

Preparing to Study at Level 3 (A-level equivalent)

Work for Applied Science

Below you will find 5 weeks preparation work (around 10 hrs) for your level 3 course and an Enrolment Task (2 hrs). You will need to do the same for your other two subjects. The final enrolment task must be submitted to Enrolment@StratfordSchool.co.uk by Monday 12th July.

AQA

You can find the course specification here:

[AQA | Science | Applied General | Science](#)

Research Tasks and Wider Reading:

The work of scientists

Much of the work on this course is applied to the work of scientists. An understanding of the work of different scientists will be helpful as you undertake this course. Complete the table below to give you an overview of what they study and how their work is used in our world.

A good starting point is <https://www.prospects.ac.uk/job-profiles/browse-a-to-z> but you must summarise each section in your own words.

Type of scientist	What they study	A real life example of what they might work on.
Biologist		
Marine biologist		
Zoologist		
Biomedical scientist		
Chemist, including biochemistry and analysts		
Environmental scientist (ecologist)		
Geneticist		
Material scientist		
Microbiologist		
Pharmacologist		
Physicist		
Product/process developer or technologist, eg polymers or food (biotechnologist)		
Radiographer/radiologist		

Research scientist		
Scientific laboratory technician		
Sport and exercise scientist		
Toxicologist		

Activities:

Task 1

Watch this TED talk about Science in the news and how we know if it can be trusted https://www.ted.com/talks/ben_goldacre_battling_bad_science. Write notes on the features of evidence-based medicine (he does talk fast, I suggest regularly pausing and reading the transcript). Afterwards see if you can find an example of "bad science" in the news and explain why you think it is "bad".

Task 2

As part of one of the pieces of coursework we use colorimetry to analyse a sample of river water. Using the internet research how a colorimeter works making reference to your knowledge from GCSE of the electromagnetic spectrum. Include at least one diagram. Then research other ways you could find out about the chemical components and properties of water. Finally explain why testing water is important. Prepare no more than a page and email it through if you would like some feedback. Useful links to start with: <https://www.britannica.com/science/colorimetry> and <https://blogs.worldbank.org/water/how-test-water-quality-chemical-tests-limited-budgets>

Task 3

This focuses on some of the calculations in Chemistry which is an area some students find tough, please do email if you are have difficulties.

You might like to start by looking at BBC Bitesize (if you have done Combined Science some of it may be new to you) <https://www.bbc.co.uk/bitesize/topics/z87mw6f>

Seneca learning – complete this Quantitative Chemistry assignment (sign up for a free account if you don't already have one)

<https://app.senecalearning.com/dashboard/class/lmo5i5zaph/assignments/assignment/ed596000-e302-4d78-b78f-2dec801a20a4>

Task 4

Research the following energy resources (for renewables a place to start might be <https://www.cse.org.uk/advice/>):

- fossil fuels
- nuclear fuels
- renewable fuels such as:
 - solar power (both heat and light)
 - wind power
 - wave power
 - tidal power
 - traditional hydroelectric power

- geothermal sources
- biomass

Describe the advantages and disadvantages of each

Look at: <https://carbonintensity.org.uk/> Scroll down the page to find the pie chart of the current generation mix (remember if you look at night or on a grey day there won't be much solar, you might like to look at a couple of different times), take a screenshot and then describe how you think the UK should change by 2025 (e.g. more nuclear, less coal etc). What do you think the mix should be and why?

Task 5

Spend your remaining time completing some exercises in "Applied Science Biology GCSE Transition exercises" document (answers are also provided)

Enrolment Task (This task must be sent to enrolment@stratfordschool.co.uk):

Task 1: Unit 2 coursework – Graph Skills

A titration can be used to calculate the concentration of an acid or alkali by gradually adding an alkali or acid of known concentration to it and finding the exact volume needed to neutralise the unknown.

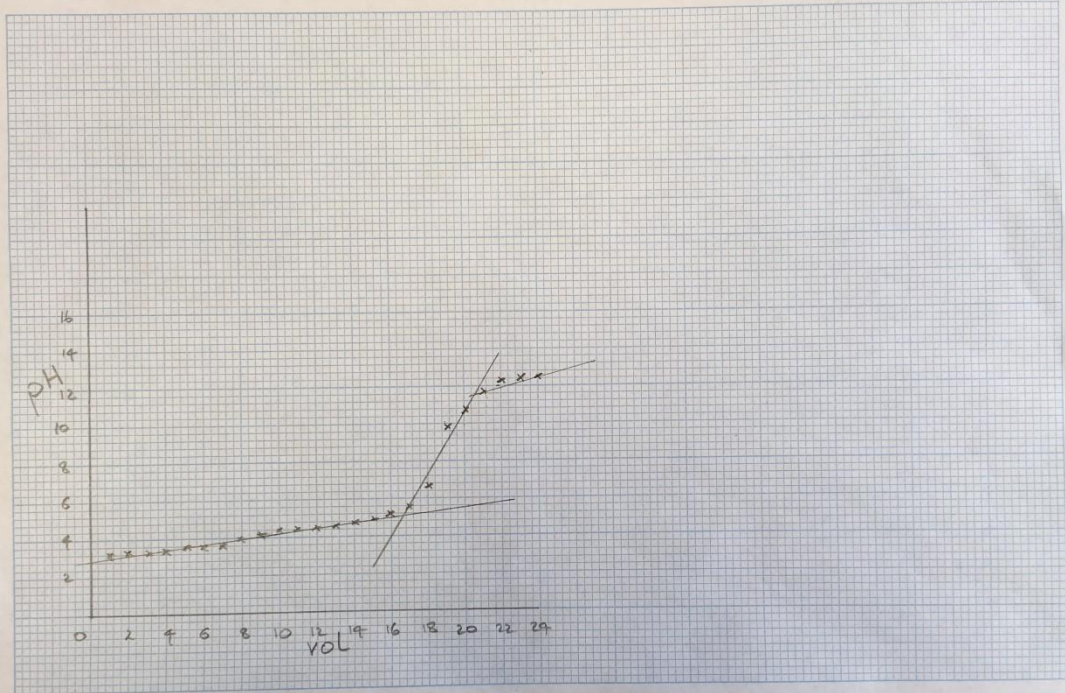
These results show the change in pH of an acid as a base (alkali) is added.

Volume Of Base (mL)	pH
1.00	3.15
2.00	3.24
3.00	3.39
4.00	3.54
5.00	3.63
6.00	3.78
7.00	3.85
8.00	3.98
9.00	4.11
10.00	4.20
11.00	4.31
12.00	4.47
13.00	4.60
14.00	4.75
15.00	4.90
16.00	5.20
17.00	5.60
18.00	6.60
19.00	9.92
20.00	10.60
21.00	11.80
22.00	12.25
23.00	12.32

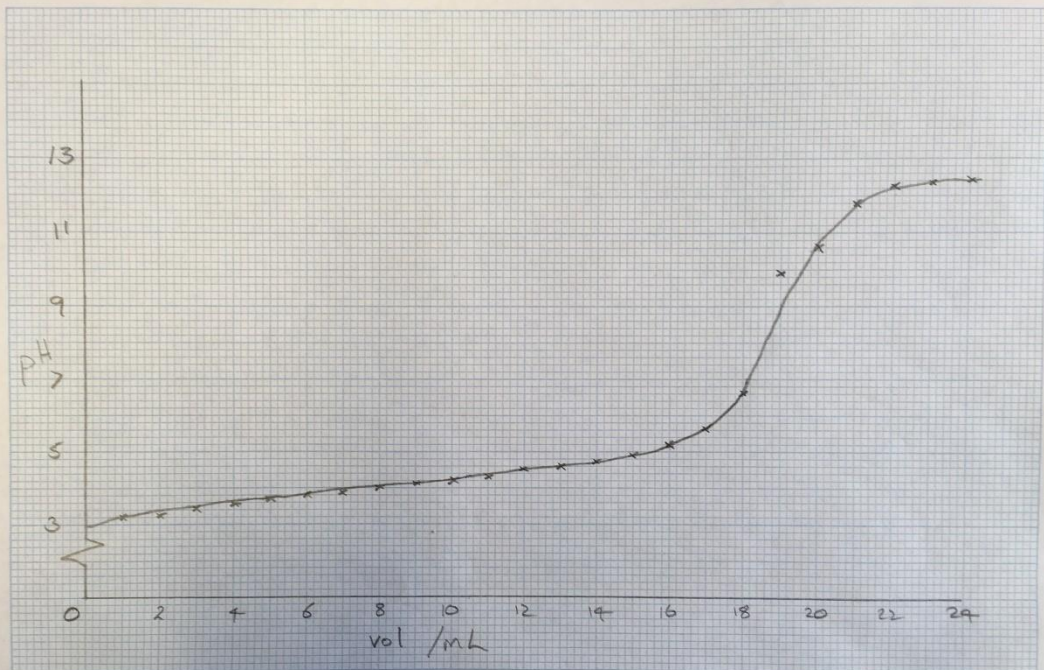
24.00

12.45

On the next page are two graphs of these results.



Graph 1



Graph 2

Questions on next page...

Look at the two graphs and follow and answer the following questions.

List the mistakes in graph 1. Explain what the student should change.

List the mistakes in graph 2. Explain what the student should change.

Plot your own graph of the results clearly on graph paper. You can find printable graph paper here: https://www.printablepaper.net/preview/Quarter_Inch_Light_Gray_Graph_Paper_Letter)

Mark clearly on your graph any anomalies.

Use your graph to find the volume of base needed to neutralise the acid (pH7.00).

Use your graph to find the pH of the solution when 19.00ml of base have been added.

Task 2 – Analysing information

As part of the unit 3 exam you are given a pre-release booklet to study and analyse, you then get a clean copy in the exam and are asked questions around the material. Below is an extract from last years pre-release, read and annotate the text. Then answer the exam style questions.

Hawaii to ban certain sunscreens harmful to coral reefs

BBC News 3 May 2018

Hawaii has become the first US state to pass a bill banning the sale of any sunscreens that have chemicals known to harm coral reefs. The bill bars the sale of sunscreens containing chemicals oxybenzone and octinoxate, which some scientists say contribute to coral bleaching.

The chemicals are used in over 3 500 of the most popular sunscreen products. The bill, which would take effect in 2021, now awaits the signature of Democratic Governor David Ige. Democratic Senator Mike Gabbard introduced the bill, which proposes to end the sale of any non-prescription sunscreens containing oxybenzone and octinoxate, state-wide. Mr Gabbard told the Honolulu Star Advertiser that if the governor signs the bill, it would become "a first-in-the-world law". "Hawaii is definitely on the cutting edge by banning these dangerous chemicals in sunscreens," Mr Gabbard said. "This will make a huge difference in protecting our coral reefs, marine life, and human health." The bill states that the chemicals kill developing coral, increase coral bleaching and cause "genetic damage to coral and other marine organisms".

What do scientists say?

Craig Downs, one of the co-authors of the main study showing the adverse effects of oxybenzone and octinoxate on reefs, told the Washington Post in 2015 that "any small effort to reduce oxybenzone pollution could mean that a coral reef survives a long, hot summer, or that a degraded area recovers".

The scholarly journal Nature noted that other reef scientists were unsure that banning sunscreens would have a big impact. "Banning sunscreen will not solve other problems: for example, temperature anomalies, overfishing, coral predators and the big issue of coastal runoffs that pollute and destroy reefs," Jorg Wiedenmann, head of the Coral Reef Laboratory at the University of Southampton in the UK told Nature. "But if you have places with a high load of tourists going in, it is not unreasonable to stay cautious and say, 'Yes, there may be additive effects.'"

Hawaii's waters see more than eight million tourists each year, and the visitor numbers have been increasing. Mr Downs' study, published in the Archives of Environmental Contamination and Toxicology journal, found that an estimated 12 000 metric tonnes of sunscreen end up washing into coral reefs.

The Star Advertiser reported that Bayer, the company that manufactures Coppertone sunscreen, said there are no similar ingredients available in the US with the same effectiveness as oxybenzone. The Hawaii Medical Association told the newspaper that it disagreed with the bill due to a lack of peer-reviewed evidence suggesting that sunscreen caused coral bleaching, while plenty of evidence shows that sunscreen protects from skin cancer.

The governor has not indicated whether he will sign the bill. "The world was watching. We delivered," wrote Senator Will Espero on Twitter, when the senate passed the bill.

0 4 . 1

Why does the government in Hawaii want to ban certain sunscreens?

[1 mark]

0 4 . 2

Suggest **two** reasons why people in Hawaii might want this ban more than people in other parts of the world.

[2 marks]

1 _____

2 _____

0 4 . 3

New sunscreens may be developed to replace the banned sunscreens.

What type of scientist will study the reactions of chemicals in order to make a new sunscreen?

Tick (✓) **one** box.

[1 mark]

Environmental scientist

Laboratory technician

Pharmacologist

Research scientist

0 5 . 2

Why might 'a lack of peer-reviewed evidence' lead to some people not wanting a ban on sunscreens?

[1 mark]

0 5 . 3

Suggest **two** other reasons why there might be opposition to the ban.

[2 marks]

1 _____

2 _____

If you have any questions, please contact Dr Smedley – ksmedley@stratfordschool.co.uk or Miss Denly sdenly@stratfordschool.co.uk