Course Start

Course Start is independent learning you need to complete as a fundamental part of your introduction to the course. It should take you approximately 5 hours to complete.

Course Name	**ENVIRONMENTAL SCIENCE**
How this **Course Start** fits into the first term of the course Details of the tasks are shown at the end of this document.	There are four aspects to our Course Start: a) Think about why you want to study Environmental Science and what the most important issues are for Environmental Scientists to help solve b) Increase your background knowledge of climate change, develop your independent study skills and prepare for one the of the first topics you will study (The Atmosphere) c) Start preparing for one of the first topics you will study (The Living Environment) by considering some of the key features that allow life to thrive on planet Earth d) Keep up your Maths skills that you needed for your GCSEs by attempting some maths questions
How will my **Course Start** learning be used in lessons?	In the first year, we shall be studying The Living Environment and The Physical Environment, where you will apply the learning from the tasks you have studied. Our first lesson will be based on discussing your ideas and research with other students. We will build on the Maths task with the skills we practice in the first year. All four activities will feed into your study over the whole course because they help you to begin to develop research skills and understanding of the course content.
Course Start learning objectives	• To consider the importance of Environmental Science as a subject and your motivations for studying it • To research using suggested sources to identify key information and increase your understanding of environmental issues • To understand the foundations of sustainability which lie in the relationship between life and the non-living environment such as gases and water. • To practice some of the mathematical skills that are needed on the course.
Study Skills	• **Research skills** - Searching and selecting appropriate material from different types of media such as TV news, newspapers and web- based sources. • **Making connections** - Using your existing knowledge and the new information you research to deepen your understanding of key topics for the Environmental Science A Level • **Communication skills** - Practising and developing your ability to present ideas and information in written form and then to be able to discuss and explain this in group situations • **Data skills** - Solving mathematical problems building on the range of mathematical skills required at GCSE

Expectations for: Environmental Science

Our specification is: AQA Environmental Science

What this course will require
Completing Planned Study (independent learning) of 5 hours per week. This will include weekly 'retrieval tasks' as ongoing revision.
Writing tasks involving a range of practice exam questions (from 1-25 mark written responses)
Application of numerical skills including analysing graphs and data, producing graphs, statistical analysis, equations and calculations.
Engaging in discussions and presentations based on the themes studied.
Reading and researching around the course, completing extension work and staying up to date with relevant current affairs
Studying a diverse range of topics: including life processes; conservation; biogeochemical cycles; natural resources and energy; water cycle; sustainability.
Developing independent learning skills (e.g. time management, preparing for each week's lessons, completing learning tasks outside lessons)
Participating in field trips across the two-year course (there will be some changes for these trips).
Working scientifically to: develop a range of practical laboratory skills and fieldwork studies to embed scientific principles and scientific skills.
Building on scientific skills to enable working safely and competently in a laboratory'
Taking part in enrichment activities such as local lectures, visiting speakers at lunchtimes, joining in with campus biodiversity activities and college environmental projects.
Thinking synoptically and making links between different areas of study

Welcome to Environmental Science at Varndean

Congratulations on an excellent choice of A Level!

You are about to begin a fantastic A-level course where you will have the chance to really enhance your understanding of the planet you live on. The learning in this booklet is designed to help you make the best possible start to the course.

Guidance:

➢ ***Please complete all activities listed below.***

➢ ***You may complete the work by hand or electronically.***

➢ ***Please ensure work is presented clearly with different tasks labelled***

➢ ***If you complete the work electronically, it must be printed out.***

➢ ***Work (clearly named) should be brought in on your first day of lessons.***

TASK 1 **45 minutes**	Write one paragraph for each of the following prompts. You may want to carry out research to support your writing. a. Why is Environmental Science A Level an important subject to study? b. What are the biggest problems in the world that Environmental Scientists can help solve both now and in the future? c. What are some solutions to these global problems that Environmental Scientists can help to develop?
TASK 2 **1 hour and 30 minutes**	A key theme that runs throughout the course is climate change, which is very topical! You are going to carry out some wider research on the theme of climate change, either in terms of its causes, impacts or solutions. You need to choose at least one of the following resources to read/ watch/ listen to. You then need to write a summary of the key information that you have learnt about either the causes, impacts or solutions of climate change (or maybe all three!) **News sources:** ● Inside Climate News ● Carbon Brief ● BBC News Climate | Latest News & Updates **Podcasts:** ● BBC World Service - The Climate Question - YouTube ● Outrage + Optimism ● Mongabay - Climate news podcasts **Documentaries:** ● BBC One - Climate Change - The Facts ● Before the Flood Full Movie National Geographic ● 1.5 Stay Alive: Science Meets Music in the Caribbean **Books:** *(If you choose to read a book then you might just want to summarise 1 chapter. Most of these will be available to borrow from your local library)* ● The Climate Book (Greta Thunberg, 2022) ● There is No Planet B: A Handbook for the Make or Break Years (Mike Berners-Lee, 2019)* ● The Future We Choose: Surviving the Climate Crisis (Christiana Figueres and Tom Rivett-Carnac, 2020)* ● How to Avoid a Climate Disaster: The Solutions We Have and the Breakthroughs We Need (Bill Gates, 2021)*

TASK 3 **1 hour and 30 minutes**	One of the first topics you will study in A Level Environmental Science is 'The Conditions for Life on Earth'. Earth has a wide range of physical features that have allowed both plant and animal life to develop. You are going to write a report to explain the five most important physical features of earth. For each one you need to identify what the feature is and then explain why it is important for life to thrive. Write this up as a short report. The report should be 1-2 sides of A4 and should be laid out with a main title of 'The Conditions for Life on Earth' and subheadings for each of the 5 features. It should include pictures or diagrams for each feature and you should include the sources of the information you have researched.
TASK 4 **1 hour**	Please complete the maths skills questions on the attached worksheet. You will need to show your workings for all questions. Some of them are more straightforward and some of them are quite tricky - just do your best! You may find it helpful to use your GCSE Maths notes and revision materials to help with the questions.

Task 4 - Maths skills questions

1.

Aircraft design	Year of introduction	Area affected by aircraft noise above 70 dBA / km^2	Maximum weight of aircraft on take-off / tonnes
A	1967	77.0	58
B	1988	25.9	68
C	2017	9.5	82

Use information in **Figure 3** to calculate the percentage (%) reduction in the area affected by aircraft noise above 70 dBA achieved by aircraft design **C** compared with aircraft design **A**.

Give your answer to **two** significant figures.

Show your working.

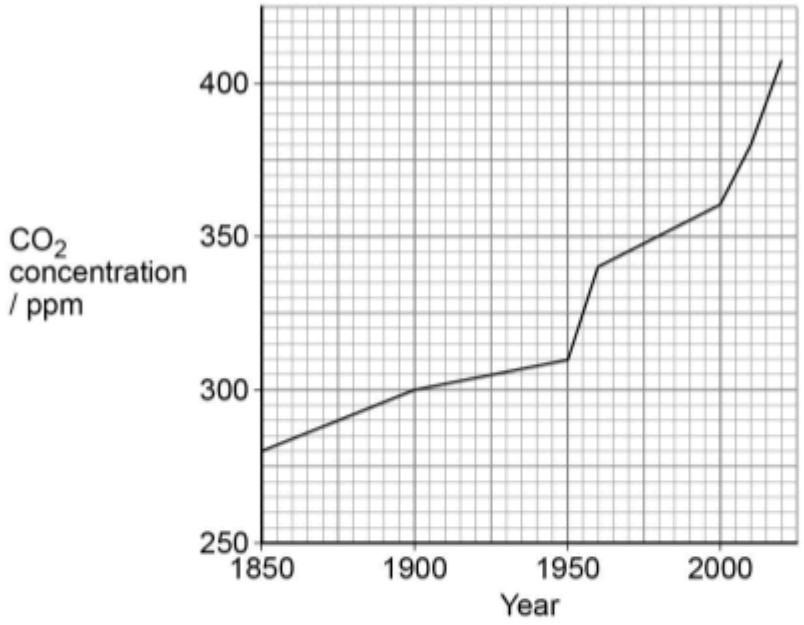
[1 mark]

_____ %

2.

Figure 8 shows the changes in atmospheric CO_2 between the years 1850 and 2020.

Figure 8



Use **Figure 8** to calculate the difference in mean annual change in CO_2 between the period 1900–1950 and the period 1960–2010.

Show your working.

[2 marks]

_____ ppm yr^{-1}

3.

Satellite imagery shows a loss of 3.23×10^4 hectares (ha) of natural forest in the UK from 2013 to 2018.

It has been estimated that this change equates to an extra 9.42 megatonnes (Mt) of CO_2 in the atmosphere.

Calculate how many tonnes of CO_2 the loss of 1 ha of natural forest would contribute to the atmosphere.

Give your answer in standard form.

Show your working.

[3 marks]

_____ t

It has been suggested that the UK needs to plant an extra 1.5 million ha of new forest to meet climate change targets by 2050. Most of this forest will be new commercial forestry plantations.

Table 4 shows the mean rate of carbon sequestration by two tree species.

Table 4

Tree species	**Mean rate of carbon sequestration / t ha^{-1} yr^{-1}**
Sitka spruce	3.65
Beech	2.46

Calculate how many extra tonnes of carbon will be sequestered in the year 2050 if 1.5 million ha of forest are planted with a mix of 80% Sitka spruce and 20% beech.

Give your answer to an appropriate number of significant figures.

Show your working.

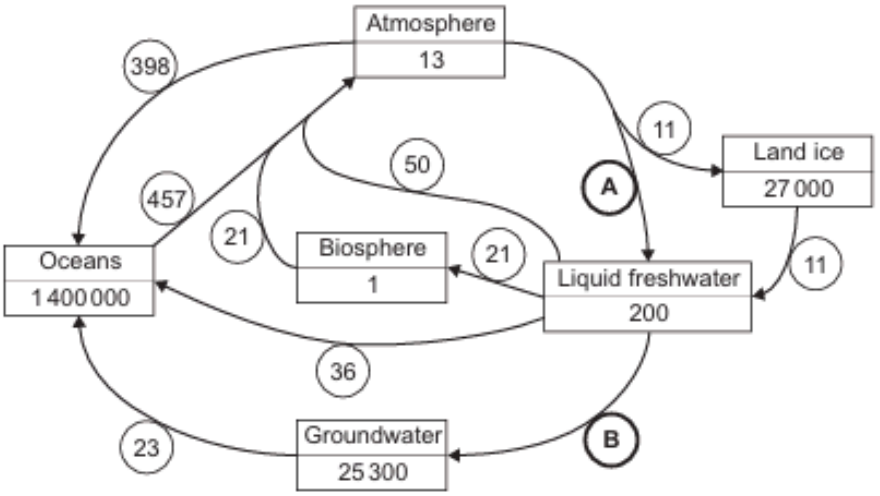
[2 marks]

_____ t

4.

Figure 3 shows the hydrological cycle in a state of dynamic equilibrium.

Figure 3



(a) (i) Calculate the values for **A and B** in **Figure 3**.

[2 marks]

A _____ 10^3 km^3 yr^{-1}

B _____ 10^3 km^3 yr^{-1}

(a) (ii) The residence time (RT) may be calculated using the formula:

$$RT = \frac{\text{Volume of water in reservoir}}{\text{Annual rate of inflow or outflow}}$$

Use the formula to estimate the RTs for water in land ice **and** for water in the biosphere.

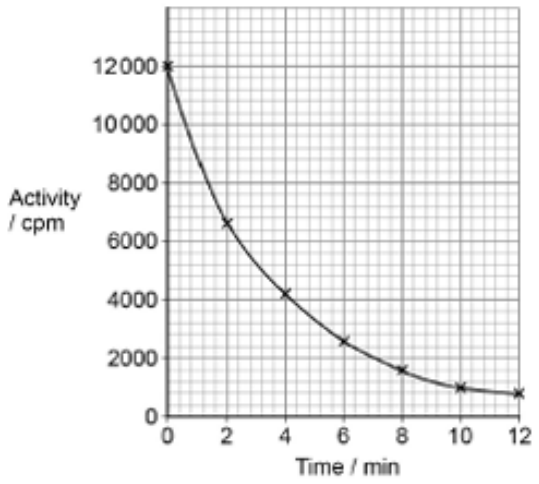
[2 marks]

RT for land ice _____ years

RT for the biosphere _____ days

5. Barium-137m is a radioactive isotope formed from a fission product in a nuclear reactor. The decay activity of barium-137m was recorded in counts per minute (cpm) using a Geiger counter. The results are shown in Figure 1.

Figure 1



Use Figure 1 to calculate the half-life of barium-137m.

[1 mark]

Half-life.....min

6.

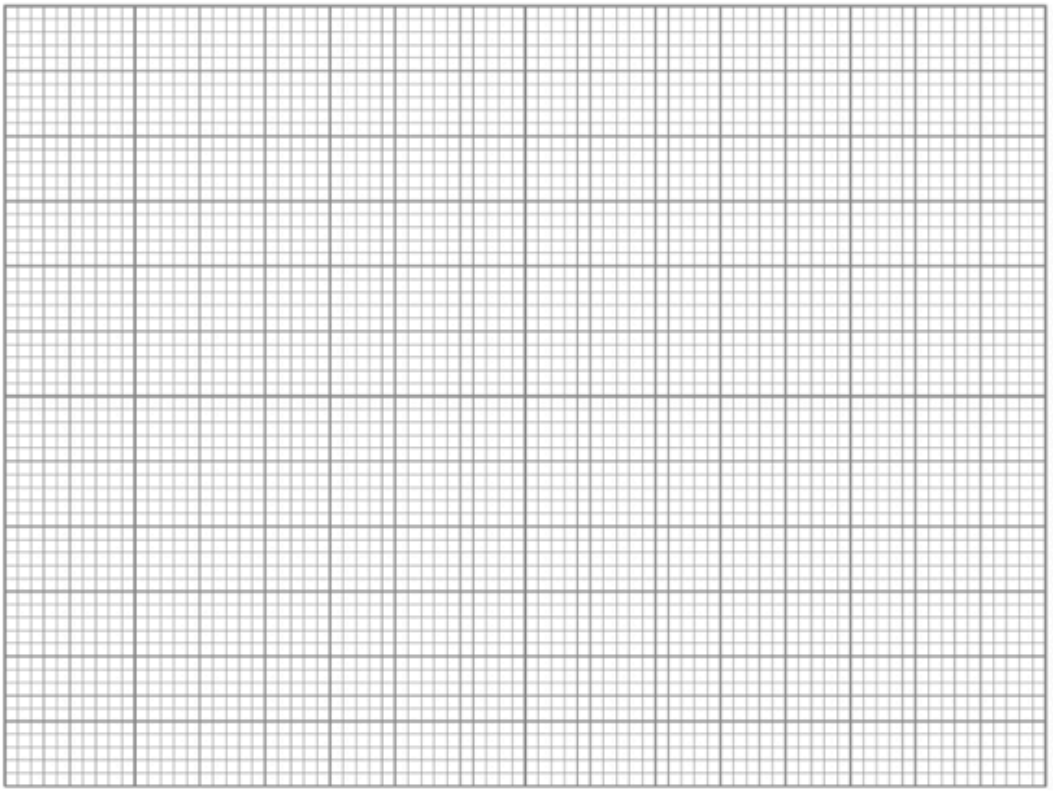
Insulating materials are used to reduce heat loss from different parts of a house. Fibreglass is often used in loft spaces to reduce heat loss through a roof. Table 5 gives data of U values (heat loss) for different thicknesses of fibreglass insulation.

Table 5

Thickness of fibreglass insulation / mm	U value / W m^{-2} °C
0	1.20
25	0.80
50	0.60
75	0.45
100	0.30
150	0.18
200	0.16
300	0.12

Use the information in Table 5 to plot a graph showing how heat loss varies with the thickness of fibreglass insulation.

[2 marks]



7.

Students collected soil samples from different locations in a field. They analysed each sample to find its water content and its organic matter content. Table 6 shows some of their results.

Table 6

Location	Wet soil mass / g	Dry soil mass / g	Burnt soil mass / g	Organic matter content / %
A	48.3	38.7	31.6	18.3
B	50.3	41.1	34.6	15.8
C	49.8	39.6	33.2	
D	49.3	36.6	29.8	18.6
E	48.9	37.8	31.1	17.7

The dry mass of soil is soil which has all its water removed. Dry mass is composed of both organic and non-organic matter. Burnt mass only contains non-organic matter. Use data from Table 6 to calculate the **percentage (%) organic matter content** in dry soil sample C. Give your answer to **one** decimal place. Show your working.

[2 marks]

.....%

8.

The research and development of a wave energy device involves calculating its capacity factor.

This involves comparing the actual annual output of electricity in MWh to the output of electricity in MW if the device worked at maximum capacity.

The capacity factor is calculated by use of the formula:

$$\text{Capacity factor (\%)} = \frac{\text{actual annual output}}{\text{potential maximum annual output}} \times 100\%$$

The capacity factor of a wave energy device is 36% and its potential maximum annual output rating is 1 MW.

Use this information and the equation above to calculate its actual annual output in MWh.

Give your answer to an appropriate number of significant figures.
Show your working.

[3 marks]