

BTEC Level 3
Forensic and Criminal
Investigation
Transition Work



St George's Academy



June-September 2023

Name: _____

Welcome to BTEC Forensic and Criminal Investigation course.

The purpose of this summer work is to prepare you for the start of your study of this BTEC Level 3 course at St George's Academy.

As you make the transition from GCSE to Level 3 studies you should find that you are expected to do much more independent reading, revision and research outside of lessons.

The tasks in this transition work will help you to practice these skill sets.

There are three key tasks for you to complete, which within them cover aspects of biology, chemistry, physics and aspects of forensic science.

Please note: The skills associated with these tasks and the biology, chemistry, physics and forensic science content in Task 2 will be formally assessed through a 2-hour written test, which will take place in class when you start in September.

You are provided with self-assessment checklists at the end of each section, which you should use as a guide for the content you need to review before taking the test.

The results of the test will form a basis to assess your suitability for the course.

Task one: Report writing task:

BTEC Level 3 Applied Science assignment-based preparation

In preparing for assignment work, you will need to write/produce a number of reports in your studies.

To do this, you will need to successfully research, find and extract relevant information from a number of sources, of both internet-sourced and non-internet sourced (*e.g.* books, journals or personal contacts for example).

You will need to structure and summarise information and produce a coherent and logical report avoiding any plagiarism or copy and paste!

Please visit & go through the following websites for guidance on summarising and avoiding plagiarism as this will be a key requirement in your BTEC assessment work practices:

<http://www.buowl.boun.edu.tr/students/avoidingplagiarism.htm>

<http://owl.english.purdue.edu/owl/resource/563/03/>

Your Task:

Follow the guidelines on these websites and the following strategy on how to summarise information to produce a 250-word report:

A good strategy in summarising a text you have read is:

- Read the text several times but do not make any notes. During your first reading you may be tempted to take extensive notes, but later you may find out that you do not need them. Therefore, read without making notes but interacting with the author. That is, familiarise yourself with the text, the author, the main ideas and arguments, etc.
- List the key ideas and supporting arguments
- Rank them in order of importance before writing them up

Your task here is to use these guidelines to produce a 250-word report, choosing only one of the following topics:

- *'A brief history of forensic science'*
- *'An overview of the processes from crime scene to the court of Law'*
- *'How have advances in DNA technology helped to solve crime?'*

Please include a word count at the end (to show how many words are in your report). The word count should be within 10% (+ or – 25 words) of the recommended 250 word count.

Remember to list the websites that you have used in preparing your report.

Microsoft Word has a 'references' menu. This is a drop down menu for 'citations and bibliography' – this is a good way to insert reference citations in the text and produces a bibliography that can be inserted at the end of the report – give it a go!

Task two: preparation for work on the core principles of biology, chemistry, physics and forensic science

Please complete each of the following tasks, these give opportunity to re-visit and re-cap on key fundamentals from your GCSE programme of study, which apply to forensic science and also to explore some early ideas of forensic study, which will be extended upon through later study.

Biology

Select the correct answer for these multiple choice questions

Which is the correct order of levels of organisation in organisms, from least complex to most complex?

☐

Cells → tissues → organelles

☐

Cells → tissues → organs

☐

Organ systems → organs → tissues

What is a tissue?

☐

A system made from similar organs

☐

A group of cells with similar structures working together

☐

A group of organelles with similar structures working together

In plants, what are shoots and roots examples of?

☐

Organs

☐

Organ systems

☐

Tissues

In plants, what are leaves examples of?

☐

Organs

☐

Organ systems

☐

Tissues

Which part of a cell contains the genetic material?

☐

Nucleus

☐

Cytoplasm

☐

Cell membrane

Which part of a cell controls the movement of substances in and out of the cell?

☐

Nucleus

☐

Cell membrane

☐

Cell wall

What is a function of the vacuole in a plant cell?

☐

To store chlorophyll for photosynthesis

☐

It is where most of the chemical reactions in the cell happen

☐

To keep the cell turgid

Which organelle absorbs light energy for photosynthesis?

☐

Chloroplast

☐

Ribosome



Mitochondrion

A cheek cell is 0.05 mm across. It is 25 mm across in a photograph taken through a microscope. What magnification was used?



× 50



× 500



× 5000

What structure does a plant cell have but an animal cell does not have?



A circular chromosome



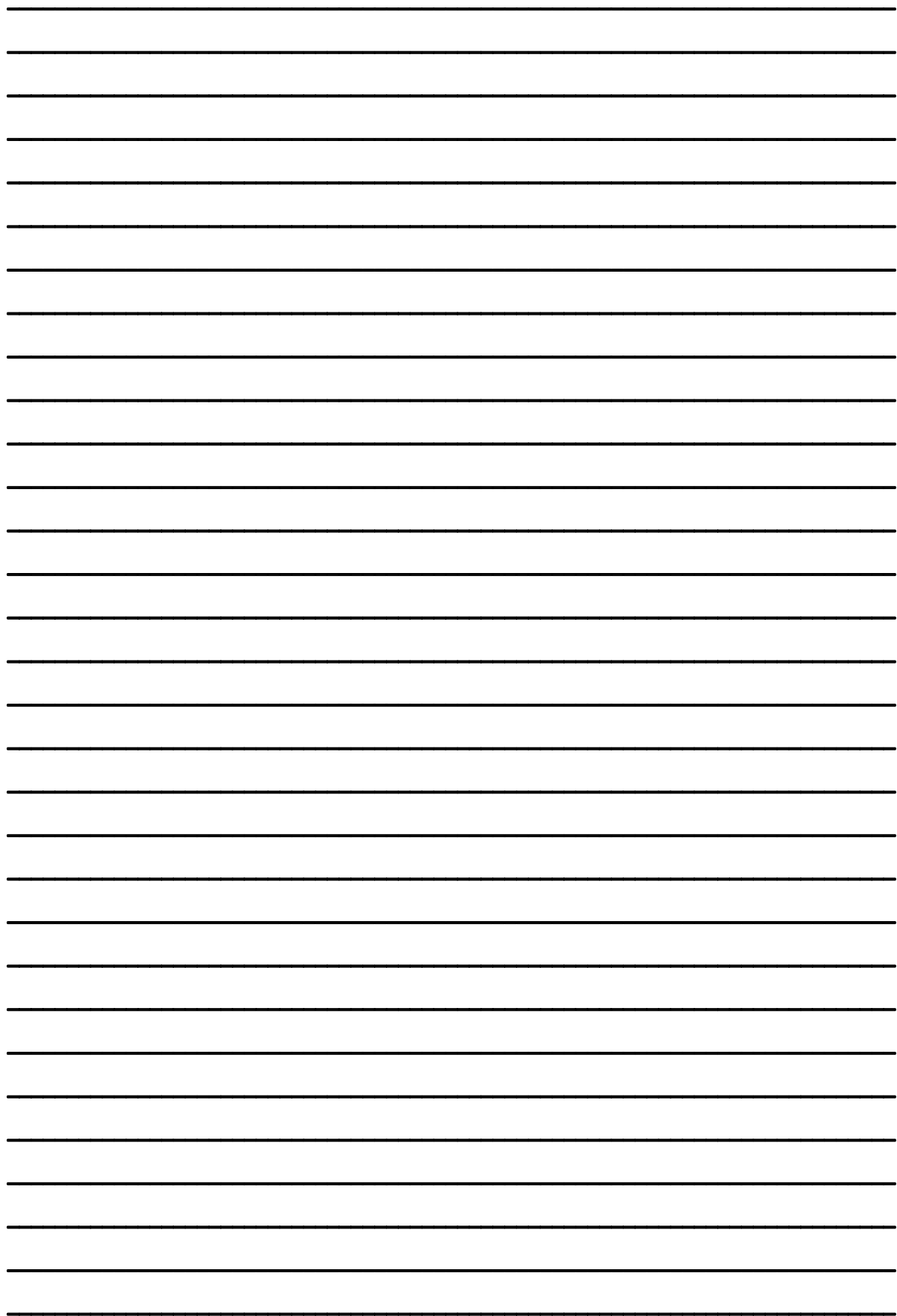
A permanent vacuole





A cell membrane

Extended answer question

Give a descriptive account of how the human body functions through the co-operation of some major organ systems; Cardiovascular (heart and lungs), digestive, muscular and nervous system.

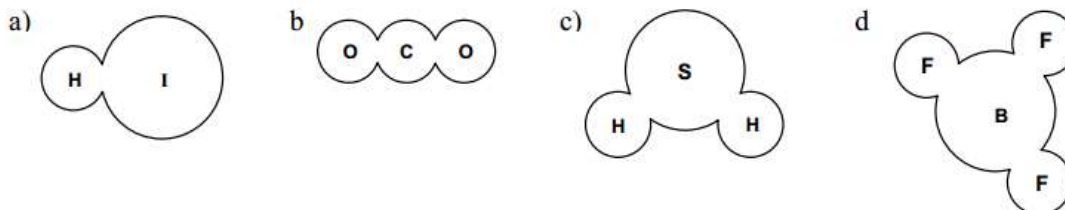


Biology:
B1 Cell Structure

Objectives: I know / I can do		 Help!
<p>a) Describe the differences in magnification and resolution of light and electron microscopes.</p> <p>b) Explain how electron microscopy has increased understanding of organelles.</p> <p>c) Rearrange the equation to calculate image size or magnification.</p> <p><i>E.g.</i> Magnification = size of image \div real size</p> <p>d) Label diagrams of animal and plant cells.</p> <p>e) Describe the function of the main organelles.</p> <p>f) Convert values for the units: cm, mm, μm and nm.</p> <p>g) Label a diagram of a prokaryotic cell</p> <p>h) Explain how the main structures of prokaryotic cells are related to their function.</p> <p>i) Describe the differences between eukaryotic and prokaryotic cells in terms of structure and size.</p> <p>j) Identify features of specialised cells and their function .</p>		

Chemistry

1 What is the formula for each molecule shown below:



2 Which of the following substances are elements and which are compounds?

- a) He b) H₂ c) CO d) Cl₂ e) S₈ f) NBr₃

Section 2

Write the full balanced chemical equation for each of the following reaction:

Chemical reaction	Equation
sodium hydroxide (NaOH) + dilute hydrochloric acid (HCl)	
sodium hydrogencarbonate (Na ₂ CO ₃) + dilute nitric acid	

Section 3

- a) What is the name given to a chemical reaction when an equal volume of acid reacts with alkali?
- b) What is the chemical name for common salt?
- c) Which salts are produced by i) Hydrochloric acid, ii) Sulfuric acid, iii) Nitric acid?

Section 4

Complete the following table with the missing terms: Magnesium, 3, 1.00, 650, fairly strong, 0.26, 1, Sodium.

Metal	Number of electrons in the last shell	Melting Point (°C)	Electrical conductivity	Strength of metallic bonding in the metal
		98		Weakest
	2		0.42	
Aluminium		661		Strongest

Section 5

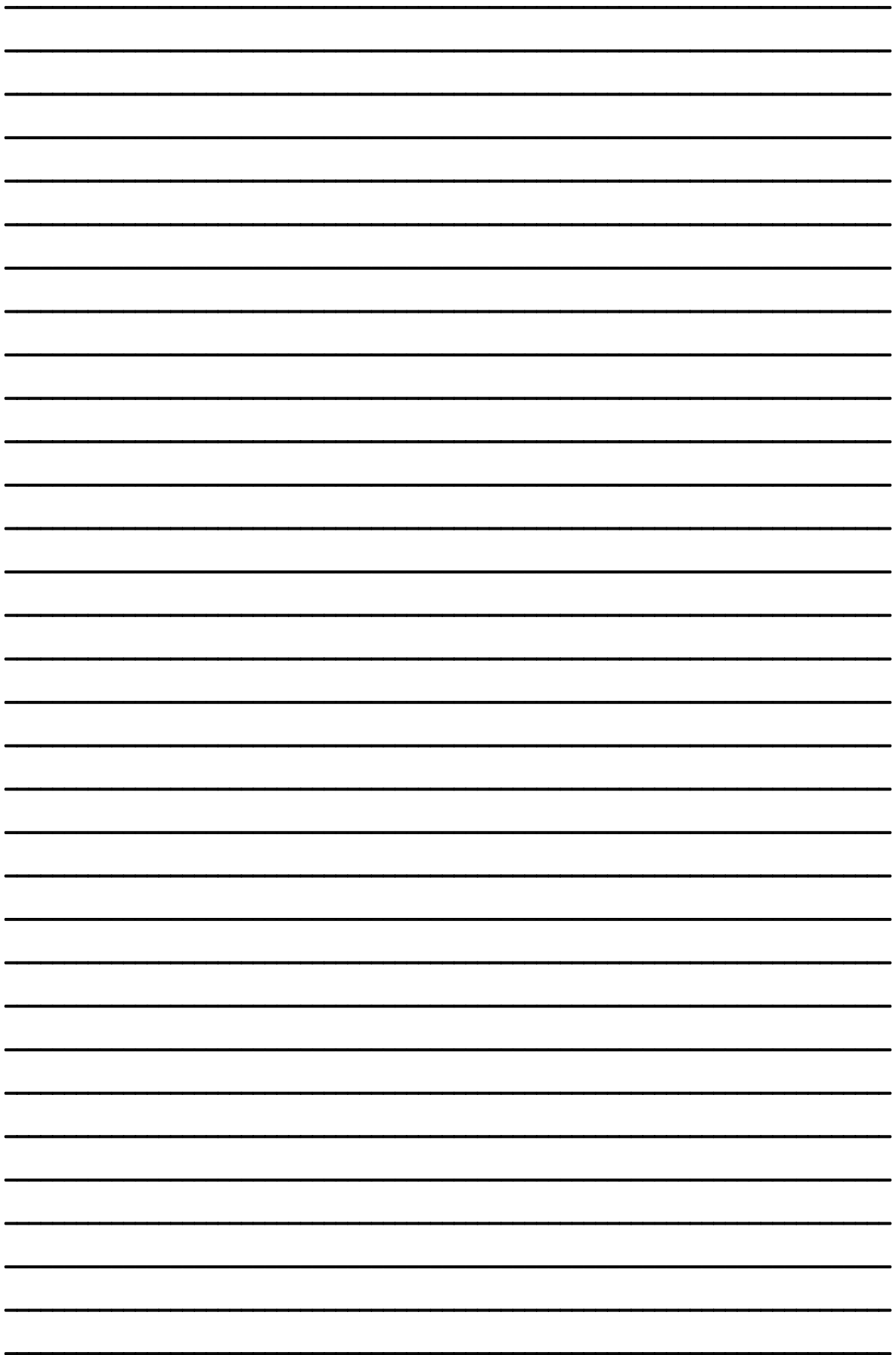
Calculate the number of moles of carbon dioxide molecules in 22 g of CO_2

Calculate the **mass of sodium sulfate** made when 20 g of sodium hydroxide reacts with excess sulfuric acid. (A_r of H = 1, A_r of O = 16, A_r of Na = 23, A_r of S = 32)

Extended answer question



Give a descriptive account of how the periodic table is structured, include the following in your answer; Groups, periods, metals, non-metals and semi-metals, number of outer shells electrons, trends of chemical and physical properties of elements for groups 1, 7 and 0, gaps left by Mendeleev and their relevance

This image shows a single sheet of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



Chemistry:

A1 Periodicity and Quantities used in Chemical Reactions

Objectives: I know / I can do		 Help!
<p>a) Describe the differences between elements, compounds and mixtures.</p> <p>b) Construct word equations and balanced symbol equations for chemical reactions.</p> <p>c) Identify the states of elements and compounds with their state symbols; (<i>s, l, g, aq</i>).</p> <p>d) Explain what a neutralisation reaction is and identify the metal salts formed from the acid used; (<i>HCl, H₂SO₄ and HNO₃</i>).</p> <p>e) Construct word equations and balanced symbol equations for neutralisation reactions.</p> <p>f) Deduce the number of outer shell electrons for an element</p> <p>g) Analyse the trends of chemical and physical properties for elements in the periodic table; (<i>type of bonding and strength, boiling point, melting point and electrical conductivity</i>).</p> <p>h) Calculate the number of moles for a given mass of element or compound.</p> <p>i) Calculate the mass of a reactant or product, using a balanced equation and the masses given.</p> <p>j) Describe the features of the periodic table in terms of its ordering of elements by; (<i>group and period number, number of outer shell electrons, Mendeleev's predictions and gaps previously left</i>).</p> <p>k) Explain the chemical and physical properties for elements in group 1, 7 and 0 of the periodic table.</p>		

Physics

Complete the following short answer questions:

1. No device is 100% efficient. Circle the correct type of non-useful energy that is dissipated in each example below:

a) A filament light bulb

Electricity	Heat	Sound
b) A hair dryer		
Electricity	Heat	Sound

2. Name two types of renewable energy that can be used to generate electricity without using heat.

3. Circle the correct answer in each case. Recall the equations you have used before.

a) The kinetic energy of a 500 kg car moving at 20 m/s is:

1,000 J	100,000 J	10,000 J
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b) The work done by force of 35 N moving a toy car a distance of 2.5 m is:

87.5 J	32.5 J	14 J
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4. a) Underline the correct definition of power.

rate at which energy is transferred	rate at which charge flows	time ÷ work
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b) Recall two equations you have used before to calculate the power of a crane, which lifts a 100 N load through a height of 6 m in a time of 5 seconds.

5. This table gives some information about three electrical appliances:

Appliance	Power input (W)	Power wasted (W)	Useful power output (W)	Efficiency (%)
Television	200	120	80	
Security light	1,000		300	30
Microwave oven		350	350	50

a) Complete the table for the security light and microwave oven.

b)i) Write the name of the unit shown by the letter W in the table.

ii) Recall the equation to calculate the efficiency and then work this out for the television.

Extended answer question



The table below gives information about generating electricity from wind and nuclear power:

	A wind turbine	A nuclear power station
Overall cost of generating electricity (p/kWh)	5.6	2.8
Maximum power output (MW)	2	3,600
Lifetime (years)	15	45
Waste produced	None	Radioactive waste
Lifetime carbon footprint (g of CO ₂ /kWh)	4.64/5.25 (onshore/offshore)	5
Commissioning cost (£ million)	3	4,000

[illegible]

Physics:

C1 Application of useful Equations

Objectives: I know / I can do		 Help!
<p>a) Identify the different types of energy transfer and their conversions.</p> <p>b) Describe some of the alternative forms of renewable energy.</p> <p>c) Recall equations and rearrange them to find a given quantity including their units for:</p> <ul style="list-style-type: none"> - Kinetic Energy ($KE = 0.5 \times mv^2$) - Work Done ($W = F \times d$) - Power (Power = Work/Time); <p style="padding-left: 40px;">Where, work ($W = mgh$; where m = mass,</p> <p style="padding-left: 80px;">g = gravitational potential</p> <p style="padding-left: 40px;">energy($9.8m/s^2$)</p> <p style="padding-left: 40px;">and m = mass)</p> <ul style="list-style-type: none"> - Energy for an electrical appliance; <p style="padding-left: 40px;">(Energy = power x time)</p> <p>d) Recall the equation for calculating % efficiency and use this for calculating appliance efficiency from information given.</p> <p>e) Evaluate data given for different forms of energy use and weigh up the benefits and drawbacks based on cost-effectiveness and environmental impact.</p>		

Forensic Science (Evidence Collection)

Use research based study to complete the following information (You may use additional sheets should they be required):



1. How is a crime scene preserved so that any evidence collected can be used in a court of Law?
2. What is collected and documented at the crime scene and how?



3. What kinds of evidence could be collected at a crime scene?

4. Who might be present at a crime scene and what are their individual roles?

Task three: communication in science

The value of communication in science is of most importance and can be seen as a major employment skill in that should you work in the science industry, you may be asked to present results and findings to an audience.

You are required to complete a presentation on an area of personal interest this could be any of the following, *e.g.* your mobile phone/sport/drama/music/employment/family or any other suitable opportunity to showcase your presenting skills.

The content is not as important as your style in pitching the information to your audience, to which you should follow the criteria of:

1. Your Presentation will need to be a maximum of 5 slides you can use either,
 - Windows PowerPoint or
 - Prezi <http://prezi.com/> (for this you will need to register)
2. One key idea to each slide (each slide should have a maximum of 5 sentences)
3. Each sentence should be 5 words maximum
4. You should include images/diagrams/animations/video clips to give high impact
5. References (if required), should be included, specifying the date when the information was accessed, using a suitable referencing system such as Harvard convention as instructed using the following link:-

<http://www.neilstoolbox.com/bibliography-creator/index.htm>

You can use the references dropdown menu in Microsoft Office to do this.

6. Your PowerPoint/Prezi presentation should be a maximum of 5 slides
7. Save your presentation on a memory stick or in a cloud based application *e.g.*
<https://www.icloud.com> or [dropbox-https://www.dropbox.com/](https://www.dropbox.com/)
8. You will be doing the presentation in your first week of study, please let the course team leader (Dr. Nicholson) know if there is a problem with doing the presentation;
E-mail address: Gary.Nicholson@st-georges-academy.org
9. Do write your presentation notes as back up, in case you have a mental freeze, which is common when not having experience of presenting to an audience
10. Do bring a memory stick to your first lesson with your presentation on it so you are well prepared

Please bring the work with you to your
first lesson

AND remember to start the study of your
course well prepared in bringing; - a pen,
pencil, ruler, eraser, calculator and an A4
lever arch folder with paper and dividers
to section your unit work in readiness for
your study

Transition work completion check list

Task Number	Activity	Evidence fully complete (Y/N)
1	One of the Forensic Science 250-word reports	
2	Biology short knowledge questions	
2	Chemistry short knowledge questions	
2	Physics knowledge short questions	
2	Biology Extended knowledge question	
2	Chemistry Extended knowledge question	
2	Physics Extended knowledge question	
2	Forensic Science Evidence Collection Research Activity	
3	Presentation pitch	