



NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Level 1, 2004

Science

Describe aspects of biology (90188)

Describe aspects of chemistry (90189)

Describe aspects of geology (90190)

Describe aspects of physics (90191)

Describe aspects of astronomy (90192)

National Statistics

Assessment Report

Assessment Schedule

Science, Level 1, 2004

General Comments

Candidates gaining Achievement knew the meaning of key words in the questions and in the resource materials provided, and were able to use key words correctly in their answers. Scientific language was used accurately to give clear descriptions and show understanding of key concepts.

Candidates gaining Achievement were able to use their scientific knowledge to understand and correctly answer questions. They attempted all questions often gaining recognition for achievement level skills from their answers to higher level questions.

Candidates who gained Achievement were able to rearrange a formula and substitute into a formula correctly. They carried calculations accurately with legible working where appropriate.

Candidates assessed as Not Achieved were unfamiliar with many scientific terms taken directly from the relevant achievement standards. They were not able to use a formula to solve a problem.

Candidates who gained Achievement with Merit or Achievement with Excellence understood what was meant by an explanation and wrote more than one or two words. They were able to draw on their knowledge to link multiple ideas and carry out more complex calculations.

Science: Describe aspects of biology (90188)

National Statistics

Number of Results	Percentage			
	Not Achieved	Achieved	Merit	Excellence
26,593	47.3%	43.6%	8.4%	0.7%

Assessment Report

Candidates who gained Achievement understood key terms such as describe, draw and define. They recognised that words in bold were key words in questions. They were able to use biological terms from the Standard correctly. These candidates showed that they knew the importance of steps in a process; they recognised that diagrams, including punnet squares, need labels; and they knew how the basic life processes applied to bacteria, viruses and fungi.

Candidates assessed as Not Achieved confused terms, eg excretion and secretion, or did not know important definitions, for example, gene. They also used jargon and slang rather than correct scientific terms.

Candidates gaining Achievement with Merit or Achievement with Excellence used biological terms accurately and were able to link their knowledge to less familiar examples. They were able to clearly explain differences between familiar terms such as genes and alleles; and wrote accurate, succinct paragraphs.

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
4(d)	<p>Blue is dominant and the recessive white flower alleles may stay hidden in Bb / White would appear in a Bb X Bb cross.</p> <p>Nb: mutation answer is only at Achieved.</p>	<p>Blue is dominant and the recessive white flower alleles may stay hidden in Bb. : White would appear in a Bb X Bb cross/ white would not appear in BB X Bb.</p>	<p>The plants may keep appearing to be blue as blue is dominant and the recessive white allele will remain hidden in Bb. : Statistically white flowers would appear 25% of the time in Bb X Bb. : However in BB X Bb white flowers would never appear / The heterozygous plant may not cross with another heterozygous plant for several generations in random planting/crossing.</p>
5(a)	<p>Punnett square complete showing 50% XX and 50% XY.</p>		
5(b)	<p>50%.</p>	<p>50% females: during fertilisation 50% chance of X or Y chromosome fertilising the egg cell / assortment of X & Y chromosomes produces ratio of 1:1(implication of independent event).</p>	
6(a)	<p>Cloning / mitosis : the same chromosomes / for growth / new cells identical.</p> <p>OR</p> <p>Sexual reproduction : the formation of gametes / ½ nos of chromosomes via meiosis before fertilisation : mitosis and a new individual (implied growth).</p>	<p>Cloning / mitosis : the same chromosomes / for growth</p> <p>AND</p> <p>Sexual reproduction : the formation of gametes / ½ nos of chromosomes via meiosis before fertilisation : mitosis and a new individual (implied growth).</p>	
6(b)	<p>Cloning means there is no variation in the offspring: In sexual reproduction there is variation in offspring.</p> <p>OR</p> <p>One (biological) advantage or one disadvantage of cloning / sexual reproduction described.</p> <p>Specific examples could be used</p>	<p>Explanation of...</p> <p>Cloning means there is no variation in the offspring: In sexual reproduction there is variation in offspring. Linked to:</p> <p>Either - One advantage + one disadvantage (biological) of cloning / sexual reproduction</p> <p>Or - One advantage of cloning : one advantage of sexual reproduction.</p> <p>Or - One advantage of cloning : one disadvantage of sexual reproduction (or reverse).</p>	<p>Discussion of...</p> <p>One advantage and one disadvantage of both cloning and sexual reproduction linked to the idea of variation or lack of (using features of the individual or species).</p>

Judgement Statement

Science: Describe aspects of biology (90188)

Achievement

Total of **EIGHT** opportunities answered at Achievement (or higher). Note, that to gain Achievement, evidence must be from both micro-organism and genetics questions.

8 × A

Merit

Total of **TEN** opportunities answered with **FOUR** at Merit level and **SIX** at Achievement level.

4 × M + 6 A

Excellence

Total of **TWELVE** opportunities answered with **TWO** at Excellence level and **FOUR** at Merit level and SIX at Achievement level.

2 × E + 4 × M + 6 × A

Science: Describe aspects of chemistry (90189)**National Statistics**

Number of Results	Percentage			
	Not Achieved	Achieved	Merit	Excellence
33,830	46.6%	35.4%	14.1%	3.9%

Assessment Report

Candidates who gained Achievement could recognise and correctly use key words such as alkaline and neutralisation. They used correct terminology in their answers, for example aluminium had an oxide coat rather than a 'protective coat'. Other candidates did not use scientific language, for example 'toothpaste killed the acid in the mouth'.

Candidates who gained Achievement were able to recall key chemical facts, identified in the Standard, such as the formula of sulfuric acid or colours of indicators. Other candidates could not recall basic chemical information.

Candidates who gained Achievement could distinguish chemical from physical properties and recognise common chemical changes. They used information provided in the questions to assist them in their answers and wrote correct formulae using correct symbols from the periodic table and table of ions provided. They were able to count atoms in a formula and correctly name common compounds.

Candidates who gained Achievement with Merit and Achievement with Excellence were able to express ideas using chemical language, including writing chemical equations. They read questions carefully and explored links to relevant chemistry.

Assessment Schedule

Science: Describe aspects of chemistry (90189)

Evidence Statement

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
One: Metals			
1(a)	(i) Copper / Cu (ii) Iron / Fe (iii) Sodium / Na 2 required		
1(b)(i)	1. hydrogen/H ₂ 2. calcium hydroxide / Ca(OH) ₂ / OH ⁻ both required		
1(b)(ii)	Correct formulae for TWO species.	Formula of all species correct but unbalanced Ca : HCl : CaCl ₂ : H ₂	Correct balanced (ionic ok) equation Ca + 2HCl → CaCl ₂ + H ₂
1(c)(i)	aluminium + oxygen = aluminium oxide		
1(c)(ii)	Aluminium foil has an oxide coating on it OR aluminium is a reactive metal. ONE idea that describes a property of Aluminium.	Al is a reactive metal but does not react with the food because of its protective oxide coating OR Al burned on the ship because of heat removing oxide coating (via a logical but not necessarily correct reason eg hot salt water). BOTH properties described OR an elaboration of one of the properties.	Al does not react with the food because of its protective oxide coating which isn't removed by water, steam or acid AND Al on the ship reacts at the high temperature because the oxide coating is removed. A full explanation referring to both situations.
1(d)(i) (d)(ii)	1. ductile/malleable 2. conducts electricity 3. solid 4. high melting point ONE relevant physical property.	The atoms can move past each other to be drawn into a wire or electrons move and still hold the atoms together. OR The mobile electrons are free to move/carry charge/electric current.	

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence				
Two: Acids and Bases							
2(a)	<table border="1"> <tr> <td>Red</td> <td>Red</td> </tr> <tr> <td>Blue/purple</td> <td>Blue/purple</td> </tr> </table> <p style="text-align: center;">1 column correct</p>	Red	Red	Blue/purple	Blue/purple		
Red	Red						
Blue/purple	Blue/purple						
2(b)(i) 2(b)(ii)	oven cleaner lemon juice both correct						
2(b)(iii)	Toothpaste is basic/alkaline OR neutralises the acid.	Toothpaste is basic/alkaline and neutralises the acid. Qualifies their achieved statement.					
2(c)(i)	carbon dioxide/ CO ₂						
2(c)(ii)	water + carbon dioxide + copper chloride TWO product species required.	Copper carbonate + hydrochloric acid → copper chloride + water + carbon dioxide	Correctly balanced symbol equation if present and needed as evidence for excellence overall.				
2(c)(iii)	NaHCO ₃ / Na ₂ SO ₄ /H ₂ SO ₄ /CO ₂ /H ₂ O THREE formulae required.	H ₂ SO ₄ + NaHCO ₃ → H ₂ O + CO ₂ + Na ₂ SO ₄ Correct formulae but not balanced.	H ₂ SO ₄ + 2NaHCO ₃ → 2H ₂ O + 2CO ₂ + Na ₂ SO ₄ correctly balanced equation.				
2(c)(iv)	Carbonates / hydrogen carbonates are bases OR the products are neutral OR the pH becomes 7 OR the effect of cancelling.	Carbonates and hydrogen carbonates are bases AND products include a salt and water OR The pH will be around 7 because [H ₃ O ⁺]=[OH ⁻] OR acids cancel out bases. An idea explaining WHY it is neutralisation.	Carbonates and hydrogen carbonates are bases so this is a neutralisation reaction where the products include a salt and water. The pH will be around 7 because [H ₃ O ⁺]=[OH ⁻]. A full explanation including products, final pH and balance of ions IF NEEDED AS EVIDENCE FOR EXCELLENCE OVERALL.				

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
Three: Atomic structure			
3(a)	Al 13 27 13 (i)13 (ii)14 C (iii)6 12 (iv)6 6 6 Na ⁺ 11 23 11 10 12 O ²⁻ 8 16 8 10 8 2 rows correct	Al 13 27 13 13 14 C 6 12 6 6 6 Na ⁺ 11 23 11 (v)10 12 O ²⁻ 8 16 (vi)8 10 8 4 rows correct	
3(b)	2,1 : 2,8,5 : 2,8 2 of 3 correct		
3(c) (i) 3(c) (ii)	Rb +1 Rb ⁺¹ / 1 / +1 / one / positive / positive one	Rb +1 All atoms are in group one (of the periodic table) OR all have one electron in their outer shell.	
3(d)(i)	(1) 6 (2) 11 both required		
3(d)(ii)	(1) CaO (2) Cu(OH) ₂ (3) Na ₂ CO ₃ TWO required	(1) CaO (2) Cu(OH) ₂ (3) Na ₂ CO ₃ THREE required	
3(d)(iii)	(i) magnesium oxide (ii) sodium sulfide (iii) calcium nitrate TWO required		
3(e)	Iron in the tablets is a compound/ion/salt OR Iron in the nails is an element/ metal.	Iron in the tablets is a compound/ion/salt/mineral AND Fe in the nails is an element/metal.	MERIT PLUS The Fe in the tablet is able to be absorbed into the body OR a property of the Fe in nail related to its use/ non-use as a tablet.

Judgement Statement

Science: Describe aspects of chemistry (90189)

Achievement

Total of **ELEVEN** opportunities answered at Achievement (or higher)

$$11 \times A$$

Merit

Total of **FOURTEEN** opportunities answered with **SIX** at Merit level and **EIGHT** at Achievement level.

$$6 \times M + 8 \times A$$

Excellence

Total of **SIXTEEN** opportunities answered with **TWO** at Excellence level (including at least one equation and one discussion), and **SIX** at Merit level and **EIGHT** at Achievement level.

$$2 \times E + 6 \times M + 8 \times A$$

(equation and one discussion)

Science: Describe aspects of geology (90190)**National Statistics**

Number of Results	Percentage			
	Not Achieved	Achieved	Merit	Excellence
23,462	46.1%	36.4%	12.3%	5.2%

Assessment Report

Candidates who gained Achievement were familiar with the rock cycle and the formation of different types of rock. They recognised that environment and geological events affect the formation of rocks. They also knew key words, understood the questions and wrote clear legible answers.

Candidates who achieved showed evidence of having practised identifying patterns from a stratigraphic column, answered the questions that were asked, and were specific in their answers. They referred to the formation of the rocks and did not focus on minerals. Knowledge of minerals, as such, is not required for this Standard.

Candidates assessed as Not Achieved, did not know key terms.

Candidates who gained Achievement with Merit were able to give concise explanations and to recognise one word is rarely an explanation. Candidates who gained Achievement with Excellence were able to link geological ideas in a logical fashion.

Assessment Schedule

Science: Describe aspects of geology (90190)

Evidence Statement

Question	Evidence contributing to Achievement State, describe, name	Evidence contributing to Achievement with Merit Explain, link, identify	Evidence contributing to Achievement with Excellence Discuss, apply, relate, evaluate, judge
	Holistic judgement statement: The student can describe aspects of geology.	Holistic judgement statement: The student can explain aspects of geology.	Holistic judgement statement: The student can discuss aspects of geology.
1(a)(i) 1(a)(ii) 1(a)(iii) 1(a)(iv)	igneous sedimentary igneous metamorphic (3/4)		
1(b)(i)	Difference Granite is coarse grained / has large crystals : Basalt has small crystals / fine grained.		
1(b)(ii)	<i>Rate / speed of cooling / position related to crystal size / no rock specified</i>	<i>Rate/speed and position and correct rock eg cooling rate (of granite) is slower than basalt, forming larger crystals / different chemical composition causing different-sized crystals / faster cooling results in smaller crystals / fine grained rocks / slower cooling results in larger crystals / coarse grained rocks intrusive/extrusive/volcanic / plutonic.</i>	
2(a)	A Metamorphism B Erosion C Melting D Solidifying All required		
2(b)	<i>Breaking up and cementing again eg igneous rock broken up / eroded / weathered: cemented / compacted together / lithification to form sedimentary rock.</i>	<i>Break up, transport, sediments deposited, new rock formed eg (igneous rock / granite) is eroded / weathered / broken up : transported : particles settle / deposited : (buried / pressure) compacted / cemented together / lithification. (4/4 sequence given or implied)</i>	
2(c)	Metamorphic		
2(d)	<i>Single idea / process /starting point eg limestone/calcite/marine animals heat and pressure needed to make into marble</i>	<i>Starting point and details of one process eg Calcite /Limestone : forms from carbonate sediment or shells or precipitated from the sea / buried (and lithified) / heat and pressure applied (metamorphism) / Calcium carbonate crystallises / hardens (forms rock).</i>	<i>Source to limestone to marble with both links and details of intermediary processes eg limestone: forms from carbonate sediment or shells or precipitated from the sea: buried / lithified. : heat and pressure applied (metamorphism) : calcium carbonate crystallises / forms rock Answer shows logical sequence</i>

Question	Evidence contributing to Achievement State, describe, name	Evidence contributing to Achievement with Merit Explain, link, identify	Evidence contributing to Achievement with Excellence Discuss, apply, relate, evaluate, judge
3(a)		1. trilobite 2. coral 3. ammonite 4. clam 5. gastropod 6. snail.	
3(b)	Any relevant idea (different rock or absence of fossils) eg absence of sea water above / layer of igneous rock.	<i>Justified reason for no fossils in new layer.</i> Any geological process linked to absence of formation of fossils eg uplift results in land above sea level so layer formed does not contain sea fossils Possibilities include: / uplift / unconformity / unsuitable chemical environment prevents formation of fossils. Wrong kind of rock for fossils, eg igneous / lava /ash.	
4(a)	mudstone		
4(b)	The oldest layer is at the bottom, or the law of superposition.		
4(c)	<i>Use of a relevant idea</i> eg relating formation of rock and relative position/ shape of layer / thickness of layer / time / sagging / influential environmental factor / idea of layering resulting from changing (geological) environments recognised / each layer is the result of a particular set of environmental circumstances. Not just sequence as listed.	<i>Explanation addresses two of:</i> <i>order of events for formation of three out of four rock types:</i> <i>sequence of five rock layers:</i> <i>influential environmental factors (at least two)</i> (folding, subduction, changing sea level, changing biota)	<i>All three of: order of events for formation of three out of four rock types : sequence of five rock layers : influential environmental factors (at least two)</i> 1. Mudstone deposited in deep/slow moving water. 2. Sandstone particles deposited in water/faster flowing water. 3. These (mudstone and sandstone) are then folded (plate tectonic forces). 4. Limestone forms from fossils and shells in (shallow warm) water. 5. Sea levels fall / land uplifted / plate tectonic forces allowing plant / forest growth. 6. Sea levels rise or land slumps / sinks. Forest drowned / vegetation in swamps and coal forms. 7. Layers of sand deposited over coal, forming sandstone.

Judgement Statement

Science: Describe aspects of geology (90190)

Achievement

Total of **SIX** opportunities answered at Achievement (or higher)

$$6 \times A$$

Merit

Total of **SEVEN** opportunities answered with **THREE** at Merit level and **FOUR** at Achievement level.

$$3 \times M + 4 \times A$$

Excellence

Total of **SEVEN** opportunities answered with **ONE** at Excellence level and **THREE** at Merit level and **THREE** at Achievement level.

$$1 \times E + 3 \times M + 3 \times A$$

Science: Describe aspects of physics (90191)**National Statistics**

Number of Results	Percentage			
	Not Achieved	Achieved	Merit	Excellence
33,377	27.9%	52.6%	17.1%	2.4%

Assessment Report

Candidates who gained Achievement could distinguish series and parallel circuits and understood the scientific significance of terms such as 'heat transfer'.

The scientific error in question 3 was confusing for some students, and the assessment schedule and the marking endeavoured to take account of this.

Candidates who gained Achievement could interpret graphs and carry out calculations accurately. They also used correct scientific language and could apply basic definitions. They understood the meaning of questions.

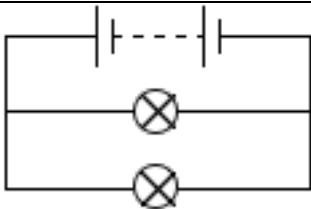
Candidates assessed as Not Achieved, could not rearrange a formula or substitute numbers into a formula correctly. They did not show legible working. They wrote short sentences or single words where full explanations and discussions were required.


Candidates who gained Achievement with Merit or Achievement with Excellence were able to carry out more complex calculations. They understood concepts from electricity, mechanics and heat, and were able to apply them in less familiar situations in open discussion questions.

Assessment Schedule

Science: Describe aspects of physics (90191)

Evidence Statement

Question	Evidence Contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence Contributing to Achievement with Excellence
1(a)	 <p>2 bulbs in parallel to each other.</p>		
1(b)	12 V (unit not required)		
1(c)	<p>If one bulb blows the other will keep going or the bulbs can be operated independently or all bulbs (in parallel) are the same brightness no matter how many are added or comparison of brightness between series and parallel.</p>	<p>ONE of can be used independently / if one bulb blows other still works : alternative pathway</p> <ul style="list-style-type: none"> bulbs in parallel are the same brightness because no matter how many you have the voltage is the same (not shared) comparison of brightness between series and parallel : related to voltage. 	<p>The following Can be used independently / if one bulb blows other still works : alternative pathway and ONE of Bulbs in parallel are the same brightness because no matter how many you have the voltage is the same (not shared) or comparison of brightness between series and parallel : related to voltage.</p>
1(d)	<p>12 W bulb has more power than 6 W bulb.</p> <p>(not uses power)</p>	<p>ONE of 12 W will be brighter than 6 W because each bulb has a different resistance value 12 W brighter as watts are energy transferred per second and 12 W transfers more energy per second and is therefore brighter 12 W bulb brighter as it draws more current. (not uses more current)</p>	
1(e)		$I = \frac{P}{V}$ $= \frac{6}{12} = 0.5 \text{ A}$ <p>unit must be given. (Check for follow-on from 1(b).)</p>	
1(f)		<p>Appropriate process for solution (solution not achieved) eg</p> $I = \frac{P}{V}$ $= \frac{12}{12}$ $= 1 \text{ A}$ <p>OR incorrectly calculated current correctly substituted $R = V/I$ Check for follow-on error from 1(b).</p>	<p>Correct solution.</p> $I = \frac{P}{V}$ $= \frac{12}{12}$ $= 1 \text{ A}$ $R = \frac{V}{I}$ $= \frac{12}{1}$ $= 12 \Omega$ <p>Check for follow-on error from 1(b).</p>

Question	Evidence Contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence Contributing to Achievement with Excellence
2(a)	6		
2(b)	constant / steady / same: speed (of 6ms^{-1})		
2(c)	$a = \frac{\text{change in speed}}{\text{change in time}}$ $= \frac{6-0}{2-0}$ $= 3 \text{ ms}^{-2}$ Unit not required.		
2(d)		One correct distance (area under part of graph) calculated or correct working shown for the calculation of one distance.	Correct solution and unit Distance travelled = area under graph $D = (\frac{1}{2} \times 2 \times 6) + (1.5 \times 6) + (\frac{1}{2} \times 1 \times 6)$ $= 6 + 9 + 3$ $= 18 \text{ m}$
3(a) and (b)	1 force drawn and labelled as shown below (ignore other forces drawn/labelled) Weight / Gravity / Gravitational 	Unbalanced as the only force acting at this point is gravity.	
3(c)	Correct solution $E_k = \frac{1}{2} m v^2$ $= \frac{1}{2} \times 0.16 \times 20^2$ $= 32 \text{ J}$		
3(d)		Puts $E_k = E_p$ but rearrangement of equation to find h incorrect or correct height but incorrect/no unit or correct rearrangement and substitution but incorrect answer.	Correct solution and unit $E_k = E_p$ $32 = 0.16 \times 10 \times h$ $h = 32 / (0.16 \times 10)$ $= 20 \text{ m}$ Check for follow-on from 3(c). Look for kinematic solution eg $v_f^2 = v_i^2 + 2 a d$ $0 = 20^2 + 2 \times -10 \times d$ $-400 = -20 d$ $d = 20\text{m}$

Question	Evidence Contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence Contributing to Achievement with Excellence
4(a)	Conduction		
4(b)	Radiation		
4(c)	Plastic is a poor conductor or plastic does not conduct or plastic is a (good) insulator or metals are (good) conductors.	Plastic is a heat insulator and lessens/stops heat loss through the top : metals are good conductors and would allow more heat loss through the top. (Look for this in answers to 4(d) too.)	
4(d)	A vacuum does not conduct or allow convection or shiny surfaces are poor radiators or shiny surfaces do not radiate heat or shiny surfaces reflect radiated heat or the stopper prevents loss of heat by convection.	One of the following: there are no particles (air) / medium in a vacuum so although radiation can travel through it, conduction and/or convection will not occur or the shiny surfaces are better reflectors of radiated heat and so reflect heat back into the liquid or the shiny surfaces are poor radiators of heat so heat is not lost to the surroundings or the plastic stopper prevents the loss of heated air through convection. ie refer to role of vacuum or role of silver to reduce heat loss, or role of stopper	Two of the following: There are no particles (air) / medium in a vacuum so although radiation can travel through it conduction and/or convection will not occur or the shiny surfaces are better reflectors of radiated heat and so reflect heat back into the liquid. / The shiny surfaces are poor radiators of heat so heat is not lost to the surroundings or the plastic stopper prevents the loss of heated air through convection. ie discuss two of vacuum, silvering reducing heat loss, or stopper preventing convection.

Judgement Statement

Achievement

Total of **SEVEN** opportunities answered at Achievement (or higher)

$$7 \times A$$

Merit

Total of **ELEVEN** opportunities answered with **FOUR** at Merit level and **SEVEN** at Achievement level.

$$4 \times M + 7 \times A$$

Excellence

Total of **THIRTEEN** opportunities answered with **TWO** at Excellence level (with at least one of 1c or 4d plus at least one of 1f, 2d, or 3d) and **FOUR** at Merit level and **SEVEN** at Achievement level.

$$2 \times E + 4 \times M + 7 \times A$$

Science: Describe aspects of astronomy (90192)**National Statistics**

Number of Results	Percentage			
	Not Achieved	Achieved	Merit	Excellence
17,969	37.0%	53.0%	6.8%	3.2%

Assessment Report

Candidates who gained Achievement understood the spatial relationships within the Solar System and that space exploration involved vast distances. They recognised the order of the planets, and how the planets could be observed from Earth by the naked eye and by telescopes.

Candidates who gained Achievement knew basic definitions (planets) and principles (gravity) and could use language appropriately in their answers. They understood questions and gave relevant answers.

Candidates assessed as Not Achieved had not learned basic facts.

Candidates who gained Achievement with Merit and Achievement with Excellence developed their answers fully and showed greater depth of knowledge by giving multiple reasons for their answers. They were able to apply their knowledge of space exploration to specific cases (Cassini) and develop logical arguments.

Assessment Schedule

Science: Describe aspects of astronomy (90192)

Evidence Statement

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
	Describe aspects of astronomy	Explain aspects of astronomy	Discuss aspects of astronomy
1(a)	Concept of relative motion eg Planets move (wander) around against the background of the stars OR show irregular/retrograde motion. Planets move, stars don't, INSUFFICIENT Planets move differently to stars, SUFFICIENT.		
1(b)(i) & (ii)	Mercury and Venus		
1(c)(i) & (ii)	Pluto has an elliptical/eccentric/oval orbit	Pluto's eccentric / elliptical orbit : means it sometimes orbits inside Neptune's orbit (making it the 8th planet).	
1(d)	Earth and other planets are all moving around the sun/ Earth orbiting faster/ Earth nearer to Sun/ Mars further from Sun/ Mars orbiting slower/ Retrograde motion.	The inner planets are moving faster than the outer planets : Earth overtakes Mars : Mars appears to change direction.	
1(e)(i) & (ii)	late evening/dusk/2 hours after sunset/2 hours before sunrise/early morning/dawn.	Link orbit with sunrise/sunset Mercury orbits close to the sun : so is seen close to sunrise / sunset. Maximum mark for diagram alone.	Elaboration using Earth's rotation Mercury orbits close to the sun : seen close to sunrise (in E) / sunset (in W) : when Earth is facing Sun OR cannot be seen during night as Earth facing away from Sun.

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
	Describe aspects of astronomy	Explain aspects of astronomy	Discuss aspects of astronomy
2(a)	Gravity		
2(b)	Ground-based telescopes suffer more interference from city lights/ atmospheric distortion / clouds OR converse argument for telescopes in orbit.	Ground-based telescopes suffer more interference from city lights/ atmospheric distortion / clouds : this means clear (light) images are more difficult to obtain on Earth OR Converse argument for telescopes in orbit.	
2(c)(i)	Some moons too small / some moons behind planet / some moons too far out.	Other moons too small : Other moons behind planet : Some moons orbit too far away to be seen in photograph. (2/3 required)	
2(c)(ii)	Pluto orbits the sun / moons orbit planets.	moons orbit planets : Pluto orbits the sun OR It is the orbit not the size that defines the body.	
2(d)	Both ideas of fuel and flight path required. Provide enough fuel : allow for moving planets (Earth and Saturn)	Explanation of fuel (linked to gravity) OR flight path (linked to arriving at Saturn in seven years). Ensure enough fuel to escape Earth's gravity/ Use other planet's gravity to slingshot and therefore require less fuel / Use nuclear fuel to overcome gravity as not enough sunlight for solar power / Time arrival of spaceship so Saturn will be in correct place in its orbit (shortest flight path to Saturn)/ Control flight path (navigation precision) at great distance so can make corrections necessary to arrive at Saturn.	Explanation of two ideas relevant to journeying through space; minimum of <u>one</u> of fuel or flight OR elaboration of fuel or flight Use intermediate planet's gravity to add energy to spacecraft slingshot / assist trajectories and decrease fuel OR Programme navigation computers to allow for time for transmission of radio signals over great distances to ensure arrival at Saturn in seven years / Alternatives include temperature extremes/ collision damage/ radiation/ solar flare.

Judgement Statement

Achievement

Total of **FIVE** opportunities answered at Achievement (or higher)

$$5 \times A$$

Merit

Total of **FIVE** opportunities answered with **FOUR** at Merit level and **ONE** at Achievement level.

$$4 \times M + 1 \times A$$

Excellence

Total of **FIVE** opportunities answered with **ONE** at Excellence level and **THREE** at Merit level and **ONE** at Achievement level.

$$1 \times E + 3 \times M + 1 \times A$$