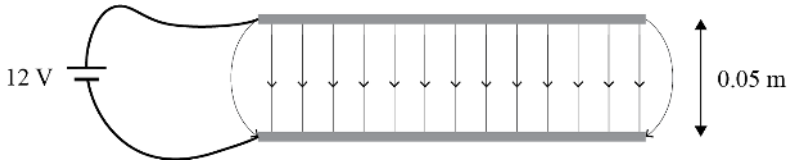
Assessment Schedule – 2023

Physics: Demonstrate understanding of electricity and electromagnetism (91173)

Evidence Statement

Q	Evidence	Achievement	Merit	Excellence
ONE (a)	$E = \frac{V}{d} = \frac{12}{0.05} = 240$ V m^{-1} or N C^{-1}	• Show question and correct unit.		
(b)		• At least two downward arrows between the plates.	• Evenly spaced parallel field lines downwards. AND Curved lines at the ends. AND Lines meet the plates at right angles.	
(c)	The electric field between the plates is uniform. $F = E_q$, so the force on the electron is constant / unchanging / the same everywhere.	• Uniform E or Constant F.	• Uniform E and constant F	
(d)(i)	$E_p = Eqd = 240 \times 1.6 \times 10^{-19} \times 0.05 = 1.92 \times 10^{-18}$ J	• ONE E_p correct.	• BOTH E_p correct. OR One E_p correct and one correct linked statement..	1E Both E_p correct plus partial explanation. 2 E Complete answer.
(ii)	$E_p = 0$ J (accept "no change" as long as it's clear it means 0 – not same as in (i) –usually found in part (iii).			
(iii)	In (i) the electron is moving along the field lines, so there is a change in voltage, and a change in electric potential energy. OR there is a force in the direction of movement, so work is done OR it's getting closer (further away) from the positive / negative plate In (ii) the electron is moving across the field lines, so there is no change in voltage, and no change in electric potential energy. OR there is no force on the electron in the direction of its movement, so no work is done. OR the distance from the plates does not change.			

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

Q	Evidence	Achievement	Merit	Excellence
TWO (a)	$\frac{1}{R}=\frac{1}{6.2}+\frac{1}{R4.2}=0.3994 \Rightarrow R=2.5$ OR $R=\frac{4.2\times6.2}{6.2+4.2}=2.5$	• Show must see $\frac{1}{R}=\frac{1}{6.2}+\frac{1}{4.2}$ OR $\frac{4.2\times6.2}{6.2+4.2}$		
(b)	$\frac{1}{R}=\frac{1}{8.2}+\frac{1}{4.2}\Rightarrow R=2.78\,\Omega$ Total $R=2.78+2.5=5.28\,\Omega$ $I=\frac{V}{R}=\frac{12}{5.28}=2.27$ A	• ONE of 5.28 Ω OR $\frac{12}{\text{any calculated } R}$	• 2.27 A	
(c)	• Total R decreases • More current flows in circuit. • Total V constant. • Either $V = IR$ so lamp gets more V and Power linked to brightness ($P = IV$) or $P = I^2$ • So the other lamp is brighter.	• 2 linked points	• 3 bullet points.(need to see total somewhere)	Complete answer.
(d)	Total resistance of the circuit is 8.2+2.5 = 10.7 Ω Current in the circuit $=\frac{V}{R}=\frac{12}{10.7}=1.12$ A Power of the 8.2 Ω = $I^2R = 1.12^2 \times 8.2 = 10.29$ W ($V = IR = 1.12 \times 8.2 = 9.18$ V and $P = IV = 9.18 \times 1.12 = 10.29$ W) In two minutes: E = 10.29 × 2 × 60 = 1234 J Alternately $I=\frac{q}{t}\Rightarrow q=120\times1.12=134.4\,C$ and $E = Vq = 9.19 \times 134.4 = 1234$ J	• Finds 10.7 Ω OR 120 times any calculated power.	• Finds 10.29 W OR 2100 J. OR 1600 J.	• 1234 J.

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

Q	Evidence	Achievement	Merit	Excellence
THREE (a)	Arrow to left. Not contradicted by words.	• Arrow to left.		
(b)	$I = \frac{V}{R} = \frac{120}{42.1} = 2.85\ \text{A}$ $F = BIL = 8.1\times10^{-3}\times2.85\times0.84 = 0.0194\ \text{N}$	• Finds 2.85A.	• 0.0194 N	
(c)(i)	Top end labelled negative.		• 0.0239 OR 0.021 V AND Top end labelled negative.	
(ii)	$V = BvL = 8.1\times10^{-3}\times3.1\times0.95 = 0.0239\ \text{V}$	• Top end labelled negative. OR 0.021.		• 0.0239 V AND Top end labelled negative
(d)	After the axle is set moving, a voltage is induced between the ends. As there is a complete circuit a current is induced in the axle. The axle is now a current carrying conductor cutting a magnetic field, so there is a force on the axle. This force opposes the motion, and the axle slows down. • Voltage induced • Complete circuit / induced current. • Current carrying wire in magnetic field. • Force opposite motion. • Slows down.	• Describes TWO effects.	• Explains THREE effects.	Complete argument.

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

Cut Scores

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