



Motto:
"Not for self but for others"

Aspley State High School Biology

TASK 6 Extended Response Task (Response to Article)

Topic: Coordination (Year 12)

Term: 1 2008

Key Concepts addressed in this assessment task

- 1 Cells are the functioning units of all living things.
- 2 Multi-cellular organisms are functioning sets of interrelated systems.
- 5 There are processes which maintain dynamic equilibrium at all organisational levels.

Research Due:

24th/3/2009

Date Due 31st/3/2009

Research Time: 2 weeks

Response Time: 140
minutes

(to unseen questions)

Name: _____

Class: _____

Teacher: _____

Result Summary

Part	Component	A+	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E+	E	E-
A	Understanding															
B	Investigating															
C	Evaluating Issues															

Task

Part 1

You will be issued with an articles and the national drug survey which relates to the subject matter studied in this unit of work (Coordination). Your task is to investigate the ideas and concepts involved in the articles and the national drug survey and collate information to answer this research question:

"What affect does MDMA and Alcohol have on neurological activity in the Central Nervous System and the Peripheral Nervous System"

Part 2

The Extended Response Task questions will provided to you in supervised exam conditions. You will be able to use the notes you have researched to help respond to the questions.

Conditions

1. You will be issued with the article two week prior completing your response (in exam conditions).
2. You will be provided with some questions to help direct your research for the task.

3. Your research information may be used in the supervised exam where you will respond to (new) questions about the article.
4. The research information must be submitted to your teacher on the day prior to the supervised exam (Extended Response Task).
5. In the Extended Response Task you will have access to the article and your research notes which must be submitted with your response and you will be able to access data for excel in a specially marked folder.
6. Your research notes must have a **bibliography**.
7. Your research must not exceed 3 typed pages, size 12 font of either arial or times new roman (including the bibliography). In addition 2 pages of diagrams are permitted (source must be provided).
8. In the supervised exam you may type or hand write your responses. If you do not wish to use excel to draw your graphs, you will be provided with graph paper.

Criteria

Your work will be assessed according to the criteria addressing each of the general objectives: **Understanding Biology, Investigating Biology and Evaluating Biology**. The standards will be attached to the questions in the response task.

Notes for Research

Ownership of Work

It is the responsibility of every student to ensure the work is your own work. You must not copy another student's work and submit this as your own.

Plagiarism

Plagiarism is copying directly (word for word) from a reference source like a textbook, encyclopedia or from a website. Plagiarism is not permitted. Instead you are asked to re-arrange the information and put it into your own words. You must still acknowledge the source of your information by referencing.

The **Bibliography** contains an alphabetical list of all the resources you actually used in the assignment. The correct way to reference a text or other source of information in your bibliography is given below.

Examples

Book	Brown, J (1999) <i>Science and Society</i> , Sydney: McGraw- Hill
Journal Article	Sparks, M (2001) <i>Science Pracs" QST</i> , University of Queensland Press
Encyclopaedia	"Archeology" (1998) <i>The World Book Encyclopaedia</i> pp556-557.
CD Rom	<i>Insects</i> (cd rom) (1997) Canberra: CSIRO
Internet	<i>Tools of Exploration</i> [On-line] http://www.nasa.edu/ceps/ (1998) accessed 2/2/06

Referencing: Any resource listed in the bibliography should be cross-referenced by footnoting. Please use following footnoting method for referencing. Use " quotation marks " for direct quotes.

"The pH of a solution is the negative logarithm of the hydrogen-ion concentration."¹

(And at the bottom of the page:)

¹ Wilbraham, A.C., Staley, D.D. and Matta, M.S. 1997, *Chemistry*, Addison-Wesley Publishing Company, New York.

Student Ownership Statement.

I declare that:

The research presented for the Extended Response Task is my own work and I have not copied other student's work or directly from textbooks or other sources. I have not gained unfair assistance from other students, parents or guardians.

STUDENT SIGNATURE _____ DATE SUBMITTED: _____

Carefully cut along the dotted line when you are ready to hand in your assignment.

Extended Response Task Research Receipt

Date:

Year 12 Biology ERT
Task 6

Name: _____

Received:

(Teacher)

Task 6 Extended Response Task

Article

This article was taken from NIDA <http://www.nida.nih.gov/consequences/neurological> on the 11/2/08

NATIONAL INSTITUTES OF HEALTH

NIDA NATIONAL INSTITUTE
ON DRUG ABUSE
The Science of Drug Abuse & Addiction



MDMA AFFECTS ON THE BRAIN AND NEURONAL ACTIVITY

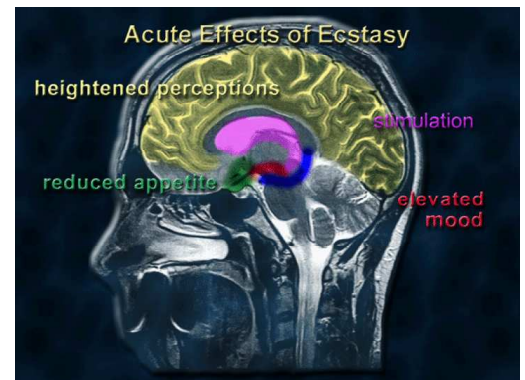
“I am 26. I started using methamphetamine (Ecstasy) eight months ago. I had been using the drug for a month when I met a young woman and fell in love. She also used the drug. After dating her for less than two months she had a stroke. Before her stroke I noticed her movements were very slow and she slurred when she spoke. She was only 25.

Methamphetamine was one of the primary causes of the high blood pressure that caused a blood vessel in her brain to rupture, I couldn’t believe she nearly died. After two months she was released from medical care. Within two weeks of being released she started using methamphetamine again, now she suffers from partial paralysis on her left side. I never really quit either, but I have noticed that my reflexes and my ability to process information has decreased immensely”

--Jimmie

Methamphetamine (Ecstasy) act in the brain to produce their euphoric effects; however some of them can also have immediate severe negative consequences in the brain such as seizures, stroke, and widespread brain damage that can impact all aspects of daily life.

Drug use can also cause long-term brain changes that lead to neurological problems such as: decreased ability to memorise facts and figures, attention, decision-making, and reflexes. In fact MRI scans of long time users show a decreased activity in certain areas of the brain relating to emotion, memory and motor control. This drug has also been known to be fatal as it is able to adversely disrupt homeostasis within the body.



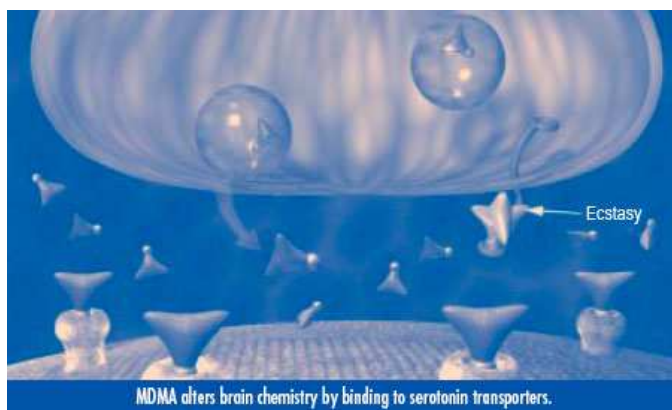
MDMA (Ecstasy) Abuse: Neurological Affects.

MDMA first gained popularity among adolescents and young adults in the nightclub scene. Reports indicate that the use of MDMA is becoming more popular within the youth of today; in fact it has become increasingly popular in adults in their 20’s and 30’s. This is concerning given that the use of club drugs has been linked to high-risk sexual behaviours that may lead to HIV or other sexually transmitted diseases. Many people in big cities report using MDMA as part of a multiple-drug experience that includes marijuana, cocaine, methamphetamine, ketamine, and other legal and illegal substances-an extremely dangerous cocktail of drugs. MDMA, long term can have severe neurological affects on neurons, as this drug has been known to disrupt the function of neurotransmitters and the de-polarisation and polarisation of the axon membrane. In the hours after taking the drug, MDMA produces significant reductions in mental abilities. These changes, particularly those affecting memory, can last for up to a week, and possibly longer in regular users. The fact that MDMA markedly impairs information processing, such as signal transduction between the CNS (Central Nervous System), PNS (Peripheral Nervous System) and effector neurons, emphasizes the potential dangers of performing complex or skilled activities, such as driving a car, while under the influence of this drug

What are the effects of MDMA ?

MDMA has become a popular drug, in part because of the positive effects that a person may experience within an hour or so after taking a single dose. Those effects include feelings of mental stimulation, emotional warmth, empathy toward others, a general sense of well-being, and decreased anxiety. In addition, users report enhanced sensory perception as a hallmark of the MDMA experience

MDMA is rapidly absorbed into the human bloodstream, but once in the body, MDMA metabolites interfere with the body's ability to metabolise, or break down, the drug. As a result, additional doses of MDMA can produce unexpectedly high blood levels, which can worsen toxic effects of this drug and increase damage to CNS and the PNS.



A NIDA-supported study has provided the first direct evidence that chronic use "ecstasy," causes brain damage in people. Using advanced brain imaging techniques-MRI, it was found that MDMA harms neurons that release serotonin, a brain chemical thought to play an important role in regulating memory and other functions. In a related study, researchers found that heavy MDMA users have memory problems that persist for at least 2 weeks after they have stopped using the drug. Both studies suggest that the extent of damage is directly correlated with the amount of MDMA use.

In people who had used MDMA, the MRI images showed significant reductions in the number of serotonin transporters, the sites on neuron surfaces that reabsorb serotonin from the space between cells after it has completed its work, furthermore there was a decreased in brain activity-proving long term damage is possible in people who are regular users of MDMA. The lasting reduction of serotonin transporters occurred throughout the brain, and people who had used MDMA more often lost more serotonin transporters than those who had used the drug less.

"The message from these studies is that MDMA does have adverse affects on neurons in the brain, CNS and PNS and it looks like there are functional and structural damages to these part of your Nervous system, leading ultimately to adverse changes in the drug users own internal homeostasis," says Dr. Joseph Frascella of NIDA's Division of Treatment Research and Development.

Findings from another Johns Hopkins/NIMH study also showed that MDMA use lead to impairments in other cognitive functions besides memory, such as the ability to sustain verbal conversations, maintain attention and the use of motor skills.

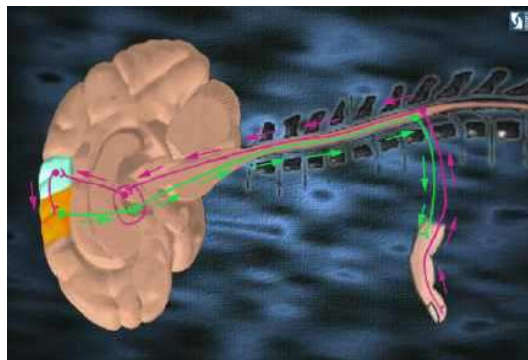
"We now know that brain damage is still present in test monkeys 7 years after discontinuing the drug," Dr. Ricaurte says. "We don't know just yet if we're dealing with such a long-lasting effect in people, however it is most likely."

Alcohol and cars – a volatile mix: Ethanol in the brain

The brain is a large and highly complex organ made up of a tangled mass of nerve cells, or neurons. Inside these neurones are vesicles full of neurotransmitters.

Different neurotransmitters have different effects on the transmission of nerve impulses. Some promote this transmission while others inhibit it. Scientists have so far found hundreds of neurotransmitters, and the list is still growing.

Ethanol appears to affect various neurotransmitters. One of these is glutamate—a particular neurotransmitter that promotes nerve activity in the brain (ie sending of messages between neurons). Scientists believe that ethanol has a negative affect on the nerves ability to create an action potential, this is due to ethanol reducing the activity of glutamate neurotransmitters, thus leading to slow brain activity.



In addition, ethanol might increase the activity of another important neurotransmitter, gamma-aminobutyric acid (GABA). GABA's role is quite different from that of glutamate in that it inhibits neuronal activity. When ethanol molecules bind to GABA receptors, the ethanol further inhibits neuronal activity, making inhibition of an action potential increase dramatically. The parts of the brain that have GABA receptors include those responsible for movement, memory, and judgment.

Studies into the effects of ethanol on the brain are also increasing our understanding of longer-term problems, such as alcoholism and the effects of alcohol on health. These might be quite different from the short-term effects. For example, animals subject to long-term exposure to ethanol have been shown to have a reduced number of GABA receptor sites. As a result, the synapses of such animals are less effective in inhibiting nervous reactions such as seizures - perhaps explaining why chronic alcohol users experience more seizures than the rest of the population.

To understand how alcohol can affect the brain one needs to know how the brain works. The brain is composed of different regions or areas. Different regions of the brain are primarily involved in different activities. For examples, the cerebellum is involved in coordination of bodily movements; the frontal cortex is primarily involved in cognitive processes; the occipital lobe contains the visual cortex; and a portion of the temporal lobe of the cortex is involved in audition. The list goes on and on.

In order for the parts to communicate with one another to achieve coordination and allow our bodies to function in a reasonable manner, the parts are connected by nerve cells also called neurons. It is estimated that there are 100 billion nerve cells in the brain so one can visualize the complexity of the inner workings of the brain. The brain is part of the central nervous system (CNS) also consisting of the spinal cord. The CNS is then connected to the peripheral nervous system.

Nerve cells communicate with one another via electrical and chemical signals. In essence signals coming from outside the body like light, sound, smells, tastes, and pressure are converted into chemical and electrical signals which pass from one part of the body to another and from one part of the brain to another, where here the signal is processed.

Once inside the brain electrical signals and chemical signals continue to be generated to allow communication between the brain parts and regions. Electrical signals generated in one neuron causes of the release of chemicals called neurotransmitters (NTs) from that neuron. These NTs in turn are then available to act at other neurons in close proximity to the first to either excite or inhibit that neuron's activity.

NTs act on neurons by attaching (binding) to chemical constituents called receptors of the neuronal membrane. There are a substantial number of different types of receptors for each NT. The binding of the NT to the receptor is the occasion for a number of secondary responses both at the membrane level and within the cell. Though there is usually only one or two NTs released from a particular neuron, numerous NTs bind to each neuron and their

collective action determines the overall response of the neuron. The resultant response can be the generation of an electrical signal (action potential) created by changes in ion flow across the nerve cell membrane (sodium, potassium, and chloride are particularly important) or inhibition of cellular electrical activity. Ethanol however, has been known to inhibit this flow of electrons and in turn can cause short term affects such as decreased mental and motor capabilities and if taken in excess over a long period of time can cause liver failure and decreased mental capabilities.

This following article was taken from the [New South Wales Government NSW Health](http://www.nsw.gov.au) Website on the 15th of Feb 08.

http://www.alcoholinfo.nsw.gov.au/dependence_disease_and_treatment/acquired_brain_injury

Alcohol is one of the many causes of acquired brain injury. The injury inflicted by alcohol abuse is referred to as **alcohol related brain impairment** (ARBI). More than 2,500 Australians are treated for ARBI every year, with approximately 200,000 Australians currently undiagnosed. Around two million Australians are potentially at risk of developing ARBI due to their drinking habits.



Just how much damage is done depends on a number of factors. These include individual differences, as well as the person's age, gender, nutrition and their overall pattern of alcohol consumption.

A person with ARBI might experience problems with memory, cognitive (thinking related) abilities and physical coordination. A younger person has a better chance of recovery because of their greater powers of recuperation. However, the effects of ARBI can be permanent for many sufferers.

Alcohol and brain injury

Brain injury can be caused by alcohol because it:

- Has a toxic effect on the central nervous system and the propagation of action potentials and neurotransmitter functions within the nervous system.
- Results in changes to metabolism, heart functioning and blood supply, and thereby disrupting the internal bodies homestasis.
- Interferes with the absorption of vitamin B1 (thiamine), which is an important brain nutrient
- May be associated with poor nutrition
- Can cause dehydration, which may lead to wastage of brain cells
- Can lead to falls and accidents that injure the brain.

Alcohol consumption and ARBI

Alcohol is one of the most popular drugs in Australia – over eighty per cent of the population are current alcohol users. Alcohol consumption ranges from light (social drinkers) to heavy consumption. Decline in cognitive functioning is gradual and depends on the amount of alcohol consumed and for how long.

ARBI is more likely to occur if a person drinks heavily on a regular basis over many years. Men who consume six standard drinks a day for more than eight years and women who consume three standard drinks a day for more than eight years are placing themselves at risk of potentially causing damage to their brain from alcohol.

It is also possible to develop ARBI over a short period of time, if the drinking is aggressive enough.

This is known as 'binge drinking' or 'heavy episodic drinking' and is a short-term, high risk form of drinking alcohol. Men who consume more than seven standard drinks and women who consume more than five standard drinks on any single occasion are at risk. Binge drinking is a huge problem amongst Australian teens, this in conjunction with driving cars makes alcohol makes teen car accidents one of the highest in the country.

Task 6 Extended Response Task

Suggested information to research for your notes preparation:

Understanding Biology

- Basic functioning of the nervous and hormonal system (and examples)
- Creating and action potential and the passage of the action potential down an axon and across the synapse.
- Terms in the article which requires further explanation for example CNS, PNS, neurotransmitters, homeostasis, gamma-aminobutyric acid (GABA), serotonin, MDMA, MRI.

Investigating Biology

- Identify the investigating aspects involved in the article and the data provided in the National Drug Survey: questions asked, hypothesis, design of investigation, data collection, analysis, judgements made and conclusions.
- Interpreting and analysing the data and providing justified explanations about the data.
- Graphing and evaluating.

Evaluating Biology

- Consider the past and present scientific and social issues associated with drug users.
- Explain explicit and implicit meaning behind both the articles and the National Drug Survey
- Evaluate and assess the reliability, authenticity, relevance, accuracy and bias of both the articles and the National Drug Survey.
- Justify decisions and develop future scenarios based on the interpretation of the articles and the National Drug Survey.

Remember that the objectives which will be tested are derived from the following statements from the syllabus:

UNDERSTANDING BIOLOGY (UB)

1. recall ideas, concepts and theories of biology
2. describe biological ideas, concepts and theories applied to a range of situations
3. apply and link ideas, concepts and theories to explain phenomena in a range of situations.

INVESTIGATING BIOLOGY (IB)

1. identify and formulate questions and hypotheses for investigations and research
3. develop skills and processes required to collect, organise, interpret, model and present primary and secondary data
4. analyse data gathered from investigations

EVALUATING BIOLOGICAL ISSUES (EBI)

1. recognise relevant past and present scientific and social issues
4. justify decisions and develop future scenarios based on the interpretation and analysis of current information.

