Science

Year 10

Below satisfactory

WORK SAMPLE PORTFOLIO

Annotated work sample portfolios are provided to support implementation of the Foundation – Year 10 Australian Curriculum.

Each portfolio is an example of evidence of student learning in relation to the achievement standard. Three portfolios are available for each achievement standard, illustrating satisfactory, above satisfactory and below satisfactory student achievement. The set of portfolios assists teachers to make on-balance judgements about the quality of their students' achievement.

Each portfolio comprises a collection of students' work drawn from a range of assessment tasks. There is no pre-determined number of student work samples in a portfolio, nor are they sequenced in any particular order. Each work sample in the portfolio may vary in terms of how much student time was involved in undertaking the task or the degree of support provided by the teacher. The portfolios comprise authentic samples of student work and may contain errors such as spelling mistakes and other inaccuracies. Opinions expressed in student work are those of the student.

The portfolios have been selected, annotated and reviewed by classroom teachers and other curriculum experts. The portfolios will be reviewed over time.

ACARA acknowledges the contribution of Australian teachers in the development of these work sample portfolios.

THIS PORTFOLIO: YEAR 10 SCIENCE

This portfolio provides the following student work samples:

Sample 1	Analysis task: The periodic table
Sample 2	Investigation report: Rates of reaction
Sample 3	Investigation report: Motion down an inclined plane
Sample 4	Worksheet: Objects in motion
Sample 5	Written test: Chemical reactions
Sample 6	Research task: The theory of evolution by natural selection
Sample 7	Research report: The Big Bang theory
Sample 8	Source analysis: Designer babies
Sample 9	Written test: Genetics and evolution
Sample 10	Cartoon: The development of the Big Bang theory

In this portfolio, the student explains how the periodic table organises elements and uses the periodic table to make predictions about the properties of elements (WS1). The student explains how chemical reactions are used to produce particular products (WS5) and describes how different factors influence the rate of reaction (WS2).

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The student explains the concept of energy conservation, representing energy transfer and transformation within a simple system involving motion down an inclined plane (WS3) and applies relationships between force, mass and acceleration to predict changes in the motion of objects (WS4). The student examines how the theory of evolution (WS6) and the Big Bang theory (WS7, WS10) developed over time and explains the structures and processes involved in inheritance and evolution by natural selection (WS9). The student describes the evidence that supports the theory of evolution by natural selection (WS6).

The student demonstrates the ability to develop hypotheses for investigation (WS2, WS3) and independently designs and improves appropriate methods of investigation (WS2, WS3), explaining how reliability and fairness were considered (WS2, WS3). The student analyses data, selects evidence and justifies conclusions with reference to areas of uncertainty (WS2, WS3) and evaluates the validity of claims made in secondary sources with reference to current scientific views (WS8). The student constructs evidence-based arguments and selects appropriate representations and text types to communicate science ideas for specific purposes and to specific audiences (WS2, WS3, WS4, WS5, WS6, WS7, WS8, WS9, WS10).

Analysis task: The periodic table

Year 10 Science achievement standard

The parts of the achievement standard targeted in the assessment task are highlighted.

By the end of Year 10, students analyse how the periodic table organises elements and use it to make predictions about the properties of elements. They explain how chemical reactions are used to produce particular products and how different factors influence the rate of reactions. They explain the concept of energy conservation and represent energy transfer and transformation within systems. They apply relationships between force, mass and acceleration to predict changes in the motion of objects. Students describe and analyse interactions and cycles within and between Earth's spheres. They evaluate the evidence for scientific theories that explain the origin of the universe and the diversity of life on Earth. They explain the processes that underpin heredity and evolution. Students analyse how the models and theories they use have developed over time and discuss the factors that prompted their review.

Students develop questions and hypotheses and independently design and improve appropriate methods of investigation, including field work and laboratory experimentation. They explain how they have considered reliability, safety, fairness and ethical actions in their methods and identify where digital technologies can be used to enhance the quality of data. When analysing data, selecting evidence and developing and justifying conclusions, they identify alternative explanations for findings and explain any sources of uncertainty. Students evaluate the validity and reliability of claims made in secondary sources with reference to currently held scientific views, the quality of the methodology and the evidence cited. They construct evidence-based arguments and select appropriate representations and text types to communicate science ideas for specific purposes.

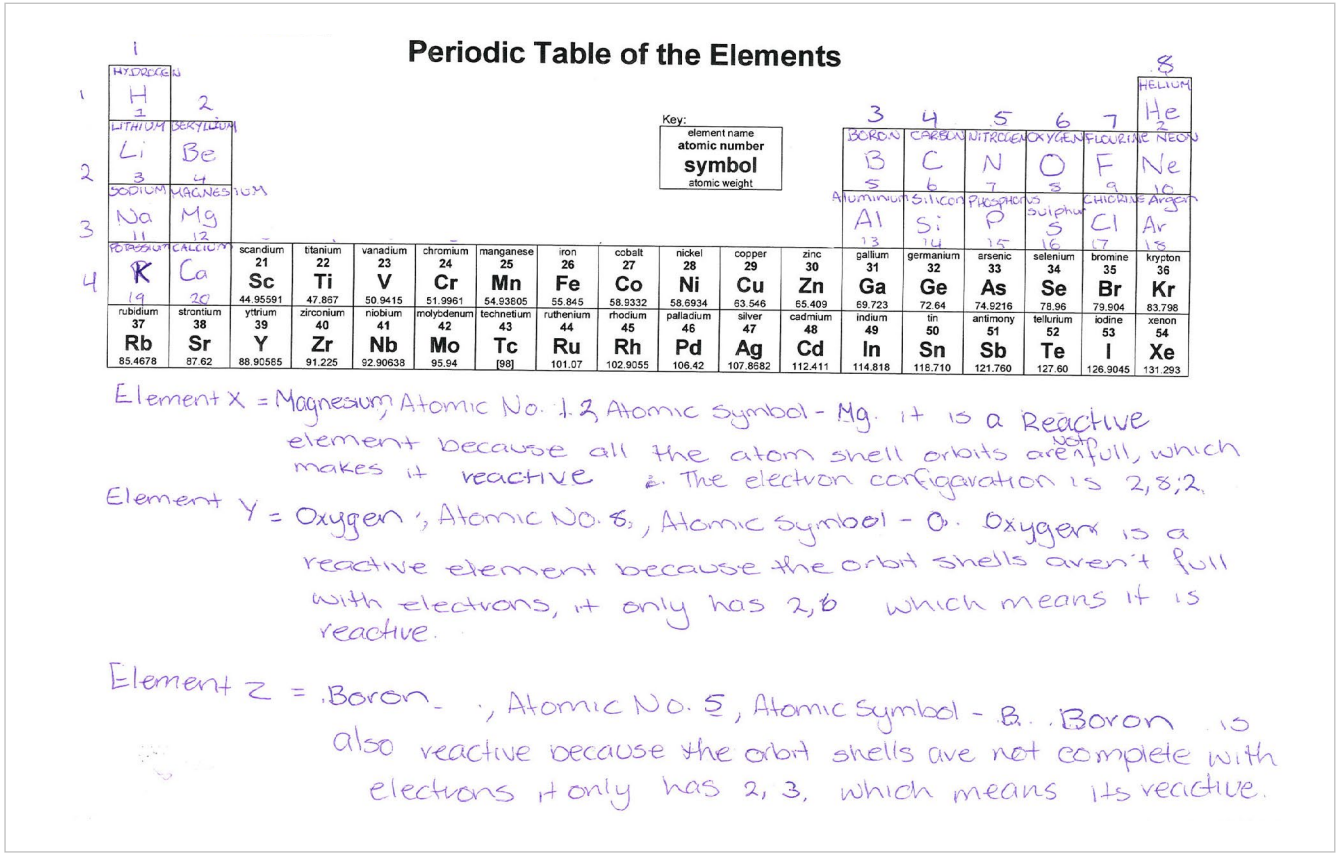
Summary of task

Before undertaking this task, students had examined the organisation of the periodic table of the elements and atomic structure.

Students were provided with a partially complete copy of the periodic table and asked to identify and describe three elements given a description of their position only, for example, 'Element x is found in Row 3, Group 2'. They were also required to explain how the elements might react with alkali metals, transition metals, non-metals and halogens.

Students completed the task in a single lesson of 100 minutes.

Analysis task: The periodic table



Annotations

Uses the position of elements in the periodic table to determine their electron configuration.

Makes minimal predictions about the reactivity of elements based on their electron configuration.

Investigation report: Rates of reaction

Year 10 Science achievement standard

The parts of the achievement standard targeted in the assessment task are highlighted.

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Summary of task

Students were asked to carry out research to identify the factors that affect the rate of a chemical reaction. They selected one factor and designed and performed an experiment to confirm its effect. Students worked in groups of 3–4 and presented their findings individually in the form of an investigation report. A report template was provided as well as opportunities for assistance and feedback in developing the experimental method.

Students were required to complete a risk assessment regarding the use of the 2.0M acetic acid.

Prior to completing the supervised experiment, students were advised of the following safety precautions when handling acetic acid: be careful to avoid skin contact as well as clothing contact and wear safety goggles at all times while handing the acetic acid.

Investigation report: Rates of reaction

RATE OF REACTION

AIM: to test what effect dilution has on the reaction of acetic acid and bicarbonate of soda.

INTRODUCTION: a chemical reaction involves a chemical change. This is different to a physical change like a change of state. Chemical reactions have chemical equations which have to be balanced to prove the law of conservation of mass.

The rate of reaction is the speed of the reaction. It can be measured by how long it takes for new substances to be made. It is considered a low rate if the particles don't combine at a fast pace. The things that affect the rate of reaction are the temperature of the room, the pressure and the concentration.

HYPOTHESIS: the rate of the reaction will drop when water is added to the reaction.

METHOD: 1. Measure 25ml of acid and add it to a conical flask

2. fill an ice cream container half full with water

3. fill a measuring cylinder with water and put it upside down in the ice cream container

4. measure 1g of bicarb soda

5. tip the sodium bicarb into the acid in the conical flask and put the stopper on and start the stop watch all at the same time.

6. do the experiment another 2 times

7. add 5mls of water to acid and repeat

8. add 10, 15 and 20mls of water to the acid and repeat

RESULTS: acetic acid + bicarbonate of soda → carbon dioxide + water

Experiment 1a – the reaction rate is 4 mls of gas

Experiment 1b – the reaction rate is 3.9 mls of gas

Experiment 1a – the reaction rate is 2.8mls of gas

Experiment 1c – the reaction rate is 4 mls of gas

Average = 3.4 mls of gas

Experiment 2a – the reaction rate is 2.6 mls of gas

Experiment 2b – the reaction rate is 2.9 mls of gas

Experiment 2c – the reaction rate is 2.9 mls of gas

Average = 2.8 mls of gas

Experiment 3a – the reaction rate is 2.9 mls of gas

Annotations

Identifies factors that influence rate of reaction, including temperature, pressure and concentration.

Develops a plausible hypothesis.

Designs an appropriate investigation method.

Considers reliability by performing repeated trials.

Investigation report: Rates of reaction

Experiment 3b – the reaction rate is 2.9 mls of gas

Experiment 3c – the reaction rate is 2.7 mls of gas

Average = 2.8 mls of gas

Experiment 4a – the reaction rate is 2.2 mls of gas

Experiment 4b – the reaction rate is 2.2 mls of gas

Experiment 3a – the reaction rate is 1.5 mls of gas

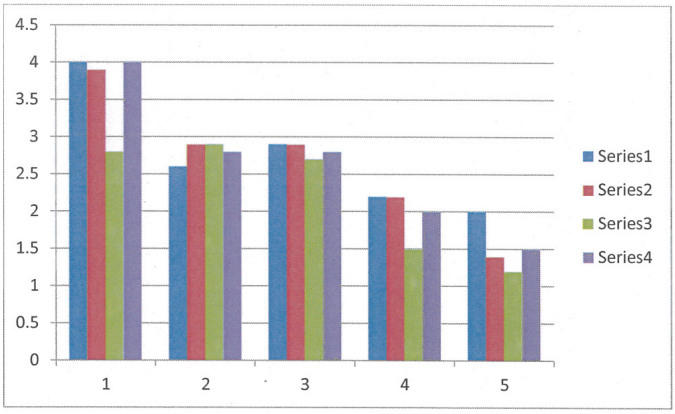
Average = 2.0 mls of gas

Experiment 5a – the reaction rate is 2 mls of gas

Experiment 5b – the reaction rate is 1.4 mls of gas

Experiment 4a – the reaction rate is 1.2 mls of gas

Average = 1.5 mls of gas



DISCUSSION: the results show that when water was added to dilute the acid less gas was produced. This shows that the amount of gas produced is connected to the amount of dilutants in the reaction. Even though the mass of the reactants in the reaction increased by adding more water the amount of gas lessened. This is the sign of the dilution having effect.

Even though our experiments produced logical results we found many problems. The amounts of reactants was sometimes different due to human error in the measuring. Sometimes gas escaped before the stopper was added. Sometimes the stopwatch wasn't started at the same time as the bicarb soda was added.

Annotations

Constructs a column graph to represent data, following some graphing conventions.

Identifies trends in data.

Identifies measurement errors.

Annotations (Overview)

The student selects language and visual representations to communicate observations and ideas within the genre of a scientific report.

Investigation report: Motion down an inclined plane

Year 10 Science achievement standard

The parts of the achievement standard targeted in the assessment task are highlighted.

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Summary of task

Students were familiar with designing open-ended investigations. They had previously investigated how the mass of an object affects its speed when travelling down an inclined plane and analysed the results as a class.

Students worked in groups to research, design and perform an investigation to answer the following question: how does the slope of an incline affect the speed of an object moving freely down it? Students were supplied with a toy car and a piece of wood to serve as the incline. They also had access to common laboratory equipment. Students were given a detailed scientific report style guide as well as opportunities to receive feedback on draft submissions. Students submitted an individual scientific report.

Investigation report: Motion down an inclined plane

The effect the height of an inclined plane has on the speed of an object travelling down it

Aim
The research question is how does the height of a ramp affect the speed of an object moving freely down it. In this experiment we changed the height of the ramp and controlled the displacement and mass of the object. We measured the depended variable which was the time taken for the toy car to travel down the ramp. This work was interesting because it is relevant to real life such as roller coasters and skateboarding down a hill.

Background information
There are several ways in which we can describe motion verbally these include velocity, time, displacement, distance, acceleration and speed (Physics Classroom, nd). Through different graphs we are able to analyse these different quantities. To calculate speed we use a distance and time graph. The slope gives us the speed which is rise over run. When we graph speed and time the slope equals acceleration. Also the part underneath the line gives us a thing called displacement (Physics Classroom, nd). Another way to calculate this is by multiplying the speed by the time.

We can measure the speed of an object through dividing the distance the object travelled by the time it took to travel the distance. We can measure speed in our experiment by allowing the car to begin its decent and timing how long it took for it to reach the bottom of the ramp, we then divide this by 1m to generate the average speed the ball took to hit the ground.

There are many factors that are able to influence the motion of an object and these include gravitational forces and friction. Friction is able to influence the motion of an object because it puts force in the opposite direction that the object is travelling in and so slows down the overall speed in which the object is travelling. It is able to do this by slowing down the overall acceleration of an object (The Science Classroom, nd). Gravity is able to act on an object because it pulls an object down once it goes up. Isaac Newton is able to explain that acceleration is a result of gravity divided by mass. In our experiment we can see that friction will affect how fast the car travels down the ramp, this friction exists between the wheels of the car and the surface of the ramp.

Gravitational potential energy is the energy potential an object has when it is raised up off the ground. Kinetic energy is the energy an object has when its moving. These two types of energy are joined because once an object is dropped it loses its gravitational potential energy and picks up kinetic energy. This can be supported by the law of conservation of energy which is that "energy cannot be created or destroyed only changed from one form to another" (The Open University, nd). When an object is traveling down a ramp it begins with potential energy, however once the object is let go the energy is changed into kinetic.

In theory a 100% efficient energy conversion would be when all the energy is converted to another kind of energy without losing any energy. However we can see that no energy conversion is 100% efficient this is because some of it is lost to the environment these factors include sound and heat. Percentage efficiency is measuring how much energy you put in you will get out. You are able to calculate percentage efficiency by dividing how much energy you got out by how much energy you began with you then divide this by 100% (University of Illinois, nd).

Hypothesis
It was hypothesised that as the height of the ramp is increased the speed of the car at the bottom of the ramp will increase.

Annotations

Develops a plausible hypothesis.

Investigation report: Motion down an inclined plane

Orientation to overall design
We have the knowledge that the independent variable affects the depended variable, so therefore our independent variable this being the height of the ramp will affect our depended variable: the speed the toy car travels. To ensure our experiment is a fair test we will have three trials at three different heights all increasing by 10 cm each time. We will keep the method of timing and the person timing the same and the way the car was released and when the timer was started and stopped.

Method
Equipment needed:
Stopwatch
Pen
Retort stand
Toy car
Clamps
Piece of wood (110cm long – 25cm wide)

Steps:

1. All equipment was collected.
2. 10cm from the end a mark was made on the wood. This line was to be the starting point with the other end the ending.
3. Using the retort stand and boss head the ramp was raised to the height of 10cm.
4. The car was bought up to the front of the line, than released making sure it was not pushed. While this happened the timer was started. When the front of the car passed the end of the ramp the timer was stopped.
5. The time was recorded then written down in the result table.
6. Step's 4 and 5 where then repeated two more times.
7. The ramp was raised 10cm and steps 4 and 5 were again repeated three times.
8. The ramp was raised another 10cm and steps 4 and 5 were repeated again in the same way as before.

Results collected from experiment

Table one: raw data

Height (cm)	Trial one	Trial two	Trial three
10	1.62	1.86	1.88
20	1.19	1.10	1.10
30	1.00	0.87	0.96

Table two: manipulated data

Height	Mass of car (g)	Average time (s)	Average speed (m/s)	Final speed (m/s)	Acceleration (m/s/s)	Initial GPE (J)	Final KE (J)	% Efficiency
10	33.2	1.79	0.56	1.12	0.81	3.25	0.052	1.6
20	33.2	1.13	0.88	1.76	0.78	6.6	0.0514	0.778
30	33.2	0.94	1.06	1.88	0.37	9.76	0.0586	0.6004

Annotations

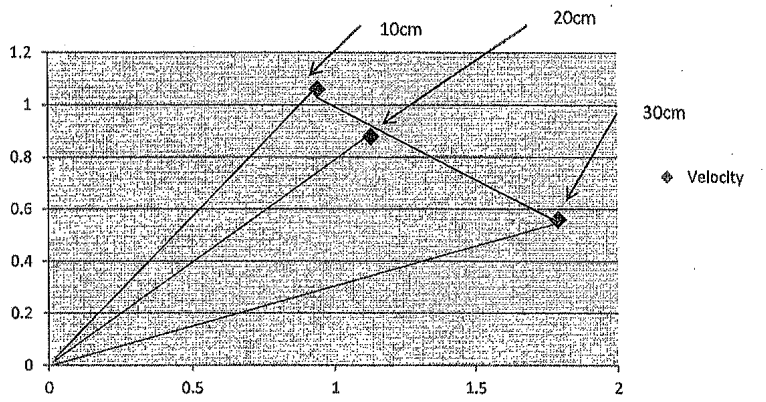
Identifies variables that can be controlled to improve the fairness of the test.

Designs an appropriate investigation method.

Considers reliability by performing repeated trials.

Constructs tables to represent data, including most measurement units.

Investigation report: Motion down an inclined plane



Discussion
The data was collected from the experimental investigation provided us with an insight into many trends. These include that as the height of the ramp increased so did the speed of the car and that as the height decreases so does the velocity. This can be supported by our data which shows that at:

10cm the speed was 0.56m/s with a GPE of 3.25 and KE of 0.052. This then leading to an energy efficiency of 1.6.

20cm the speed was 0.88m/s with a GEP of 6.6 and KE of 0.0514. This then leading to an energy efficiency of 0.778.

30cm the speed was 1.06m/s with a GEP of 9.76 and KE of 0.0586. This then leading to an energy efficiency of 0.6004.

Therefore it can be gathered from our findings that the hypothesis was supported.

From the prior knowledge gained in our research we can see why our hypothesis was correct. This is because the steeper the ramp the stronger the pull towards the earth's core.

Throughout our experiment there were a few errors firstly the use of the stopwatch and how spot on the person timing was in pressing stop and start as the car crosses the one metre line. Another problem was that the ramp may have been put at a wrong angle this would then affect the speed which the car travels at as the height and curvature the car would endure would not be in line with the experiment.

Conclusion
In conclusion my hypothesis being that as the height of the ramp is increased the speed of the car at the bottom of the ramp will increase was supported through nine trials at three different heights these being 10am, 20cm, 30cm. these results were then manipulated and through the conclusions drawn the hypothesis was proved correct. In relation to real life situations, this experiment can be applied to roller coasters and skateboards. The design of the slope can take into consideration the proved fact that the object will travel faster as the height is increased. So therefore this

Annotations

Constructs a line graph using collected data.

Identifies trends in data.

Identifies problems in method and implications for data precision.

Draws conclusions from data and confirms the hypothesis.

Annotations (Overview)

The student selects some appropriate representations to communicate science ideas within the genre of a scientific report.

Worksheet: Objects in motion

Year 10 Science achievement standard

The parts of the achievement standard targeted in the assessment task are highlighted.

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Summary of task

Students had previously been introduced to concepts and equations of motion. This task required students to complete a series of problems. Approximately 30 minutes was allowed and equations for velocity, average acceleration and force were provided.

Worksheet: Objects in motion

Year 10 Physics: Objects in motion

1. During the Olympic 4 x 100 metre relay, the winning team completed the race in 39.2 seconds.

(a) What is the average speed of the runners in metres per second and kilometres per hour?

s = d / t = 100 / 39.2 = 2.5

(b) The athlete who runs the third leg of the relay reaches his maximum speed of 10.1 ms^{-1} after about 4.40 seconds. Calculate the average acceleration of the athlete.

a = s / t = 2.5 / 4.4 = 0.568

(c) The athlete has a mass of 85.0 kg. Determine the approximate force exerted by the athlete.

F = ma = 85 x 0.568 = 48

2. A dragster accelerated at 9.00 ms^{-2}.

(a) Calculate its speed after 4.00 s.

s = 9.00 x 4.00 = 36

(b) Find the distance it travels in this time.

d = 9.00 x 4.00 = 36

(c) A parachute is deployed and the driver applies the brakes, which reduces the dragster's speed to zero in just 2.50 seconds.

(i) Calculate the deceleration of the dragster during this period.

a = 36 x 2.5 = 90

(ii) Determine the stopping distance.

d = 36 x 2.5 = 90

(iii) Calculate the force exerted by the brakes and parachute if the dragster and driver have a total mass of 950 kg.

F = ma = 950 x 90 = 85, 500

(iv) If the total mass of the dragster and driver are doubled and the same force is applied, predict its deceleration without the use of calculations. Justify your answer.

The deceleration will be double as well.

Annotations

Applies the force, mass and acceleration relationship to problems involving the motion of objects.

Annotations (Overview)

The student selects representations to solve numerical problems.

Written test: Chemical reactions

Year 10 Science achievement standard

The parts of the achievement standard targeted in the assessment task are highlighted.

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Summary of task

Students completed a written assessment at the end of a unit of work on the periodic table, chemical reactions, reaction rate and energy. The assessment was carried out under closed-book examination conditions.

Written test: Chemical reactions

12. Write a **word equation** AND a **balanced chemical equation** for each of the following reactions:

a) The combustion of hexane (C_6H_{14}) in oxygen gas:

Word: Carbon + Hydrogen → Oxygen + hexane

Balanced: $C_6 + H_{14} \rightarrow CO_2 + H-$

b) The reaction of lead nitrate with potassium iodide:

Word: lead + nitrate → Potassium iodide

Balanced: $Pb^{-4} N^{+3} \rightarrow K^{+} \quad I^{-}$

13. Calcium perchlorate is an ionic compound. Its formula is $Ca(ClO_4)_2$. Iron chloride in also an ionic compound. Its formula is $FeCl_3$

a) Write the formula for the **ions** that are present in calcium perchlorate (include their charge).

Ca^{+2} ClO_4

b) Write the formula for the **ions** that are present in iron chloride (include their charge).

$Fe\,Cl^{-}$

c) Using this information, write the formula for iron perchlorate

Fe

Annotations

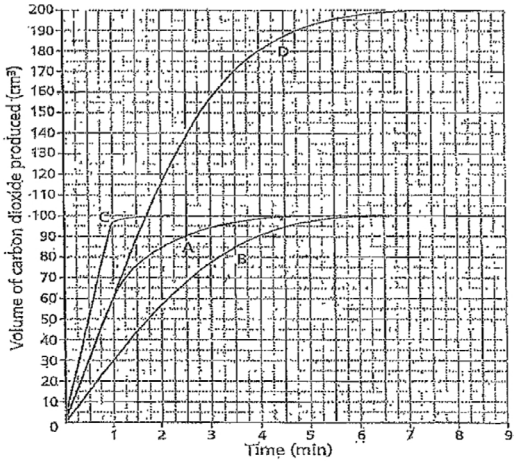
Identifies symbols of elements when constructing equations to show how chemical reactions produce particular products.

Written test: Chemical reactions

14. Emma and Luke carried out some reactions using hydrochloric acid and calcium carbonate (marble chips). They did an experiment four times each time changing one variable. The table below gives the conditions they used for each of the experiments:

Reaction	A	B	C	D
Volume of acid (mL)	50	50	50	100
Volume of water added (mL)	0	50	0	0
Temperature (°C)	20	20	60	20

The graph on the next page shows the results:



a) How much carbon dioxide was produced in reaction A?

100 (cm^3)

b) Which reaction was the fastest? Why? **Justify** your answer.

Reaction C was the fastest because it is the steepest line shown in the graph above indicating it was the fastest reaction.

Annotations

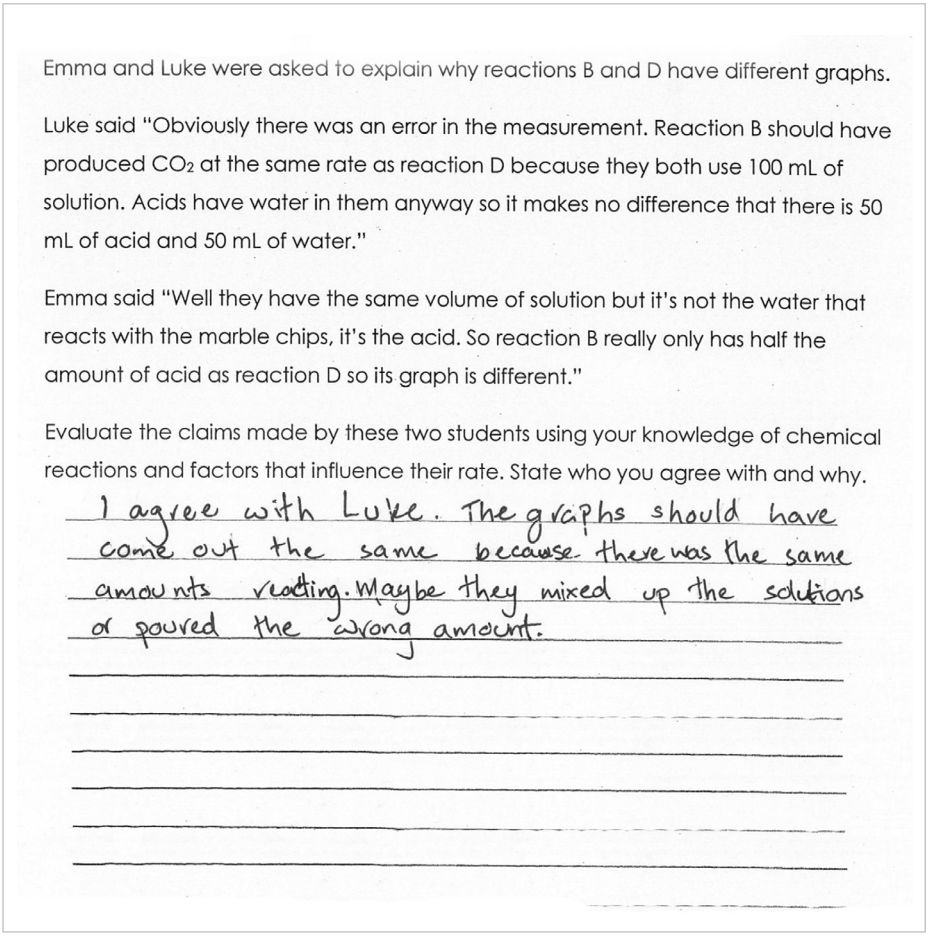
Recognises different rates of reaction from graphical data.

Science

Year 10

Below satisfactory

Written test: Chemical reactions



Emma and Luke were asked to explain why reactions B and D have different graphs.

Luke said "Obviously there was an error in the measurement. Reaction B should have produced CO_2 at the same rate as reaction D because they both use 100 mL of solution. Acids have water in them anyway so it makes no difference that there is 50 mL of acid and 50 mL of water."

Emma said "Well they have the same volume of solution but it's not the water that reacts with the marble chips, it's the acid. So reaction B really only has half the amount of acid as reaction D so its graph is different."

Evaluate the claims made by these two students using your knowledge of chemical reactions and factors that influence their rate. State who you agree with and why.

I agree with Luke. The graphs should have come out the same because there was the same amounts reacting. Maybe they mixed up the solutions or poured the wrong amount.

Annotations

Identifies that the quantity of reactant present influences the outcome of a chemical reaction.

Annotations (Overview)

The student selects representations to communicate scientific ideas for a specific purpose.

Research task: The theory of evolution by natural selection

Year 10 Science achievement standard

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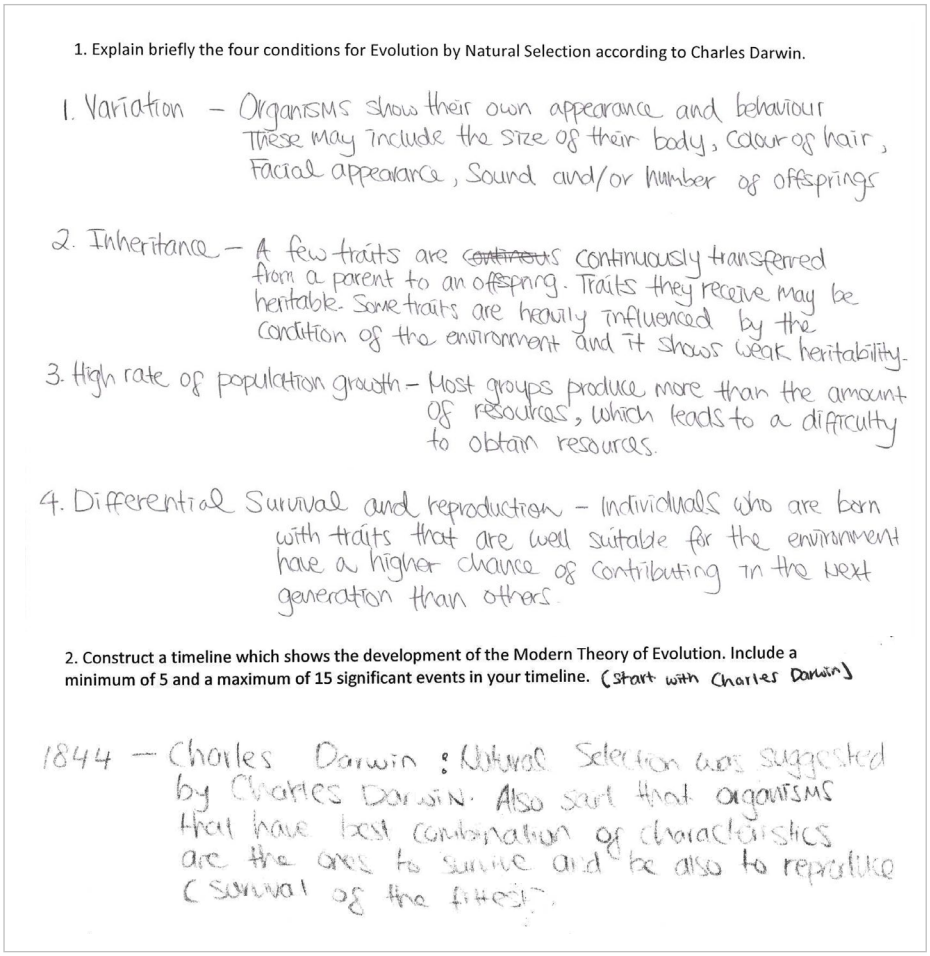
Summary of task

Students had previously completed a unit of work in which early theories of evolution were discussed as well as the theory of evolution by natural selection. In this task, students worked individually to demonstrate their understanding of the theory, its development over time and its evidence base. They investigated how improvements in technology have influenced the development of the theory and researched the contribution of a scientist of their choice to development of the theory.

Students completed a task booklet in response to identified questions. They were required to include a list of sources used in their research.

Research task: The theory of evolution by natural selection



1. Explain briefly the four conditions for Evolution by Natural Selection according to Charles Darwin.

1. Variation – Organisms show their own appearance and behaviour These may include the size of their body, colour of hair, Facial appearance, Sound and/or number of offsprings

2. Inheritance – A few traits are ~~continuous~~ continuously transferred from a parent to an offspring. Traits they receive may be heritable. Some traits are heavily influenced by the condition of the environment and it shows weak heritability.

3. High rate of population growth – Most groups produce more than the amount of resources, which leads to a difficulty to obtain resources.

4. Differential Survival and reproduction – Individuals who are born with traits that are well suitable for the environment have a higher chance of contributing in the next generation than others.

2. Construct a timeline which shows the development of the Modern Theory of Evolution. Include a minimum of 5 and a maximum of 15 significant events in your timeline. (start with Charles Darwin)

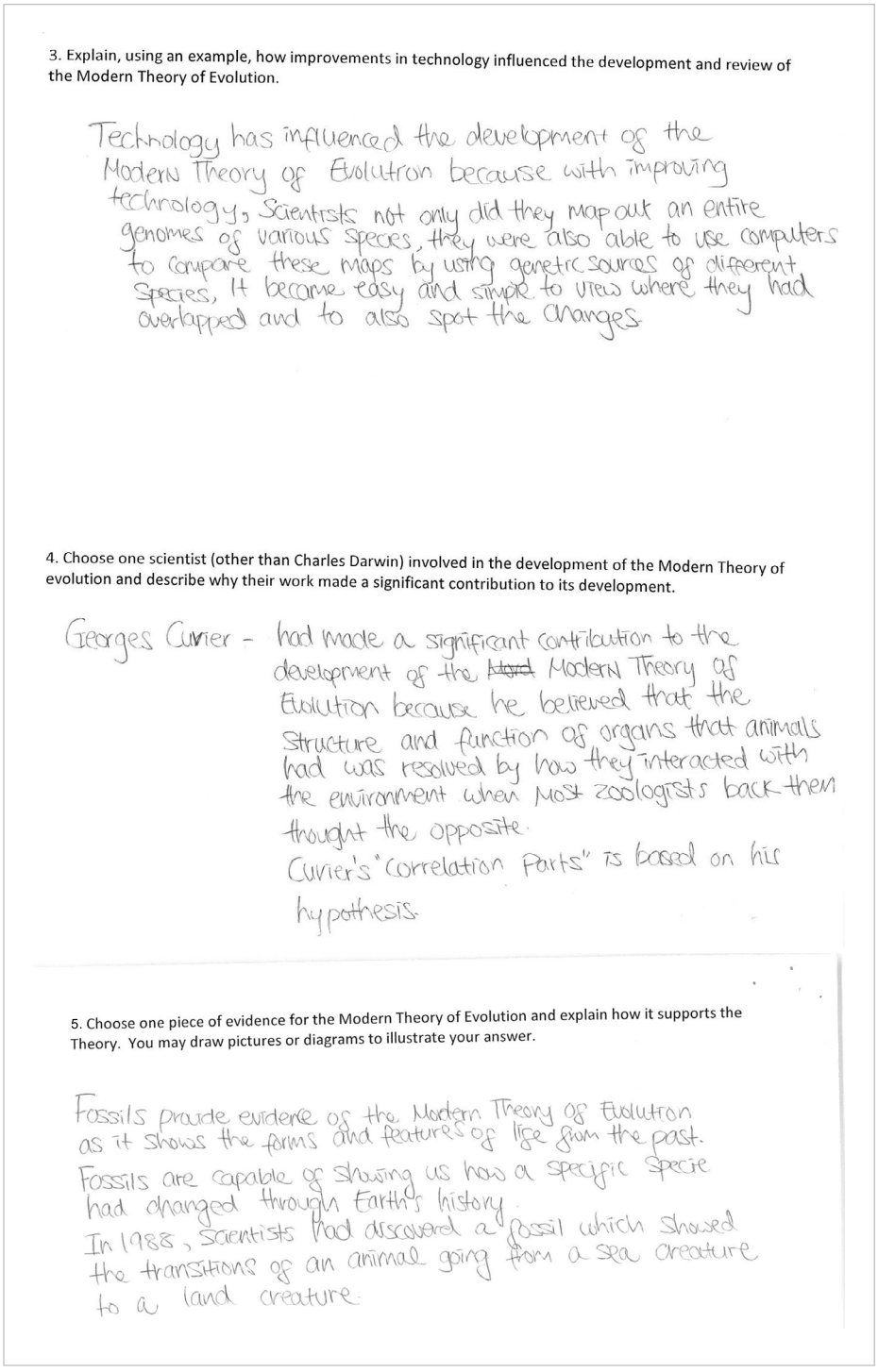
1844 – Charles Darwin : Natural Selection was suggested by Charles Darwin. Also said that organisms that have best combination of characteristics are the ones to survive and be also to reproduce (survival of the fittest).

Annotations

Identifies processes and attempts to link these to the theory of evolution by natural selection.

Selects an event that contributed to the development of the theory of evolution.

Research task: The theory of evolution by natural selection



3. Explain, using an example, how improvements in technology influenced the development and review of the Modern Theory of Evolution.

Technology has influenced the development of the Modern Theory of Evolution because with improving technology, Scientists not only did they map out an entire genomes of various species, they were also able to use computers to compare these maps by using genetic sources of different species, It became easy and simple to view where they had overlapped and to also spot the changes.

4. Choose one scientist (other than Charles Darwin) involved in the development of the Modern Theory of evolution and describe why their work made a significant contribution to its development.

Georges Curier - had made a significant contribution to the development of the ~~Hard~~ Modern Theory of Evolution because he believed that the structure and function of organs that animals had was resolved by how they interacted with the environment when most zoologists back then thought the opposite.
Curier's "correlation Parts" is based on his hypothesis.

5. Choose one piece of evidence for the Modern Theory of Evolution and explain how it supports the Theory. You may draw pictures or diagrams to illustrate your answer.

Fossils provide evidence of the Modern Theory of Evolution as it shows the forms and features of life from the past. Fossils are capable of showing us how a specific specie had changed through Earth's history.
In 1988, Scientists had discovered a fossil which showed the transitions of an animal going from a sea creature to a land creature.

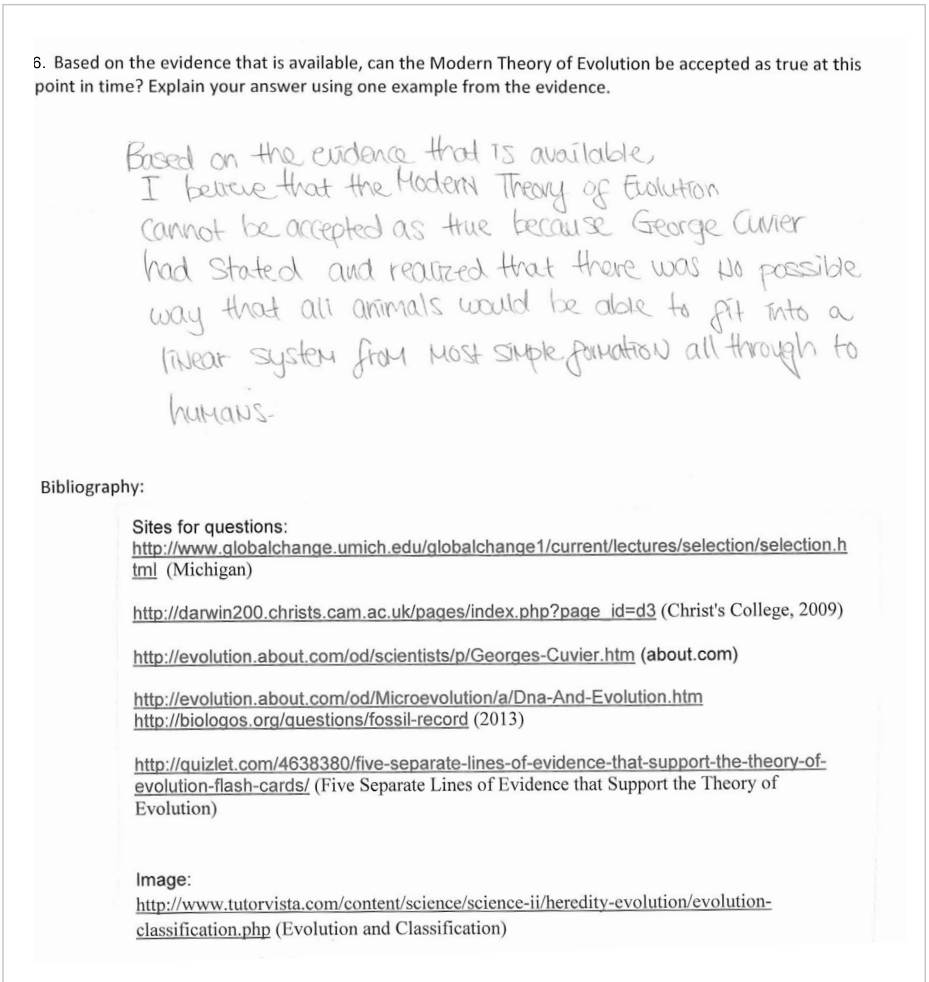
Annotations

Links genome mapping technology to the development of the theory of evolution.

Explains the work of a scientist in the field of zoology.

States that fossils provide evidence supporting the theory of evolution.

Research task: The theory of evolution by natural selection



6. Based on the evidence that is available, can the Modern Theory of Evolution be accepted as true at this point in time? Explain your answer using one example from the evidence.

Based on the evidence that is available, I believe that the Modern Theory of Evolution cannot be accepted as true because George Cuvier had stated and realized that there was no possible way that all animals would be able to fit into a linear system from most simple formation all through to humans.

Bibliography:

Sites for questions:
http://www.globalchange.umich.edu/globalchange1/current/lectures/selection/selection.html (Michigan)

http://darwin200.christs.cam.ac.uk/pages/index.php?page_id=d3 (Christ's College, 2009)

http://evolution.about.com/od/scientists/p/Georges-Cuvier.htm (about.com)

http://evolution.about.com/od/Microevolution/a/Dna-And-Evolution.htm
http://biologos.org/questions/fossil-record (2013)

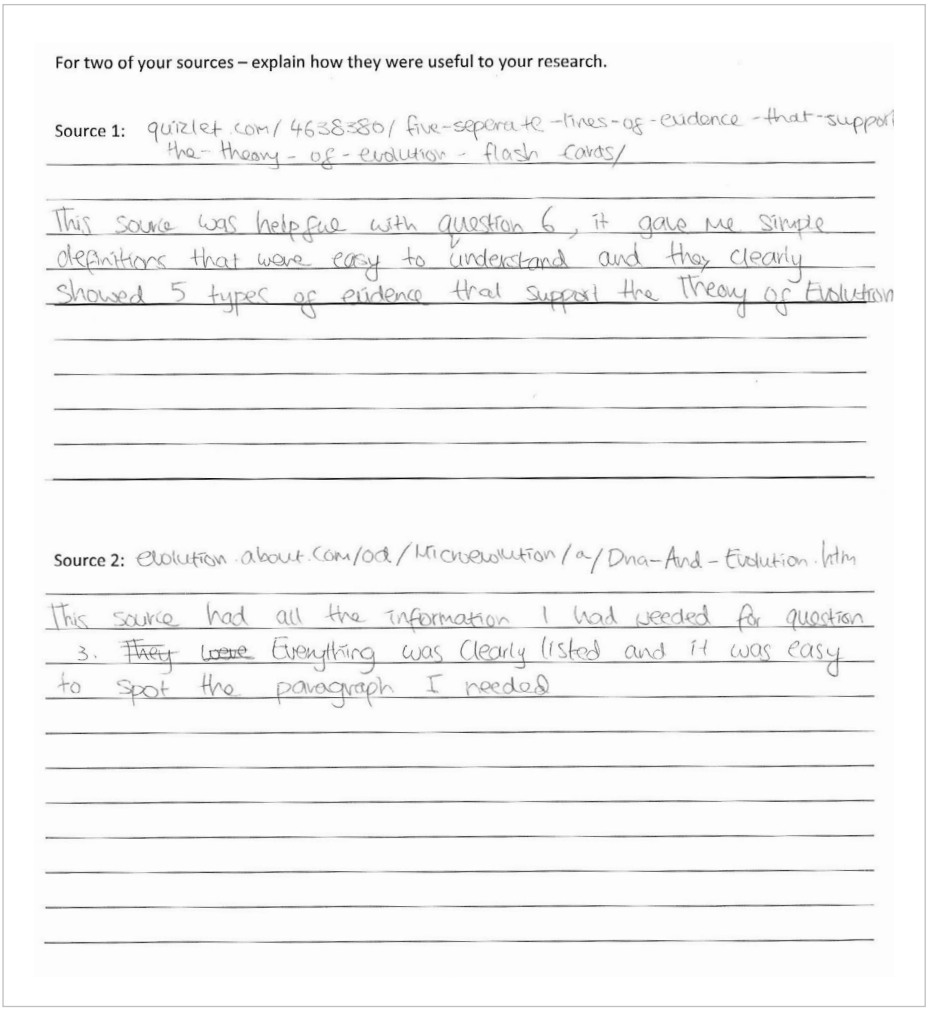
http://quizlet.com/4638380/five-separate-lines-of-evidence-that-support-the-theory-of-evolution-flash-cards/ (Five Separate Lines of Evidence that Support the Theory of Evolution)

Image:
http://www.tutorvista.com/content/science/science-ii/heredity-evolution/evolution-classification.php (Evolution and Classification)

Annotations

Constructs an argument.

Research task: The theory of evolution by natural selection



For two of your sources – explain how they were useful to your research.

Source 1: quizlet.com/4638380/five-separate-lines-of-evidence-that-support-the-theory-of-evolution-flash-cards/

This source was helpful with question 6, it gave me simple definitions that were easy to understand and they clearly showed 5 types of evidence that support the Theory of Evolution

Source 2: evolution.about.com/od/Microevolution/a/Dna-And-Evolution.htm

This source had all the information I had needed for question 3. ~~They were~~ Everything was clearly listed and it was easy to spot the paragraph I needed

Annotations

Annotations (Overview)

The student uses appropriate language and some scientific terms to communicate ideas.

Research report: The Big Bang theory

Year 10 Science achievement standard

The parts of the achievement standard targeted in the assessment task are highlighted.

> *By the end of Year 10, students analyse how the periodic table organises elements and use it to make predictions about the properties of elements. They explain how chemical reactions are used to produce particular products and how different factors influence the rate of reactions. They explain the concept of energy conservation and represent energy transfer and transformation within systems. They apply relationships between force, mass and acceleration to predict changes in the motion of objects. Students describe and analyse interactions and cycles within and between Earth's spheres. They evaluate the evidence for scientific theories that explain the origin of the universe and the diversity of life on Earth. They explain the processes that underpin heredity and evolution. Students analyse how the models and theories they use have developed over time and discuss the factors that prompted their review.*
>
> *Students develop questions and hypotheses and independently design and improve appropriate methods of investigation, including field work and laboratory experimentation. They explain how they have considered reliability, safety, fairness and ethical actions in their methods and identify where digital technologies can be used to enhance the quality of data. When analysing data, selecting evidence and developing and justifying conclusions, they identify alternative explanations for findings and explain any sources of uncertainty. Students evaluate the validity and reliability of claims made in secondary sources with reference to currently held scientific views, the quality of the methodology and the evidence cited. They construct evidence-based arguments and select appropriate representations and text types to communicate science ideas for specific purposes.*

Summary of task

Students were required to undertake research that would enable them to outline the origin of the universe as described by the Big Bang theory. They were also asked to discuss the contributions of scientists in the development of the theory and elaborate on the involvement of Australian scientists.

Students presented their research in the form of a written report. There was no word limit specified. Students were encouraged to provide a reference list of the sources used to gather their information.

Research report: The Big Bang theory

Big Bang Theory

The big bang theory is science's best explanation of how the universe was first created. This theory states that our entire universe was created when a tiny, super dense, super hot fireball of energetic radiation exploded and everything began expanding very rapidly, at speeds greater then light, which then cooled off and formed galaxies and stars in our sky today. This event is said to have happened around about 14 billion years ago.

In 1917 Albert Einstein developed his general theory of relativity which was the first clear hint that the universe might change as time passes. His equations showed that the universe was either expanding or contracting but it could not be standing still because if it were then gravity would attract all the galaxies toward one another. In 1929 Edwin Hubble discovered that the universe is in fact expanding at enormous speeds. Edwin noted that other galaxies outside our own Milky Way were moving away at speeds relative to its distance from us. Hubble then realised this meant that the entire universe was once contained in a small point in space, where it had been born from this single violent event. This discovery later lead to a Belgian astronomer in 1927 who was the first person to produce a version of what is known as the big bang model.

The Steady State Theory was put forward in 1920 by a man named Sir James Jeans, this theory states that the universe is always expanding, galaxies are moving apart and matter is being created continuously but maintaining a constant average density.

Cosmic Microwave Background Radiation (CMBR) is said to be the ancient radiation of the big Bang Theory as it keeps travelling through the universe to this present day. It is thought to be heat left over from the original explosion. It was accidently detected in 1965 by Arno Penzias and Robert Wilson when these men were picking up horrible static trying to detect radio signals in space.

Annotations

Describes the Big Bang theory of the origin of the universe.

Presents evidence that led to the development of the Big Bang theory.

Research report: The Big Bang theory

Red shift is the evidence that the universe is expanding, as when an object moves away and a red light is observed. Edwin Hubble discovered this theory expanding on his own theory expansion of the universe.

Brian Schmidt was the Nobel Prize winner in 2011. Brian expanded on Hubble's theory the expansion of the universe. He discovered that the universe is expanding at different rates, for example, it is speeding up and slowing down.

References:

Big Bang Theory [online] http://www.wisegeek.com/what-is-the-big-bang-theory.htm accessed 6th of November 2012

Big Bang [online] http://science.nasa.gov/astrophysics/focus-areas/what-powered-the-big-bang/ accessed 6th of November 2012

Big Bang Theory [online] http://www.thekeyboard.org.uk/The%20Big%20Bang%20Theory.htm accessed 6th of November 2012

Annotations

Presents evidence that supports the theory that the universe is expanding.

Annotations (Overview)

The student constructs evidence-based arguments and selects representations of science ideas for an explanatory essay.

Source analysis: Designer babies

Year 10 Science achievement standard

The parts of the achievement standard targeted in the assessment task are highlighted.

> *By the end of Year 10, students analyse how the periodic table organises elements and use it to make predictions about the properties of elements. They explain how chemical reactions are used to produce particular products and how different factors influence the rate of reactions. They explain the concept of energy conservation and represent energy transfer and transformation within systems. They apply relationships between force, mass and acceleration to predict changes in the motion of objects. Students describe and analyse interactions and cycles within and between Earth's spheres. They evaluate the evidence for scientific theories that explain the origin of the universe and the diversity of life on Earth. They explain the processes that underpin heredity and evolution. Students analyse how the models and theories they use have developed over time and discuss the factors that prompted their review.*
>
> *Students develop questions and hypotheses and independently design and improve appropriate methods of investigation, including field work and laboratory experimentation. They explain how they have considered reliability, safety, fairness and ethical actions in their methods and identify where digital technologies can be used to enhance the quality of data. When analysing data, selecting evidence and developing and justifying conclusions, they identify alternative explanations for findings and explain any sources of uncertainty. Students evaluate the validity and reliability of claims made in secondary sources with reference to currently held scientific views, the quality of the methodology and the evidence cited. They construct evidence-based arguments and select appropriate representations and text types to communicate science ideas for specific purposes.*

Summary of task

Students read an article published by an online news source outlining the practices of an American fertility clinic. They were then required to analyse the article for its relevance, credibility and bias. Students were provided with prompts and clues to assist in this process. A single 50-minute lesson was allowed for completion of the task.

Source analysis: Designer babies

The Task:

- Read and analyse the source attached for relevance, credibility and bias. You should identify elements by **annotating** the articles to show indicators of relevance, bias and credibility. You should try to use a number of different indicators to demonstrate clear understanding of these terms.
- Answer the questions below:

1. Describe the intended audience for "Designer baby row over US clinic." based on the annotations you have made.

The intended audience is parents.
The article might help people to decide whether to have children or not.

2. Do you think the article is credible? Support your answer using specific examples from your annotations of the article.

The people in the article are doctors so the article is credible.
When the article says we make NO guarantees it costs them to lose some credibility.

3. Do you think the article is biased? Support your answer using specific examples from your annotations of the article.

The article shows the pros and cons so it can't be biased.
The pros are that it can ~~be~~ help to stop disease and a con is that what will happen to the more embryos being created than can be implanted.

4. You are researching whether people should be allowed to use Genetic Techniques to design their own babies. Would this article be useful for your research? Explain your answer.

The article would be useful because it gives everyone a better understanding.
If I am doing research then I need a good understanding so it would be useful.

Annotations

Identifies a potential audience for the article.

Makes a judgement about the credibility of the article based on the qualifications of the respondents.

Makes a judgement that the article is unbiased because it includes pros and cons.

Identifies that use of secondary sources benefits research.

Annotations (Overview)

The student constructs arguments and selects representations to communicate science ideas.

Written test: Genetics and evolution

Year 10 Science achievement standard

The parts of the achievement standard targeted in the assessment task are highlighted.

By the end of Year 10, students analyse how the periodic table organises elements and use it to make predictions about the properties of elements. They explain how chemical reactions are used to produce particular products and how different factors influence the rate of reactions. They explain the concept of energy conservation and represent energy transfer and transformation within systems. They apply relationships between force, mass and acceleration to predict changes in the motion of objects. Students describe and analyse interactions and cycles within and between Earth's spheres. They evaluate the evidence for scientific theories that explain the origin of the universe and the diversity of life on Earth. They explain the processes that underpin heredity and evolution. Students analyse how the models and theories they use have developed over time and discuss the factors that prompted their review.

Students develop questions and hypotheses and independently design and improve appropriate methods of investigation, including field work and laboratory experimentation. They explain how they have considered reliability, safety, fairness and ethical actions in their methods and identify where digital technologies can be used to enhance the quality of data. When analysing data, selecting evidence and developing and justifying conclusions, they identify alternative explanations for findings and explain any sources of uncertainty. Students evaluate the validity and reliability of claims made in secondary sources with reference to currently held scientific views, the quality of the methodology and the evidence cited. They construct evidence-based arguments and select appropriate representations and text types to communicate science ideas for specific purposes.

Summary of task

Students had completed a unit on genetics and heredity. They had investigated processes of inheritance and the structure and function of DNA, chromosomes and genes. They had used Punnett squares and pedigree charts to investigate and predict patterns of inheritance and explored the difference between phenotype and genotype.

The students were required to complete an end-of-unit written test. The task was completed under closed-book conditions. The time allowed was 90 minutes. A selection of the test items has been included.

Written test: Genetics and evolution

SECTION A: Multiple Choice: Circle the most correct answer. (1 Mark for each Question)

1. Animals that use sexual reproduction
   A. inherit their chromosomes from one parent
   B. gets exactly half their chromosomes from each parent
   C. get their father genes if they are a boy, their mother's if they are a girl
   D. rely on mutation for variation within the species

2. A chromosome is
   A. A strand of DNA containing many genes
   B. A strand of DNA containing one gene
   C. Half of the genetic code for an organism
   D. something that is used to coat bumper bars

3. A normal human cell has
   A. 92 chromosomes
   B. 23 chromosomes
   C. 1 chromosomes
   D. 46 chromosomes

4. The gene for brown colour in eyes (B) is dominant over the gene for blue eye colour (b). If a person has blue eyes then their genotype must be:
   A. BB
   B. BB or bb
   C. Bb
   D. bb

5. The pair of chromosome that determines if a baby is a boy is:
   A. XY
   B. XX
   C. YY
   D. XO

6. In sheep, white coat colour (W) is dominant over black coat colour (w). If Mr and Mrs Baa are both white sheep, could they produce a black sheep?

   A. Yes, if one of the parents is heterozygous.
   B. No, one of the parents would have to be black to have a black offspring.
   C. Yes, if both of the parents are heterozygous.
   D. Yes, if one of the "grandparents" was a black sheep.

Annotations

Responses to multiple-choice questions demonstrate some understanding of structures associated with heredity and genetics.

Written test: Genetics and evolution

7. A biology student wants to examine gamete formation. **Select** the most suitable prepared slide for her to examine.

A. Human skin
B. Rat testes
C. Early developing embryo
D. Human bone marrow

12. **Explain** why variation is necessary before natural selection can occur.

Its necessary or else everyone would be like clone.

13. Y represents the allele for a yellow coat and y represents the allele for a black coat.

a) Complete the punnett square of a cross between a homozygous yellow-coated Labrador and homozygous black coated Labrador.

	Y	y
Y	YY	Yy
y	Yy	yy

b) What offspring are likely to be produced from the cross in part a)

GENOTYPE		PHENOTYPE	
YY	% 25%	yellow	% 75%
Yy	% 50%	black	% 25%
yy	% 25%		%

Annotations

Explains that variation within a species means that individuals are different.

Uses Punnett squares to predict possible genotypes.

Written test: Genetics and evolution

c) Complete the punnett square of a cross between two heterozygous Labradors.

	Y	Y
Y	YY	YY
y	Yy	Yy

d) What offspring are likely to be produced from the cross in c)

GENOTYPE		PHENOTYPE	
~~Bb~~ YY	% 50%	~~black~~ yellow	% 100%
Yy	% 50%	black	% 0%
	%		%

b) **List** and **explain** 2 things which are different between Mitosis and Meiosis

1. Mitosis is the non-sex cell

2. Meiosis is the sex cell

Annotations

Identifies a difference between mitosis and meiosis.

Written test: Genetics and evolution

The following information relates to Q 20

The Spiro was a very simple, single-celled organism that once lived in a freshwater lake. It was so simple that it did not have to rely on meeting the opposite sex in order to reproduce. Baby Spiros, identical to their parents, budded off directly from their parent cell.

The main competition for the Spiros in the lake was from another simple organism, called a Hiro, which looked very similar to the Spiro and had very similar requirements. There was, however, one major difference: Hiros reproduced sexually and therefore, females had to find a male to mate with.

The lake was fed by an inland river system and although it usually contained some water, water levels fluctuated with seasons.

At first the Spiros out-competed the Hiros and there were many more Spiros than Hiros. Later on, however, it was the Hiros that flourished, while the Spiros numbers declined.

20. Reflect on the above information and **hypothesise** why the Hiros may have eventually out-competed the Spiros.

The Spiros lasted longer because they didn't need to find a mate, they could just do it themselves. So it was more convenient if spiro could make 1 or more by themself. The Hiro needed 2 to make 1 or more. Over time it would add up that the spiros would make heaps more!

Annotations

Identifies a difference between the rate of asexual and sexual reproduction.

Annotations (Overview)

The student constructs arguments and uses a range of representations to communicate science ideas.

Cartoon: The development of the Big Bang theory

Year 10 Science achievement standard

The parts of the achievement standard targeted in the assessment task are highlighted.

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Summary of task

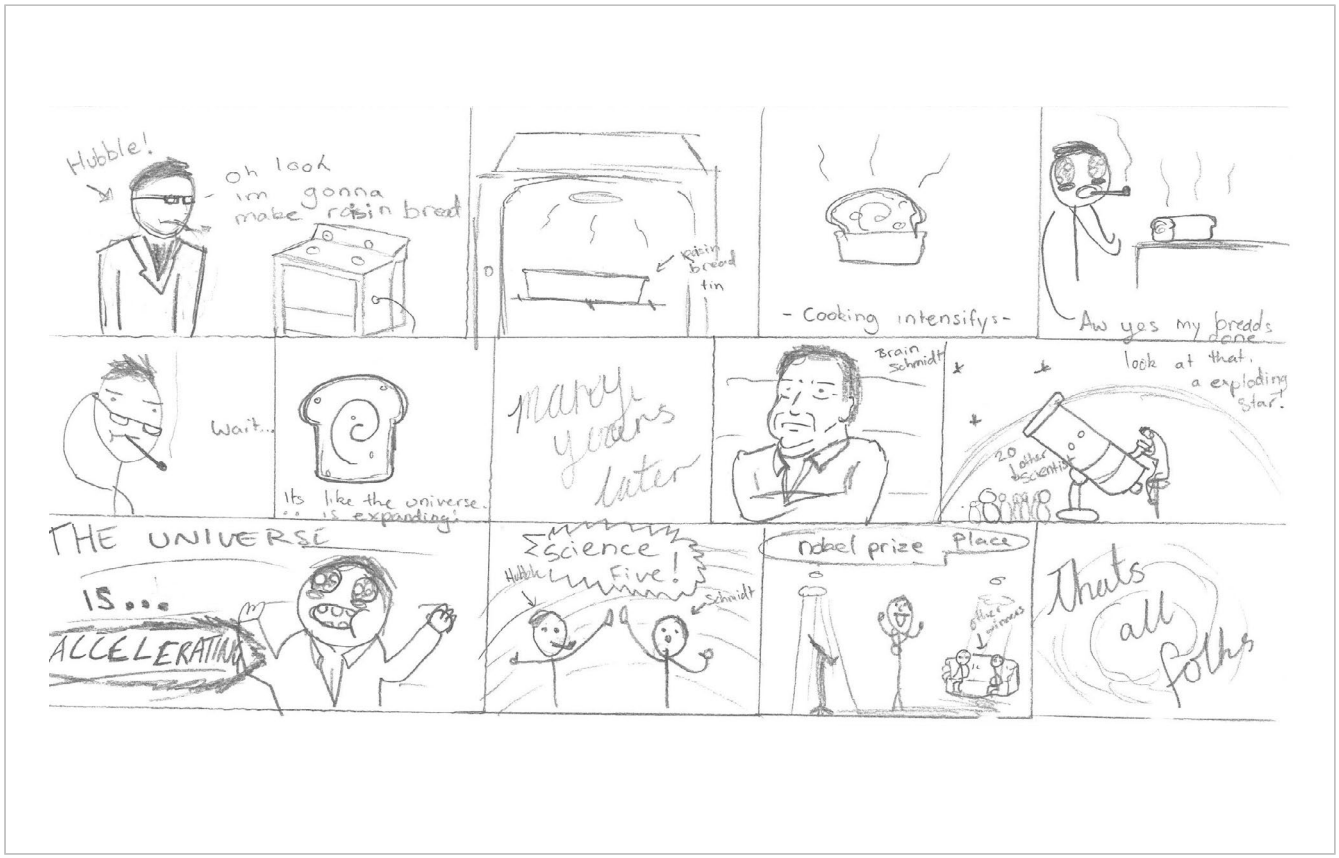
Students had previously completed a unit of work exploring the Big Bang theory. In this task, students worked individually to construct a cartoon that provided a one-page summary for their peers of the role of different scientists in the development of the Big Bang theory. They were specifically required to consider the audience for the cartoon and how to communicate science ideas to this audience.

Science

Year 10

Below satisfactory

Cartoon: The development of the Big Bang theory



Annotations

Identifies the contributions of two scientists to one aspect of the Big Bang theory, the expansion of the universe.

Annotations (Overview)

The student uses a multimodal text to communicate scientific ideas in a way that is appealing for their peers.