NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Level 1, 2003

Science: Describe spatial relationships in astronomy and their effects on space exploration (90192)

National Statistics

Assessment Report

Assessment Schedule

Science: Describe spatial relationships in astronomy and their effects on space exploration (90192)

National Statistics

Number of Results	Percentage achieved			
	Not Achieved	Achieved	Merit	Excellence
22,063	34.9%	47.8%	14.7%	2.6%

Assessment Report

General Comments

Every candidate for a National Certificate of Educational Achievement examination paper is expected to:

- read the question and do what the question asks
- allow adequate time to complete answers
- be accurate: check and/or proofread
- use appropriate technical terms
- bring the correct equipment
- write and/or draw clearly
- use pen if work is to be eligible for reconsideration.

Many candidates were able to describe spatial relationships in astronomy and their effects on space exploration. However, use of knowledge to explore challenges to space exploration was less well done.

Evidence presented by candidates showed the following misconceptions:

1 The gravity of Jupiter is so extreme as to be able to crush a human being, whereas it is only 2.7 times that of Earth.

2 Venus is a ‘gas’ planet with no solid surface, demonstrating a limited understanding of Solar System formation.

3 Mars is the ‘closest’ planet, as discussed recently by the media, yet candidates showed limited understanding of the true spatial relationships within the solar system, ie the planets do not orbit ‘all together’ and their orbits are elliptical.

Assessment Schedule

Science: Describe spatial relationships in astronomy and their effects on space exploration (90192)

Evidence Statement

Evidence contributing to Achievement	Evidence contributing to Achievement with merit	Evidence contributing to Achievement with excellence
Describe spatial relationships in astronomy and their effects on space exploration.	Explain spatial relationships in astronomy and their effects on space exploration	Analyse spatial relationships in astronomy and their effects on space exploration
Holistic judgement statement *Student can describe interplanetary relationships and exploration.*	***Holistic judgement statement*** *Student can explain interplanetary relationships and relate these to exploration.*	***Holistic judgement statement*** *Student can describe interplanetary relationships and relate these to exploration.*

/ = or : = both parts required

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with merit	Evidence contributing to Achievement with excellence
One (a) (i)	Venus (no other planet)	**Note: f/o = follow on**	
One (a) (ii)	45 million km (can be standard form; have no units, **but count zeros)**.	**Note: f/o from Mars only calculation must be correct 75,000,000 km**	
One (b)	Thick/dense clouds, acid clouds, sulphurous clouds; extreme temperature (459^{o}C); extreme pressure (91 atm.). **Volcanoes allowed but not storms**.	**Note: Toxic/poisonous does not count. If Mars in 1(a) then 1(b) only feature acceptable is dust clouds.** **Note: hot must be qualified in some way – too hot = very hot = extreme temperature. Temperature or heat by itself IS not enough.**	
One (c) (i)	Uranus, Neptune and Pluto (no other planets)		
One (c) (ii)	Too far away to see **(implication that distance prevents seeing).**	Too far away to recognise as planets/no **telescopes or other named visual aids** (e.g. radio telescope is acceptable) and could not see them.	Too far away : to see without visual aids : to **track them** : to realise that they were planets.
One (d)	Name Jupiter, Saturn, Neptune, Uranus: **can have Pluto as being too far away (but only achieve).**	Explanation of feature of gas planet or why the space probe/craft cannot land.	Discussion of the link between the feature of planet and why the space probe/craft cannot land. **Nothing to land on.**

Question	Evidence contributing to Achievement	Evidence contributing to Achievement with merit	Evidence contributing to Achievement with excellence
Two (a)	Red/orange/rust coloured **also yellow/cream but NOT WHITE**.		
Two (b)	Gullies, mountains, volcanoes, polar caps, (face) rock formation, craters, river channels, moons, dark marking, white clouds, polar caps, range/different shades of colour, **crevices, dust storms and canyons MUST be a large scale physical feature to count.**		
Two (c)	Description of Mars features such as: Can be landed on (ie not a gas planet) will only be given an Achieve. **Features:** Close to Earth. CO_2 in atm. Gravity 0.38. Low pressure atm. Temperature (–87 to 17^{o}C). Frozen Water. Scientists think there might be life there.	**Explanation of how these features are related to human exploration, link made between feature and exploration.** **Exploration:** Comparative ease to get there – no nasty effects on astronaut. Photosynthesis/Plants can grow. Easier to leave/comfort. Comfort for humans. Comfort for humans. Fuel/oxygen/life sustaining. Scientific curiosity.	**Discussion of how these features are related to human exploration, multiple links or link explained.** Current technology can cope with the distance and ranges of environment extremes relatively easily on Mars or **sustainable** (colonies, terra-forming) and comparatively few health risks with low gravity there. Leading to development of new technology etc.
Two (d)	**The key words are 'time' and 'travel'. For any one of limited (water, oxygen, fuel or food) only an Achieve can be awarded.** **Full answers** must relate to the following: 1. Zero or micro-gravity: 2. Radiation solar storms: 3. Psychological pressure:	**Explanation of problems with long space travel and effect on astronauts**. **Examples** included for 1 are bone waste/decalcification, muscle atrophy, motion sickness, iron depletion, increased bacterial growth and risk of infection. Examples for 2 include radiation sickness (all of its symptoms) and obviously death. Examples for 3 could include any extreme behavior.	**Discussion of problems with long space travel and effect on astronauts, multiple links or link explained.** What steps are taken to halt or reduce health effects (like technology or behaviours) and/or implications for later return to Earth or on Mars itself. Examples for 1 could be artificial gravity, for 2 spaceship construction, and 3 counselling, debriefing, psych profiling, contact with Earth.

Judgement Statement

Judgement statements (formerly referred to as sufficiency statements) help candidates understand how their overall results for each standard were arrived at.

Achievement	Achievement with Merit	Achievement with Excellence
Sufficiency: any 6 answers.	Sufficiency: 5 answers plus 2 answers at Merit level.	Sufficiency: 5 answers plus 2 answers at Excellence level.