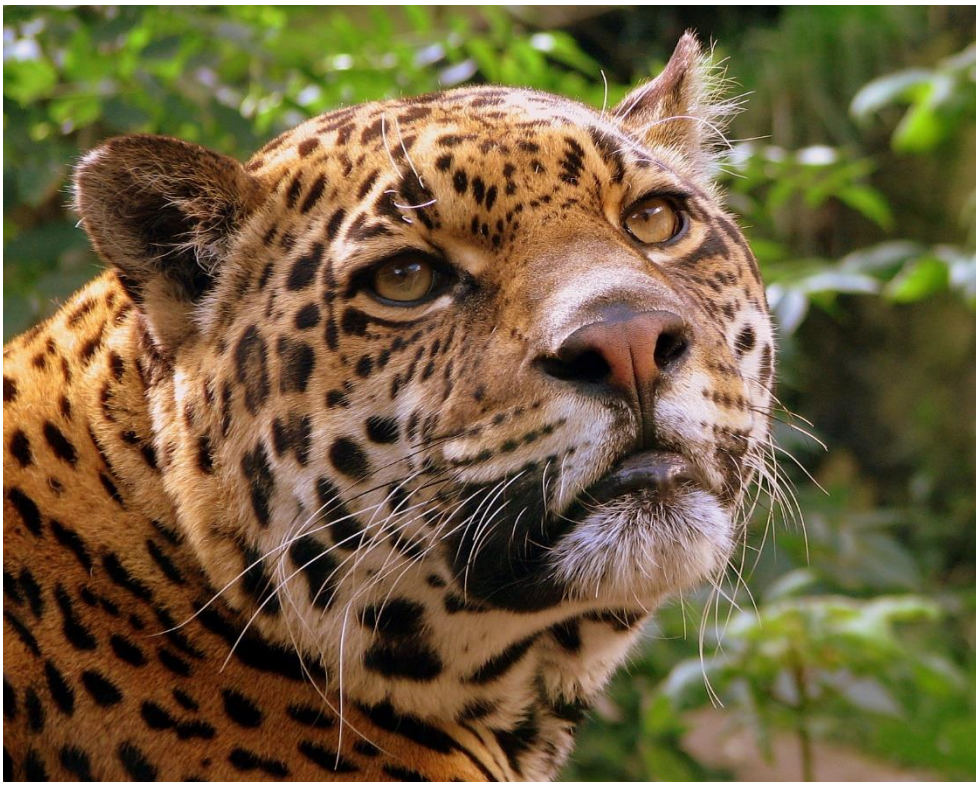
BTEC Applied Science



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Welcome to Applied Science!

Our aim is to ensure that you thoroughly enjoy studying science and we will provide help, support and guidance throughout the course!). We want to ensure that you reach your full potential and we hope that the enthusiasm of our highly qualified staff will allow you to reach your goal. You will find excellent laboratories that are both well-equipped and pleasant to work in. In addition, there is information about careers and university courses in ST2.1 (the Science & Technology computer room).

Whilst we expect you to work hard, we hope that you find your Science lessons stimulating and enjoyable.

Your background in Science

Before arriving here many of you will have studied Science at school. Some of you will have followed separate subject Science courses and others Double Science courses. For this reason we do not assume that everyone has a full knowledge of GCSE science topics. Rather, we approach each unit by starting with the basics and then building upon this.

When we cover a topic which you have met at GCSE, do not assume that you know it all already - we will be teaching it in more depth and expecting more detail and understanding than before. Don't worry if you struggle at first - this is quite normal. As long as you are prepared to work hard and come and ask for help, you will get over this initial period.

BTEC Science Our department comprises:

Gareth Wright – gwri@asfc.ac.uk (Head of Department)

Gemma Chadwick – gemma.chadwick@asfc.ac.uk (Second in Department)

Natalie Lorenzen-nlor@asfc.ac.uk

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Sydney Jones-Jackson- sjjo@asfc.ac.uk

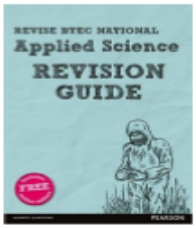
Andrew Hodson- anho@asfc.ac.uk

Alison Isaac (technician)

During the course you may be taught by more than one of us. Remember that if you have a problem and require help you may ask **any** one of the tutors. When not teaching we can be found in the Science office.

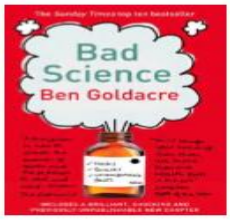
Useful Resources:

- **http://qualifications.pearson.com/en/qualifications/btec-nationals/applied-science-2016.html#tab-1**
- **BTEC Applied Science Revision Guide**



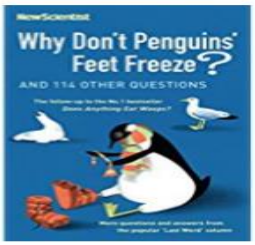
- **Revision - http://www.bbc.co.uk/schools/gcsebitesize/science/add_aqa/**

Suggested Reading



By Ben Goldacre
http://bit.ly/pixlchembook3
Here Ben Goldacre takes apart anyone who published bad or misleading science. This book will make you think about everything the advertising industry tries to sell you by making it sound 'sciency'.

By New Scientist
Why Don't Penguins' Feet Freeze? is the latest compilation of readers' answers to the questions in the 'Last Word' column of *New Scientist*, the world's best-selling science weekly.



Movie Recommendations

Yes that's right. There are some great films linked to science and perfect for a rainy day! Here are our top 5 recommendations.

Inherit the wind (1960): Based on the real life trial of a teacher accused of teaching Darwinian evolution.

Lorenzo's oil (1992): The parents of a child with an autoimmune disorder challenge Doctors to find a new cure. Based on a true story

Gorillas in the mist(1988): An absolute classic must watch! Based on the life work of Diane Fossey and her bid to protect mountain Gorillas from poachers and habitat destruction.

Something the lord made (2004): A black man in the 1930's is originally hired as a janitor but proves himself adept at assisting the "Blue Baby Doctor" with his medical research. This film stars the late Alan Rickman and also tackles themes of predjudice.

The Andromeda strain (1972): Written by Michael Crichton (of Jurassic Park fame) people start to become very ill when infected by alien microbes.

If you have 30 minutes to spare, why don't you watch a presentation from a leading scientist? Visit www.ted.com to find your favourite, here are a couple to get you started.

A New Superweapon in the Fight Against Cancer
Available at :
http://www.ted.com/talks/paula_hammond_a_new_superweapon_in_the_fight_against_cancer?language=en
Cancer is a very clever, adaptable disease. To defeat it, says medical researcher and educator Paula Hammond, we need a new and powerful mode of attack.

Why Doctors Don't Know About the Drugs They Prescribe
Available at :
http://www.ted.com/talks/ben_goldacre_what_doctors_don_t_know_about_the_drugs_they_prescribe?language=en
When a new drug gets tested, the results of the trials should be published for the rest of the medical world — except much of the time, negative or inconclusive findings go unreported, leaving doctors and researchers in the dark.

How to get help

No one expects you to know the answers to all the questions you might be asked just by coming to lessons. You must be prepared to seek out assistance if you are to make progress at this level.

You can obtain help in a number of ways:

1. **Speak to your teacher** at the end of the lesson. If the query is straightforward, you can be given some help. If it will take more time to explain than is available before the next lesson, your teacher will arrange a mutually convenient time for your problem to be discussed.
2. **Come and find any of the science staff** when you are free. As long as there is someone available to speak to you, your problem can be discussed immediately.
3. Come to one of the **Subject Support Sessions** that we run at various times throughout the year. These are informal sessions where problems arising from class work or homework assignments can be discussed with one of the science staff. Check the notices around the labs for details of times and places of topic specific sessions.

Science department

What you can expect from us:

- The setting of worthwhile tasks to improve scientific skills and knowledge through a variety of approaches
- Guidance and monitoring to improve your Scientific skills
- The regular setting, marking and prompt return of work
- Regular feedback to identify problems, find solutions and give direction for the future
- To try to make lessons enjoyable, interesting and stimulating
- Full coverage of the syllabus and preparation for University
- Confirmation in the first few weeks that the course is the right one for you and your skills. If this is not the case we will recommend transfer to something more suitable for you
- Daily support from either a teacher or A2 students

What we expect from you:

- To come prepared to work hard in lessons and participate fully. This includes having completed your lesson preparation work as well as making sure you have a pen, pencil, ruler and calculator
- Safe working practice throughout

- Completion of all work set to realistic deadlines
- Work is completed at the best possible standard you can attain
- If you are absent through illness / visit to a university etc., you take responsibility to complete any work missed
- You get help from a teacher or classmate if you have not understood work done in class, need homework help, or need to catch up after absence
- Do more than just the set work! Just turning up to class and doing homework is the absolute bare minimum. For a high grade you need to have excellent attendance, great punctuality, high grades in coursework and tests and have done extra reading, practising, reviewing and researching
- No inappropriate or unauthorised use of mobile phones in lessons
- Self motivation! This is your BTEC course!
- Complete a minimum of 4 hours private study per week. More if you're aiming for a high grade!

Don't forget:

- If you are unable to attend a class you must call the college reception to inform us. Tel. 0161 330 2330
- If you need to speak to a member of the team, call ext. 302
- Alternatively you can contact us by email.

Safety code: Science department

It is very important to keep the laboratory a safe place to work, therefore you must always abide by the following:

Before the lesson starts you must:

1. Never go into a laboratory without permission
2. Always walk in the laboratory and never run or push anyone
3. Always remove/secure your coat, hat, watch, jewellery etc. as appropriate
4. Always fasten loose clothing etc.
5. Always tie back long hair and scarves
6. Place your bag under the bench or in the storage cubes
7. Never eat or drink in the lab

During the lesson you must:

1. Always follow the instructions as provided by the teacher
2. Work sensibly and quietly to minimise hazards and to ensure that you can hear any instructions
3. Always wear safety goggles / glasses when heating anything, working with chemicals or when told to do so
4. Always wear a lab coat when completing practical activities
5. Always put your stool under the bench if you leave your seat
6. Always report an accident or breakage immediately. If you spill anything on yourself, immediately wash with water and call for your teacher's help
7. Never put anything in your mouth
8. Never interfere with apparatus
9. Never put glass or solids down the sink
10. Never sit on the benches unless instructed to do so
11. Never remove safety screens or notices
12. Always wash and dry your hands thoroughly as appropriate

At the end of the lesson:

1. Clean any equipment used and return it as instructed by your teacher
2. Wipe the benches, tables and sink areas if they are wet
3. Wash and dry your hands
4. Leave the laboratory clean and tidy
5. Return your lab coat

Science communication is essential in the modern world and all the big scientific companies, researchers and institutions have their own social media accounts. Here are some of our top tips to keep up to date with developing news or interesting stories:

Follow on Twitter:
Commander Chris Hadfield – former resident aboard the International Space Station @cmdrhadfield

Tiktaalik roseae – a 375 million year old fossil fish with its own Twitter account!
@tiktaalikroseae

NASA's Voyager 2 – a satellite launched nearly 40 years ago that is now travelling beyond our Solar System
@NSFVoyager2

Neil dGrasse Tyson – Director of the Hayden Planetarium in New York
@neiltyson

Sci Curious – feed from writer and Bethany Brookshire tweeting about good, bad and weird neuroscience
@scicurious

The SETI Institute – The Search for Extra Terrestrial Intelligence, be the first to know what they find!
@setiinstitute

Carl Zimmer – Science writer Carl blogs about the life sciences
@carlzimmer

Phil Plait – tweets about astronomy and bad science
@badastronomer

Virginia Hughes – science journalist and blogger for National Geographic, keep up to date with neuroscience, genetics and behaviour
@virginiahughes

Maryn McKenna – science journalist who writes about antibiotic resistance
@marynmck

Find on Facebook:
Nature - the profile page for nature.com for news, features, research and events from Nature Publishing Group

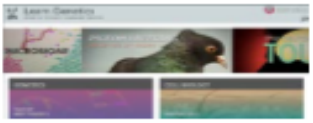
Marin Conservation Institute – publishes the latest science to identify important marine ecosystems around the world.

National Geographic - since 1888, National Geographic has travelled the Earth, sharing its amazing stories in pictures and words.

Science News Magazine - Science covers important and emerging research in all fields of science.

BBC Science News - The latest BBC Science and Environment News: breaking news, analysis and debate on science and nature around the world.

These websites all offer an amazing collection of resources that you should use again and again through out your course.



Probably the best website on Biology---
Learn Genetics from Utah University has so much that is pitched at an appropriate level for you and has lots of interactive resources to explore, everything from why some people can taste bitter berries to how we clone mice or make glow in the dark jelly fish.
http://learn.genetics.utah.edu/

ZSL
LIVING CONSERVATION

In the summer you will most likely start to learn about Biodiversity and Evolution. Many Zoos have great websites, especially London Zoo. Read about some of the case studies on conservation, such as the Giant Pangolin, the only mammal with scales.
https://www.zsl.org/conservation

Drosophila
sciencecourseware.org

At GCSE you learnt how genetic diseases are inherited. In this virtual fly lab you get to breed fruit flies to investigate how different features are passed on.
http://sciencecourseware.org/vcise/drosophila/

DNA from the beginning is full of interactive animations that tell the story of DNA from its discovery through to advanced year 13 concepts. One to book mark!
http://www.dnaftb.org/

Ok, so not a website, but a video you definitely want to watch. One of the first topics you will learn about is the amazing structure of the cell. This BBC film shows the fascinating workings of a cell... a touch more detailed than the "fried egg" model you might have seen.
http://www.dailymotion.com/video/xzhOkb_the-hidden-life-of-the-cell_shortfilms
If this link expires – google "BBC hidden life of the cell"

Science: Things to do!

Day 4 of the holidays and boredom has set in?
There are loads of citizen science projects you can take part in either from the comfort of your bedroom, out and about, or when on holiday. Wikipedia does a comprehensive list of all the current projects taking place. Google 'citizen science project'

Bumblebee Conservation Trust

AgeGuess

OPAL EXPLORE NATURE

big butterfly count

THE SHORE THING GET INVOLVED!

eoceans
www.eoceans.org

WildlifeLog
SPOT IT - SHARE IT - SAVE IT

The Big Moss Map

MOOC

Want to stand above the rest when it comes to UCAS? Now is the time to act.
MOOCs are online courses run by nearly all Universities. They are short FREE courses that you take part in. They are usually quite specialist, but aimed at the public, not the genius!
There are lots of websites that help you find a course, such as edX and Future learn.
You can take part in any course, but there are usually start and finish dates.
They mostly involve taking part in web chats, watching videos and interactives.

edX coursera FUTURELEARN ed2go

Completing a MOOC will look great on your Personal statement and they are dead easy to take part in!

Referencing and Quotations

Referencing systems for electronic sources are becoming standardised. The in text reference should follow the same format as for printed resources. However the bibliographic information on your references page will be different and generally requires you to include the type of resource plus when it was accessed as well as the URL for online sources.

For example:

British Sports-Disability Sports online reference:

http//www.britishsports.com/disabilitysports.htm (downloaded 11th July 2017)

General Quotations

When using a quotation you will reproduce the actual words a writer uses in your work. You should therefore take care to copy it accurately. If you copy the actual words a writer uses you should put thewords in quotation marks (“”) and give a reference.

In this example:

Jack Frost wrote “summer is not coming in” (this is the quotation)

(Frost A 2001 p9) would appear in the text (this is the reference)

Plagiarism

Plagiarism is copying and passing off work as the learners own. This can be a whole piece of work or a part, including artwork, images, words, computer generated work (including the internet) Thoughts, inventions etc. This is taken very seriously and work handed in that has a form of plagiarism will not be accepted.

To ensure you do not plagiarise, write using your own words. If you do use the work of others e.g. books, internet etc you must reference it using the protocol above.

Initial Assessment

You must print the relevant sections and take them to your first lesson. **Complete all tasks if you are starting on the 90 Credit Diploma course. Complete tasks 1 and 2 only if you are starting the BTEC Certificate.** Complete each task as well as you can and sign to acknowledge your understanding of the lab rules and those regarding plagiarism.

Name……

I have read and understand the health and safety rules and agree to follow them at all times in the laboratory

signed…….

Date……..

I have read and understand the information on plagiarism and agree to acknowledge all others work and to only submit work that is my own

signed……

Date…….

BTEC Induction Assignment:

Part one:

Health & Safety Awareness

When scientists work in a laboratory there are certain procedures and practices they have to carry out whether they are involved in routine laboratory analysis or in scientific research.

In order for them to carry out these procedures and practices safely they must follow health and safety rules.

In the table below enter each Personal Protective Equipment (PPE) that has to be used when carrying out a practical at school and when it is used and what it is specifically used to protect you from.

Personal Protective Equipment (PPE)	When it is used and what it is used to protect you from

Biology skills

Part two

You will be looking at different types of cells under the microscope when you begin studying Biology topics.

A tissue is a group of similar cells which together perform a function (i.e together they have a job to do in the body).

Research on the internet about the following 4 tissues:

- Muscular tissue
- Epithelial tissue
- Nervous tissue
- Connective tissue

Find and print an image that shows the cells of each tissue.

Find out what is the function (job) of each tissue.

Hand this in as a separate report and include any references used at the end.

Chemistry

Part three: What are atoms made of?

In chemistry, you need to know that atoms are made of 3 "sub-atomic" particles called protons, neutrons and electrons. These particles have mass and charge values which are relative to each other as shown in this table:

Particle name	Relative charge	Relative mass
Proton	+1	1
Neutron	0	1
Electron	-1	0

Atomic Number, Mass Number and Isotopes

- Atomic number = Z. It is also called the proton number as it gives the number of protons in the nucleus. For atoms, the number of protons is equal to the number of electrons because atoms have no overall charge.
- Elements are arranged in the periodic table in order of their atomic (proton) number.
- The mass number is given the symbol A. It gives the total number of neutrons + protons. These are the particles in the atom which have mass, and they are found in the nucleus.

1. Use the periodic table of elements on the last page – it gives the atomic number (a whole number) for each element – and complete the table below:

Element	Symbol	Z	A	Number of protons	Number of neutrons	Number of electrons
sodium			23			
		6	12			
		12			12	
		84	210			
chlorine		17	35			
chlorine		17	37			

2. The last two elements are "isotopes" of chlorine. In general, what are isotopes?

_____

_____

Part four: Arrangement of Electrons

- Electrons orbit the nucleus in energy levels (called shells)
- You always fill innermost levels first
- The first level can hold a maximum of 2 electrons, the second can hold 8 and the third can hold a maximum of 8.

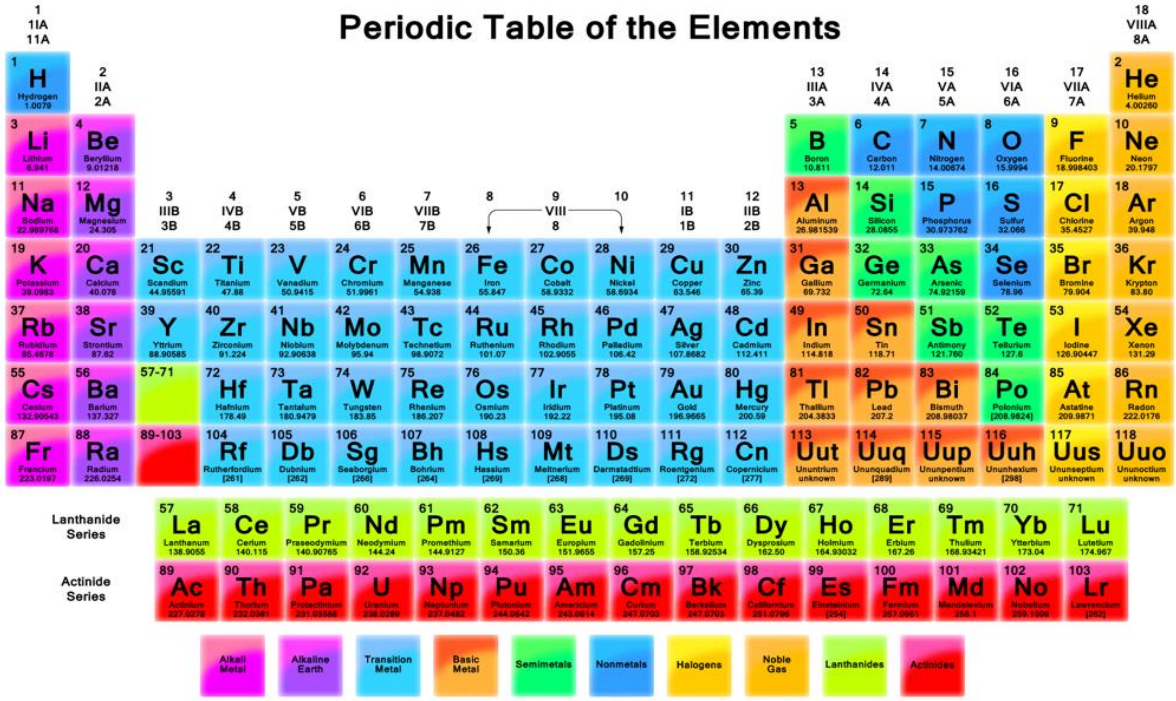
Elements and the periodic table

Elements are arranged in groups in the periodic table according to how many electrons they have in their highest energy level (outer shell). You will probably be familiar with groups 1 to 7 (lithium to fluorine) of the periodic table.

Use the copy of the periodic table provided to carry out the next task.

3. Draw a diagram to show the electron arrangement in shells of each of the following elements- carbon, fluorine, magnesium and sulfur.

Carbon	Fluorine
Magnesium	Sulfur



Physics

Part 5

The purpose of this exercise is to see how you analyse and present data in a scientific way.

<u>Investigating how the Length of a Pendulum effects the Swing Time</u>

The length of a pendulum was altered and the time taken for each swing was measured. The time of each swing was measured 3 times so that an average value could be found. The results were:

(length = 10 cm, time 1 = 2.7 sec, time 2 = 3.1 sec, time 3 = 2.5 sec)

(length = 20 cm, time 1 = 6.2 sec, time 2 = 5.7 sec, time 3 = 6.5 sec)

(length= 30 cm, time 1 = 9.7 sec, time 2 = 8.6 sec, time 3 = 9.2 sec)

(length= 40 cm, time 1 = 12.6 sec, time 2 = 11.9 sec, time 3 = 12.2 sec)

(length= 50 cm, time 1 = 15.8 sec, time 2 = 14.4 sec, time 3 = 15.3 sec)

(length= 60 cm, time1 = 18.2 sec, time 2 = 17.6 sec, time 3= 18.4 sec)

<u>Task 1</u>

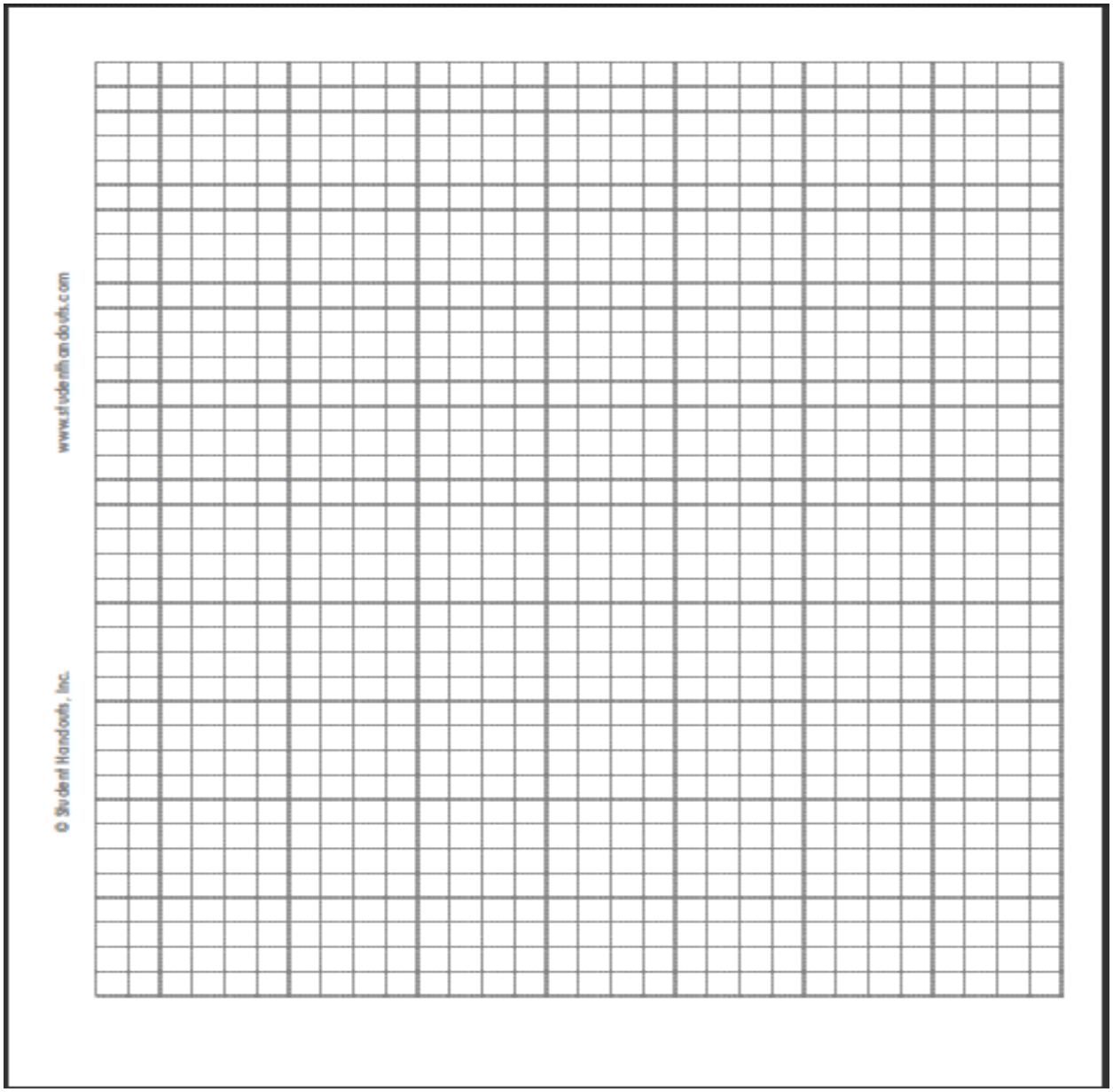
Present the results above results in a table using correct headings and including correct and appropriate units. You should have a column for time 1, time 2 and time 3 and a column for the average time.

Task 2

Using the data presented in your table, produce a graph of your results. Choose an appropriate style of graph and correctly label the axes.

Task 3

Draw the most appropriate line of best fit for your points. Find the gradient of this line and express the value of the gradient to **2 decimal places (2 d.p.)**.



Task 4

The period for a pendulum may be roughly given by the equation T = 6.28 x (length of string in **meters**/0.2). Work out the expected period for a pendulum of length of string of 40 cm. Calculate the difference between the calculated value and the value you found for a pendulum of length of string 40 cm in the data. Express the difference **to 2 significant figures (2 s.f.).**

Task 5

Produce a graph from the data in the table below. Draw a line of best fit for the points and identify any anomalous results.

Mass of pendulum (kg)	Period (seconds)
2	26
3	21
5	17
7	11
9	10
13	8
21	3