

12.1 DC: Practical Circuits & Kirchhoff's Laws

Question Paper

Course	CIE A Level Physics (9702) 2019-2021
Section	12. D.C. circuits
Topic	12.1 DC: Practical Circuits & Kirchhoff's Laws
Difficulty	Hard

Time allowed:

10

Score:

/10

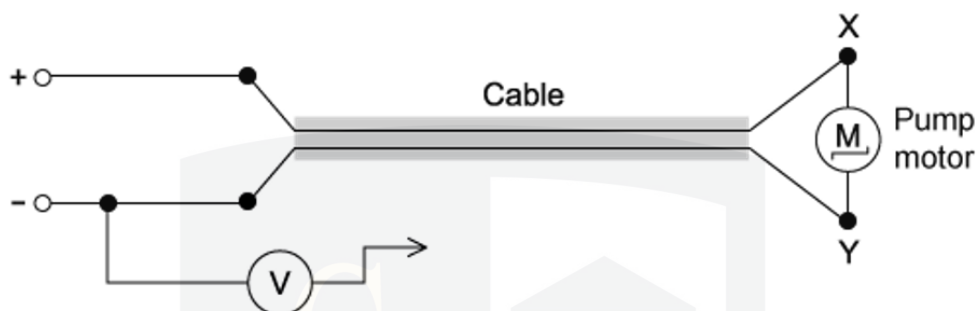
Percentage:

/100

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Question 1

The diagram shows the electric motor for a garden pump connected to a 24 V power supply by an insulated two-core cable.



The motor does not work so, to find the fault, the negative terminal of a voltmeter is connected to the negative terminal of the power supply, and its other end is connected in turn to terminals X and Y at the motor.

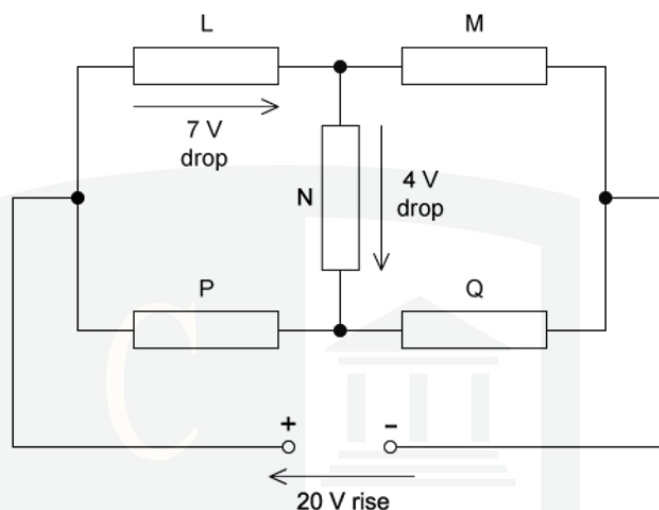
Which row represents two readings and a correct conclusion?

	voltmeter reading when connected to X / V	voltmeter reading when connected to Y / V	conclusion
A	24	0	break in positive wire of cable
B	24	12	break in negative wire of cable
C	24	24	break in connection within the motor
D	24	24	break in negative wire of cable

[1 mark]

Question 2

A 20 V d.c. supply is connected to a circuit consisting of five resistors L, M, N, P and Q.



There is a potential drop of 7 V across L and a further 4 V potential drop across N.

What are the potential drops across M, P and Q?

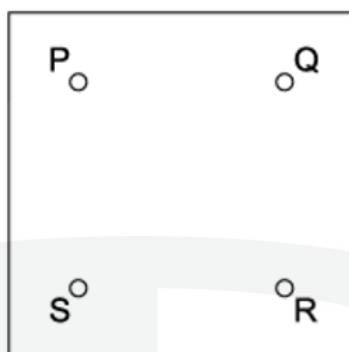
	potential drop across M / V	potential drop across P / V	potential drop across Q / V
A	9	7	13
B	13	7	13
C	13	11	9
D	17	3	17

[1 mark]

Question 3

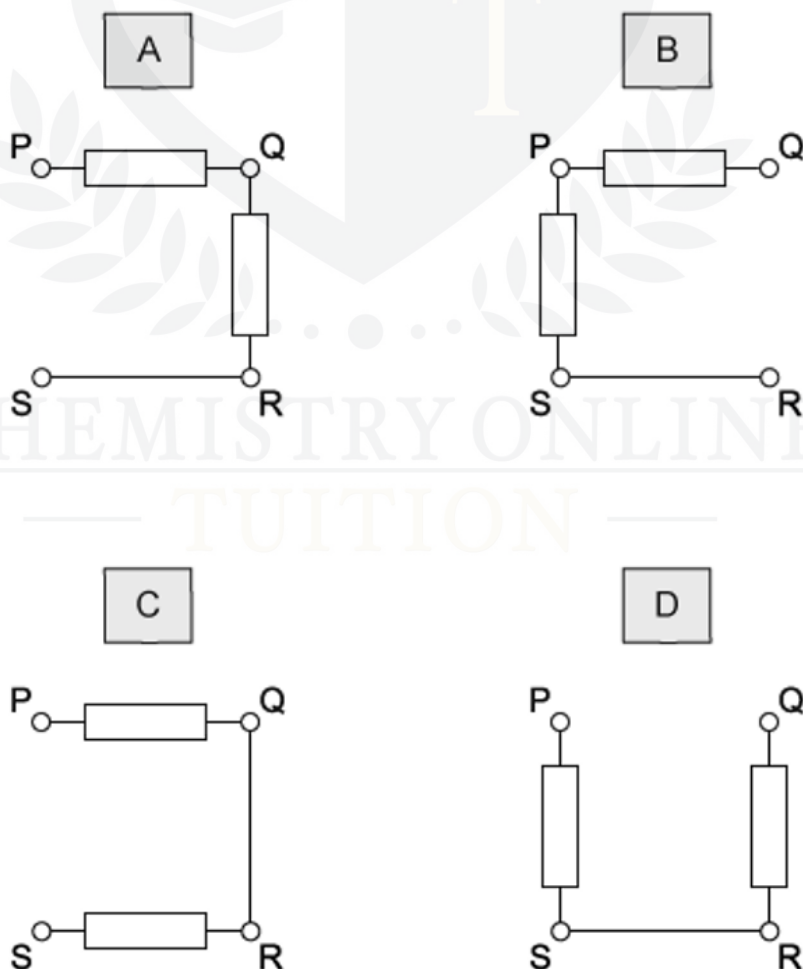


A box with four terminals P, Q, R and S contains two identical resistors.



When a battery of electromotive force (e.m.f.) E and negligible internal resistance is connected across PS, a high-resistance voltmeter connected across QR reads $\frac{E}{2}$

Which diagram shows the correct arrangement of the two resistors inside the box?



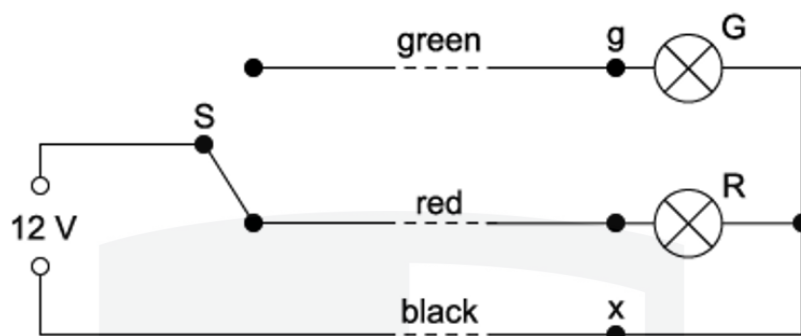
[1 mark]



Question 4

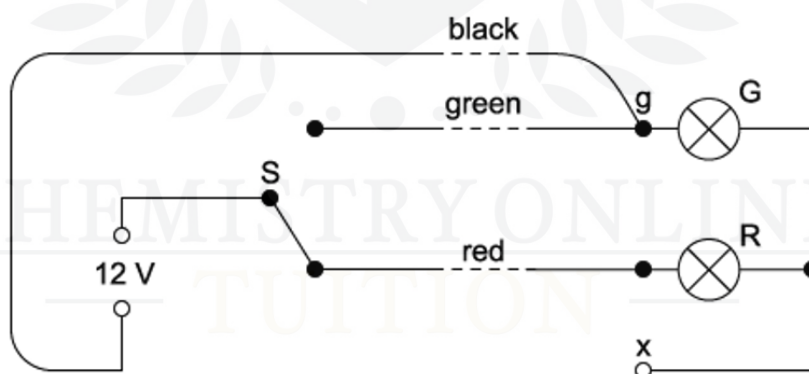


The diagram shows the circuit for a signal to display a green or a red light. It is controlled by the switch S.



The signal is some way from S to which it is connected by a cable with green, red and black wires. At the signal, the green and red wires are connected to the corresponding lamp and the black wire is connected to a terminal x to provide a common return. The arrangement is shown correctly connected and with the switch set to illuminate the red lamp.

During maintenance, the wires at the signal are disconnected and, when reconnected, the black wire is connected in error to the green lamp (terminal g) instead of terminal x. The red wire is connected correctly to its lamp and connections at S remain as in the diagram.



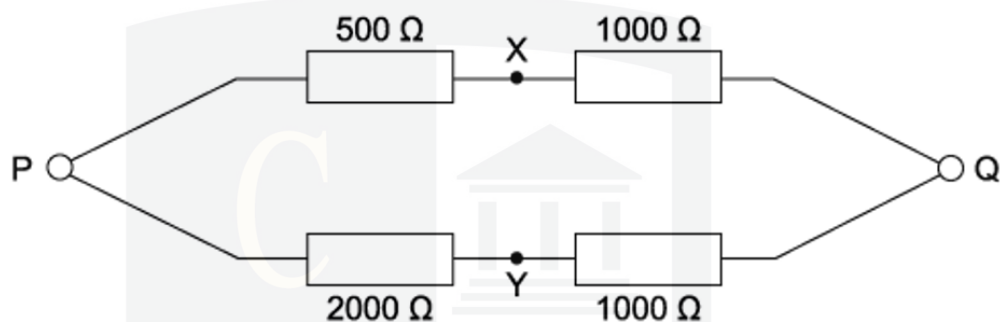
When the system is tested with the switch connection to the red wire, what does the signal show?

- A** the green lamp illuminated normally
- B** the red lamp illuminated normally
- C** the red and green lamps both illuminated normally
- D** the red and green lamps both illuminated dimly

[1 mark]

Question 5

A p.d. of 12 V is connected between P and Q.



What is the p.d. between X and Y?

A 0 V

B 4 V

C 6 V

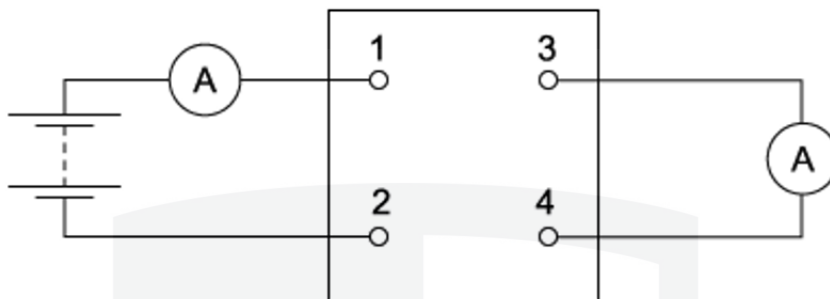
D 8 V

[1 mark]

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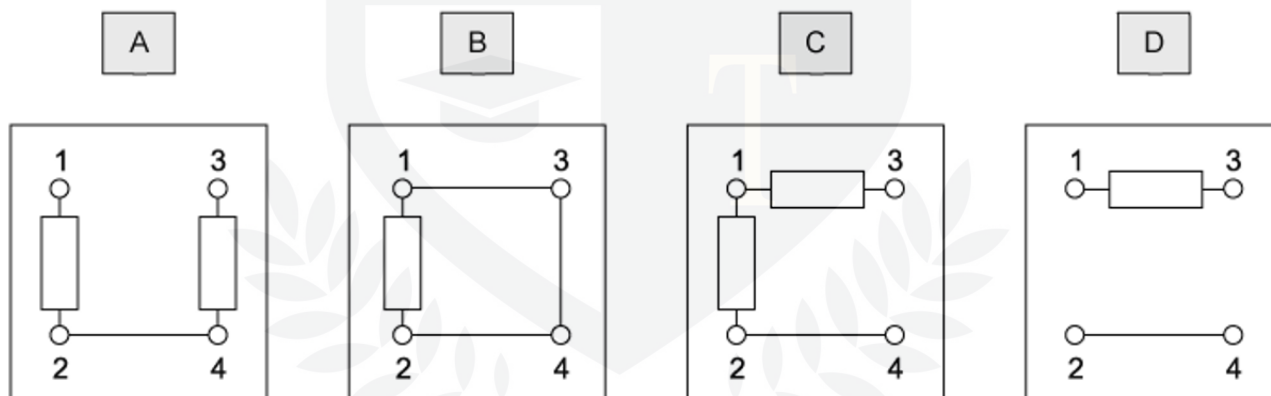
Question 6

The diagram shows a four-terminal box connected to a battery and two ammeters.



The currents in the two meters are identical.

Which circuit, within the box, will give this result?

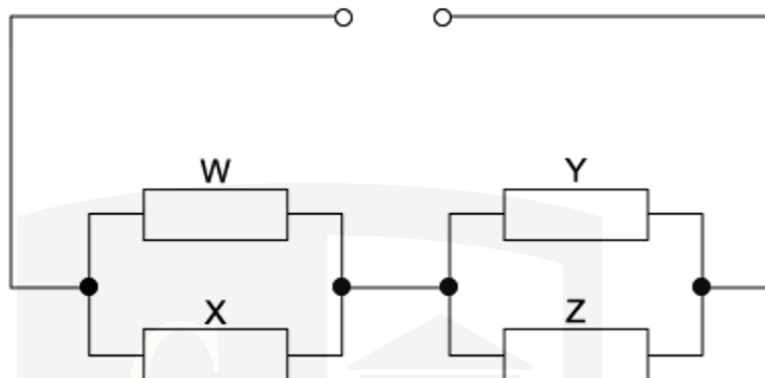


[1 mark]

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Question 7

Four resistors of equal value are connected as shown.



How will the powers to the resistors change when resistor W is removed?

- A** the powers to X, Y and Z will all increase
- B** the power to X will decrease and the powers to Y and Z will increase
- C** the power to X will increase and the powers to Y and Z will decrease
- D** the power to X will increase and the powers to Y and Z will remain unaltered

[1 mark]

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Question 8

A relay is required to operate 800 m from its power supply. The power supply has negligible internal resistance. The relay requires 16.0 V and a current of 0.60 A to operate.

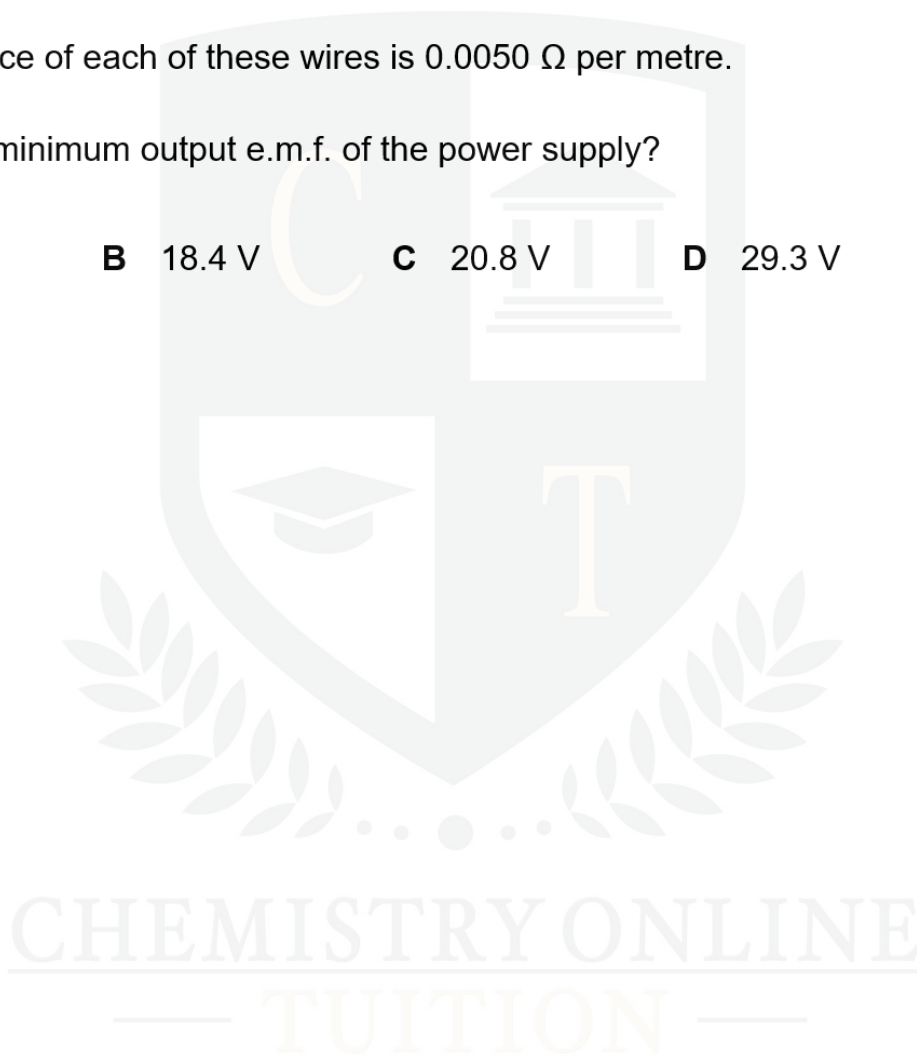
A cable connects the relay to the power supply, and two of the wires in the cable are used to supply power to the relay.

The resistance of each of these wires is 0.0050 Ω per metre.

What is the minimum output e.m.f. of the power supply?

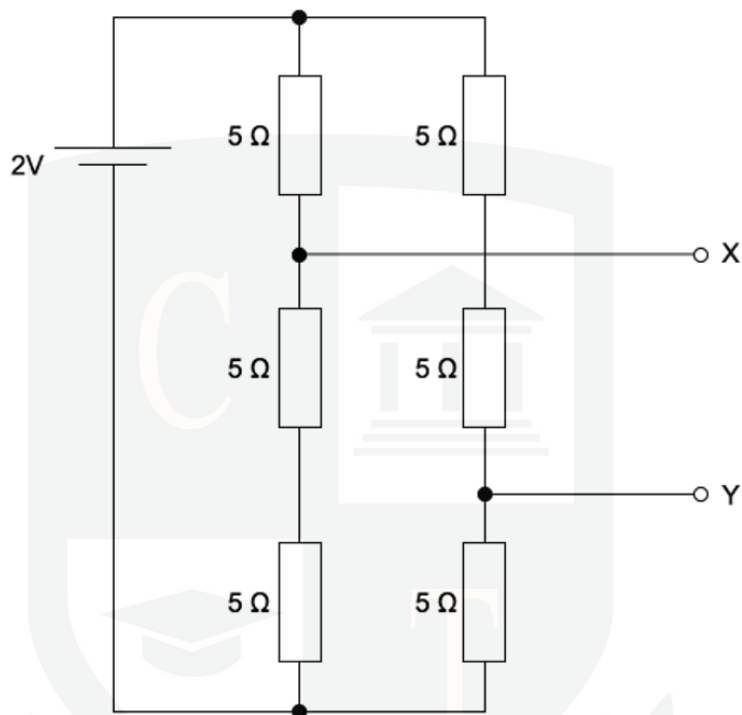
- A** 16.6 V **B** 18.4 V **C** 20.8 V **D** 29.3 V

[1 mark]



Question 9

Six resistors, each of resistance $5\ \Omega$, are connected to a 2 V cell of negligible internal resistance.



What is the potential difference between terminals X and Y?

A $\frac{2}{3}\text{ V}$

B $\frac{8}{9}\text{ V}$

C $\frac{4}{3}\text{ V}$

D 2 V

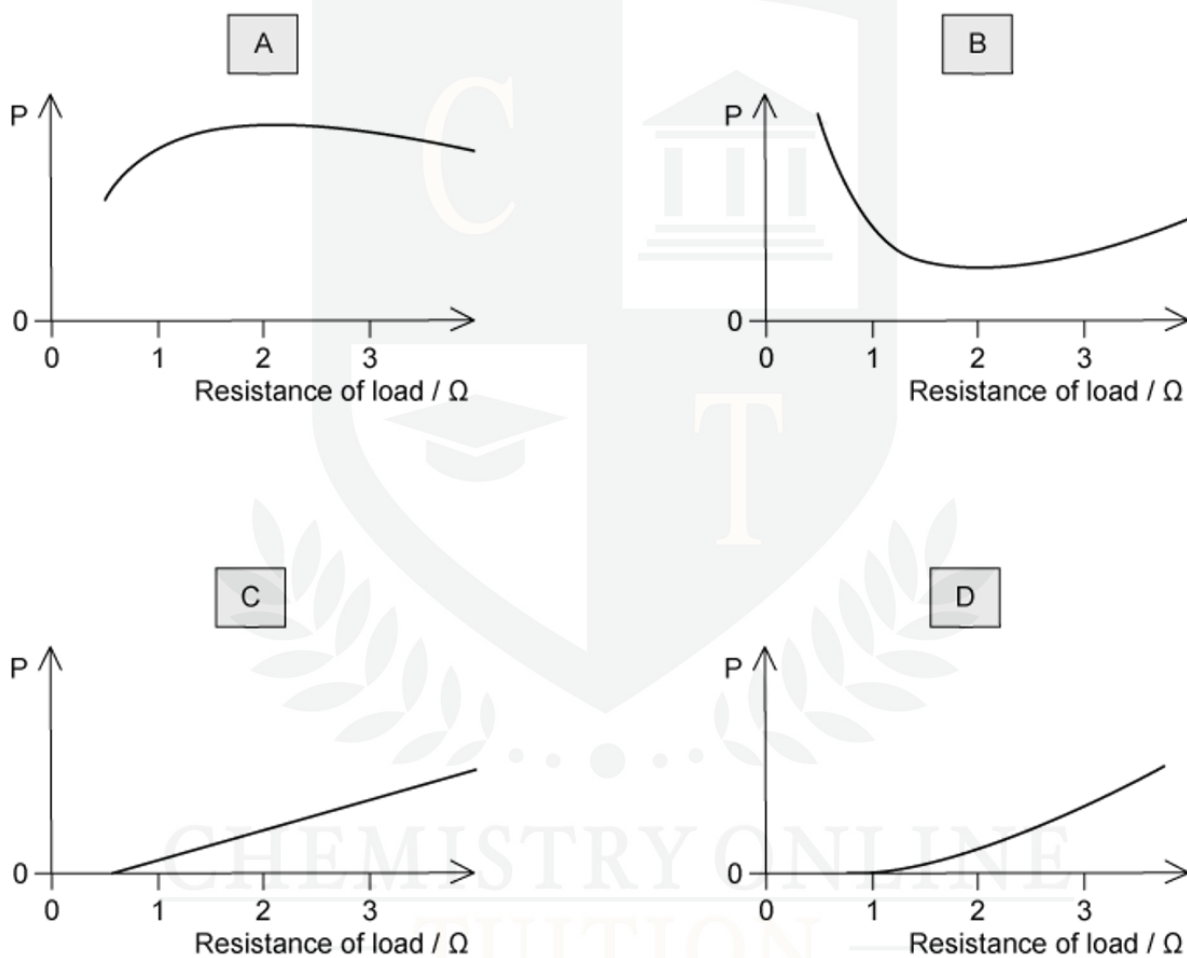
[1 mark]

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Question 10

A power supply of electromotive force (e.m.f.) 12 V and internal resistance $2\ \Omega$ is connected in series with a load resistor. The value of the load resistor is varied from $0.5\ \Omega$ to $4\ \Omega$.

Which graph shows how the power P dissipated in the load resistor varies with the resistance of the load resistor?



[1 mark]