

Assessment Schedule – 2016

Physics: Demonstrate understanding of electricity and electromagnetism (91173)

Evidence Statement

Q	Evidence	Achievement	Merit	Excellence
ONE (a)	$V = IR$ $V = 0.300 \times 10$ $V = 3.0 \text{ V}$	Correct answer.		
(b)	Voltage across Speaker A = $12 - 3 = 9.0 \text{ V}$ $I = \frac{V}{R}$ $I = \frac{9}{80}$ $I = 0.113 \text{ A}$	Correct voltage across Speaker A 9.0 V. OR Incorrect current calculation due to incorrect voltage across Speaker A.	Correct current = 0.113 A	
(c)	Speaker B has a smaller resistance, because: <ul style="list-style-type: none"> • more current is passing through Speaker B (300 mA – 113 mA = 190 mA) • $R = \frac{V}{I}$ and both have the same voltage. 	Correct answer with one reason.	Correct answer with both correct reasons.	
(d)(i) (ii)	Current from car battery = $\frac{60}{12} = 5.0 \text{ A}$ Current from the household lamp = $\frac{60}{240} = 0.25 \text{ A}$ Both bulbs shine with the same brightness. Brightness depends on power, and both bulbs have the same power. OR Brightness depends on voltage and current, and product of voltage and current is same. OR Car bulb = $12 \times 5 = 60 \text{ W}$ Household lamp = $240 \times 0.25 = 60 \text{ W}$	Correct current from the battery. OR Correct current through the household lamp. OR Both lamps have the same brightness.	Correct current through the car battery and the household lamp. Both lamps have the same brightness. OR Correct answer to part (ii).	Comprehensive answer.

Not Achieved			Achievement		Achievement with Merit		Achievement with Excellence	
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Very little Achievement evidence.	Some evidence at the Achievement level, but most is at the Not Achieved level.	A majority of the evidence is at the Achievement level.	Most evidence is at the Achievement level.	Some evidence is at the Merit level.	A majority of the evidence is at the Merit level.	Evidence is provided for most tasks. The evidence at the Excellence level may have minor errors, or the evidence is weak.	Evidence is provided for most tasks and the evidence at the Excellence level is accurate.

Q	Evidence	Achievement	Merit	Excellence
TWO (a)	$E = \frac{V}{d}$ $= \frac{20000}{0.05}$ $= 400\,000 \text{ V m}^{-1} = 4 \times 10^5 \text{ V m}^{-1}$ Direction positive (anode) to negative (cathode) plate.	Correct working and correct direction.		
(b)	<ul style="list-style-type: none"> The electron loses electrostatic potential energy (EPE) and gains kinetic energy (KE). The electric field is working on the electron so it loses EPE and lost EPE changes into KE. 	Names one energy.	Names both energies and implies “change”.	
(c)	work done = Eqd $4 \times 10^5 \times 1.6 \times 10^{-19} \times 0.05 = 3.2 \times 10^{-15}$ work done = $\frac{1}{2}mv^2$ $3.2 \times 10^{-15} = \frac{1}{2} \times 9.1 \times 10^{-31} \times v^2$ $v = 8.39 \times 10^7 \text{ m s}^{-1}$	Work done is calculated correctly. OR Showing the understanding that kinetic energy equals work done. OR Incorrect work done and consequently incorrect speed.	Correct answer.	
(d)	<ul style="list-style-type: none"> The forces acting on the oil drop are downward weight force and upward electrical force. These two forces must be balanced, as the oil drop is stationary. For the electrical force to be upwards, the type of charge on the oil drop must be opposite to the charge on the top plate. 	Identifies the two forces. OR Saying that the forces must be balanced. OR Top plate should be positive and the charge on the oil must be negative, or vice versa.	Identifies the forces and that the forces must be balanced, as the charged drop is stationary.	Explain that the electrical force must be upwards to balance the downward weight force, as the oil drop is stationary. AND For the electric force to be upwards, the charge on the oil drop must be negative.

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Q	Evidence	Achievement	Merit	Excellence
THREE (a)	The rod moves to left.	Correct answer.		
(b)	$I = \frac{V}{R} = \frac{12}{20} = 0.6 \text{ A}$ $F = BIL$ $= 1.5 \times 10^{-3} \times 0.6 \times 0.16$ $= 1.44 \times 10^{-4} \text{ N}$	Correct current value or incorrect current but consequently correct force.	Correct force.	
(c)	The electrons in the conducting rod experience a force, and move creating an induced voltage.	Partial explanation.	Complete explanation.	
(d)	$V = BvL$ $= 1.5 \times 10^{-3} \times 3.0 \times 0.16$ $= 7.2 \times 10^{-4} \text{ V}$ $I = \frac{V}{R} = \frac{7.2 \times 10^{-4}}{20} = 3.6 \times 10^{-5} \text{ A}$ Conventional current is down (A to B).	ONE of: <ul style="list-style-type: none"> • correct direction of conventional current • correct workings for induced voltage • correct workings for induced current. 	TWO of: <ul style="list-style-type: none"> • correct direction of conventional current • correct workings for induced voltage • correct workings for induced current. 	Comprehensive answer.

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Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 6	7 – 13	14 – 19	20 – 24