

Tasks which will boost your start to BTEC Applied Science



With the majority of the BTEC course being assignment based, independent research, writing and time management are key skills to develop. These tasks will allow you to engage with the language used in assessment criteria, carry out your own independent research and practice writing a 'mock' assignment. There are also some exam questions that will allow you to revisit GCSE content in preparation. There are four tasks to be completed for September 2021.

Task 1: Read the list of command words used by the exam board, these are used in the assessment criteria, the marking guidance and in the external exams so the more they become second nature to you the better. Find out the definitions of the keyword and fill them in the table below. You could create flash cards with the word and the definition or try cutting them up and making them into a card sort activity to revisit regularly.

Command or term	Definition
Add/label	
Assess/analyse	
Calculate	
Comment on	
Compare	
Complete	
Deduce	
Derive	
Describe	
Determine	
Devise	
Discuss	
Draw	
Evaluate	
Explain	
Give/state/name	
Give a reason why	
Identify	
Plot	
Predict	
Show that	
Sketch	
State and justify/identify and justify	
State what is meant by	
Write	

Task 2:

Engaging with the scientific media, journals, articles and the news is essential for scientists to keep up to date with technology and research. This year we have introduced scientific media engagement as one homework per half term. One of the external examined units, unit 7 contemporary issues in science, requires a review of articles and an interpretation of how trustworthy the information is.

There is a lot going on in the news currently, most of it is science/health related. Find a topic that you have a particular interest in, research it using 2 or 3 different sources and write a review on the topic using the template provided. There are two interesting articles below.

Article title	
Authors	
Date	
What are the three things you have learnt?	
How does the article link to KS4 learning?	
Summary of the article	
Why did you find this article interesting?	
What are the future applications?	

Task 3

BTEC Applied Science – Numeracy Skills Task

Each component of the course requires your understanding of some basic maths. This includes using formulae, rearranging formula and converting between units. The tasks below are intended to build on your maths skills from GCSE and prepare you for the maths that you will encounter this year.

You will use three different formulas to answer the questions below. The formulas have been taken from each of the three sciences. They are...

Magnification = Observed Size \div Actual Size

(Both units for size must be the same e.g., both measured in centimetres)

Number of Moles = Mass (g) \div Relative Formula Mass

Concentration = number of moles \div volume

Wave speed (m/s) = Frequency (Hz) x Wavelength (m)

Part 1: Using formulae

For each question, identify the formula that needs to be used and then use this to calculate your answer.

- Using a microscope, Anna measures a palisade cell to be 16mm wide, but its actual size is 0.04mm wide. What was the magnification of her microscope?
- Mim prepares a solution using 8 grams of Sodium Chloride (NaCl). How many moles of NaCl will her solution contain? $Mr(Na)=23$, $Mr(Cl)=35.5$
- Cathy is calculating the speed of water waves in the sea. She measures that they have a wavelength of 2 metres and a frequency of 1.5Hz. What is the speed of these waves?

Part 2: Rearranging formulae

For each question, identify the formula that needs to be used and then use this to calculate your answer. The formula will need to be rearranged to reach the correct answer.

- Mim is now measuring some Magnesium Chloride (MgCl₂). How many grams of MgCl₂ will she require for 3 moles of the salt? $Mr(Mg) = 24$, $Mr(Cl) = 35.5$
- Cathy notices that the speed of the water waves remains constant overall (at 4m/s), however some waves have a smaller wavelength of only 1 metre. Calculate the frequency of these waves.
- Anna now uses a 200x microscope to look at the same palisade cell. What will its new observed size be? (Actual size = 0.04mm)

Part 3: Converting between units

For each question, convert the value to the units in brackets.

E.g., 300 metres (centimetres) means "what is 200 metres in centimetres?"

- 300 metres (centimetres)
- 5 kilograms (grams)
- 5000 milliseconds (seconds)
- 400 grams (kilograms)
- 173 centimetres (metres)

These are some optional questions that we recommend you complete to secure your understanding of these tasks. It would be very beneficial to have a go at these questions.

- Anna now measures a red blood cell with her microscope. The red blood cell has an actual size of 0.007mm but the size Anna observes with the microscope is 0.5cm. Calculate the magnification of her microscope to 1 decimal place.
- Mim finds 2kg of a substance and calculates that it contains 9 moles of Radon. Find the relative formula mass of the substance to prove that it contains pure Radon.
- Cathy sees 5 waves pass her every second, and each has a wavelength of 240cm. Calculate the speed of the waves that she is observing.

Task 4

Q1.

Alveolar tissue is found in the lungs.

Endothelial tissue is found in the blood vessels.

Describe how a build-up of cholesterol in artery walls is a risk factor in the development of atherosclerosis.

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(Total for question = 4 marks)

Q2.

Figure 3 shows a synapse.

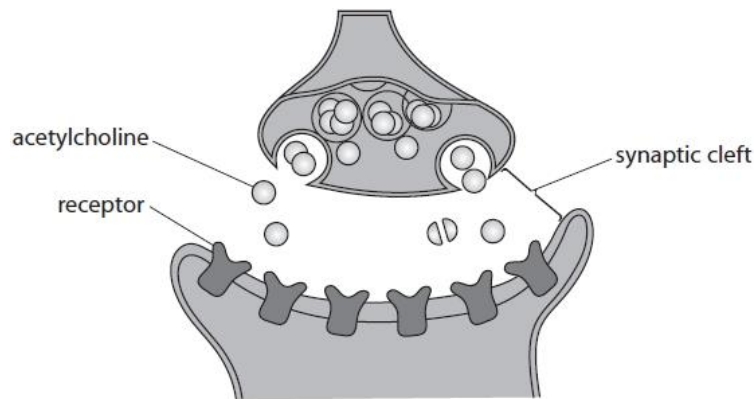


Figure 3

Describe the function of a synapse.

(2)

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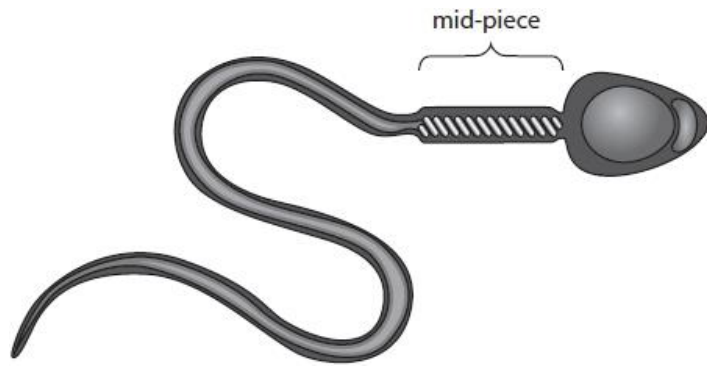
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(Total for question = 2 marks)

Q3.

Scientists researching fertilisation in humans need to understand how sperm cells are adapted for their specific function.

The diagram shows a human sperm cell.



Explain how the mid-piece of a human sperm cell is specialised to support the function of its tail.

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(Total for question = 3 marks)

Q4.

Serotonin is a neurotransmitter produced by certain neurones in the brain.

Figure 4 shows a synapse in the brain.

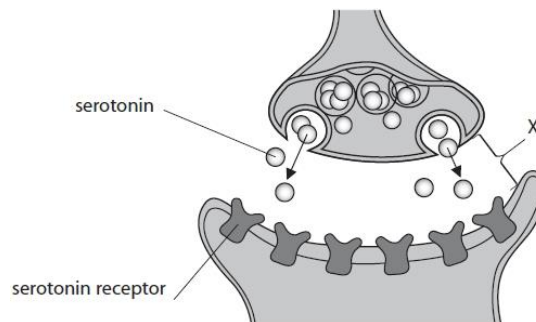


Figure 4

Explain how imbalances in serotonin in the brain may affect a person's mood.

(4)

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(Total for question = 4 marks)

Q5.

Lithium, Li, is a metal in group 1 of the periodic table.

(i) What is the name given to group 1 of the periodic table?

(1)

- A alkali metals
- B alkaline earth metals
- C halogens
- D transition metals

(ii) Lithium has an atomic number of 3.

Complete the electronic configuration of lithium.

(1)

1s..... 2s.....

(iii) Write the equation to show the first ionisation energy of lithium.

(2)

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(Total for question = 4 marks)

Q6.

The table shows some data about three compounds.

compound	formula	relative molecular mass	boiling point (°C)
water	H ₂ O	18	100
methanol	CH ₃ OH	32	65
ethanol	C ₂ H ₅ OH		79

Calculate the relative molecular mass for ethanol.

Show your working.

Relative molecular mass =

(Total for question = 2 marks)

Q7.

Ammonium chloride, ammonium sulfate and ammonium nitrate are used in fertilisers.

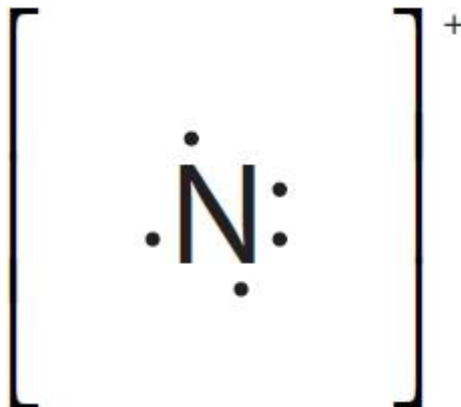
Figure 1 shows the arrangement of electrons in the outer shell of an atom of nitrogen and in an atom of hydrogen.



Figure 1

Complete the dot and cross diagram to show the bonding in the ammonium ion, NH_4^+ .

(2)



(Total for question = 2 marks)

Q8.

Industrial chemists have to understand the chemistry of oxides.

For example, silicon dioxide is used in glass making and carbon monoxide is used in the extraction of iron from iron ore.

(i) Explain how burning carbon in air can lead to the formation of carbon monoxide.

(2)

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(ii) Write the balanced equation for the reaction between silicon and oxygen.

(2)

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(Total for question = 4 marks)

Q9.

Longitudinal and transverse are two types of wave.

(i) Give an example of a longitudinal wave.

(1)

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(ii) Describe how a longitudinal wave travels through air.

(2)

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(Total for question = 3 marks)

Q10.

Copper wire is used in electric cables because it is ductile and a conductor of electricity.

The properties of copper are related to its structure.

Explain why copper is a conductor of electricity.

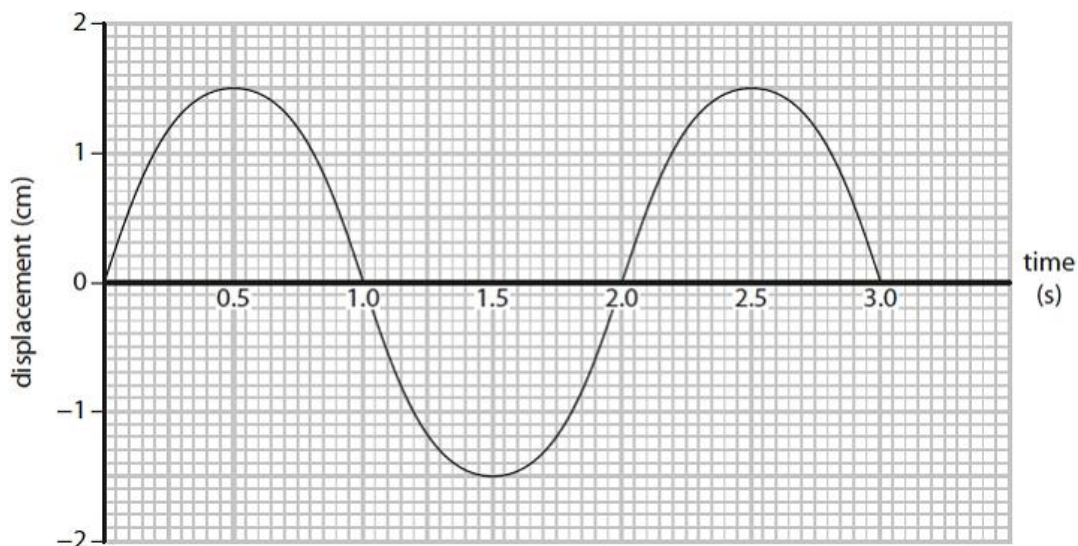
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(Total for question = 3 marks)

Q11.

A student uses a cathode ray oscilloscope (CRO) to investigate the properties of waves produced by a signal generator.

The student obtains the following output.



Give the amplitude of the wave

Amplitude = cm

(Total for question = 1 mark)

Q12.

Various parts of the electromagnetic spectrum are used for communication.

An electromagnetic wave has a frequency of 4.5×10^9 Hz.

The speed of light is 3×10^8 m/s.

Discuss the advantages and disadvantages of using radio waves and microwaves in communication.

(Total for question = 6 marks)