

Pre-entry Preparation, Requirements and Recommendations

Welcome to Level 3 BTEC in Applied Science at Comberton Sixth Form

Preparation

Reading:

You may wish to remind yourselves of the scientific principles covered in preparation for the GCSE exams. It would be useful to ensure you have all exercise books and revision materials easily accessible at home as the externally examined units cover some aspects of GCSE science as well as extending your knowledge further.

A core part of Level 3 Applied Science is scientific skills and you should thus make sure you are familiar with the terminology of conducting practical investigations. In particular, considering factors, variables, risk assessments, presenting scientific data, evaluating and making recommendations, will be important. The course will encompass additional skills used within any scientific career and you should therefore remind yourself of basic maths and computing skills.

Transition work will be emailed to you, it is essential that this work is completed to consolidate prior learning.

Research:

Keeping up to date with new developments in science is an essential part of any scientific career. We recommend the following websites to keep you up to date.

http://www.bbc.co.uk/news/science_and_environment/

<http://www.bbc.co.uk/news/health/>

<http://www.bbc.co.uk/news/technology/>

<http://www.newscientist.com/>

You will require the following resources for this course:

- A lab coat and safety goggles
- Ring binder folder to store your notes and class work
- A4 Note pad
- Folder dividers to organise your notes effectively
- Hole puncher
- A diary is also recommended to help with your organisation
- A suitable USB stick, or similar, to store and back up assignment work **will be essential**
- Revision guides and workbooks are also available for the external elements of the course

We look forward to seeing you in September.

If you have any queries regarding your course preparation, please contact Dr Carolyn Meadows, BTEC Science coordinator (cmeadows@comberton.cambs.sch.uk)

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

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.

Try cutting them up and making them into a card sort activity to revisit regularly.

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.

Task 3

There are so many new diets and health crazes available the article about teenage blindness triggers a very important debate on how society can help support healthy living. Most people know the benefits of a healthy balanced diet but being able to maintain it with peer pressure and advertisements around us all the time makes it more challenging.

The assignment brief will guide you through the different levels of identifying the issues, analysing and evaluating the role that society can play. Remember to refer back to your command word list from what the exam board would be looking for at each of these levels.

Task 4

Complete the exam questions. On your first attempt, complete them without looking up the information, however if you do need to look anything up, change colour pen to show that you have answered these questions open book.

The resources for each of these tasks are below.

TASK 1

Command or term	Definition
Add/label	Learners label or add to a stimulus material given in the question, for example labelling a diagram or adding units to a table.
Assess/analyse	Learners give careful consideration to all the factors or events that apply & identify which are the most important or relevant. Make a judgement on the importance of something & come to a conclusion where needed.
Calculate	Learners obtain a numerical answer, showing relevant working. If the answer has a unit, this must be included.
Comment on	Learners synthesise a number of variables from data/information to form a judgement. More than two factors need to be synthesised.
Compare	Learners look for the similarities & differences of two (or more) things. Should not require the drawing of a conclusion. Answer must relate to both (or all) things mentioned in the question. The answer must include at least on similarity & one difference.
Complete	Learners complete a table/diagram.
Deduce	Learners draw/reach conclusion(s) from the information provided.
Derive	Learners combine two or more equations or principles to develop a new equation.
Describe	Learners give an account of something. Statements in the response need to be developed as they are often linked but do not need to include a justification or reason.
Determine	Learners' answers must have an element that is quantitative from the stimulus provided, or must show how the answer can be reached quantitatively. To gain maximum marks there must be a quantitative element to the answer.
Devise	Learners plan or invent a procedure from existing principles/ideas.
Discuss	Learners identify the issue/situation/problem/argument that is being assessed within the question. Explore all aspects of an issue/situation/problem/argument. Investigate the issue/situation, etc. by reasoning or argument.
Draw	Learners produce a diagram either using a ruler or using freehand.
Evaluate	Learners review information, then bring it together to form a conclusion, drawing on evidence, including strengths, weaknesses, alternative actions, relevant data or information. Come to a supported judgement of a subject's qualities and relation to its context.
Explain	Learners' explanations require a justification/exemplification of a point. The answer must contain some element of reasoning/justification – this can include mathematical explanations.
Give/state/name	These generally require recall of one or more pieces of information.
Give a reason why	When a statement has been made & the requirement is only to give the reasons why.
Identify	Usually requires some key information to be selected from a given stimulus/resource.
Plot	Learners provide a graph by marking points accurately on a grid from data that is provided & then drawing a line of best fit through these points. A suitable scale & appropriately labelled axes must be included if these are not provided in the question.
Predict	Learners give an expected result.
Show that	Learners prove that a numerical figure is as stated in the question. The answer must be to at least one more significant figure than the numerical figure in the question.
Sketch	Learners produce a freehand drawing. For a graph this would need a line & labelled axes with important features indicated. The axes are not scaled.
State and justify/identify and justify	When a selection is made & a justification has to be given for the selection.
State what is meant by	When the meaning of a term is expected but there are different ways in which the meaning can be described.
Write	When the question asks for an equation.

Task 2

Article titles and date published		
Authors		
3 things you have learned		Key term definition
How does the article link to current topics?		
Summary of the articles		
Why did you find this article interesting?		

How to Beat the Burnout

Simon Compton, Focus October 2017

- Doctors are seeing more patients who are experiencing TATT (tired all the time), UK sales of energy drinks have increased by 155% in 8 years and it is estimated that 1 in 5 of us feels unusually tired. This article addresses some of the causes and how we might be able to help ourselves overcome the fatigue.
- For some people, fatigue is caused by a chronic syndrome such as ME, for others it is because they just don't get enough sleep. But for the majority of us, the mechanism of fatigue is not fully understood.
- There are diseases that affect mitochondria, which considering their function could be the answer. There is also research going on to explore the association of leptin, a hormone produced in fat tissue, which could lead to feeling less energetic. This kind of makes sense, if we don't need to go and get food, we are more likely to sit on the sofa for longer.
- Increasingly, the use of mobile devices is being blamed for the rise in tiredness. Again this is a phenomenon which makes sense; the blue light emitted from devices triggers the brain to release hormones to keep us alert thinking that it is still daylight and therefore we need to be awake.
- Essentially there are many things we are doing to our bodies which contribute to our feelings of tiredness and it is only going to be down to us to change the patterns of our lifestyle to feel less fatigued.
- 7 Causes of Fatigue that we can change
 - Social jetlag
 - Lack of exercise
 - Cabin fever
 - Diet
 - Caffeine and alcohol
 - Drugs
 - Worry and Depression



Task 3

Teenager 'blind' from living off crisps and chips

By Michelle RobertsHealth editor, BBC News online

• 3 September 2019



Image copyrightGETTY IMAGES

Experts are warning about the risks of extreme fussy eating after a teenager developed permanent sight loss after living on a diet of chips and crisps.

Eye doctors in Bristol cared for the 17-year-old after his vision had deteriorated to the point of blindness.

Since leaving primary school, the teen had been eating only French fries, Pringles and white bread, as well as an occasional slice of ham or a sausage.

Tests revealed he had severe vitamin deficiencies and malnutrition damage.

Extreme picky eater

The adolescent, who cannot be named, had seen his GP at the age of 14 because he had been feeling tired and unwell. At that time he was diagnosed with vitamin B12 deficiency and put on supplements, but he did not stick with the treatment or improve his poor diet. Three years later, he was taken to the Bristol Eye Hospital because of progressive sight loss, **Annals of Internal Medicine journal reports.**

Dr Denize Atan, who treated him at the hospital, said: "His diet was essentially a portion of chips from the local fish and chip shop every day. He also used to snack on crisps - Pringles - and sometimes slices of white bread and occasional slices of ham, and not really any fruit and vegetables.

"He explained this as an aversion to certain textures of food that he really could not tolerate, and so chips and crisps were really the only types of food that he wanted and felt that he could eat."

Dr Atan and her colleagues rechecked the young man's vitamin levels and found he was low in B12 as well as some other important vitamins and minerals - copper, selenium and vitamin D.

Shocking findings

He was not over or underweight, but was severely malnourished from his eating disorder - **avoidant-restrictive food intake disorder**.

"He had lost minerals from his bone, which was really quite shocking for a boy of his age."

He was put on vitamin supplements and referred to a dietitian and a specialist mental health team.

In terms of his sight loss, he met the criteria for being registered blind.

"He had blind spots right in the middle of his vision," said Dr Atan. "That means he can't drive and would find it really difficult to read, watch TV or discern faces."

"He can walk around on his own though because he has got peripheral vision."



Image copyright GETTY IMAGES

Nutritional optic neuropathy - the condition the young man has - is treatable if diagnosed early. Left too long, however, the nerve fibres in the optic nerve die and the damage becomes permanent.

Dr Atan said cases like this are thankfully uncommon, but that parents should be aware of the potential harm that can be caused by picky eating, and seek expert help.

- **Calorie counting apps 'can exacerbate eating disorders'**
- **Gene therapy first to 'halt' most common cause of blindness**
- **Five tips for your fussy eaters**

For those who are concerned, she advised: "It's best not to be anxious about picky eating, and instead calmly introduce one or two new foods with every meal."

She said multivitamin tablets can supplement a diet, but are not a substitute for eating healthily.

"It's much better to take on vitamins through a varied and balanced diet," she said, adding that too much of certain vitamins, including vitamin A, can be toxic, "so you don't want to overdo it".

Dr Atan said vegans are also at increased risk of B12 deficiency-related sight problems if they do not replace what they can lack when excluding meat from their diet.

"Nutritional yeast is a way of adding B12 to your diet," she said.

Sources of vitamin B12 for vegans include:

- breakfast cereals fortified with B12
- unsweetened soya drinks fortified with vitamin B12
- yeast extract, such as Marmite, which is fortified with vitamin B12



Media caption Fake-meat and fries: The rise of vegan fast food

Rebecca McManamon, consultant dietitian and spokesperson for the British Dietetic Association, said restricted diets might happen for a range of reasons, including eating disorders, allergies and autism, and need specialist assessment.

"It's also worth noting that since 2016 the UK government has recommended daily Vitamin D supplementation (10 microgrammes/400 International Units) for everyone between October and March as we are not likely to get enough from fortified foods.

"Multivitamin supplementation is recommended for all children up to their fifth birthday."

Assignment front sheet

Learner name		Assessor (Teacher) name	
		Dr C Meadows	
Date issued	Completion date	Submitted on	
Summer term 2020	7 Sept 2020		
Unit number and title			
Induction			

Assignment title	Assignment 1: The implications of diet and nutrition
In this assessment you will have opportunities to provide evidence against the following criteria. Indicate the page numbers where the evidence can be found.	

Criteria reference	To achieve the criteria the evidence must show that the learner is able to:	Task No.	Evidence
I.P1	Explain how society might view dietary restrictions		
I.M1	Analyse the impact that society might have on personal choice regarding diet and nutrition		
I.D1	Evaluate the benefits of nutrition advice		

Learner declaration
I certify that the work submitted for this assignment is my own and research sources are fully acknowledged.
Learner signature: _____ Date: _____

Assignment brief

Qualification	BTEC Applied Science Level 3 Diploma / Extended diploma
Unit number and title	Induction
Start date	Summer term 2020
Deadline	7 Sept 2020
Assessor (Teacher) name	Dr C Meadows

Assignment title	Assignment 1: The implications of diet and nutrition
The purpose of this assignment is to show your knowledge of public concerns about science and how these concerns are influenced or informed by the different types of media and how these can change scientific advancements.	
<p>Scenario</p> <p>You have recently heard about the teenager who became blind from eating a poor diet and have suggested to your school science teacher that you produce a document to investigate the social and medical impact of this.</p>	
<p>Task 1</p> <p>Consider the implications dietary and nutrition advertising on society. You can present this in any way that you see fit. Remember to list references.</p>	
<p>Task 2</p> <p>For each implication explained in task 1, analyse the impact it would have on the advancements of diet and nutrition advice.</p>	
<p>Task 3</p> <p>Evaluate the benefits and disadvantages of diet advice on the patient and on society</p>	
Sources of information used	
□	

This brief has been verified as being fit for purpose			
Assessor	C Meadows		
Signature		Date	31 Mar 2020
Internal verifier			
Signature		Date	

For Pass (Explain how society might view dietary restrictions):

Learners should research case studies and explain some of the viewpoints of different society groups. They should consider the impact on the patient and family as well as the social groups. They might consider the views of religious groups and patients who have not been able to access advice/treatment.

For Merit (Analyse the impact that society might have on personal choice regarding diet and nutrition):

Learners should analyse the limitations of advancing treatments that society may enforce. They could approach this grading criterion as benefits and drawbacks. They should consider the manner in which the media portrays the stories of diet and nutrition and analyse the impact this will have on the viewpoint of society.

For Distinction (Evaluate the benefits of nutrition advice):

Learners should use some data to evaluate whether dietary and nutritional advice should be delivered by all NHS trusts, including consideration of financial cost and well being of patients.

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.

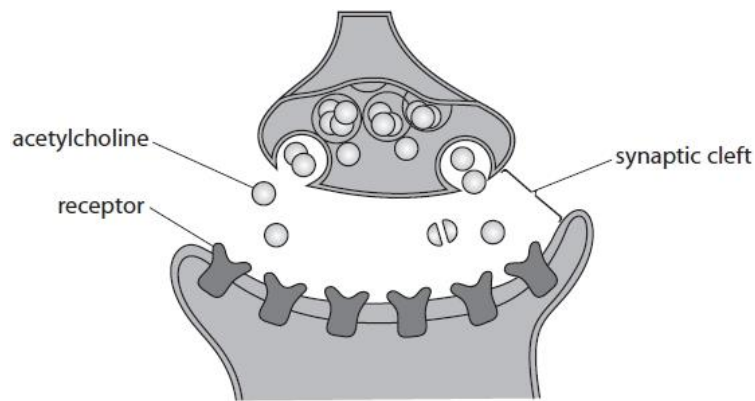


Figure 3

Describe the function of a synapse.

(2)

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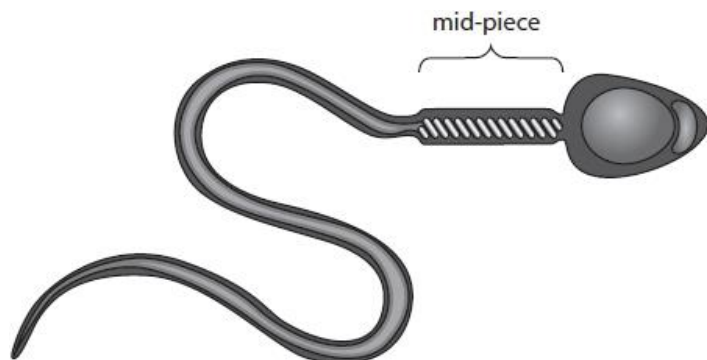
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(Total for question = 2 marks)

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.

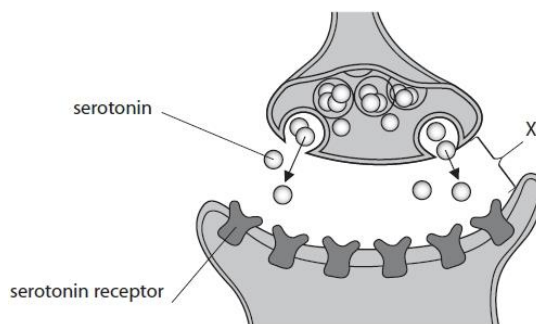


Figure 4

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

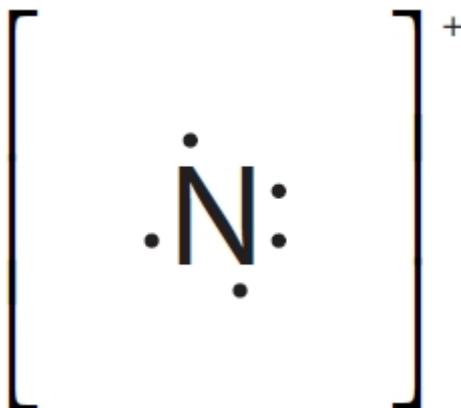
hydrogen.



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.

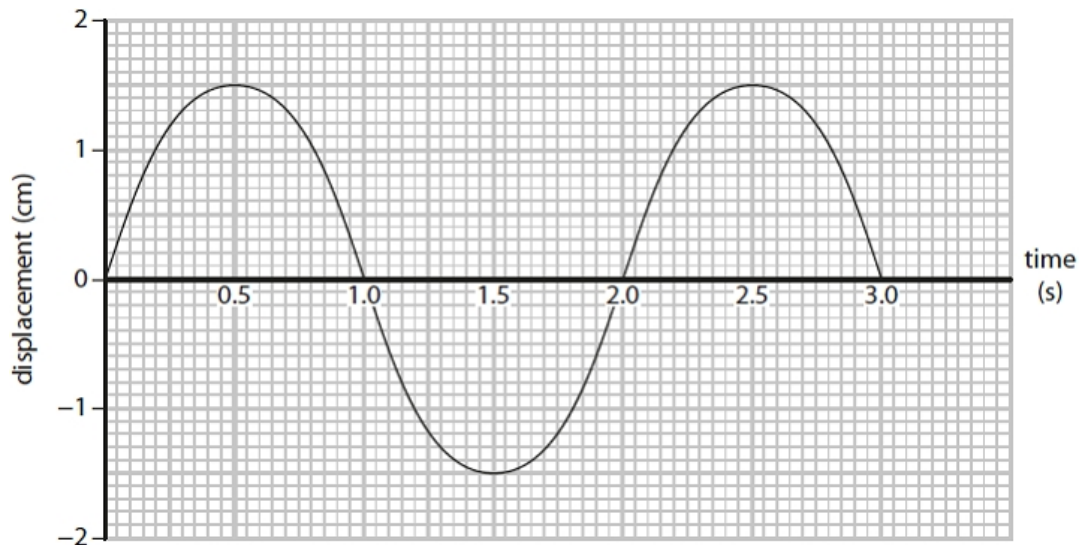
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(Total for question = 3 marks)

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)