

Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic : 3_ElectricCircuits

Name of the Student: _____

Max. Marks : 19 Marks

Time : 19 Minutes

Mark Schemes

Q1.

Question Number	Acceptable answers	Additional guidance	Mark
(a)	- Use of charge = area under the graph (1) - Charge in 5 hours = 89 (A h) (1) 90% charge is 99 (A h) so statement is not correct (1) Or 89 (A h) is 81% charge so statement is not correct (1)	$Q = 0.5(0.5 \text{ h} \times 17.5 \text{ A}) + 0.5(4.5 \text{ h} \times 2.5 \text{ A}) + (17.5 \text{ h} \times 4.5 \text{ A})$ $Q = 88.8 \text{ A h}$ 90% charge = $0.9 \times 110 = 99 \text{ A h}$ MP3 dependent on MP1	3
(b)(i)	- Use of efficiency = $\frac{\text{useful energy output}}{\text{total energy input}}$ and conversion of kWh to J (1) - Use of $\Delta W = F\Delta s$ (1) $F = 803 \text{ (N)}$ (1)	<u>Example Calculation</u> Useful energy output = $0.85 \times 42\,000 \times 3600$ Useful energy output = $1.29 \times 10^8 \text{ J}$ $1.29 \times 10^8 \text{ J} = F \times 160 \times 10^3 \text{ m}$ $F = 803 \text{ N}$	3
(b)(ii)	- Use of $mg\Delta h$ (1) - Use of useful energy output = work done against frictional forces + ΔE_{grav} (allow ecf from (b)(i)) (1) Or Use of ΔE_{grav} = reduction in work done against frictional forces (1) - Reduction in range = 47 km (1)	<u>Example Calculation</u> $\Delta E_{grav} = 1300 \text{ kg} \times 9.81 \text{ Nkg}^{-1} \times 3000 \text{ m}$ $\Delta E_{grav} = 3.8 \times 10^7 \text{ J}$ $1.29 \times 10^8 \text{ J} = (803 \times s) + (3.8 \times 10^7 \text{ J})$ $s = 113 \text{ km}$ Reduction in range = $160 \text{ km} - 113 \text{ km} = 47 \text{ km}$	3

Q2.

Question Number	Answer	Mark
(a)	Use of $\Phi = BA$ (1) Converts cm to m Or mT to T (1) $\Phi = 1.1 \times 10^{-4} \text{ Wb}$ (1) <u>Example of calculation</u> $\Phi = 6.0 \times 10^{-2} \text{ m} \times 2.4 \times 10^{-2} \text{ m} \times 74 \times 10^{-3} \text{ T}$ $\Phi = 1.07 \times 10^{-4} \text{ Wb}$	3
(b)	Use of $\mathcal{E} = \Delta\Phi/\Delta t$ (1) Use of time = distance/speed (1) $\mathcal{E} = 5.3 \text{ mV}$ (5.0 mV or 5.5 mV depending on value of Φ used, ecf value of Φ from (a)) (1) Or (1) Quotes $\mathcal{E} = Blv$ (1) $l = 6.0 \times 10^{-2} \text{ m}$ used (1) $\mathcal{E} = 5.3 \text{ mV}$ <u>Example of calculation</u> Time = $0.024 \text{ m} / 1.2 \text{ m s}^{-1}$ $t = 0.020 \text{ s}$ $\mathcal{E} = 1.1 \times 10^{-4} \text{ Wb} / 0.02 \text{ s}$ $= 5.5 \text{ mV}$	3
(c)	Use of $I = V/R$ (1) Use of $F = BIl$ (1) $F = 9.8 \times 10^{-5} \text{ N}$ (ecf value of $\mathcal{E}$ from (b)) (1) This force is too small to be felt. (this comment must be consistent with their value of force) (1) <u>Example of calculation</u> $I = 5.5 \text{ mV} / 0.25 \Omega = 0.022 \text{ A}$ $F = 74 \times 10^{-3} \text{ T} \times 0.022 \text{ A} \times 0.060 \text{ m}$ $F = 9.8 \times 10^{-5} \text{ N}$	4
Total for question		10