Name: _____

Edexcel_Potential_Divider

Questions

Date:

Time:

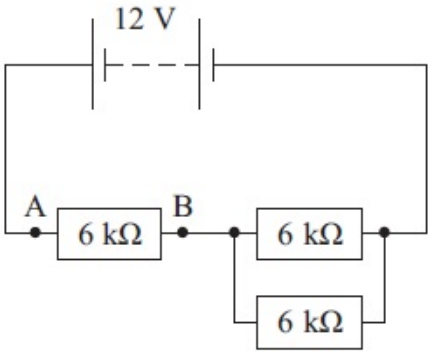
Total marks available:

Total marks achieved: _____

Questions

Q1.

A combination of resistors is connected to a 12 V supply of negligible internal resistance.



The potential difference between points A and B is

☒ **A** 4 V

☒ **B** 6 V

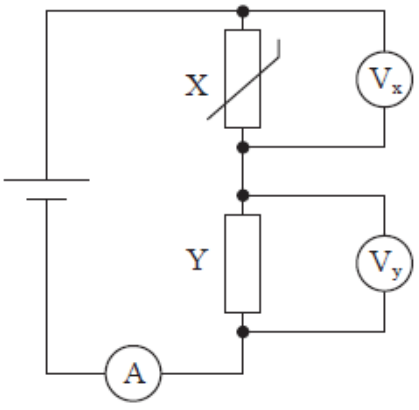
☒ **C** 8 V

☒ **D** 12 V

(Total for question = 1 marks)

Q2.

The diagram shows a potential divider circuit that contains a negative temperature coefficient thermistor.



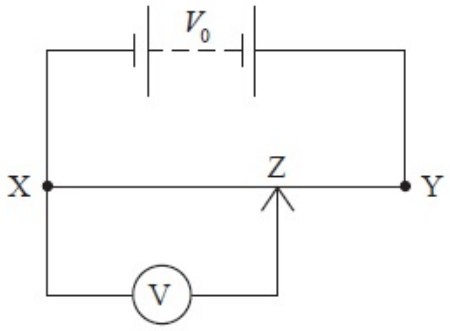
The temperature of the room containing the circuit increases.

Select the row of the table that correctly shows the changes in readings on the meters.

	V_x	V_y	A
☐ A	decrease	increase	decrease
☐ B	decrease	increase	increase
☐ C	increase	decrease	decrease
☐ D	increase	decrease	increase

(Total for question = 1 mark)

Q3. The diagram shows a uniform wire XY across which a potential difference V_0 is applied.



Which of the following correctly shows the output potential difference across XZ?

☐ **A** $V = \frac{XY}{XZ}V_0$

☐ **B** $V = \frac{XZ}{XY}V_0$

☐ **C** $V = \frac{XZ}{ZY}V_0$

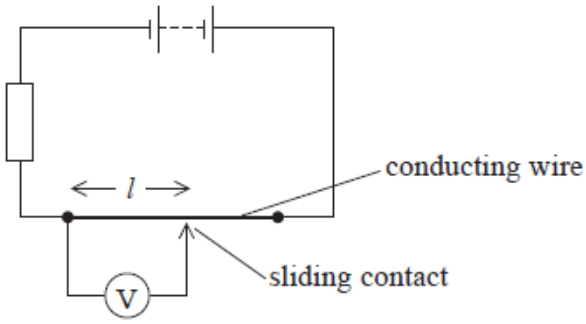
☐ **D** $V = \frac{ZY}{XY}V_0$

(Total for Question = 1 mark)

Q4.

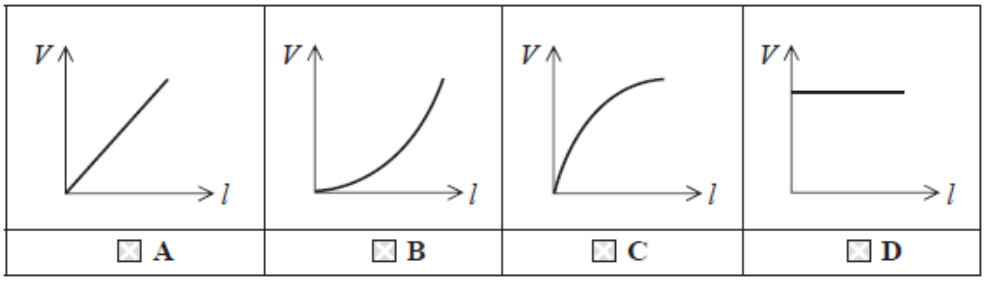
A student set up the circuit below and moved a sliding contact along a uniform conducting wire.

The student recorded the potential difference *V* across each length of wire *l* under test.



Which graph correctly shows how V varies with l?

(1)



(Total for question = 1 mark)

Q5.

A series circuit consists of two resistors with resistances R_1 and R_2 and a battery of potential difference V.

Which of the following gives the potential difference across the resistor with resistance R_2?

(1)

☒ **A** $\frac{R_1}{R_2}V$

☒ **B** $\frac{R_2}{R_1}V$

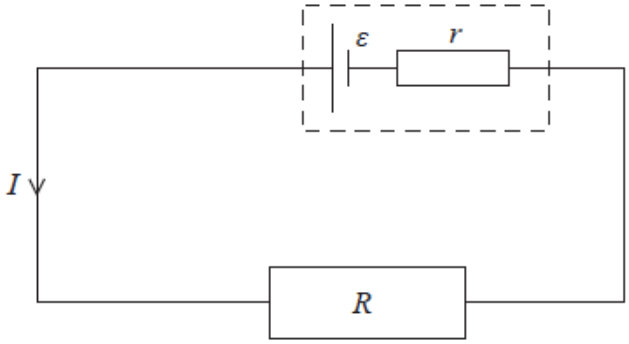
☒ **C** $\frac{R_1}{R_1 + R_2}V$

☒ **D** $\frac{R_2}{R_1 + R_2}V$

(Total for question = 1 mark)

Q6.

The diagram represents a resistor of resistance R in a series circuit with a cell of e.m.f. ε and internal resistance r.



Which of the following correctly gives the potential difference V across the internal resistance?

☒ **A** $V = \dfrac{\varepsilon(R+r)}{r}$

☒ **B** $V = \dfrac{\varepsilon R}{R+r}$

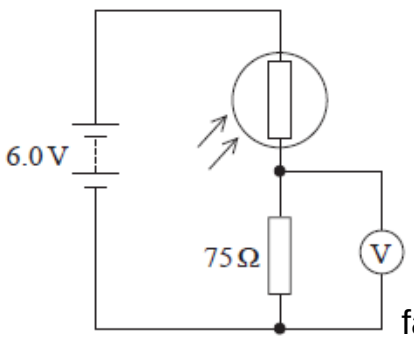
☒ **C** $V = \dfrac{\varepsilon(R+r)}{R}$

☒ **D** $V = \dfrac{\varepsilon r}{(R+r)}$

(Total for question = 1 mark)

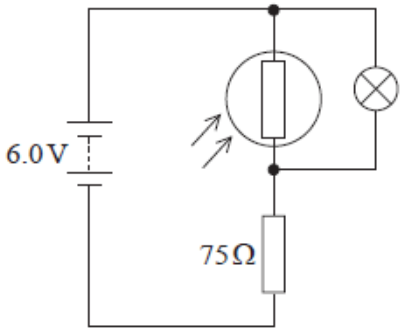
Q7.

A student set up a circuit containing a light dependent resistor (LDR) in series with a fixed resistor as shown.



The student wants to modify the circuit so that a light bulb lights up when the room goes dark.

She modifies the circuit as shown below. When working normally the resistance of the light bulb is 3Ω and the p.d. across it is 3V.



Explain, without further calculation, whether this circuit would work as intended.

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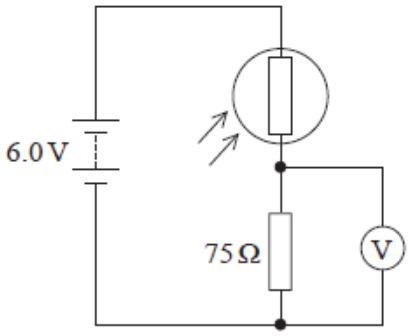
(Total for question = 3 marks)

Q8.

A student set up a circuit containing a light dependent resistor (LDR) in series with a fixed resistor as shown.



When the lamp was at a distance of 10 cm from the LDR, the reading on the voltmeter was 2.4V.

Calculate the resistance of the LDR at this distance.

(3)

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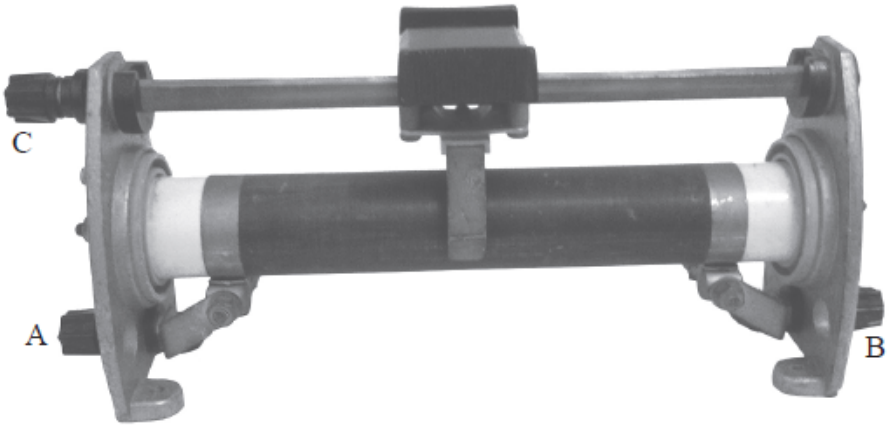
Resistance of the LDR = ...

(Total for question = 3 marks)

Q9.

Photograph 1 shows a rheostat (a variable resistor).

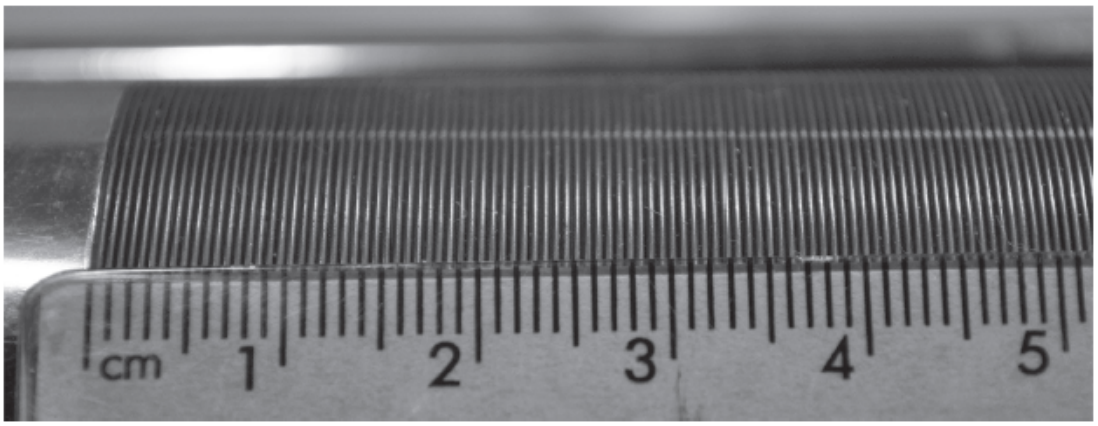


Photograph 1

The rheostat is made of a long resistance wire coiled around an insulating cylinder. The turns of wire are also separated from each other by insulation of negligible thickness. The ends of the wire are connected to the sockets A and B at either end and there is a sliding contact in the centre connected to the socket C. The resistance between A and C is varied by moving the sliding contact.

(a) A student decides to determine the resistivity of the material from which the wire is made by measuring the dimensions of the wire and its resistance.

Photograph 2 shows a section of the rheostat and a scale.



Photograph 2

(i) Take measurements from the photograph and use them to show that the cross-sectional area of the wire is about 2×10^{-7} m^2.

(3)

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(ii) Calculate the resistivity of the material from which the wire is made.

resistance of wire = 22 Ω

length of wire = 12 m

(3)

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Resistivity = ...

(iii) Suggest an advantage for the student of using a photograph rather than taking direct measurements.

(1)

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(b) The coil of the rheostat is 10.2 cm long. A potential difference of 12 V is applied across AB and the slider C is 7.0 cm from the end of the coil near A. Calculate the potential between A and C

(2)

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Potential difference = ...

(Total for question = 9 marks)

Q10.

Read the following extract and then answer the questions that follow.

Powdery dust, the by-product of fearsome meteor storms that pounded the Moon, coats much of the lunar surface. A build-up of this dust could damage sensitive machinery.

Scientists theorise that lunar dust must be electrostatically charged by ultraviolet solar radiation from the Sun. When ultraviolet radiation hits the Moon's "day side", the half that faces the Sun, it knocks electrons out of atoms in the lunar soil.

(a) Describe the particle model of ultraviolet radiation that explains how it can "knock electrons out of atoms".

(3)

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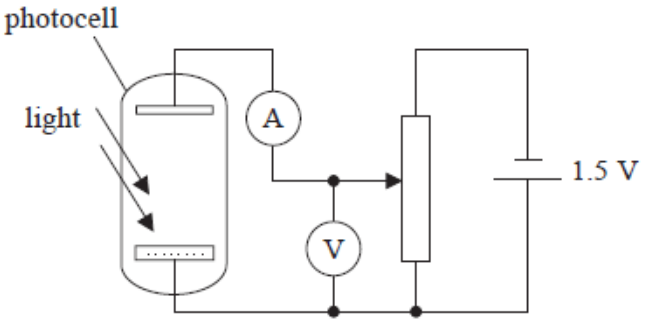
(b) A teacher uses the arrangement below to demonstrate that electrons can be knocked out of a metal surface in a photocell by visible light.

The arrangement can also be used to measure the maximum kinetic energy of these electrons.



(i) Explain how the potential divider circuit can produce a range of values from 0 to 1.5 V on the voltmeter.

(3)

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(ii) The potential difference on the voltmeter is increased until the ammeter reading is zero.

The voltmeter reads 0.6 V at this instant.
State the maximum kinetic energy of the electrons in eV.

(1)

Maximum kinetic energy = ... eV

(c) Discuss whether the photocell arrangement in part (b) gives a valid demonstration of how dust particles become charged on the Moon.

(4)

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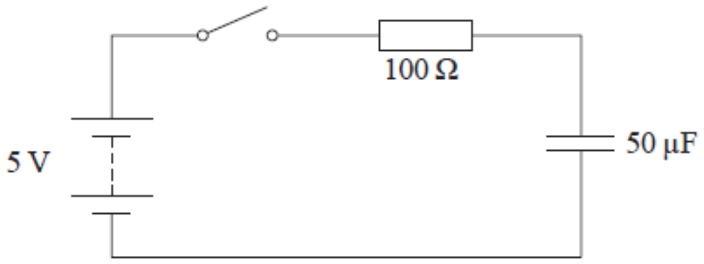
(Total for question = 11 marks)

A circuit consists of a battery of e.m.f. 5 V and negligible internal resistance, a switch, a 100 Ω resistor and an uncharged 50 μF capacitor.



Describe what happens to the potential difference across the resistor and the potential difference across the capacitor after the switch is closed.

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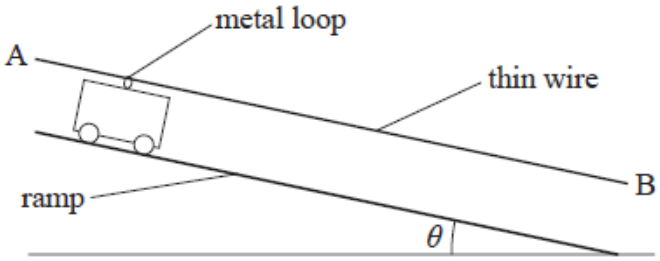
(Total for question = 4 marks)

Q12.

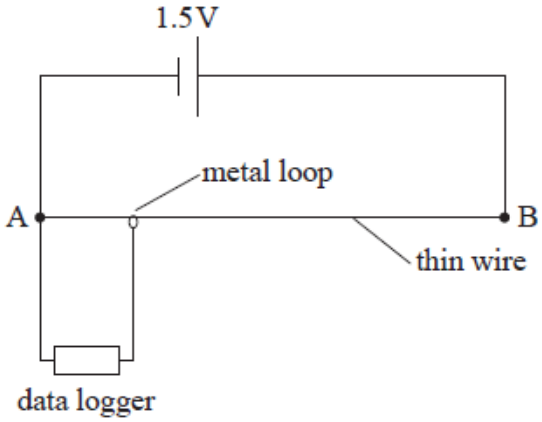
A student investigates the motion of a friction-free trolley down a ramp. On the top of the trolley there is a metal loop which makes contact with a length of thin resistance wire, AB, fixed above the ramp. The resistance wire has a uniform diameter.

The trolley accelerates down the ramp and the metal loop stays in contact with the wire along the full length of the ramp.



The student uses a protractor to measure the angle θ between the ramp and the horizontal and records a value of 4° with an uncertainty of ±1°.

(a) The two ends of the wire are connected to a 1.5 V cell. A data logger, set to measure potential difference, is connected to the metal loop and to the negative terminal of the cell.



Explain how the potential difference recorded by the data logger will vary as the loop moves along the length of the
wire AB.

(3)

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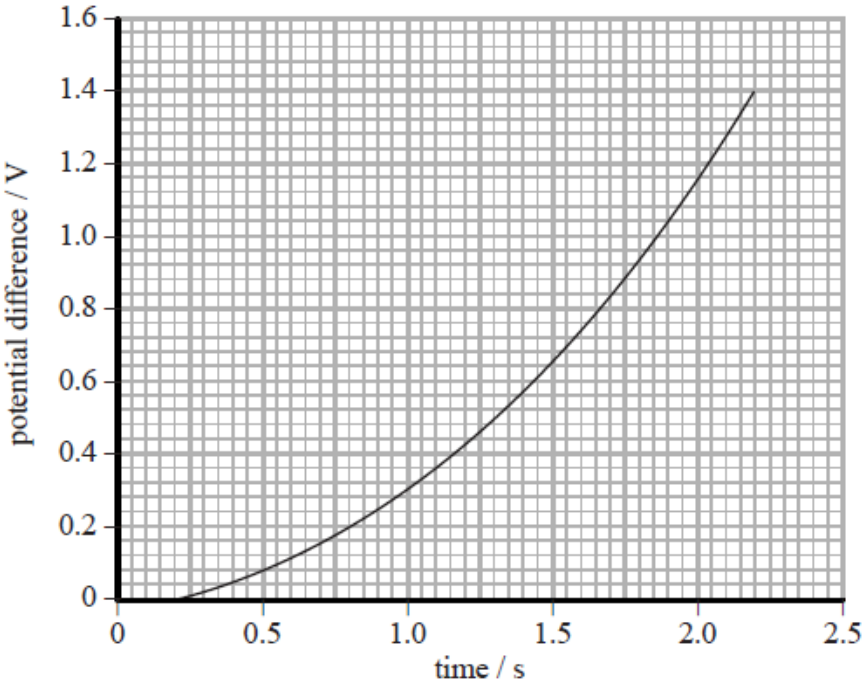
(b) The graph shows the data obtained from the data logger.



Determine the velocity of the trolley at 1.5 s.

1.5 V represents a distance of 2.00 m.

(4)

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Velocity = ...

(c) The student calculated the velocity of the trolley at 2.0 s to be 1.5 m s^{-1}.

By considering the acceleration of the trolley, determine whether the student's measurement of θ was within the uncertainty quoted.

(4)

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(Total for question = 11 marks)