NZQA
New Zealand Qualifications Authority
Mana Tohu Matauranga O Aotearoa

Assessment Report

Level 1 Science 2016

Standards 90940 90944 90948

Part A: Commentary

Candidates need to learn key concepts and apply them to the context given in the question to gain Merit and Excellence. Some candidates continue to rote-learn previous year's answers, or use examples or contexts used in class as part of their answer, neither of which are successful strategies.

Candidates are advised to use any scaffolding provided to answer the overarching questions. Some candidates answer the bullet points but not the overall question, which can limit their achievement.

Overall, candidates used good examination techniques and left few gaps in the papers. Attempting all parts in the papers is important for those seeking the higher grades.

Part B: Report on Standards

90940: Demonstrate understanding of aspects of mechanics

Candidates who were awarded **Achievement** commonly:

- interpreted information from a graph, e.g. described in words the motion of objects in speed/time or distance/time graphs
- correctly processed information from a graph, e.g. calculated velocity or speed from a distance time graph
- showed a basic understanding of terms involved in mechanics including force, pressure, surface area, mass, weight and energy
- distinguished between balanced and unbalanced forces acting on objects
- performed simple calculations from given data, e.g. calculated acceleration from change of speed and time
- showed they knew that energy is conserved, i.e. E_p is converted into E_k as an object falls
- showed they knew that adding one object to another increased the weight force, i.e. adding a person increased the weight of the horse on the ground.

Candidates who were assessed as **Not Achieved** commonly:

- chose the wrong formula to use in calculations
- did not gather and/or use information from graphs
- did not perform simple calculations or may not have brought their calculators with them
- did not appear to have thought critically about the answers appearing on their calculator screens
- did not describe physics terms in their own words
- copied formulae incorrectly or relied on memory to recall formulae rather than using those provided
- tried to explain physics from their own experiences, e.g. ‘it feels heavier’
- tried to define physics terms in relation to their unit, e.g. ‘mass is something measured in kilograms’.

Candidates who were awarded **Achievement with Merit** commonly:

- manipulated formulae to complete multiple step calculations, but sometimes brought forward errors from previous steps
- compared mass and weight accurately
- understood and could apply the ideas around balanced and unbalanced forces, and how net forces give rise to a change in speed
- understood conservation of energy when work is done lifting or dragging objects
- explained the effect that the use of a ramp has on force size/work done/power on objects
- communicated ideas clearly so concepts like applied pressure were not misinterpreted
- mistook downwards weight force for ‘thrust’
- explained the relationship between force and pressure but did not include area
- interpreted graphs accurately and used information to explain concepts.

Candidates who were awarded **Achievement with Excellence** commonly:

- accurately made multi-step calculations and included the appropriate units
- made clear links between ideas and consequences, e.g. “horse and rider sink because mass increases and hence an increase in weight which means an increased force and an increase in hooves’ pressure as long as the surface area is unchanged”
- understood and applied ideas on energy gained and work done on objects moved above the earth’s surface under the influence of gravitational force
- recognised that the same work would be done using two methods to move an object yet less force and power was needed when dragging compared to lifting
- described clearly how a rocket behaves under the influence of gravity and friction forces as it returns to earth during free fall and on release of a parachute.

Standard-specific comments

Candidates generally had a good understanding of most concepts examined. Clearly labelled diagrams were not used by some candidates to help them explain their answers, and when used, these diagrams were sometimes incomplete or inaccurately drawn, e.g. the length of arrows, the drawing of straight lines, and the naming all force pairs were not done carefully enough.

The failure of candidates to recognise that work done (or Ep) is conserved when using a ramp or lifting vertically prevented some from achieving a higher level.

Use of subject-specific language is important, as is using graphs to explain motion. e.g. some candidates used ‘constant speed of acceleration’ or ‘accelerate at a constant speed’ where ‘speed’ was used instead of ‘rate’, showing a confusion between these two terms.

90944: Demonstrate understanding of aspects of acids and bases

Candidates who were awarded **Achievement** commonly:

- showed basic understanding of atomic structure including electron arrangement and ion formation
- related learned knowledge of the two basic word equations of the standard to the examples given
- recognised the factors increasing/decreasing reaction rate and their effects
- related knowledge of universal indicator colours to pH values and acidity/alkalinity.

Candidates who were assessed as **Not Achieved** commonly:

- gave irrelevant responses suggesting they did not understand the questions
- lacked basic chemistry skills/knowledge such as atomic structure (difference between protons/electrons or atoms/ions), formulae of acids, simple word equations, that acids have low pH and bases high
- used language inaccurately, such as faster or more rather than more frequent or rate
- confused acids and bases, with universal indicator colours and pH values reversed
- were unable to identify from the ion table the differences between oxides and hydroxides, or sulfates and sulfides, and use them appropriately to write ionic formulae.

Candidates who were awarded **Achievement with Merit** commonly:

- used correct terminology such as more frequent particle collisions rather than faster collisions due to higher acid concentration or reactant surface area
- wrote chemical equations
- related ion formation to the need for a full valence shell or to the groups on the periodic table
- linked hydrogen and hydroxide ion concentration to pH values.

Candidates who were awarded **Achievement with Excellence** commonly:

- understood ionic bonding as the transfer of electrons between elements to attain stable valence shells and an overall neutral molecule, with ions retaining charges to give electrostatic attraction
- related reaction rate to both surface area and concentration, with frequency of collisions increasing, and recognised that the same number of collisions would occur if reactant/s had the same number of particles in each experiment
- understood neutralisation as the interaction between hydrogen and hydroxide ions to form neutral water
- appeared to have returned to each question when finished to ensure all parts of the question were answered, often adding more or proofreading.

Standard-specific comments

A significant number of candidates, including some of those achieving with Merit or Excellence, incorrectly believed:

- that ions get/give back electrons when forming a compound, presumably because the compound is neutral they assume that the ions need to be neutral again. This misconception appeared to be linked to the idea of 'swap and drop' with very limited understanding of ion formation and ionic bonding
- that an acid of pH 5 is stronger/has more H^+ ions than an acid of pH 1
- that hydroxide or hydrogen ions are simply outnumbered by the other to change pH, rather than that there is any interaction.

90948: Demonstrate understanding of biological ideas relating to genetic variation

Candidates who were awarded **Achievement** commonly:

- clearly defined basic genetic concepts such as DNA, gene, allele, sexual reproduction, inheritable, non-inheritable
- used the pedigree chart to interpret genotypes
- completed punnet squares correctly
- confused mitosis and meiosis
- listed genotypes and phenotypes in context
- gave phenotypic ratios
- used diagrams to support answers
- described how sexual reproduction led to variation
- identified variation as leading to adaptation and survival but focused on a single individual
- recognised inheritable variation is caused by DNA
- used contexts poorly or not at all, often using examples that were irrelevant to the question.

Candidates who were assessed as **Not Achieved** commonly:

- showed weak understanding of basic genetics terms
- gave only partial answers which were sometimes not relevant to the question
- confused processes, events and terms, e.g. gamete/zygote, asexual/sexual, meiosis/fertilisation, genotype/phenotype
- were unable to interpret a pedigree chart
- did not complete punnet squares
- did not write genotype or phenotype ratios
- did not show even very basic understanding of meiosis.

Candidates who were awarded **Achievement with Merit** commonts

- explained why pedigrees can be used to identify a dominant trait, i.e. if 2 parents have an offspring different from them, the offspring's trait must be recessive (hidden in the parents)
- explained an unknown genotype by describing the inheritance of both alleles
- recognised that a dominant feature needs only 1 dominant allele to be shown
- explained the link between DNA, gene and allele using an unfamiliar context
- clearly explained how meiosis results in variation
- explained the differences between inherited and non-inherited traits in context
- explained how greater survival rates would lead to the inheritance of favourable genes/ being better adapted to the environment but without clear link to the change being over generations
- explained how random fertilisation leads to deviations from expected outcomes
- identified which traits were inherited and which were not, linked to DNA, but did not explain that non-inheritable variation does not affect the gametes
- answered the bullet points individually rather than using them as a guide to answering the main question.

Candidates who were awarded **Achievement with Excellence** commonly:

- fully explained the difference between possible genotypes based on parent's phenotypes and their offspring, i.e. used punnet square and pedigree charts correctly
- fully explained the difference between expected and observed phenotypic ratios, e.g. citing sample size and random fertilisation
- clearly explained the link between base changes on DNA, gene, allele and phenotype using an unfamiliar context
- used relevant diagrams to help explain clearly
- discussed comprehensively how meiosis and or fertilisation produces variation and how this influences survival
- used the context to explain the differences between inheritable and non-inheritable variation and then described how inheritable traits can be passed on through fertilisation
- structured answers well using key terms, giving examples, using resource material, and linking ideas.

Standard-specific comments

Candidates are advised to plan their responses to longer questions to ensure that they answer completely but concisely in the context given. Many candidates wrote far too much, went off topic, or repeated themselves and/or the question.

Some candidates used pre-prepared responses that did not address the question or contained irrelevant information.

Phenotype/genotype ratios should include phenotypes/genotypes and not just the numbers.

There appears to be confusion over the timing and chromosomes involved in crossing over. This is not a part of the standard and might be better avoided in favour of other less complex processes in sexual reproduction.

Some candidates incorrectly identified mutation as a process in meiosis.

Candidates often used meiosis and fertilisation as synonyms for sexual reproduction though these are not interchangeable.

Some candidates described meiosis as making sex cells from gametes or that meiosis occurs in the gametes, showing confusion.

Some candidates seem to believe that all organisms have 46 chromosomes, not just humans.

Science subject page

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