The Bridge to Post-16
Summer Work

Environmental Science
AQA

This pack contains a programme of activities and resources to prepare you to embark on your Post-16 course in Environmental Science in September.

It should be completed throughout the remainder of the Summer term and over the Summer Holidays to ensure you are ready to start your course in September.

You MUST have this pack completed before your first lesson in the subject

The resources include:

1. Links to three websites where you can research the topics you will be exploring in the course and get a flavour of what you will be learning about in Post-16
2. Research task on key pre-knowledge topics that will help you to be successful in your course.
3. Other relevant revision/questions to help bridge between GCSE and Post-16 courses
4. Suggested therapies to help you if you are struggling with the tasks

Overall we suggest you spend around 3 hours of total work working through the tasks for Environmental Science.

Therefore in total, across your 3 subjects you should be completing 9 hours of Summer Work.

Useful Websites

- BBC Bitesize KS4 Biology: https://www.bbc.co.uk/bitesize/subjects/z9ddmp3
- https://www.khanacademy.org/science/biology/intro-to-biology/what-is-biology/a/prep-to-study-biology
- https://www.ocr.org.uk/subjects/science/maths-for-biology/
- Grade gorilla https://www.gradegorilla.com/

Part 1 Scientific skills and Research Methods

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 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.

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

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.

To reduce confusion, and to help with conversion between different units, 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 is 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 (its SI unit) 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 time between heart beats
2. The diameter of a cheek cell
3. The distance that a migratory bird travelled each year
4. The thickness of a DNA helix
5. The mass of a rabbit
6. The mass of iron in the body
7. The diameter of a glucose molecule

Activity 5 Units

Choose the most appropriate unit and estimate the size of each of the following.

1. The mass of an earthworm
2. The volume of water in a teardrop
3. The volume of water in a garden pond
4. The time taken for a sunflower to grow
5. The temperature difference between the blood in the heart and in the ear on a cold day
6. The diameter of a human hair
7. The length that your fingernails grow each day
8. The total length of DNA in one human body cell

Activity 6 Converting data

Re-write the following.

1. 0.00224 metres in millimetres
2. 104 micrograms in grams
3. 6.2 kilometres in metres
4. 10 micrograms in nanograms
5. 70 decilitres in litres
6. 10 cm^3 in litres

Analysing data

Biological investigations often result in large amounts of data being collected. It is important to be able to analyse this data carefully in order to pick out trends.

Activity 7 Mean mode median and scatter graphs

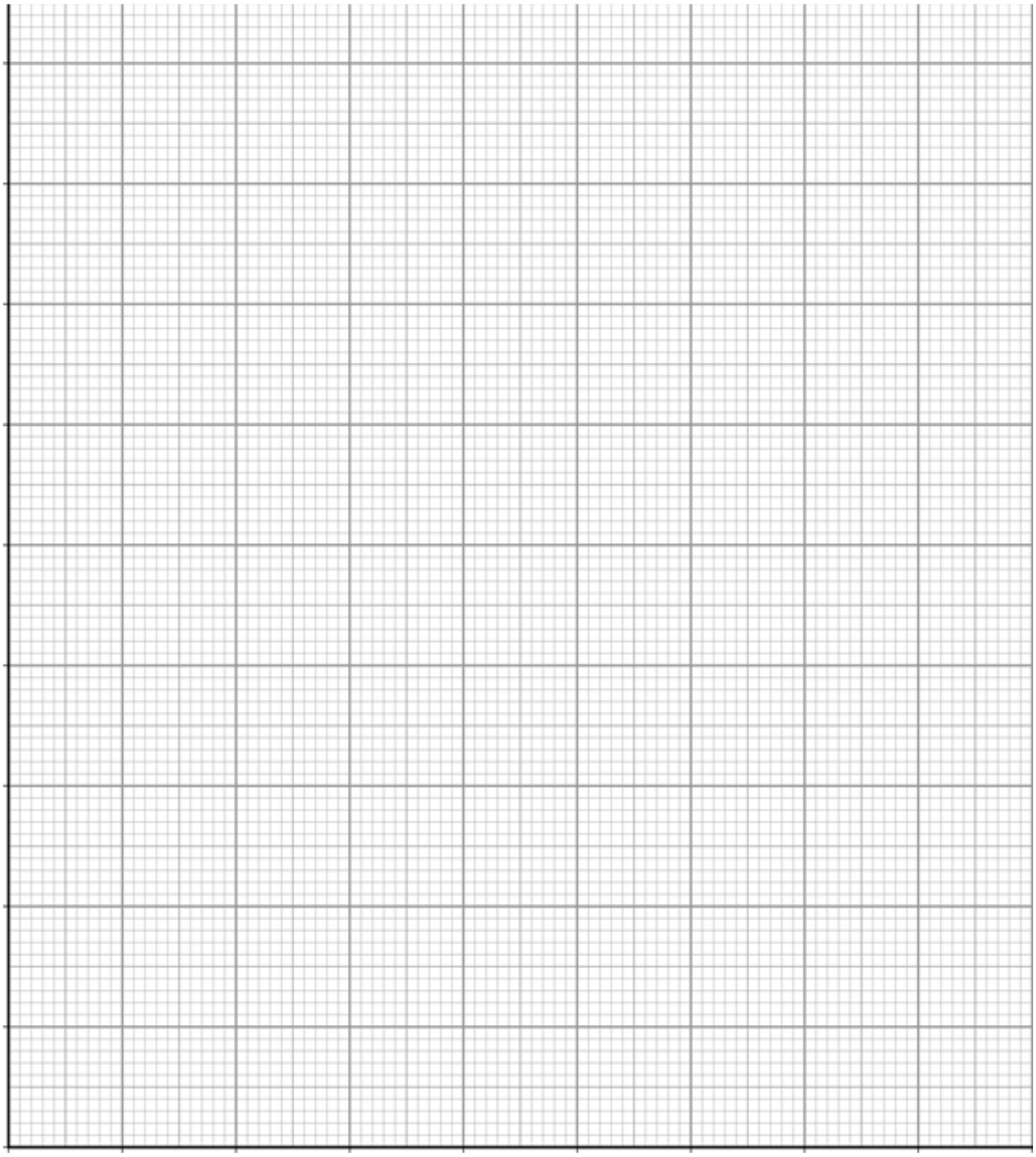
A student investigated an area of moorland where succession was occurring. The student used quadrats to measure the area covered by; different plant species, bare ground and surface water.
They did this every 10 metres along a line transect. The student also recorded the depth of soil at each quadrat. Their results are shown in the table.

	Area covered in each quadrat A to E in cm^2				
	A	**B**	**C**	**D**	**E**
Bog moss	55	40	10	–	–
Bell heather	–	–	–	15	10
Sundew	10	5	–	–	–
Ling	–	–	–	15	20
Bilberry	–	–	–	15	25
Heath grass	–	–	30	10	5
Soft rush	–	30	20	5	5
Sheep's fescue	–	–	25	35	30
Bare ground	20	15	10	5	5
Surface water	15	10	5	–	–
Soil depth / cm	3.2	4.7	8.2	11.5	14.8

Calculate:

1. Calculate the mode area of soft rush in the sample.
2. Calculate the mean soil depth of the area of moorland sampled.
3. Calculate the median amount of bare ground in the sample.

4. Using the data in the table plot a **scatter graph** of the soil depth against the area covered by bare ground, soft rush and bog moss (use different colours or markers for each).



5. What conclusions can you draw from this graph?

6. Suggest how to improve the validity of these conclusions.

Activity 8 Data in tables

A patient with a leaking heart valve may have the valve replaced. A study compared two different types of replacement heart valve:

- mechanical valves
- biological valves from pigs.

The data used in the study was collected from female patients aged 50–69. **Table 4** shows the data

Table 4

	Type of replacement heart valve	
	Mechanical	**Biological**
Number of patients given the valve	2852	1754
Number of patients who died from heart-related problems after valve replacement	180	178
Percentage of patients alive after 5 years	91	89
Percentage of patients needing a second valve replacement within 6 years	2.2	5.2
Percentage of patients who had a blood clot on the brain after surgery	5.8	0.1

1. Give **one** conclusion about the death of patients from heart-related problems after a valve replacement.
   Include calculations to support your answer.

2. Evaluate the use of mechanical replacement heart valves and biological replacement heart valves.
   Use information from **Table 4**.

Part 2 Environmental Science Research

TOPIC 1 The Physical World -

In this topic you will learn how anthropogenic (human) activities are interconnected with ***physical processes***, and how to formulate management strategies and plan sustainable activities for the future. You need to recognise that supplies of renewable and physical resources may be maintained by the control of activities that may cause over-exploitation and by protecting the processes that aid their production. However, supplies of non-renewable and physical resources may be extended by controlling exploitation and developing improved technologies to harness them.

TASK 1: Some key words you need to know: write out the word with a definition

Enhanced greenhouse effect	
El Nino and La Nina	
Cryosphere	
Albedo	
Persistence	
Sedimentation	
Aquifer	
Depletion	
Cut -off ore	
Contour ploughing	
Companion cropping	
Turbidity	
Ozone depletion	
Rowland-Molina hypothesis	
Lasky's principle	
USLE - soil erosion equation	

Task 2: Cornell Note Taking

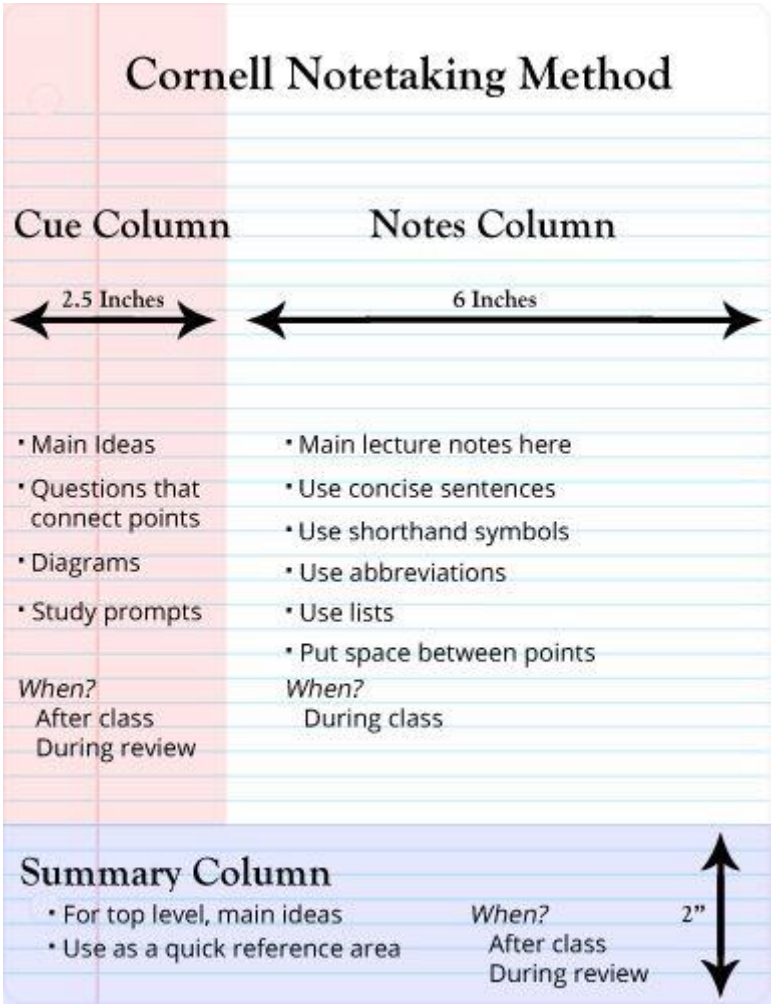
Follow the links below and generate three summaries of the new content you have learnt, using the cornell note taking structure. This is the note taking style you will be encouraged to use throughout the A-level course. Be prepared to share these findings with the class in September.

1) BBC - https://www.bbc.co.uk/news/science-environment-24021772

2) The guardian – https://www.theguardian.com/environment/climate-crisis

3) Nature - https://www.nature.com/srep/calls-for-papers?subject=Earth+%26+Environment&gclid=EAIaIQobChMI_aSLx5rm_wIVGuPtCh2IoQUrEAAYAiAAEgIOqfD_BwE

4) New Scientist https://www.newscientist.com/



Task 3: Writing Skills

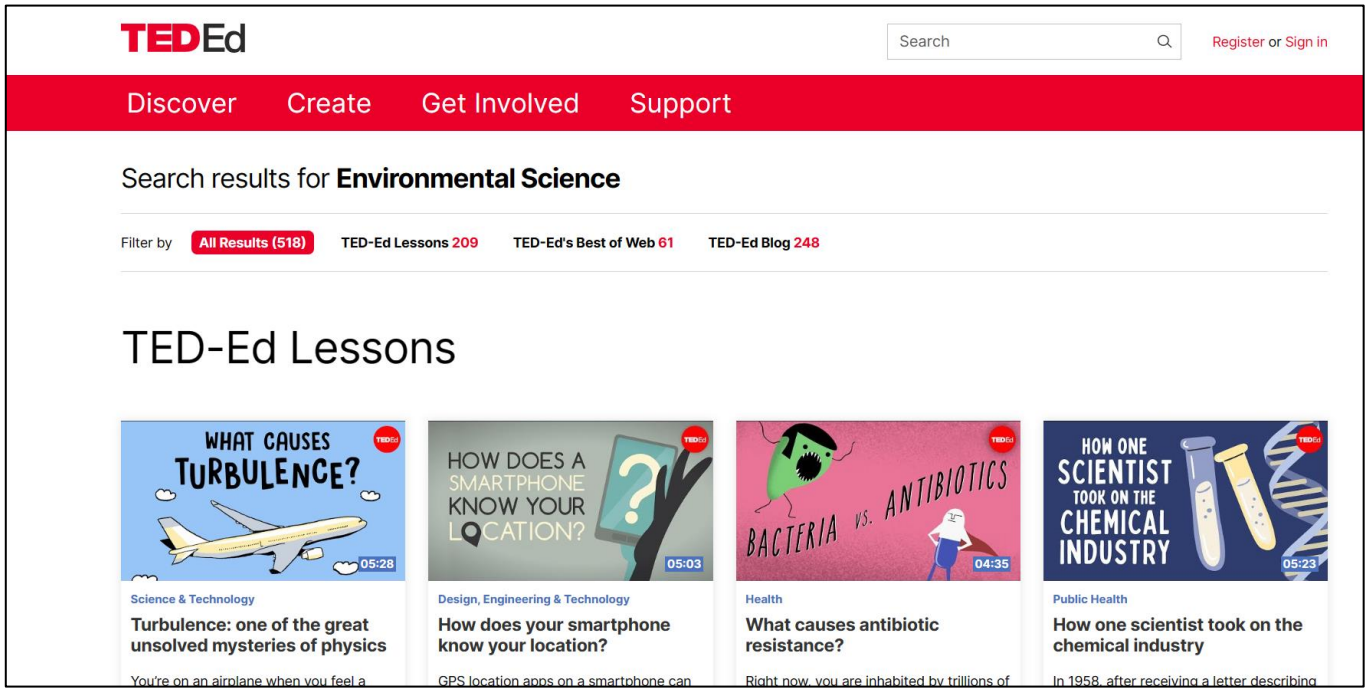
Write a response to the following question in approximately 500 words:

"How will the conservation of species and ecosystems benefit people?"

Task 4: Descovering the current research

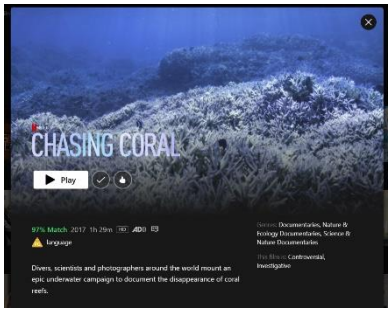
Use the TedEd website (linked below) to find an article of interest on the environmental science topic. You will need to summarise the key point of the article and be prepared to share these findings with your class in September.

https://ed.ted.com/lessons?category=environmental-science



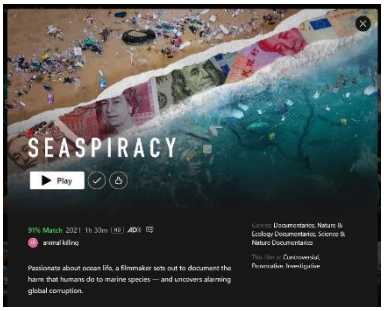
Additional research tasks

If you are extremely keen to start the course and want to do some additional research, please use some of these resources below to start your learning sooner!



Netflix:

1) Chasing Coral – Netflix



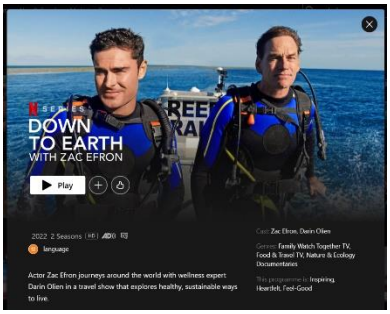
2) Seaspiracy – Netflix

3) Down to Earth – Season 1 – Netflix

4) David Attenborough – A life on our planet - Netflix

5) Every species is a masterpiece – Edward O Wilson - Book

6) 10 Billion – Stephen Emmott - Book



7) No one is too small to make a difference – Greta Thunberg - Book

8) Environment Agency: https://www.gov.uk/government/organisations/environment-agency

9) The Institution of Environmental Scientists: https://www.the-ies.org/

10) The Birmingham Institute of Forestry Research: https://www.birmingham.ac.uk/research/bifor/about/index.aspx

11) BBC Earth Podcast - https://www.bbcearth.com/Podcast

12) Welcome to Earth – Disney+/National Geographic

13) A-level revision skills - https://www.kingseducation.com/kings-life/a-level-revision

14) ENDS report (current news) - https://www.endsreport.com/

15) National Environment Research Council - https://www.ukri.org/councils/nerc/

16) UK center for ecology and hydrology - https://www.ceh.ac.uk/

Transition Task Checklist (Tick when completed)	
Part 1	
Activity 1 Scientific vocabulary: Designing an investigation	
Activity 2 Scientific vocabulary: Making measurements	
Activity 3 Scientific vocabulary: Errors	
Activity 4 SI units and prefixes	
Activity 5 Units	
Activity 6 Converting data	
Activity 7 Mean mode median and scatter graphs	
Activity 8 Data in tables	
Part 2	
Task 1 Definitions	
Task 2 Cornell Note Taking	
Task 3 Writing Skills	
Task 4 Discovering the current research	
Additional Research Tasks	