SAFFRON WALDEN
COUNTY HIGH SCHOOL

SWCHS SIXTH FORM SUMMER WORK

A Level Environmental Science

TASK
If you have any queries regarding this work please email dchadwick@swchs.net **Task** Read through the information below and complete the following tasks before you first lesson: 1. Make flash cards on the following key terms to bring to your first lesson. [abiotic, biotic, biodiversity, keystone species, flagship species, in situ conservation, ex-situ conservation, carbon capture storage, carbon sequestration, dynamic equilibrium, El nino, La nina, permafrost and proxy data] Use the key list that can be found here - 7447 Subject specific vocabulary 2. Complete activity 1,2 and 3 on key terms used in practical investigations by matching up the correct term with the definition 3. Complete activity 4 and 5 using the math conversion tables provided. 4. Complete activity 10 on describing and explaining graphs. **How will this work be used in lessons?** Your key vocab will be tested, and the maths skills and practical skills questions will be marked and used throughout the year. **How long will this task take?** Approx. 2-3 hours

Aim of the booklet

This booklet will support your transition from GCSE science to A-level. At first, you may find the jump in demand a little daunting, but if you follow the tips and advice in this guide, you'll soon adapt. As you follow the course you will see how the skills and content you learnt at GCSE will be developed and your knowledge and understanding of all these elements will progress.

We have organised the guide into three sections:

1. Understanding the specification and the assessment
2. Transition activities to bridge the move from GCSE to start of the A-level course
3. Progression of key ideas from GCSE to A-level.

Understanding the specification and the assessments

Specification at a glance

The specification is a useful reference document for you. You can download a copy from our website here.

The most relevant parts of the specification for students are the following:

Section 3: Subject content

Section 6: Appendix A: Working scientifically

Section 7: Appendix B: Maths requirements and examples

In Environmental Science the subject content is arranged into seven main sections, all of which need to be covered over the 2 years of your A-level course. The section titles are listed here:

3.1 The living environment

3.2 The physical environment

3.3 Energy resources

3.4 Pollution

3.5 Biological resources

3.6 Sustainability

3.7 Research methods

Each section of the content begins with an overview, which describes the broader context and encourages an understanding of the place each section has within the subject. This overview will not be directly assessed.

The content is presented in a two-column format. The left-hand column contains the specification content and the right-hand column contains additional information to further exemplify the content.

The seventh section (3.7) is Research methods. These are overarching methods that environmental scientists use to investigate a wide range of environmental issues. They include scientific methodologies and sampling techniques. You are not expected to have first-hand experience of all these methodologies and techniques but over your 2-year course you need to develop an understanding of the general principles and apply them to a range of environmental situations and techniques. The practical handbook will help with this, and you can download it here.

The Working scientifically and maths skills you need to develop are set out in Appendix A and Appendix B. At the end of each topic of the subject content we have listed opportunities for the development of these skills. These tables are extensive, and we do not expect that you would use all these opportunities during your learning of this content. They are there as examples for your teacher, not as a checklist for coverage. These skills can be assessed through any of the content on the written papers, not necessarily in the topics we have signposted.

Assessment structure

The assessment for the A-level consists of two exams, which you will take at the end of the course.

Paper 1	+	Paper 2
What's assessed • The physical environment • Energy resources • Pollution • Research methods		**What's assessed** • The living environment • Biological resources • Sustainability • Research methods
How it's assessed • Written exam: 3 hours • 120 marks • 50% of the A-level		**How it's assessed** • Written exam: 3 hours • 120 marks • 50% of the A-level
Questions A combination of multiple choice, short answer, and extended response (9 marks) and one essay from a choice of two titles 25 marks		**Questions** A combination of multiple choice, short answer, and extended response (9 marks) and one essay from a choice of two titles 25 marks

Assessment objectives

As you know from GCSE, we have to write exam questions that address the Assessment objectives (AOs). It is important you understand what these AOs are, so you are well prepared. In Environmental Science there are three AOs.

- AO1: Demonstrate knowledge and understanding of scientific ideas, processes, techniques, and procedures, including in relation to natural processes/systems and environmental issues (about 30-35% of the marks).
- AO2: Apply knowledge and understanding of scientific ideas, processes, techniques, and procedures, including in relation to natural processes/systems and environmental issues (about 40-45% of the marks).
- AO3: Analyse, interpret, and evaluate scientific information, ideas, and evidence, including in relation to environmental issues to make judgements and draw conclusions (about 25–30% of the marks).

Other assessment criteria

At least 10% of the marks for A-level Environmental Science will assess mathematical skills, which will be equivalent to Level 2 (Higher Tier GCSE Mathematics) or above.

At least 15% of the overall assessment of A-level Environmental Science will assess knowledge, skills and understanding in relation to practical work.

Command words

Command words are used in questions to tell you what is required when answering the question. You can find definitions of the command words in Environmental Science assessments on the website. They are very similar to the command words used at GCSE.

Subject-specific vocabulary

You can find a list of definitions of key terms used in our A-level Environmental Science specification here

You will become familiar with, and gain understanding of, these terms as you work through the course.

Transition activities

The following activities cover some of the key skills from GCSE science that will be relevant at A-level. They include the vocabulary used when working scientifically and some maths and practical skills.

You can do these activities independently or in class. The booklet has been produced so that it can be completed electronically or you can print them out.

The activities are **not a test**. Try the activities first and see what you remember and then use textbooks or other resources to answer the questions. **Don't** just go to Google for the answers, as actively engaging with your notes and resources from GCSE will make this learning experience much more worthwhile.

The answer booklet guides you through each answer. It is not set out like an exam mark scheme but is to help you get the most out of the activities.

Understanding and using scientific vocabulary

Understanding and applying the correct terms are key for practical science. Much of the vocabulary you have used at GCSE for practical work will not change but some terms like working out uncertainty are dealt with in more detail at A-level so are more complex.

Activity 1 Scientific vocabulary: Designing an investigation

Link each term on the left to the correct definition on the right.

Hypothesis	The maximum and minimum values of the independent or dependent variable
Dependent variable	A variable that is kept constant during an experiment
Independent variable	The quantity between readings, eg a set of 11 readings equally spaced over a distance of 1 metre would give an interval of 10 centimetres
Control variable	A proposal intended to explain certain facts or observations
Range	A variable that is measured as the outcome of an experiment
Interval	A variable selected by the investigator and whose values are changed during the investigation

Activity 2 Scientific vocabulary: Making measurements

Link each term on the left to the correct definition on the right.

Term	Definition
True value	The range within which you would expect the true value to lie
Accurate	A measurement that is close to the true value
Resolution	Repeated measurements that are very similar to the calculated mean value
Precise	The value that would be obtained in an ideal measurement where there were no errors of any kind
Uncertainty	The smallest change that can be measured using the measuring instrument that gives a readable change in the reading

Activity 3 Scientific vocabulary: Errors

Link each term on the left to the correct definition on the right.

Term	Definition
Random error	Causes readings to differ from the true value by a consistent amount each time a measurement is made
Systematic error	When there is an indication that a measuring system gives a false reading when the true value of a measured quantity is zero
Zero error	Causes readings to be spread about the true value, due to results varying in an unpredictable way from one measurement to the next

Understanding and using SI units

Every measurement has a size (eg 2.7) and a unit (eg metres or kilograms). Sometimes, there are different units available for the same type of measurement. For example, milligram, gram, kilogram and tonne are all units used for mass.

There is a standard system of units, called the SI units, which are used for most scientific purposes.

These units have all been defined by experiment so that the size of, say, a metre in the UK is the same as a metre in China.

There are seven SI base units, which are given in the table.

Physical quantity	Unit	Abbreviation
Mass	kilogram	kg
Length	metre	m
Time	second	s
Electric current	ampere	A
Temperature	kelvin	K
Amount of substance	mole	mol
luminous intensity	candela	cd

All other units can be derived from the SI base units. For example, area is measured in metres square (written as m^2) and speed is measured in metres per second (written as $m\ s^{-1}$). This is a change from GCSE, where it would be written as m/s.

Using prefixes and powers of ten

Very large and very small numbers can be complicated to work with if written out in full with their SI unit. For example, measuring the width of a hair or the distance from Manchester to London in metres (the SI unit for length) would give numbers with a lot of zeros before or after the decimal point, which would be difficult to work with.

So, we use prefixes that multiply or divide the numbers by different powers of ten to give numbers that are easier to work with. You will be familiar with the prefixes milli (meaning 1/1000), centi (1/100), and kilo (1 × 1000) from millimetres, centimetres, and kilometres.

There is a wide range of prefixes. Most of the quantities in scientific contexts will be quoted using the prefixes that are multiples of 1000. For example, we would quote a distance of 33 000 m as 33 km.

The most common prefixes you will encounter are given in the table.

Prefix	Symbol	Power of 10	Multiplication factor	
Tera	T	10^{12}	1 000 000 000 000	
Giga	G	10^{9}	1 000 000 000	
Mega	M	10^{6}	1 000 000	
kilo	k	10^{3}	1000	
deci	d	10^{-1}	0.1	1/10
centi	c	10^{-2}	0.01	1/100
milli	m	10^{-3}	0.001	1/1000
micro	μ	10^{-6}	0.000 001	1/1 000 000
nano	n	10^{-9}	0.000 000 001	1/1 000 000 000
pico	p	10^{-12}	0.000 000 000 001	1/1 000 000 000 000
femto	f	10^{-15}	0.000 000 000 000 001	1/1 000 000 000 000 000

Activity 4 SI units and prefixes

What would be the most appropriate unit to use for the following measurements?

1. The length of a leaf
2. The distance that a migratory bird travels each year
3. The diameter of a smoke particle
4. The mass of a woodlouse
5. The volume of the trunk of a large tree
6. The flow volume of a river

Activity 5 Converting data

1. Re-write the following.

   a. 0.00122 metres in millimetres
   b. 1 042 000 micrograms in grams
   c. 1120.2 metres in kilometres
   d. 0.7 decilitres in millilitres
   e. 70 decilitres in litres

2. It is estimated that 33 000 000 000 tonnes of CO_2 was released globally in 2019 from energy-related sources. Circle the correct conversion. Use the prefix table above to help you.

   33 Tt   33 Gt   33 Mt

3. The distance between the Sun and the Earth is 149.6 Gm. In this case, Gm is not a common unit, so we can convert it to km and express it in standard form. Circle the correct conversion. Use the prefix table above to help you.

   1.496×10^6 km 1.496×10^8 km 1.496×10^{12} km

4. The estimated volume of ice stored in the Antarctic ice sheet is 0.027 billion km^3. Circle the correct conversion. Use the prefix table above to help you.

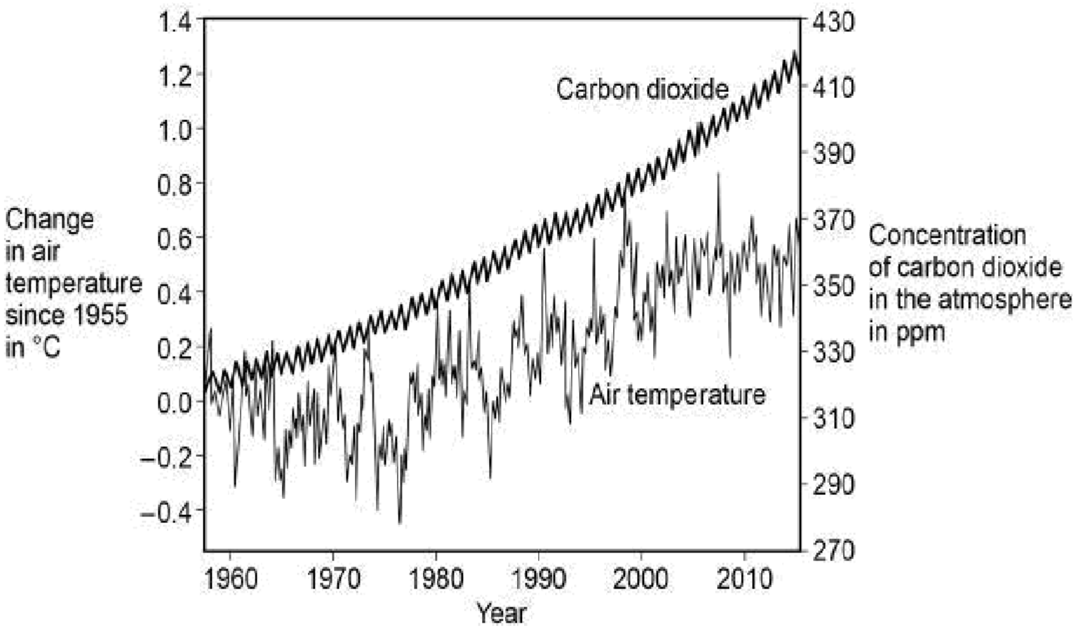
   27 million km^3 2.7 million km^3 270 million km^3

Describing and explaining observations

Activity 10 is based on a GCSE question. Complete the questions to ensure you understand about describing and explaining trends in data.

Activity 10 Climate change

The graph below shows changes in global air temperature and changes in the concentration of carbon dioxide in the atmosphere.



1. Use the graph to describe two trends in carbon dioxide from 1955 to 2015.

2. Many scientists think that an increase in carbon dioxide concentration in the atmosphere causes an increase in air temperature.

   How would an increase in the concentration of carbon dioxide in the atmosphere cause an increase in air temperature?

In each year, the concentration of carbon dioxide in the atmosphere is higher in the winter than in the summer.

3. Give **one** human activity that could cause the higher concentration of carbon dioxide in the winter.

4. Give **one** biological process that could cause the lower concentration of carbon dioxide in the summer.

5. Give the name of **one** other greenhouse gas that contains carbon.