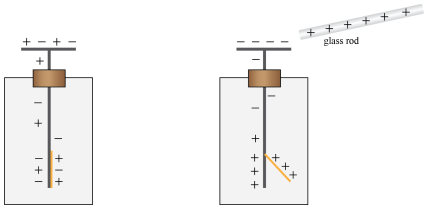
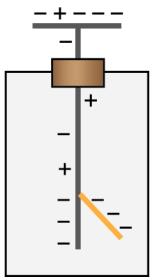
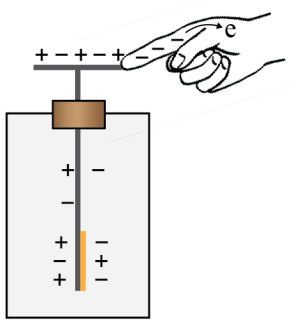
Assessment Schedule – 2020

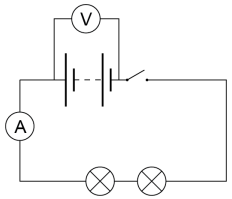
Physics: Demonstrate understanding of aspects of electricity and magnetism (90937)

Evidence

Q	Evidence	Achievement	Merit	Excellence
ONE (a)	Charging by friction / contact. Tribo electric effect	• Charging by friction.		
(b)	$P = \frac{E}{t}$ $P = \frac{12.5\times10^{-3}\text{ J}}{1.5\times10^{-3}\text{ s}}$ $P = 8.3\text{ W}$	• Correct equation, but wrong working.	• Correct answer with unit watts.	
(c)	 When a positive piece of glass is brought toward an electroscope, the negative charges in the electroscope move towards the positive charge (opposites attract). This leaves both the gold leaf and the metal plate at the bottom positive. The same charges repel each other thus separating the leaves.	• Both drawings correct. (blank neutral diagram is correct) OR Correct explanation of charge movement and effect on electroscope.	• Both drawings correct. AND Correct explanation of charge movement.	

(d)	negatively charged  grounding / earthing  • A negatively charged electroscope has an excess of electrons. • Like charges repel separating gold leaf from stem. • Grounding removes the excess electrons from the electroscope. • Removing the excess electrons balances the charges and makes the leaf fall towards the stem.	• Any ONE bullet point. OR Correct charge distribution (blank neutral diagram is correct). OR Correct leaf position on both diagrams.	• Charge distribution on electroscope diagrams correct AND position of leafs correct. • OR TWO bullet points.	• Complete answer.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No evidence.	1A	2A OR 1M	3A OR 1A + 1M	4 A OR 2A + 1M OR 2M	1A + 2M OR 1M + 1E	3M	1A + 1M + 1E	2M + 1E

Q	Evidence	Achievement	Merit	Excellence
TWO (a)	Conductor is any material that allows the flow of current / electrons, whereas an insulator does not allow the flow of charge.	• Correct answer.		
(b)		• Correctly drawn series circuit with minor error, e.g. voltmeter or ammeter around wrong way, switch closed.	• Correctly drawn circuit.	
(c)(i)	$V = IR$ $I = \frac{V_{total}}{R_{total}} = \frac{9\text{ V}}{150\,\Omega} = 0.06\text{ A}$ $P = IV$ $P = 0.06\text{ A} \times 4.5\text{ V} = 0.27\text{ W}$ for one light bulb $E = Pt$ $E = 0.27\text{ W} \times 3600\text{ s}$ $E = 972\text{ J}$	• Correct current. OR • Correct power for TWO lights (0.54). OR • Correct process to find energy but minor error.	• Correct energy for TWO lights. (1944J)	• Correct energy.
(ii)	Current is 0.06 A or 60 mA, therefore $\frac{500}{60} = 8.3$ hours before it is dead. Alt method: $P_{TOTAL} = 4.5\text{ W}$ $P_{bulbs} = 0.54\text{ W}$ $\frac{4.5}{0.54} = 8.3\text{ hours}$	OR • Correct hours of dead battery with incorrect current.	OR Correct power and attempt to calculate time of battery life.	AND Correct time that battery lasted.
(d)	The third light bulb would appear brighter, as it would have less resistance, and since they are in parallel, they would all receive the same voltage; thus more current would go through the new light bulb. Since brightness depends on power, $P = IV$, and all the bulbs receive the same voltage, the higher the current the brighter the bulb C.	• Some idea of being brighter because lower resistance.	• Complete answer. (*Current must be linked to decrease resistance.)*	

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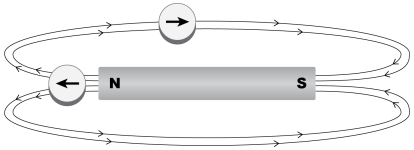
Q	Evidence	Achievement	Merit	Excellence
THREE (a)		• Both needles correct.		
(b)	$B = \frac{kI}{d}$ $k = 2.0 \times 10^{-7}$ (constant) $I = \frac{Bd}{k}$ $I = \frac{8 \times 10^{-8} \times 0.05}{2 \times 10^{-7}} = 0.02$ A Current is smaller than a typical electric fence. This means that the current needs to increase. Since $V = I \cdot R$; if the current needs to increase, then the voltage needs to increase as resistance is constant.	• current calculation with incorrect d. OR Attempts to use equation AND makes a comparison. OR Comparison without stating R is constant.	• Correct current. OR Correct comparison (need to state constant resistance).	• Complete answer (need to state constant resistance).
(c)	The clip is made of plastic because it is an insulator. The insulator prevents the flow of current from going to the ground via the wood.	• States plastic is an insulator. OR Prevents grounding / flow of current to ground.	• Complete answer.	
(d)	When the switch of the electric bell is turned on, it allows for current to flow through the coil, which creates an electromagnet. This attracts the moving arm. As the moving arm is pulled away from the contact screw, the hammer strikes the gong, and the circuit is broken and the current stops. Since the current stops, the coil is no longer magnetised, and the moving arm is pulled back to its original position. It is now back to its original position, and the hammer is now in contact with the contact screw and completes the circuit to start the process all over again.	• ONE point.	• TWO points.	• Complete answer.

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Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 19	20 – 24