NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Level 1, 2003

Physics: Demonstrate understanding of electricity and magnetism (90185)

National Statistics

Assessment Report

Assessment Schedule

Physics: Demonstrate understanding of electricity and magnetism (90185)

National Statistics

Number of Results	Percentage achieved			
	Not Achieved	Achieved	Merit	Excellence
3,065	13.1%	41.6%	25.5%	19.8%

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 demonstrated a thorough knowledge and understanding with fully set out answers to numerical problems and clear and complete responses to explanations. However there was also a large number of candidates who were let down with incomplete responses.

A large number of candidates solved problems to an Achieved or higher level (the DC Electricity question proved easy for this reason) but were unable to reach Achievement for the standard because they could not provide satisfactory written explanations. Candidates need to meet the minimum standard for both criteria to achieve the standard, and ‘explain’ requires in-depth reasoning.

Candidates must continue to develop their ability to show all working with numerical calculations. In general, knowledge of and use of appropriate units was good.

Electromagnetism proved the most difficult concept for candidates. A large number of candidates failed to answer the Electrostatics question using electrostatics ideas.

Assessment Schedule

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Evidence Statement

Note: Minor computational errors will not be penalised. A wrong answer will be accepted as correct provided there is sufficient evidence that the mistake is not due to a lack of understanding. Such evidence includes:

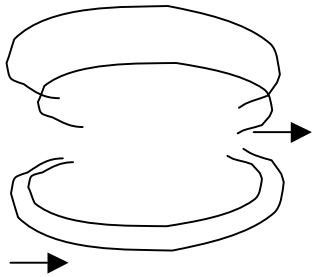
- the last written step before the answer is given has no unexpanded brackets or terms and does not require rearranging
- the power of any number that is multiplied by a power of 10 is correct.

Italics indicate replacement evidence.

	Q	Evidence	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence	Code
P 3	1(a)	The brush has removed (or added) electrons from (to) Sally's hair so that each hair strand becomes positively (negatively) charged. Like charges repel so the hair strands repel each other and thus stick out.	*Any correct statement that is relevant to the situation,* *eg like charged hairs repel each other*	Hairs become + or – and like charges repel	A statement that clearly relates the like charges on the hairs <u>to friction with the brush</u> causing the <u>transfer of electrons</u>	M_1 E_1
	1(b)	The brush has become negatively (positively) charged due to the electrons removed from the hair(brush). Opposite charges attract so that negatively charged brush will attract the positively charged hair.	*Because brush has the opposite charge to the hair.*	Achievement plus <u>Either</u> the reason for getting opposite charges described <u>Or</u> transfer of charge from one material to other		M_1
	1(c)	The moisture in the air allows charge to leak away.	***Answer***			**A_1**

	Q	Evidence	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence	Code
P 4	2(a) (i)	$V_{supplied} = V_{used}$ Each bulb is identical. 12/4 = 3 V	3 V			A_2
	2(a) (ii)	$R = R_1 + R_2 + R_3 + R_4$ R = 3 + 3 + 3 + 3 (OR R = 3 x 4) R = 12 Ω	Answer correct			A_2
	2(a) (iii)	I = V/R I = 12/12 I = 1.0 A	Correct answer			A_2
	2(a) (iv)	I = V/R I = 6.0/3 I = 2.0 A	Merit	Correct working		M_2
P5	2(a) (v)	P = VI P = 6.0 x 2.0 P = 12 W	Correct answer with No/incorrect unit	Correct answer with unit		M_2
	2(a) (vi)	(I = V/R I = 12/12 I = 1.0 A) from (iii) P = VI P = 3.0 x 1.0 P = 3.0 W	Merit	Current calculated correctly in (iii) used	Correct working and answer	E_2
	2(a) (vii)	Brightness depends on power (voltage and current)	Voltage or current	Power (or wattage) OR voltage and current BUT voltage <u>through</u> negates M		A_1 M_1

	Q	Evidence	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence	Code
P 6	2(b) (i)	12 V	12 V			A_1
	2(b) (ii)	$R = R_1 + R_2$ $R = 3.0 + 3.0$ $R = 6.0\ \Omega$ $I = V/R$ $I = 12/6.0$ $I = 2.0$ A	*Resistance correct* *Or* *Correct answer for wrong resistance*	*Correct working*		M_2
	2(b) (iii)	(V = 12/2 = 6.0 V) $P = VI$ $P = 6.0 \times 2.0$ P = 12 W	*Merit*	*Calculation correct for V* OR *P correct with no/wrong unit*	Correct working and answer with correct unit	E_2
P 7	2(b) (iv)	Because there is an extra pathway for current to flow through so the total resistance would decrease, the voltage is unchanged so the total current from the battery would increase. OR each of the 3 pathways carries 2 A so total current increased to 6 A	*Current increases*	Current increases AND resistance decreases or extra pathway	Current increases Resistance decreased and voltage unchanged so current increases OR Current increases to 6 A because each pathway has 2 A	M_1 E_1

	Q	Evidence	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence	Code
P 8	3(a) (i)		Shape	Shape and direction correct		A_1 M_1
	3(a) (ii)	• By increasing current/voltage • By increasing the number of turns of wire	2 correct			A_1
P 9	3(b) (i)	The electromagnet becomes magnetised and attracts the hammer towards it, which causes the hammer to hit the bell.	*The electromagnet becomes a magnet*	Electromagnet becomes magnetised <u>AND</u> attracts the hammer		M_1
	3(b) (ii)	When the hammer is attracted to the electromagnet the contact is no longer touching the hammer and current stops flowing, switching off the electromagnet. This causes the spring to pull the hammer back again to its original position, allowing the current to flow again. This pattern repeats for as long as the switch is closed.	*Merit*	Either the current-breaking process or the current-making process is explained	The current breaking-and-making process is clearly explained.	M_1 E_1

	Q	Evidence	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence	Code
P 10	3(c) (i)	Down	*Merit*	Correct answer		M_1
	3(c) (ii)	B = F/I × L B = 0.050/ (2.0 × 0.10) B = 0.25 T	*Answer without converting 10 cm to m* *0.0025 or 2.5 × 10^{-3} T*	Correct answer		M_2
P 11	3(c) (iii)	To make the motor spin faster you need to increase the magnetic force (or torque) on the loop of wire. The force is dependent on BIL so you could: • Increase the current through the wire (by increasing the battery voltage or decreasing the resistance of the wire). • Increase the length of the wire (by increasing the number of loops of wire or increasing the area of the coil). • Increase the strength of the magnetic field (replace the magnets with stronger ones). • Curved pole pieces	Any correct method	Any bullet point linked to the idea that it gives increased force Force lasts longer	As for merit with relevant justification ie stating equation F = BIL Force at right angles for longer, so torque greater	A_1 M_1 E_1
	TOTAL		6 × A_1 3 × A_2	9 × M_1 4 × M_2	4 × E_1 2 × E_2	

Judgement Statement:

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

Achievement	Achievement with Merit	Achievement with Excellence
3 × A1 ***and*** 2 × A2	Achievement ***plus*** 4 × M1 ***and*** 2 × M2	Merit ***plus*** 2 × E1 including 1 × E2