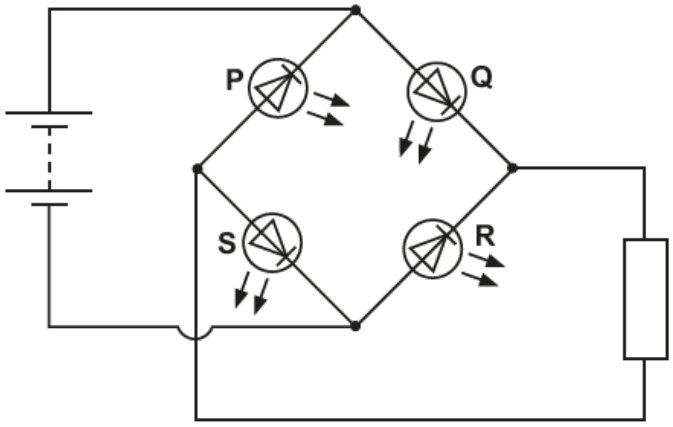
Electrical circuits – 2021/20 GCE Physics A Component 02

1. Nov/2021/Paper_H556_02/No.5

A circuit with four light-emitting diodes (LEDs) **P**, **Q**, **R** and **S** is shown below.



Two LEDs are lit in this circuit. Which **two** LEDs are lit?

A **P** and **Q**

B **P** and **R**

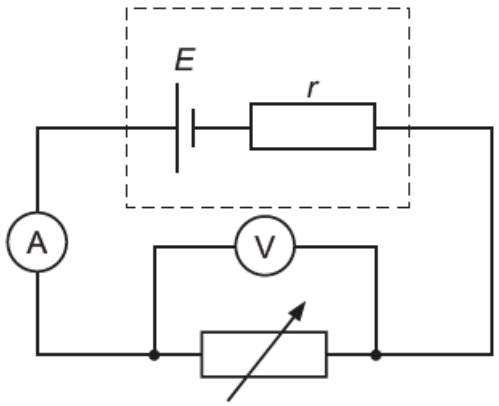
C **Q** and **R**

D **Q** and **S**

Your answer ☐ **[1]**

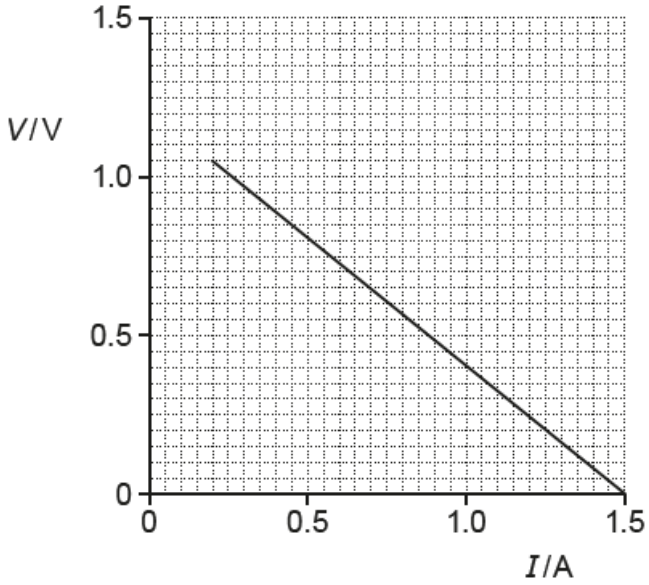
2. Nov/2021/Paper_H556_02/No.18(b)

(b)* A student is doing an experiment to determine the e.m.f. E of a cell and its internal resistance r. The circuit diagram of the arrangement is shown below.



The student changes the resistance of the variable resistor. The potential difference V across the variable resistor and the current I in the circuit are measured.

The V against I graph plotted by the student is shown below.



V/V	I/A	R/Ω	P/W
0.20	1.25		
0.40	1.00		
0.60	0.75		
0.80	0.50		
1.00	0.25		

There is an incomplete table next to the graph.
R is the resistance of the variable resistor and P is the power dissipated by the variable resistor.

- Use the graph to determine E and r. Explain your reasoning.
- Calculate R and P to complete the table. Describe how P depends on R.

[6]

.....

.....

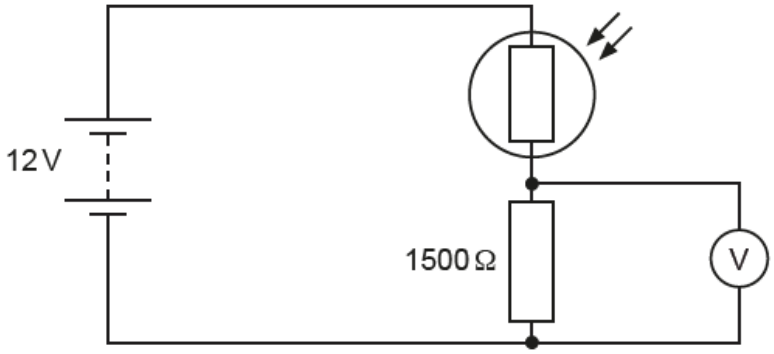
.....

Additional answer space if required

3. Nov/2021/Paper_H556_03/No.2

This question is about a light-dependent resistor (LDR).

(a) A student connects a potential divider circuit as shown below. It contains an LDR.



The fixed resistor has resistance 1500 Ω.
The battery has electromotive force (e.m.f.) 12 V and negligible internal resistance.
The voltmeter has extremely high resistance.

(i) When the LDR is covered, its resistance is 3000 Ω.

Calculate the voltmeter reading.

voltmeter reading = ... V **[2]**

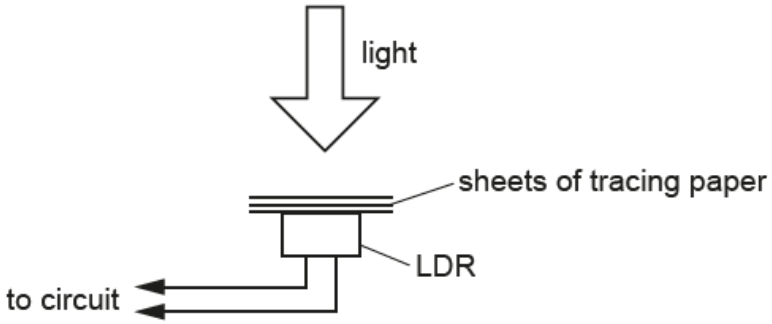
(ii) When fully illuminated, the resistance of the LDR is 100 Ω.
Show that the voltmeter reading **changes** by more than 7 V.

[1]

***(b)** The current in an LDR depends on the intensity of light incident on it.

A student decides to alter the intensity of light incident on an LDR by using sheets of tracing paper and a light source.

The diagram below shows **part** of an arrangement suggested by the student.



It is suggested that the current I in the LDR is given by the expression

$I = ke^{-nx}$

where x is the **total** thickness of the sheets of tracing paper, and k and n are constants.

Describe how the student could carry out an experiment to verify the validity of this expression and determine k and n. Include in your answer

- a circuit diagram
- a possible table for the results, including the headings
- the graph plotted to determine k and n
- any precautions taken to improve the quality of the results. **[6]**

.....

.....

.....

.....

Additional answer space if required

4. Nov/2020/Paper_H556_03/No.1(b)

(b) The ball is still positively charged.

The plates are now moved slowly towards each other whilst still connected to the 4.0 kV power supply. The plates are stopped when the separation is 5.0 cm.

Explain the effect that this has on the deflection of the ball and explain why the ball eventually starts to oscillate between the plates.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[4]**