8 minutes to Live – Our Sun

Key Stage 4 Programme

Pupil Name	
Handbook Designed by	Dr Stackhouse

Timetable and Assignment Submission

Timetable – Tutorials

1			
2			
3			
4			
5			
6 (Feedback)			

Timetable – Homework Assignments

Tutorial 1		
Tutorial 2		
Tutorial 3		
Tutorial 4		
Tutorial 5		

Assignment Submission – Lateness and Plagiarism

Lateness	
Submission after midnight on	10 marks deducted
Plagiarism	
Some plagiarism	10 marks deducted
Moderate plagiarism	20 marks deducted
Extreme plagiarism	Automatic fail

The Brilliant Club KS4 Programme – 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 GCSE
3rd	40-49	Performing to a good standard at GCSE
Working towards a pass	0-39	Performing below a good standard at GCSE
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 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 – Analytical Thinking	
What you did in relation to this Key Learning Priority	How you could improve in the future
Learning Feedback Comment 2 – Presenting Scientifically	
What you did in relation to this Key Learning Priority	How you could improve in the future
Learning Feedback Comment 3 – Collaboration	
What you did in relation to this Key Learning Priority	How you could improve in the future
Resilience Comment	
How you showed learning resilience during the course	How you could build learning resilience in the future

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Course Rationale

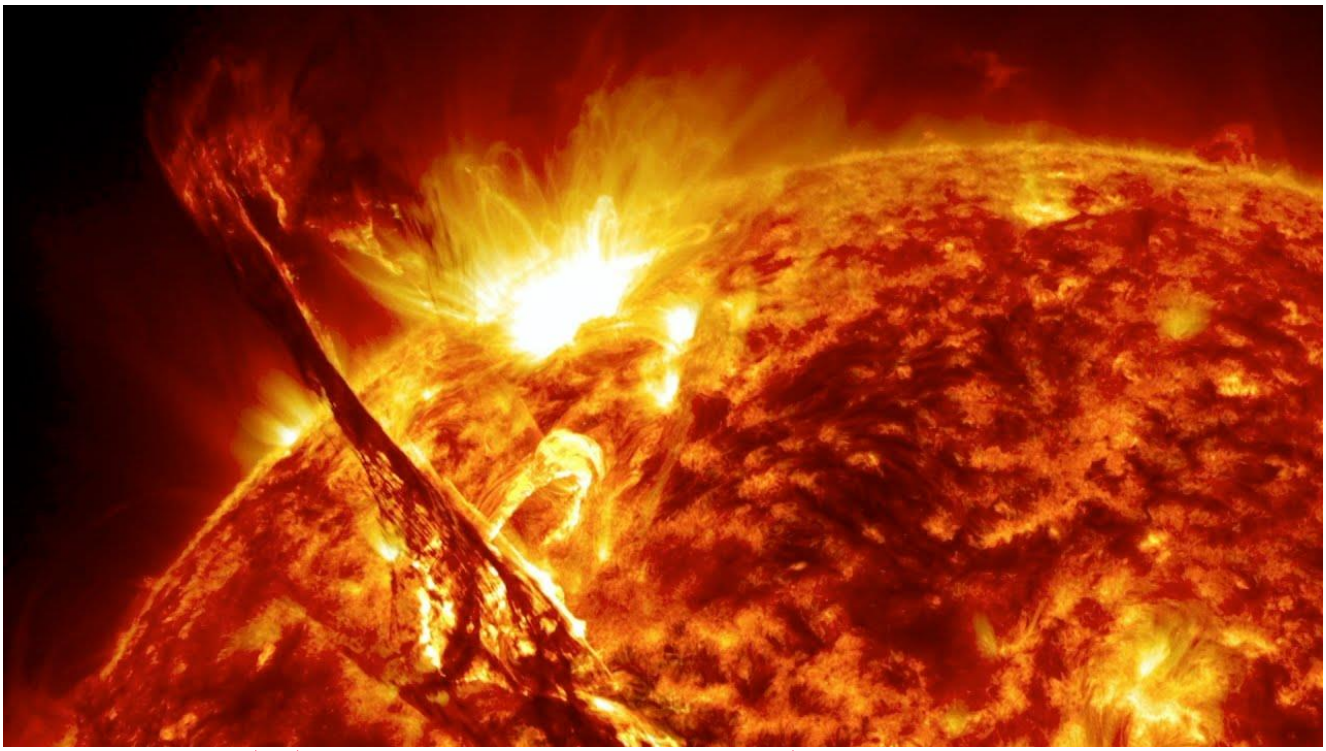

Figure 1: Image of a solar flare and associated CME. Credit: Youtube url: https://i.ytimg.com/vi/g9owdmL2UWQ/maxresdefault.jpg

A solar flare is a massive release of energy – the largest in our solar system – and this results in far ranging effects that can impact our life on Earth. These explosions, and the related phenomenon of coronal mass ejections, affect such large ranging things as telecommunications, astronauts and power grids.

During this course, you will learn the basics of how flares work and how they affect life on Earth. Why do we study something that is so far away? You will begin to understand how the Sun is not only a life-giver but can also be a tremendous negative influence on our way of life. As our world community becomes more and more technologically dependent, the chances of a solar event severely affecting us is greatly increased. During Uni-Pathways you will understand the general process behind solar flares, how the Sun is magnetically connected to the Earth, the evidence for this connection, why we care and what we can do to mitigate the effects.

Your final assignment will allow you to focus on how solar flares work and how they affect us. You will complete a scientific report, including a pre-submission of an abstract, and a group presentation.

You will furthermore develop the key transferrable skills of analytical thinking, presenting scientifically and collaboration. This will not only help in the progression of yourself as a scientist but improving these essential abilities will help you in your path through education.

Course Objectives

The overarching objectives of this course on solar flares are:

- to gain an understanding of the basics of energy release via a flare,
- to understand how the Sun is connected to the Earth,
- to know the evidence for space weather,
- to understand how flares and coronal mass ejections can affect life on Earth.

Mark Scheme Table

	Skills	1st (70-100)	2:1 (60-69)	2:2 (50-59)
Subject knowledge	Knowledge and Understanding	○ All content included is relevant to the general topic and to the specific question/title ○ Good understanding of all the relevant topics. ○ Scientific terms are defined and used accurately throughout ○ Clear justification on how the content included is related to the specific issues that are the focus of the assignment	○ Most of the content included is relevant to the general topic and to the specific question/title ○ Good understanding of most the relevant topics ○ Scientific terms are used accurately but not always clearly defined. ○ Adequate justification on how the content included is related to the specific issues that are the focus of the assignment	○ Some of the content included is relevant to the general topic and to the specific question/title ○ Good understanding on some of the relevant topics but occasional confusion on others. ○ Scientific terms are used mostly accurately with occasional confusion and often not defined. ○ Some justification on how the content included is related to the specific issues that are the focus of the assignment
Critical thinking	Research and Evidence	○ Inclusion of rich sources of research findings, and other sourced material as evidence for the claims/ ideas ○ Use evidence to support claims/assertions /ideas, consistently clearly and convincingly ○ Evidence of further reading beyond materials provided which were used in an appropriate context	○ Inclusion of adequate sources of research findings or other sourced material as evidence for the claims/ ideas ○ Use evidence to support claims/assertions/ideas, mostly clearly and convincingly ○ Evidence of further reading beyond materials provided	○ Inclusion of some sources of research findings or other sourced material as evidence for the claims/ ideas ○ Use evidence to support claims/assertions/ideas, at times clearly and convincingly ○ Limited evidence of further reading beyond materials provided
	Developing an Argument	○ A point of view or position in relation to the title or question is consistently clear ○ Argument exceptionally well-developed and well-justified ○ A position is clearly established in relation to the	○ A point of view or position in relation to the title or question is adequately clear ○ Argument clear and well-developed and position justified ○ A position is established in relation to the question, and is	○ A point of view or position in relation to the title or question is somewhat clear ○ Argument clear but not well-developed ○ A position is established in relation to the question, and is well-developed in parts of the

		question, and is developed effectively and consistently throughout the scientific report o Uses concepts from the tutorials in an unfamiliar context, and does so accurately and confidently. o Content is analysed effectively to support the argument	well-developed in most of the scientific report o Use some concepts from the tutorials in an unfamiliar context, but not always accurate o Analysis of content to support the argument	scientific report o Limited use of concepts from the tutorials in other contexts o Some analysis of content to support the argument
	Critical Evaluation	o Moved beyond description to an assessment of the value or significance of what is described o Evaluative points are consistently explicit/systematic/reasoned/justified o Effective critiques on the reliability of sources provided	o Mostly description but some assessment of the value or significance of what is described o Evaluative points are mostly explicit/systematic/reasoned/justified o Some evidence of critiques on the reliability of sources provided	o Only description with minimal assessment of the value or significance of what is described o Evaluative points are at times explicit/systematic/reasoned/justified o Limited evidence of critiques on the reliability of sources provided
Written communication	Structure and Presentation	o Ideas are presented in paragraphs and arranged in a logical structure that is appropriate for the assignment o The abstract clearly outlines how the scientific report will deal with the issues o The conclusion summarises all the main points clearly and concisely o Tables and graphs are effectively constructed including appropriate headings, units and scales. o All sources are referenced correctly in an agreed format	o Ideas are presented in paragraphs and arranged in a structure that is mostly appropriate for the assignment o The abstract adequately describes how the scientific report will deal with the issues o The conclusion summarises most of the main points clearly o Most tables and graphs are well constructed o Most sources are referenced correctly in an agreed format	o Ideas are presented in paragraphs and arranged in a structure o The abstract mentions how the scientific report will deal with the issues o The conclusion summarises some of the main points clearly o Some tables and graphs are well constructed but contains some errors o Some sources are referenced correctly in the agreed format with occasional errors

	Language and Style	○ No spelling, grammar or punctuation errors ○ Units and significant figures are presented accurately throughout ○ Writing style consistently clear, appropriate for scientific documents and easy to follow ○ Accurate and consistent use of technical language and vocabulary	○ Minimal spelling, grammar or punctuation errors ○ Units and significant figures are presented accurately throughout ○ Writing style mostly clear, appropriate for scientific documents and easy to follow ○ Some attempts of using technical language and vocabulary, but not always accurate	○ Some spelling, grammar or punctuation errors ○ Units and significant figures are presented accurately throughout with occasional errors ○ Writing style moderately clear, appropriate for scientific documents and easy to follow ○ Use of simple language and vocabulary effectively but struggles to use technical language

Glossary of Keywords

This is for reference throughout this set of tutorials. You are encouraged to try and define them in your own words. There are some empty spaces at the bottom for you to add extra words and definitions as you see fit.

Word	Definition	In a sentence	In your own words
Solar Storm	Umbrella term for any kind of solar flare or plasma ejection event.	A particularly energetic **solar storm** just missed earth today.	
Solar Flare	A release of energy from the Sun's magnetic field resulting in the acceleration of particles and heating of coronal plasma.	The **solar flare** appeared as a sudden flash of bright light.	
Coronal Mass Ejection (CME)	An ejection of the Sun's plasma into the solar wind. Sometimes associated with a flare.	The solar flare and associated **CME** produced disruption to the Earth's satellites.	
Plasma	The fourth state of matter, a gas that has enough energy that enough free charges have been created for large scale electric and magnetic fields to exist in it and drive its evolution.	The **plasma** was magnetically confined in the nuclear fusion device.	
Plasmoid	A 'ball' of plasma ejected by the Sun	The Sun ejected a **plasmoid** that was on course for Earth.	
Sunspot	Dark, cool, regions on the Sun's surface, associated with areas of high magnetic field strength.	Richard Carrington noticed in his study of the Sun that **sunspots** were an indicator of activity.	
Solar Wind	The constant stream of plasma continuously ejected from the Sun, filling up the interstellar medium.	The **solar wind** is found to have an average speed of ~ 500 km/h.	
Space Weather	The umbrella term for time varying conditions in the in the solar system. Including the solar wind.	A change in the local **space weather** resulted in brilliant aurora.	
Space/Solar Radiation	The radiation in our solar system. Consisting mainly of electrons and ions.	The **space/solar radiation** was particularly dangerous due to its highly ionising nature.	
Geomagnetic Storm	A temporary disturbance of the Earth's magnetosphere. Associated with solar coronal mass ejections,	The **geomagnetic storm** caused fabulous northern lights, as far south as Manchester.	

	coronal holes, or solar flares.		
Aurora	Either Australis (Sothern) or Borealis (Northern). An incredible light show caused by particles from the Sun interacting with molecules in the Earth's atmosphere.	The **aurora** danced across the sky in green, red and violet.	
Charged Particles	Referring to electrons, protons or ions. In this course, we talk about those specific to the Sun.	The **charged particles** in the corona were accelerated during the flare.	
Magnetic Field	The field caused by magnetic materials or electric currents. It has a size and direction.	The **magnetic field** of the Sun is caused by the motions of the solar plasma.	
Reconnection	The rearrangement of magnetic field.	The solar flare caused a **reconnection** event in the Earth's magnetosphere.	
Magnetosphere	The magnetic field of a sun or planet.	The Earth's **magnetosphere** protects us from much of the harmful radiation of space.	
Kinetic Energy	The energy a body has because it is in motion.	The solar flare caused the **kinetic energy** of the electrons and ions to increase.	
Potential Energy	The energy stored in something due to its position in relation to a zero position or relaxed state.	The gravitational **potential energy** of the plane increased as it climbed to its cruising altitude.	
Magnetic Potential Energy	The energy stored in a magnetic field due to its configuration.	The **magnetic potential energy** of the field above a sunspot increased as the complexity of the field increased.	
Thermal Energy	The energy that comes from heat. The internal energy in a system due to its temperature.	The **thermal energy** of the coronal plasma increased because of the release of magnetic energy by the flare.	
Arcsecond	A unit of distance, one arcsecond equals 725 km at the Sun's distance from the Earth.	The sunspot was 20 **arcsecond** across.	
Photosphere	The 'surface' of the Sun, this is the last layer of atmosphere that is opaque and so is what you see if you look at the Sun without extra filters.	The **photosphere** of the Sun was littered with dark sunspots	

Chromosphere	The next layer up, red in colour, can be seen during eclipses.	As the moon fully eclipsed the sun the **chromosphere** seemed to show its edge on fire.	
Corona	The outermost layer of the Sun's atmosphere. Extends extensively into space. Can also be seen during an eclipse.	The mystery of the **corona** being so much hotter than the layers below it has puzzled scientists for decades.	

Tutorial 1 – Explosions on the Sun?

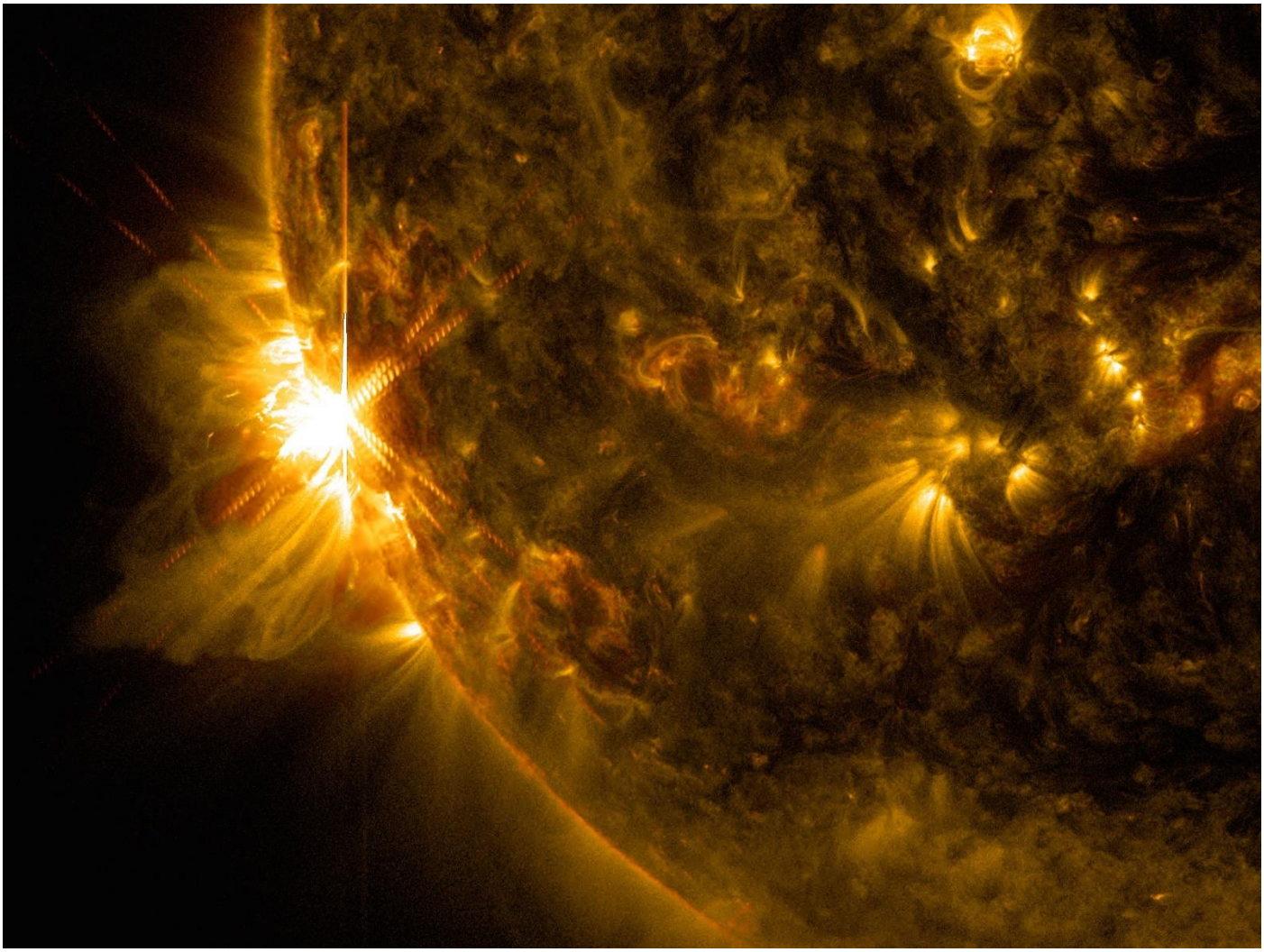

Figure 2: A solar flare captured by NASA's Solar Dynamics Observatory on June 10, 2014, at 7:41 a.m. EDT. A magnitude X2.2 flare, shown as a blend of two wavelengths of light: 171 and 131 angstroms. Image Credit: NASA/SDO/Goddard/Wiessinger. Link: https://svs.gsfc.gov/11564

What is the Purpose of Tutorial 1?

Solar flares are a massive release of energy; the equivalent to one billion of the largest Nuclear bombs. This energy goes into heating the solar plasma (a very energetic gas, the fourth state of matter) and accelerating particles (making them faster), amongst other things. In order to begin to understand this process, it is useful to revise what you know about magnetic fields. The internal motions of the Sun cause its magnetic field to become very convoluted (complicated), eventually this becomes too much and the field rearranges to a more relaxed state. This means that the field has changed from a high to low energy state. This energy does not just disappear, it heats the plasma and accelerates particles. This is a solar flare!

By the end of this session you will be able to:

- illustrate the magnetic field of a bar magnet,
- illustrate the magnetic field of a sunspot pair,
- describe energy transfer in a simple situation, and,
- compare solar flares to energy transfer in an elastic band.

Activity 1: Magnetic Fields

On the desk in front of you there is a magnet. We are going to explore the magnetic field of this magnet as you have probably done before. Use iron filings or compasses to map out points in the magnetic field and then join to show the field lines.

Activity 2: The Solar Magnetic Field

The magnetic field of any body behaves in the same way, field runs from magnetic north to magnetic south. On the figure of the Sun provided, the north and south poles of Sunspot pairs are labelled. How do you think the field looks between these pairs? Draw on what you decide.

Figure 3: Cartoon of a Sunspot pair, draw on what you think the magnetic field looks like. Credit: University of California

Activity 3: Converting Energy

When we are discussing a release of energy, we are not losing it, the energy is conserved. It is transferred into another form. In the case of the Sun, the magnetic energy is released into the kinetic energy of particles and heating the plasma (thermal energy). We can begin to understand the conservation of energy by considering dropping a ball from a height; as it falls it picks up velocity, this is because the potential energy of the ball is being transferred to kinetic energy.

Exercise: Discuss the change in energy of a tennis ball dropped from a height of 1m.

This is perhaps the simplest way to think about the conservation of energy. The Sun, however, is an extremely complex system. So how does this relate?

At its basest form, the process is the same, the Sun's magnetic field holds potential energy due to the twisting of the field by its internal motions, just as the ball holds potential energy due to its height above the ground (what is the force here?). When the field of the Sun gets too twisted it relaxes to a more simple state. This rearrangement is what causes the release of energy to other forms, as the dropping of the ball releases the gravitational potential energy of the ball into the kinetic energy of the fall.

Activity 4: Energy Transfer in an Elastic Band

Try twisting an elastic band and then release it. What do you notice about how it feels after being twisted? What forms of energy do you think the released energy transferred into?

Baseline Assessment

Using the links below, and the work we have done in today's session, write a short summary (max 300 words) on what a solar flare is. At the bottom of this document include the links you use from the list below, as well as any other sources you may find. The format is preferably a word document (it can be used in your final assignment) but can also be submitted in writing. There is space below to make notes.

You will be assessed on the quality of your written communication. You will be marked on your spelling, punctuation, and grammar (SPaG) and the correct use of technical terms.

Links:

- https://www.nasa.gov/mission_pages/sunearth/spaceweather/index.html
- https://www.nasa.gov/content/goddard/the-difference-between-flares-and-cmes (focus on first two paragraphs)

Tutorial 2 – The Earth-Sun Connection. Our Eventual Undoing?

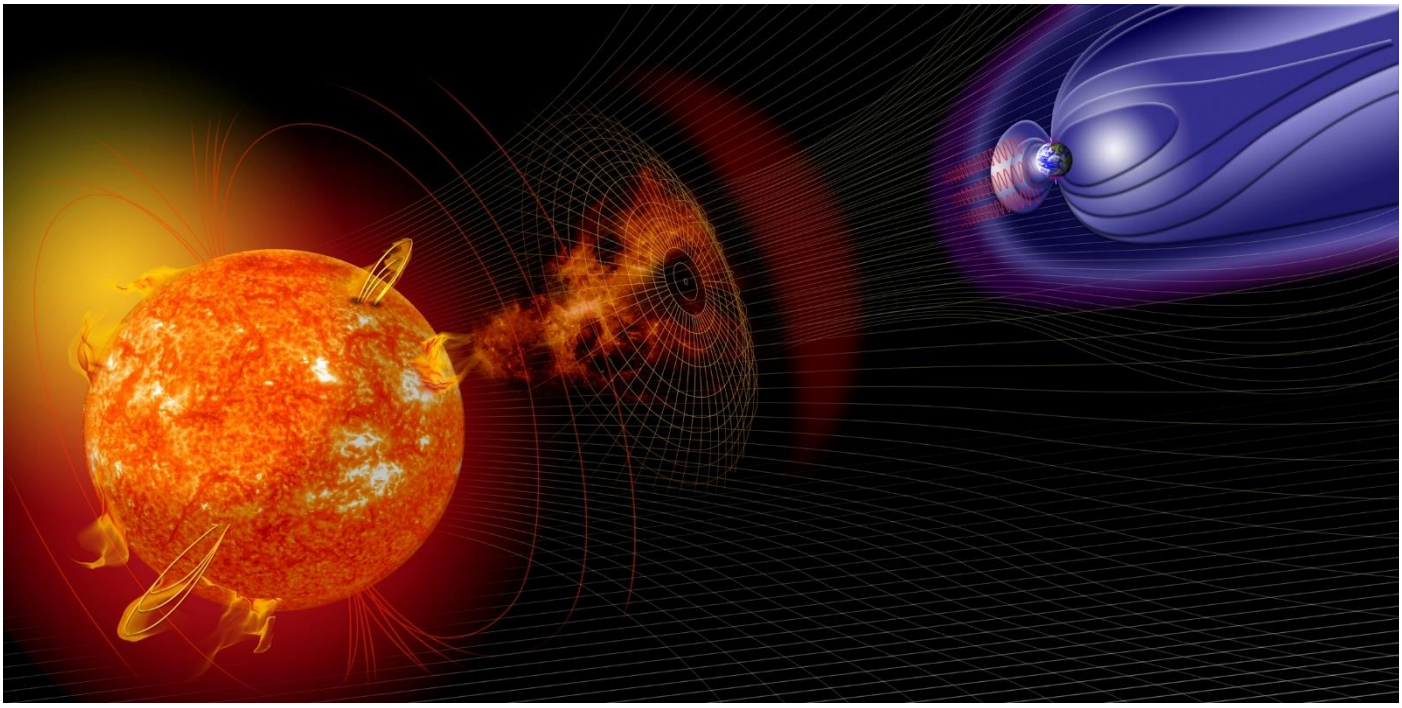

Figure 4: An artist's impression of a solar eruption heading towards Earth. Credit: The Sun Today, Link: http://www.thesuntoday.org/space-weather/geomagnetic-storms/

What is the Purpose of Tutorial 2?

The Sun is connected to the earth magnetically, its atmosphere extends out into the solar system as something called the solar wind. This ejected plasma contains the Sun's magnetosphere, the largest structure in our solar system. The location of a flare sometimes coincides with a part of the Sun that is magnetically connected to the Earth. Charged particles accelerated during solar flares can thus travel to Earth.

During this session, you will:

- explore how the Earth and Sun are connected magnetically,
- describe how particles reach the Earth from the Sun,
- examine the dangers of radiation, and,
- reflect on why we might be interested in solar flares from what you know so far.

Activity 1: Parker Spiral

On the board, I have drawn the Sun and the earth (not to scale). In 5 minutes think about how the magnetic field of the Sun may look, then discuss with a partner and, finally, copy the picture and draw what you think.

Activity 2: Plasmoid Ejections

In the figure provided there are 8 images of a plasmoid being ejected from the Sun. Using the scale calculate the speed with which the plasmoid is moving. How do you think this compares to energetic particles?

Activity 3: The Dangers of Radiation

Why do you think that we should care about these particles that are released towards the Earth during a flare or a CME? A plasma is made of many free charges, i.e. lots of electrons and ions split apart from being neutral atoms. This means that the radiation in the space around Earth is extremely ionising; it can cause severe damage to the tissues in your body.

Astronauts on the International Space Station (ISS) receive 80 -160 mSv per 6 month stay. A Sievert (Sv) is the equivalent dose of radiation. It takes into account how much damage the radiation absorbed can do. The higher the value, the more possible damage. One mSv of space radiation is equivalent to approximately three chest X-rays.

Watch the video, fill in the table below: https://www.youtube.com/watch?v=zl2vRwFKnHQ

Question	Answer
What are the two types of radiation?	
What type of radiation is used for telecommunications?	
What part of an atom does nuclear radiation come from?	
Why do isotopes emit nuclear radiation?	
How does radiation damage DNA?	
What is an acute exposure?	
What unit is used when describing a radiation dose?	
How much of a dose is probably lethal?	

Activity 4: Reflection

From what you know so far about solar flares and CMEs, summarise in your own words why the radiation from these events may be of great interest to us. You may want to consider:

- do flares produce fast particles?
- Is radiation harmful to humans?
- Is the radiation from solar events ionising?
- Can solar radiation impact the Earth?

Second Assessment

Using the links below, and the work we have done in today's session, write a short summary (max 300 words) on how the Sun is connected to the Earth magnetically and what a flare or a CME ejects that might affect us. At the bottom of this document include the links you use from the list below, as well as any other sources you may find. Have a look at the appendix on referencing, attempt to include your sources in this style. The format is preferably a word document (it can be used in your final assignment) but can also be submitted in writing. There is space below to make notes. You will be assessed on SPaG.

Links:

- https://www.nasa.gov/mission_pages/themis/auroras/sun_earth_connect.html
- http://cse.ssl.berkeley.edu/coronalweather/CMEsFlares/page3.html (make sure you look at all three pages!)
- http://www.asc-csa.gc.ca/eng/sciences/osm/radiation.asp

Tutorial 3 – Space Weather

Figure 5: Aurora as seen from space, note the different colours caused by different elements being excited by different energy electrons. Credit: ISS, NASA GSFC Media

What is the Purpose of Tutorial 3?

So, we've discussed that the Earth and the Sun are connected magnetically, but how do we know? What is the evidence that what happens on the Sun can actually impact us on Earth? The most obvious example is aurora (both southern and northern lights). These are caused by the Sun transferring energy to the Earth's magnetosphere. This energy causes 'reconnection' events in the Earth's magnetosphere, which excite electrons that then stream down into the Earth's atmosphere and produce aurora at high latitudes.
Other evidence includes geomagnetic storms, where there is a global change in the Earth's magnetic field due to solar activity and particle storms where high energy particles created by solar flares or CMEs impact on the Earth.

In this session, you will:

- understand the evidence for the connectedness of the Earth-Sun system,
    - through the observations of aurora and the solar wind, and,
- explore the history of human knowledge of flares.

Activity 1: Aurora

Watch the short video, answer the questions on how aurora occur and why they might be of interest to us. Then discuss with a partner and share what you have found with the group.

Link: https://youtu.be/PaSFAbATPvk

What are they caused by?

Which molecules in the Earth's atmosphere are excited?

What effects can they have?

What is the name of the 5 satellites sent into orbit to observe the aurora?

Activity 2: The Solar Wind

Another piece of evidence for the connectedness of the Sun-Earth system is the solar wind. This is the (fairly) steady stream of plasma that is pushed out from the Sun and fills our solar system.

Following the link https://solarscience.msfc.nasa.gov/SolarWind.shtml answer the following questions:

What is the average speed of the Solar wind?

Is its speed always the same?

Which two spacecraft are mentioned in the passage?

What is special about the L1 point?

Activity 3: The History of Solar Flares

The first known observation of a solar flare was what has become known as the Carrington flare in 1859.

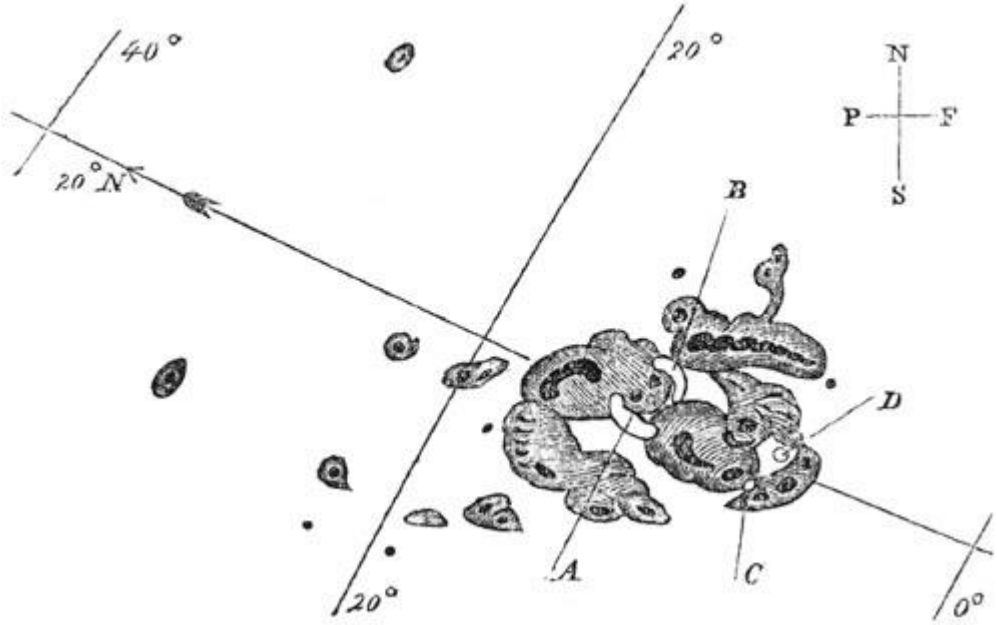

Figure 6: Carrington's sketch of the 1859 flare. Credit: Wikipedia

This event was associated with a coronal mass ejection that, due to the configuration of the Sun's magnetic field, caused a huge geomagnetic storm which meant that the northern lights were seen as far south as Cuba! Telegraph systems ran on their own and some even caught fire!

In pairs, follow the link below and have a look at the other events of interest listed at the bottom of the page. Note down how each event has affected Earth. Discuss and then write down how you think YOU might be affected by a particularly large event.

Link: http://www.thesuntoday.org/space-weather/impacts/

Date	Location affected	Effects

I might be affected by a large solar flare because…

Third Assessment

Using the links below, any others you find, and the work we have done in today's session, write a short summary (max 300 words) on how we know that the Sun and Earth are connected. At the bottom of this document include the links you use from the list below, as well as any other sources you may find, use the feedback I have provided on referencing to further your technique. The format is preferably a word document (it can be used in your final assignment) but can also be submitted in writing. There is space below to make notes. You will be assessed on your SPaG.

Links:

- http://www.aurora-service.eu/aurora-school/aurora-borealis/
- https://science.nasa.gov/science-news/science-at-nasa/2008/06may_carringtonflare

Tutorial 4 – Why do We Care?

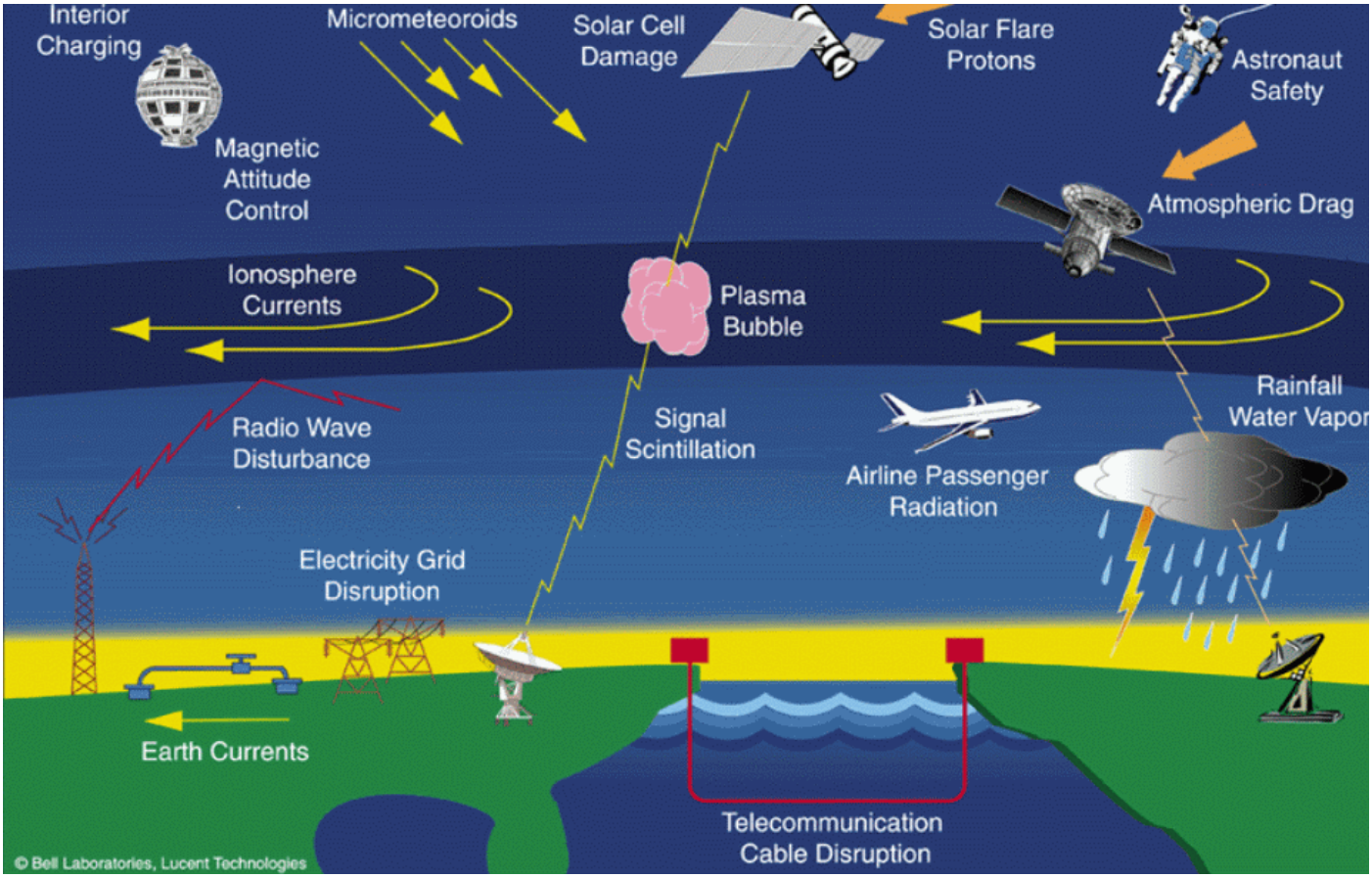

Figure 7: Cartoon showing the various effects of space weather. Credit: Bell Laboratories, Lucent Technologies

What is the Purpose of Tutorial 4?

Our relationship with technology has changed greatly since the Carrington event, we are becoming more and more dependent on electronics, a lot of which are in space. While we have learned from the events studied in the previous tutorial, we are still to properly experience the impact of a major space weather event upon our society.

The possible effects of a solar event having a catastrophic effect on our way of life only increases with each technological advance. The good news is that with the proper precautions the effects can be mitigated against.

In this tutorial, you will examine the effects of space weather, specifically:

- why we care about space weather,
- the effects of excess current on electronics, and,
- other possible effects on our way of life.

Activity 1: Why do We Care?

Watch the short video and answer the questions below on why solar flares and space weather are of interest to us. Then discuss with a partner and share what you have found with the group.

Link: https://youtu.be/JXZj3KzT5ag

During the Carrington event, what happened to the crew's compasses?

What happened to the telegraph system?

In 1989 what happened to parts of Canada due to a Solar flare?

Why would a Carrington size flare affect us more now?

Activity 2: Excess Current

We are going to examine how excess current affects electronics via a demonstration. Where normally we would have a resistor, we have a small length of wire (or wire wool), we are going to slowly increase the voltage (and hence the current) through this wire, explain what happens to the wire below.

Use what you have learned here to explain why a solar storm may adversely affect electronics in space and on Earth.

Activity 3: Other Effects

In pairs, follow the link below and find the paragraphs on the effects of solar events on our society. Write the effects of Solar flares and CMEs in the table. In the section for notes list the companies and sectors taking an active interest in space weather. Is there anything you feel this summation has missed? Consider the picture at the start of this tutorial…

Link: http://www.thesuntoday.org/space-weather/impacts/

Solar Event	Effects
Solar Flares	
CMEs	

Fourth Assessment

Using the links below, any others you find, and the work we have done in today's session, write a short summary (max 300 words) on how solar events affect us. At the bottom of this document include the links you use from the list below, as well as any other sources you may find, in the correct scientific format. The format is preferably a word document (it can be used in your final assignment) but can also be submitted in writing. There is space below to make notes. You will be assessed on your SPaG.

Links:

- https://news.nationalgeographic.com/news/2011/03/110302-solar-flares-sun-storms-earth-danger-carrington-event-science/
- https://science.nasa.gov/science-news/science-at-nasa/2008/06may_carringtonflare (This is the same link as for last assessment, but contains some useful things for this assessment as well!)
- https://www.nasa.gov/mission_pages/sunearth/news/flare-impacts.html

In addition, in a group, you will start preparing your group presentation. I want each of you to choose one tutorial and prepare a 3-5 minute segment on it. Together in the group you will make this coherent and present it to me as part of tutorial 5 or 6 (20% of your final assessment). You will be assessed on:

- the quality of your slides,
- the understanding of the subject, and,
- your ability to deliver a coherent message as a group.

Tutorial 5 – Summary and Reflection

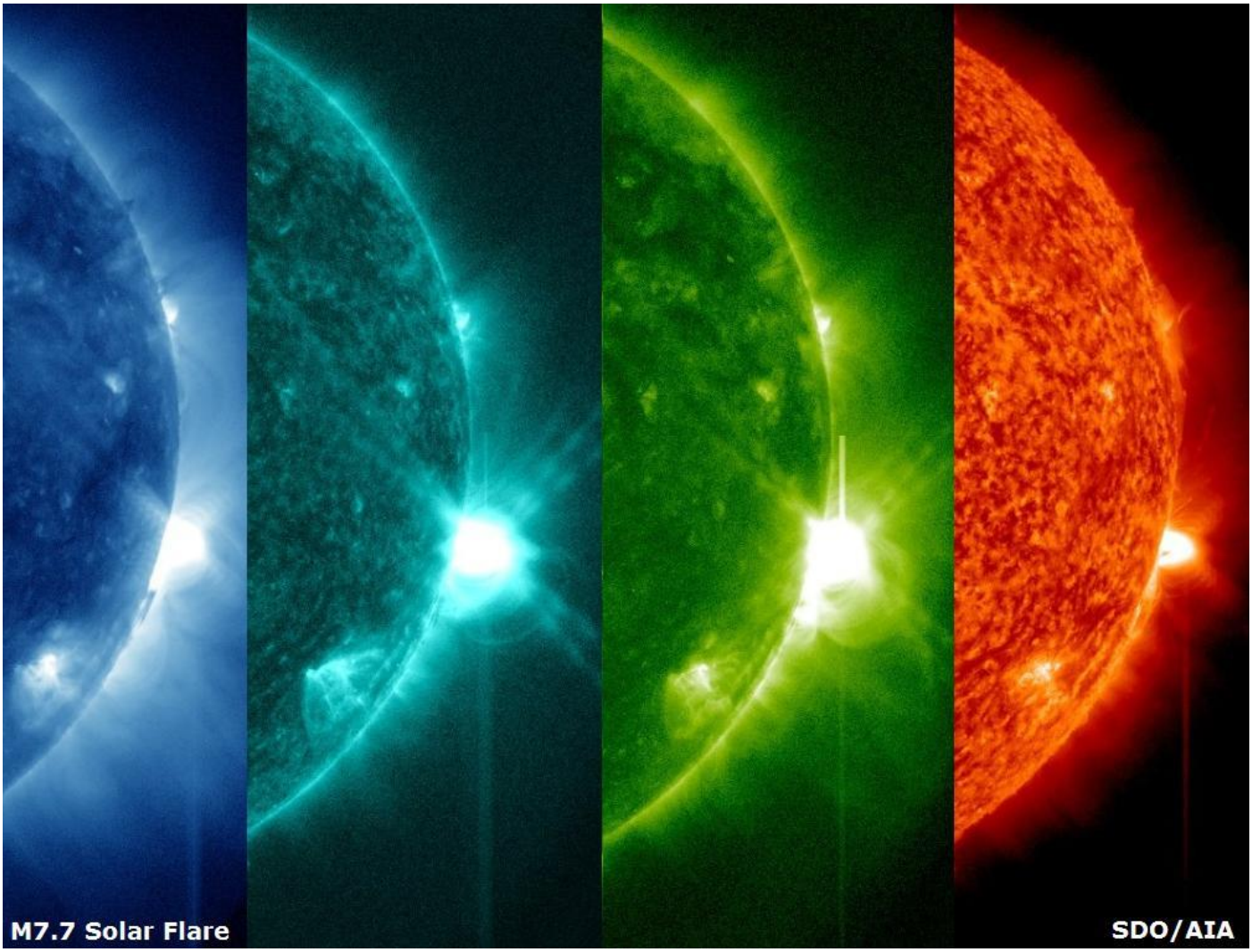

Figure 8: Showing a flare in different wavelengths of light. Credit: NASA SDO/AIA.

What is the Purpose of Tutorial 5?

- To summarise the topics covered in tutorials 1-4,
- to look at referencing in a scientific report,
- to prepare for/do your group presentation, and,
- to ask any questions about the final assessment.

Activity 1: Group Discussion

As a group we will go round one by one and listen to each other's summary of the course, this is a chance for you to gather your thoughts ahead of the final assessment. It is also a chance for you to ask any outstanding questions you may have regarding what we have covered.

Activity 2: Referencing Correctly

In our assessments so far, we have tried to get to the point where we are referencing in a scientific manner. Here, we shall make sure that we understand how to do this. It will form an essential part of the final assessment.

Activity 3: Group Presentation

As a group you will present a 15-20 minute presentation to me as part of your final assessment (20 %). This will give you experience of academic style conference proceedings. There will be around 5 minutes for questioning from the audience (me) at the end.

FINAL ASSESSMENT!!!

The basics of solar flares and why we care.

- Abstract: Within a week supply me with an 'abstract' summarising the main points studied during this Uni Pathways course. This should be no more than 250 words or 5 bullet points (10% of final mark).
- Group Presentation: Described above (20%)
- Essay: This should take the form of a scientific review and be set out as follows:
    - abstract: a summary of the main points studied and your findings (~ 250 words);
    - review: the largest part of the report, basically describe your findings at length (~500 – 1000 words). You might want to split this into 4 sections for each tutorial;
    - conclusion: your findings and what they mean, you will want to include your 'results' which will be your understanding of flares and why we should care.

This report should be no more than 1500 words (and no fewer than 800). Your end of tutorial assessments should help to form this document BUT make sure that each section leads into the next, i.e. it is a coherent message! You will, as always be assessed on your SPaG.

It is due the Friday before your final feedback tutorial.

Tutorial 6 – Feedback tutorial

What is the Purpose of Tutorial 6?

- To receive feedback on final assignments.
- To share examples of best practice with the other pupils in your group.
- To write targets for improvement in school lessons.
- To reflect on the programme including what was enjoyed and what was challenging.

Final assignment feedback

What I did well…	What I could have improved on…
•	•
•	•
•	•

My target for future work is…

Reflecting on Uni Pathways

What did you most enjoy about Uni Pathways?
•   •   •

What did you find challenging about the programme?	How did you overcome these challenges?
• • •	• • •

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:

1. 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].
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.

    a. 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].

    b. 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.

    c. 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 – Using the VLE

VLE username	
VLE password	

Please remember the following key details...

- You are able log into the VLE either through the link on our website (www.thebrilliantclub.org) or going directly to the VLE site at (https://portal.thebrilliantclub.org/sign-in).
- Please update your profile with your full name and email address- this will allow you to retrieve forgotten passwords or usernames
- If you forget your log-in details you can request them to be emailed to you by clicking the link on the VLE home page. (If you are still having problems you can email: schools@thebrilliantclub.org)

What is the VLE?

The VLE is a virtual learning environment for all pupils on Uni Pathways it is used for:

- messaging your tutor
- submitting homework
- submitting your final assignment
- accessing resources for your tutorials
- finding out more information about university and careers

How should I use the VLE?

The VLE is a professional academic environment in which pupils are able to message their PhD Tutor. Here are a few things to consider:

- Ensure you keep a professional tone in the messages you send to your tutors.
- Ensure you always reply to your tutors in a timely manner.
- Thank your tutor for the effort they are putting in to give you your feedback etc.
- Submit all homework to your tutor on time.

IMPORTANT: Final assignment

- When you submit your final assignment, please remember that you need to do so through the 'My Activities' tab and not as an attachment to a message.

Notes

Notes

Notes

8 minutes to live – Our Sun

Key Stage 4 Programme

researchersinschools.org