Name: ____

Edexcel_Potential_Divider

Mark Scheme

Date:

Time:

Total marks available:

Total marks achieved: ______

Mark Scheme

Q1.

Question Number	Answer	Mark
	C	**1**

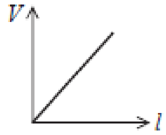
Q2.

Question Number	Answer	Mark
	B	**1**

Q3.

Question Number	Answer	Mark
	B	**1**

Q4.

Question Number	**Acceptable Answer**	**Additional Guidance**	**Mark**
	A 		**1**

Q5.

Question Number	**Answer**	**Mark**
	D $\frac{R_2}{R_1+R_2}V$	**1**
	Incorrect Answers: A – this looks similar to the correct formula but has an incorrect resistance as the numerator and does not have the total resistance as the denominator B – this looks similar to the correct formula with the correct resistance as the numerator but does not have the total resistance as the denominator C – This would give the PD across resistor R_1 and not R_2	

Q6.

Question Number	Answer	Mark
	D	**1**

Q7.

Question Number	Acceptable Answer	Additional Guidance	Mark
	An explanation that makes reference to the following: • Combined resistance of (light) bulb and LDR is about 3 Ω (in the dark) **Or** the combined resistance is less than the resistance of bulb/LDR (1) • The combined resistance is always much less than the (75 Ω) fixed resistance (1) • The p.d. across the bulb will be much less than 3 V and so the bulb will **not** come on (in the dark). (1)	MP3: accept the idea that the p.d. across the bulb is never high enough to make the bulb come on in the dark	**3**

Q8.

Question Number	Acceptable Answer		Additional Guidance	Mark
	• potential difference across the LDR = 3.6 V **Or** $\frac{R}{(R+75\ \Omega)}$ seen **Or** $\frac{75\ \Omega}{(R+75\ \Omega)}$ seen • Use of $V = IR$ **Or** resistance ratio × 6.0 V = corresponding p.d. • $R = 110\ \Omega$	(1) (1) (1)	MP2 use of $V = IR$ with 2.4 V or 3.6 V only Example of calculation $I = 2.4\ \text{V}/75\ \Omega = 0.032\ \text{A}$ Voltage across LDR = 6.0 V – 2.4 V = 3.6 V $R = \frac{3.6\ \text{V}}{0.032\text{A}}$ $R = 112.5\ \Omega$ **Or** use of ratios $\frac{75\ \Omega}{(R+75\ \Omega)} \times 6.0\ \text{V} = 2.4\ \text{V}$ $R = 112.5\ \Omega$	3

Q9.

Question Number	Answer		Mark
(a)(i)	Determines width of at least 9 coils Use of half of their diameter in πr^2 Area = (1.96 to 2.42) × 10^{-7} (m^2) Example of calculation 18 coils = 1.00 cm Diameter = 0.0100 m ÷ 18 = 5.56 × 10^{-4} m Area = π × (5.56 × 10^{-4} ÷ 2)^2 Area = 2.42 × 10^{-7} m^2	(1) (1) (1)	3
(a)(ii)	Use of $R=\rho l/A$ Resistivity magnitude = 4.4 × 10^{-7} (show that value gives 3.7× 10^{-7}) Unit Ωm Example of calculation $\rho=RA/l$ = 22 Ω x 2.4 × 10^{-7} m^2 / 12 m = 4.4 × 10^{-7} Ωm	(1) (1) (1)	3
(a)(iii)	A sensible response with some detail, e.g. • Avoid difficulty in reading a small scale while holding it and counting turns • it can be enlarged and done more accurately • compare with unravelling and using a micrometer • remains stationary, so easier to measure accurately • you can mark the coils as you go so you don't lose count (treat parallax as neutral and)	(1)	1
(b)	Use of ratio of lengths × pd V = 8.2 V Example of calculation V = (7.0 cm / 10.2 cm) × 12 V = 8.2 V	(1) (1)	2
	Total for question		**9**

Q10.

Question Number	Acceptable answers		Additional guidance	Mark
(a)	• (UV radiation consists of) photons • One photon interacts with one electron **Or** energy of photon depends on frequency • Electrons released if energy (of photon) greater than work function **Or** frequency is greater than threshold frequency **Or** <u>energy</u> supplied is sufficient to remove electron	(1) (1) (1)	Accept quanta/packets of energy	3

Question Number	Acceptable answers		Additional guidance	Mark
(b)(i)	• when slider at the bottom - reading on voltmeter is zero **Or** minimum resistance - reading on voltmeter is zero	(1)		
	• When slider at the top – reading on voltmeter is 1.5 V **Or** maximum resistance - reading on voltmeter is 1.5 V	(1)		
	• Potential difference split between top and bottom part of resistor (either side of slider) **Or** reading on voltmeter depends on the ratio of resistances (either side of slider) **Or** moving the slider changes the resistance that the voltmeter is across	(1)		3

Question Number	Acceptable answers		Additional guidance	Mark
(b)(ii)	Maximum Kinetic Energy of electron = 0.6 (eV)	(1)		1

Question Number	Acceptable answers		Additional guidance	Mark
(c)	**Max 4**		Full marks can only be scored if a correct link is made between at least one physics point and the demonstration being valid or not valid	
	Valid because:			
	• Moon and photocell both have vacuum	(1)		
	• Both demonstration and theory use photoelectric effect	(1)	Accept the same concept for photoelectric effect	
	Not valid because:			
	• Different wavelengths in each case	(1)	Accept one uses light the other UV	
	• On the moon there is dust not metal	(1)	Accept different materials for MP4	
	• Dust is free to move but the metal plate is fixed	(1)		
	• On the moon UV removes electrons from (individual) <u>atoms</u> **and** in the demo light removes electrons from metal <u>surface</u>	(1)		
	• Demonstration is based on photoelectric effect but effect on moon could be ionisation	(1)		4

Q11.

Question Number	Acceptable answers	Additional guidance	Mark
	• p.d. across capacitor increases **Or** p.d. across resistor decreases (1) • p.d. across capacitor increases to 5V (1) • p.d. across resistor starts at 5V and reduces to 0V (1) • Exponentially (1)		4

Q12.

Question Number	Acceptable answers	Additional guidance	Mark
(a)	• V at top/start = 0V **Or** recognition "potential divider" **Or** V increases (by implication) **Or** V at bottom = 1.5V **(1)** • Two sections of wire act as series resistors **Or** $R=\rho l/A$ **Or** comment about R proportional to length **(1)** **Or** $\frac{V}{1.5}=\frac{R}{R_T}$ • potential difference proportional to length of wire **(1)**	**Alternative MS** Constant Current (I) in wire (1) p.d. across section of wire $=Ir$ between A and loop (1) Increases from 0V to 1.5V linearly (1)	3

Question Number	Acceptable answers	Additional guidance	Mark
(b)	• Tangent drawn at 1.5 s **(1)** • Scales p.d. to give distance **(1)** • Gradient determined using a base of triangle of at least 1.0 s **Or** use of $s=\frac{(u+v)}{2}t$ and correct V read from graph **(1)** • velocity = 1.0 m s^{-1} – 1.3 m s^{-1} **(1)**	Example of calculation Gradient $=\frac{1.1\text{V}-0.2\text{V}}{1.0\text{s}}=0.9\text{Vs}^{-1}$ As 1.5 V represents 2.00 m $v=0.9\text{ Vs}^{-1}\times\frac{2.00\text{m}}{1.5\text{V}}=1.2\text{ ms}^{-1}$	4

Question Number	Acceptable answers		Additional guidance	Mark
(c)	• Use of $v = u + at$ • Use of $a = g\sin\theta$ • Calculates a value for a, θ or v (using a SUVAT AND $a = g\sin\theta$) • Valid comparison of their calculated quantity and the stated quoted uncertainty.	(1) (1) (1) (1)	Example of calculation $1.5\,\text{m}\,\text{s}^{-1} = 1.2\,\text{m}\,\text{s}^{-1} + a \times 0.5\,\text{s}$ $a = \dfrac{0.3\,\text{m}\,\text{s}^{-1}}{0.5} = 0.6\,\text{m}\,\text{s}^{-2}$ $0.6\,\text{m}\,\text{s}^{-2} = 9.81\,\text{m}\,\text{s}^{-2}\sin\theta$ $\theta = 3.6°$	4