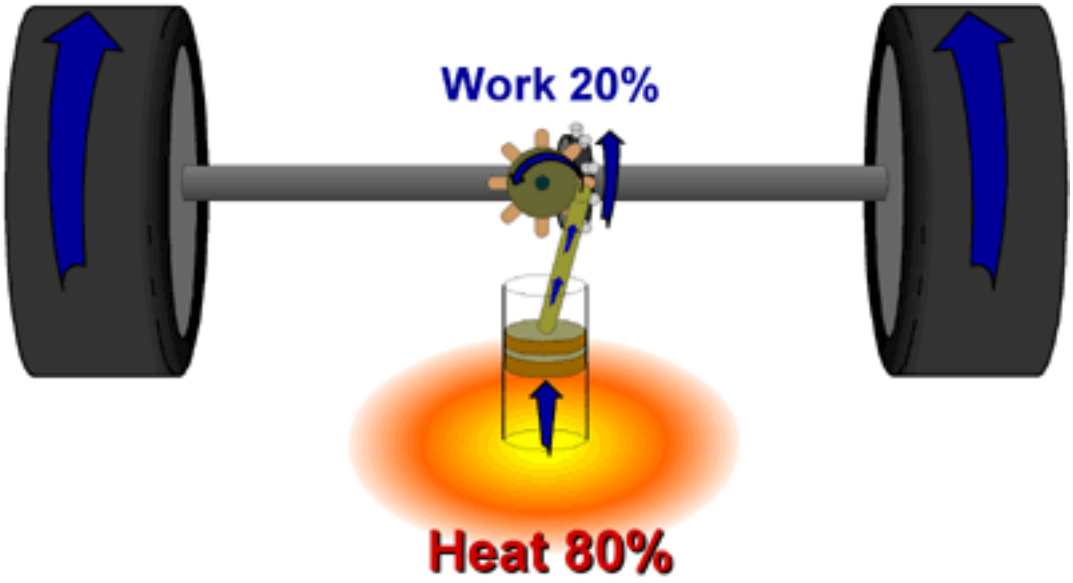
What is the Purpose of Tutorial 4?

- Derive the properties of nano sized materials
- Explain why nano sizing helps
- Describe how time can affect materials

Today's Homework is:

- Draft Final Assignment

Tutorial 5 – Thermodynamics



Today's Key Question(s):

- Why are thermodynamics important?
- Efficiency is a problem

What is the Purpose of Tutorial 5?

- Develop a basic knowledge of thermodynamic principles
- Discuss efficiency in terms of work done and useful energy lost
- Discuss heat engine vs electric motor efficiencies

Today's Homework is:

- Final Assignment

The Deadline is:

TBC

Tutorial 6 – Feedback

What is the Purpose of Tutorial 6?

- Reflect on skills learned on the programme with a view to encouraging resilience
- Receive feedback on final assignment

What are the key questions?

- What strengths have I demonstrated in my work and what areas of development are there left for me to address?
- What steps do I need to take to improve my academic output?

Activity 1 – Marking your own

Using the mark scheme, identify three things you did well and three things you could improve.

What went well?

1.

2.

3.

What could be improved?

1.

2.

3.

Activity 2 – Responding to feedback

Read through your feedback sheet and highlight on your assignment where you received positive feedback (one colour) and areas for improvement (different colour). You might find it helpful to annotate this with a brief comment or two.

Activity 3 – Looking Forwards: Think, Pair Share

1. Think about how you can use this feedback in your future school work.
2. Talk to your partner about how you both plan to make changes to your school work in the future as result of this feedback
3. Share your ideas as a group.

Appendix 1 – Referencing correctly

When you get to university, you will need to include references in the assignments that you write, so we would like you to start getting into the habit of referencing in your Brilliant Club assignment. This is really important, because it will help you to avoid plagiarism. Plagiarism is when you take someone else's work or ideas and pass them off as your own. Whether plagiarism is deliberate or accidental, the consequences can be severe. In order to avoid losing marks in your final assignment, or even failing, you must be careful to reference your sources correctly.

What is a reference?

A reference is just a note in your assignment which says if you have referred to or been influenced by another source such as book, website or article. For example, if you use the internet to research a particular subject, and you want to include a specific piece of information from this website, you will need to reference it.

Why should I reference?

Referencing is important in your work for the following reasons:

- It gives credit to the authors of any sources you have referred to or been influenced by.
- It supports the arguments you make in your assignments.
- It demonstrates the variety of sources you have used.
- It helps to prevent you losing marks, or failing, due to plagiarism.

When should I use a reference?

You should use a reference when you:

- Quote directly from another source.
- Summarise or rephrase another piece of work.
- Include a specific statistic or fact from a source.

How do I reference?

There are a number of different ways of referencing, and these often vary depending on what subject you are studying. The most important to thing is to be consistent. This means that you need to stick to the same system throughout your whole assignment. Here is a basic system of referencing that you can use, which consists of the following two parts:

A marker in your assignment: After you have used a reference in your assignment (you have read something and included it in your work as a quote, or re-written it your own words) you should mark this is in your text with a number, e.g. [1]. The next time you use a reference you should use the next number, e.g. [2].

Bibliography: This is just a list of the references you have used in your assignment. In the bibliography, you list your references by the numbers you have used, and include as much information as you have about the reference. The list below gives what should be included for different sources.

Websites – Author (if possible), title of the web page, website address, [date you accessed it, in square brackets].

E.g. Dan Snow, 'How did so many soldiers survive the trenches?', http://www.bbc.co.uk/guides/z3kgjxs#zg2dtfr [11 July 2014].

Books – Author, date published, title of book (in italics), pages where the information came from.

E.g. S. Dubner and S. Levitt, (2006) *Freakonomics*, 7-9.

Articles – Author, 'title of the article' (with quotation marks), *where the article comes from* (newspaper, journal etc.), date of the article.

E.g. Maev Kennedy, 'The lights to go out across the UK to mark First World War's centenary', *Guardian*, 10 July 2014.

Appendix 2 – University Applications Guidance

For course choices and careers information:	www.brightknowledge.org.uk
For information and statistics on universities and course:	www.unistats.direct.gov.uk
For comprehensive information on universities, including rankings:	www.thecompleteuniversityguide.co.uk

PLEASE NOTE – The Researchers in Schools programme is designed to support the university applications process at your school. The work you complete for the programme should add to your schoolwork rather than detract from it. Please be aware of deadlines and try to manage your workload appropriately. If you are worried about the programme interfering with your schoolwork then please speak to your teacher.

Subject Specific Top Tips for Strengthening an application?

To be discussed in tutorial 6