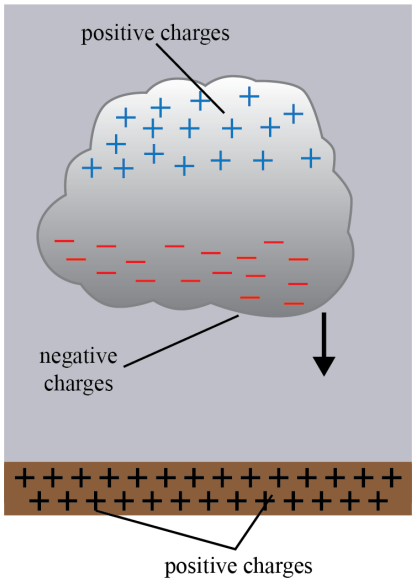
Assessment Schedule – 2023

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

Evidence

Q	Evidence	Achievement	Merit	Excellence
ONE (a)	The charge in the cloud is created by the friction between the particles.	• Separation due to friction.		
(b)(i)	 • Drawn charge distribution correct in the cloud.	• Correct charge distribution in cloud. AND ONE bullet point from (ii).	• Correct charge distribution in cloud AND two bullet point. from (ii).	• Complete answer for both (i) and (ii).
(ii)	• The cloud is electrically neutral as it has an equal number of protons and electrons (positive and negative). • The cloud ais an insulators which is a poor conductors of electrons/ negative charge allowing the charge to build up, as electrons cannot move freely in them • Some parts of the clouds will have different charges (top positive bottom negative) causing an uneven charge distribution / polarisation.			

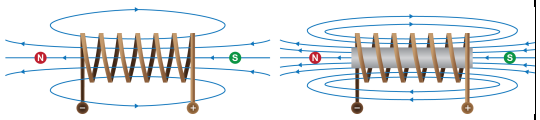
(c)	Calculate energy created by lightning strike. $P = I \times V$ $P = 20\,000 \times 500\,000$ $P = 1 \times 10^{10}$ W $P = \frac{E}{t}$ $E = P \times t$ $E = 1 \times 10^{10} \times 0.1$ $E = 1 \times 10^{9}$ J	• Correct calculated power. OR Calculated energy correctly, but used wrong power.	• Correct energy calculated.	
(d)	• A lightning rod works by placing a metal rod on the top of a building so it is the highest point of the building. • The lightning rod is made from metal, which is a conductor so that electrons can flow through it easily. • The lightning rod is charged through induction. When a charged cloud passes by, the electrons (negative charges) in the lightning rod are repelled. (lightning rod is positive as its connected to the ground) • Since opposite charges attract, when enough build-up of charge, the electrons move from the cloud to the lightning rod. • The lightning rod then allows for an alternative path for the electrons to reach the ground, preventing fire or electrocution.	• TWO bullet point correct.	• THREE bullet points correct.	• Complete answer.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No evidence	1a	2a	3a	4a	2m	3m	2a + 1m + 1e	1m + 2e

Q	Evidence	Achievement	Merit	Excellence
TWO (a)	$V = I \cdot R$ by using the equation if R stays same, and voltage is increased, current will increase.	• Current increases.		
(b)	$V = I \cdot R$, determine the resistance of the rheostat. $R = \frac{V}{I}$ $R = \frac{12}{1.6}$ $R = 7.5\,\Omega$ If rheostat resistance stays same, then at 2 V: $V = I \times R$ $I = \frac{V}{R}$ $I = \frac{2}{7.5}$ $I = 0.27$ A $= 0.3$ A, rounded to 1 sig. fig.	• Determines the resistance of the rheostat. OR Uses correct method with incorrect resistance.	• Correct answer.	
(c)	• Voltmeter reading 0. • The current increases dramatically as there is no resistance to stop/slow the current. $V = IR$ if voltage is constant, and the drop in resistance is large, the current increases will be equally large. • The current will travel in the path of least resistance. The rheostat no longer controls the current as it is no longer the path of least resistance.	• ONE of three bullet points.	• TWO of three bullet points.	• Complete answer.

(d)	• Rheostats are usually made from a high resistance material. Copper is a good conductor, and hence has a low resistance in the circuit. This means that the ability of the rheostat to control the current will be minimised, and would only be effective with a low voltage. • The copper rheostat will have an overall lower resistance, and if the voltage stays constant, the current will increase. OR If voltage increases, the current will become much larger. • The larger the current, the more power / energy causing the wire heats up, and if the wire gets too hot, it can be a safety hazard. Larger currents are a safety hazard, and hence a copper rheostat could create a safety hazard.	• Idea that copper is a good conductor, and hence not ideal to use as a variable resistor in the circuit. Effect of resistor is minimised OR Due to low resistance from the rheostat, the current will increase. OR If the current increases due to low resistance, it could be a potential safety hazard, as energy / power increases and could heat wires up too much.	• TWO out of three Achievement points.	• Full answer.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No evidence	1a	2a	3a	4a	2m	3m	2a + 1m + 1e	1m + 2e

Q	Evidence	Achievement	Merit	Excellence
THREE (a)		• Correct drawing of magnetic field. OR Correctly labelled N and S on one diagram.	• Both Correct magnetic field drawing and labelling of N and S poles on both diagram.	• Complete answer.
(b)	It increases the magnetic field.	• Correct answer.	•	•
(c)	• A solenoid valve works by applying a current to the solenoid, which creates a magnetic field. • The 'plunger', which is made out of iron (which can be easily magnetised/ferro magnetic), is placed in the solenoid which attracts the iron plunger into the middle when current flows, releasing the seal and allowing a flow of liquid or gas. • When the current is turned off, the iron plunger falls back down because there is no more magnetic field to attract it, and it seals up again.	• Any one of the following points below: - Plunger is made out of iron because it is easily magnetised(ferro/soft iron) - When current is applied to solenoid, it creates a magnetic field. - The plunger is iron and is attracted to the magnetic field. - The magnetic field lifts the seal liquid flows.	• General understanding of how the solenoid valve works, but lacking (some)detail.	• Complete answer.
(d)	$B = \frac{kI}{d}$ $d = \frac{kI}{B}$ $d = \frac{2 \times 10^{-7} \times 0.67}{44.6 \times 10^{-6}}$ $d = 0.0030$ m or 3.0 mm	• Rearrange equation correctly.	• Correct answer.	

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No evidence	1a	2a	3a	4a	2m	3m	2a + 1m + 1e	1m + 2e

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 18	19 – 24