11.2 Resistance & Resistivity

Question Paper

Course	CIE A Level Physics (9702) 2019-2021
Section	11. Current of Electricity
Topic	11.2 Resistance & Resistivity
Difficulty	Easy

Time allowed: **20**

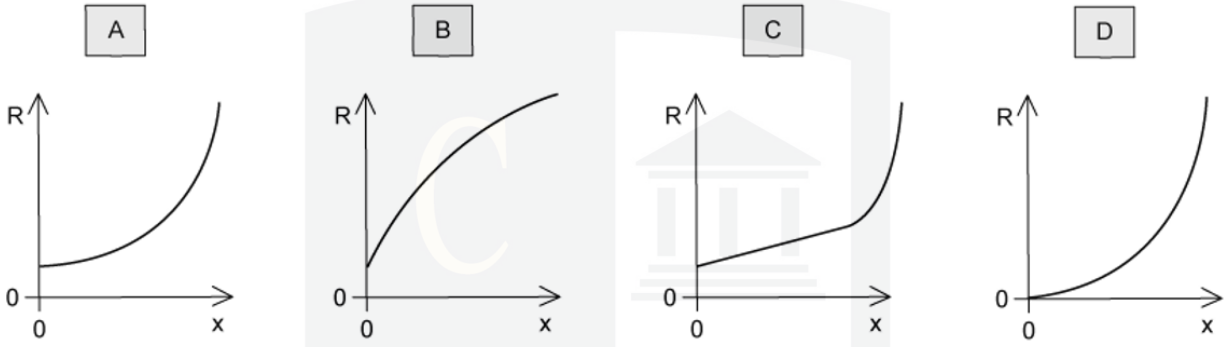
Score: **/20**

Percentage: **/100**

Question 1

When a thin metal wire is stretched, it becomes longer and thinner. This causes a change in the resistance of the wire. The volume of the wire remains constant.

Which graph could represent the variation with extension *x* of the resistance *R* of the wire?



[1 mark]

Question 2

A cylindrical wire 4.0 m long has a resistance of 31 Ω and is made of metal of resistivity 1.0×10^{-6} Ω m.

What is the radius of cross-section of the wire?

A 1.0×10^{-8} m

B 2.0×10^{-8} m

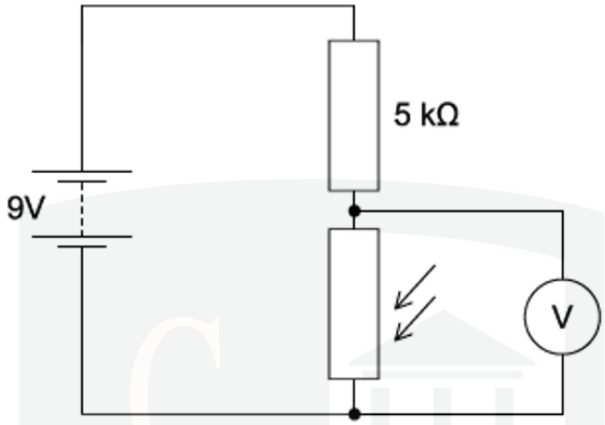
C 6.4×10^{-8} m

D 2.0×10^{-4} m

[1 mark]

Question 3

A circuit is set up with an LDR and a fixed resistor as shown.



The voltmeter reads 4 V.
The light intensity is increased.

What is a possible voltmeter reading?

A 3V **B** 4V **C** 6V **D** 8V

[1 mark]

Question 4

A power cable has length 2000 m. The cable is made of twelve parallel strands of copper wire, each with diameter 0.51 mm.

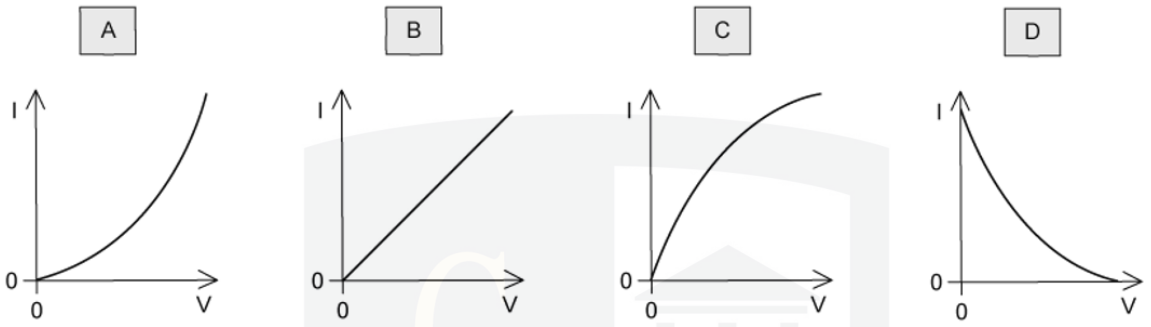
What is the resistance of the cable? (resistivity of copper = 1.7×10^{-8} Ω m)

A 0.014 Ω **B** 3.5 Ω **C** 14 Ω **D** 166 Ω

[1 mark]

Question 5

Which graph best represents the way in which the current I through a thermistor depends upon the potential difference V across it?



[1 mark]

Question 6

A copper wire is stretched so that its diameter is reduced from 1.0 mm to a uniform 0.5 mm. The resistance of the unstretched copper wire is 0.2 Ω.

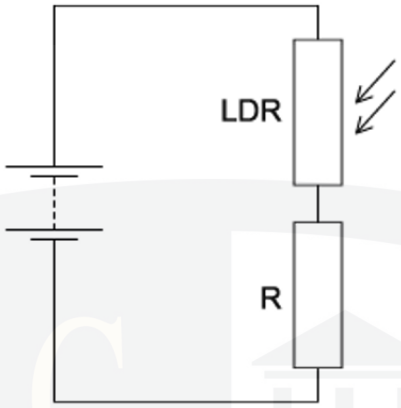
What is the resistance of the stretched wire?

A 0.4 Ω **B** 0.8 Ω **C** 1.6 Ω **D** 3.2 Ω

[1 mark]

Question 7

A light-dependent resistor (LDR) is connected in series with a resistor *R* and a battery.



The resistance of the LDR is equal to the resistance of *R* when no light falls on the LDR. When the light intensity falling on the LDR increases, which statement is correct?

A the current in *R* decreases

B the current through the LDR decreases

C the p.d. across *R* decreases

D the p.d. across the LDR decreases

[1 mark]

Question 8

The resistance of one device R_1 is designed to change with temperature; the resistance of another device R_2 is designed to change with illumination.

What are the names of these devices?

	R_1	R_2
A	thermistor	light-dependent resistor
B	thermistor	potential divider
C	semiconductor diode	light-dependent resistor
D	semiconductor diode	potential divider

[1 mark]

Question 9

A cylindrical wire of length 10 m and diameter 2.0 mm has a resistance of 0.050 Ω.

From which material is the wire made?

	material	resistivity / Ω m
A	bronze	1.6×10^{-7}
B	nichrome	1.6×10^{-6}
C	silver	1.6×10^{-8}
D	zinc	6.3×10^{-8}

[1 mark]

Question 10

The unit of resistivity, expressed in terms of base units, is given by

$$kg\ x^3\ y^{-2}\ z^{-3}$$

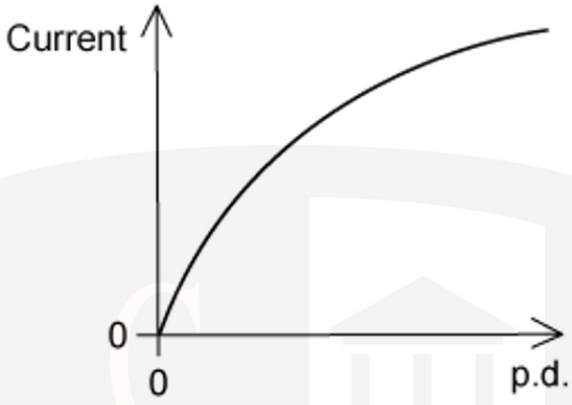
Which base units are *x*, *y* and *z*?

	x	*y*	*z*
A	ampere	metre	second
B	metre	ampere	second
C	metre	second	ampere
D	second	ampere	metre

[1 mark]

Question 11

The graph shows the variation with potential difference (p.d.) of the current in a lamp filament.



Which statement explains the shape of this graph?

A as the filament temperature rises, electrons can pass more easily through the filament

B it takes time for the filament to reach its working temperature

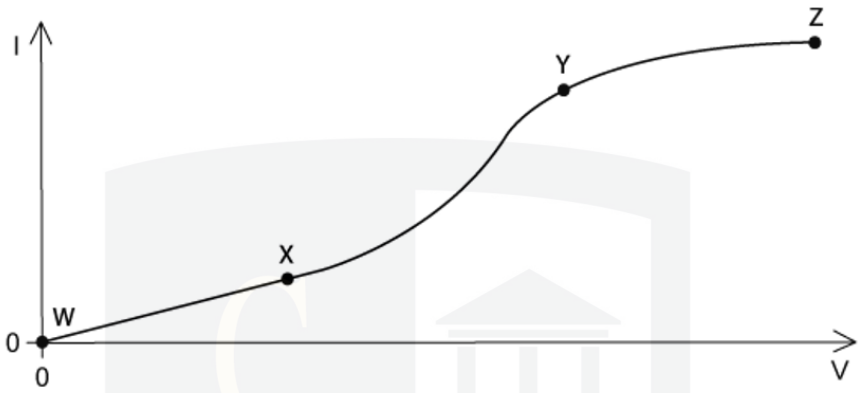
C the power output of the filament is proportional to the square of the current in it

D the resistance of the filament increases with a rise in temperature

[1 mark]

Question 12

An electrical component has a potential difference *V* across it and a current I through it. A graph of I against *V* is drawn and is marked in three sections WX, XY and YZ.



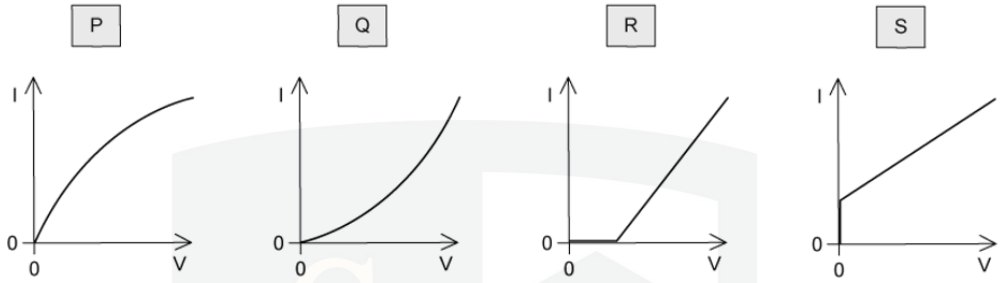
In which ways does the resistance of the component vary within each of the three sections?

	WX	XY	YZ
A	constant	decreases	increases
B	constant	increases	increases
C	increases	decreases	constant
D	increases	increases	decreases

[1 mark]

Question 13

The graphs show possible current-voltage (I–V) relationships for a filament lamp and a semiconductor diode.



Which row best specifies the correct I–V graphs for the lamp and the diode?

	filament lamp	semiconductor diode
A	P	R
B	P	S
C	Q	R
D	Q	S

[1 mark]

Question 14

What is a correct statement of Ohm's Law?

A the potential difference across a component equals the current providing the resistance and other physical conditions stay constant

B the potential difference across a component equals the current multiplied by the resistance

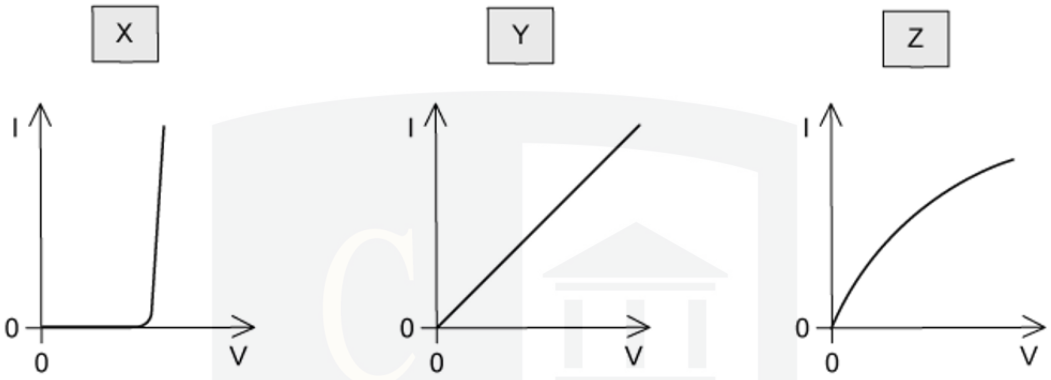
C the potential difference across a component is proportional to its resistance.

D the potential difference across a component is proportional to the current in it providing physical conditions stay constant

[1 mark]

Question 15

The graphs show the variation with potential difference V of the current I for three circuit components.



The components are a metal wire at constant temperature, a semiconductor diode and a filament lamp.

Which row of the table correctly identifies these graphs?

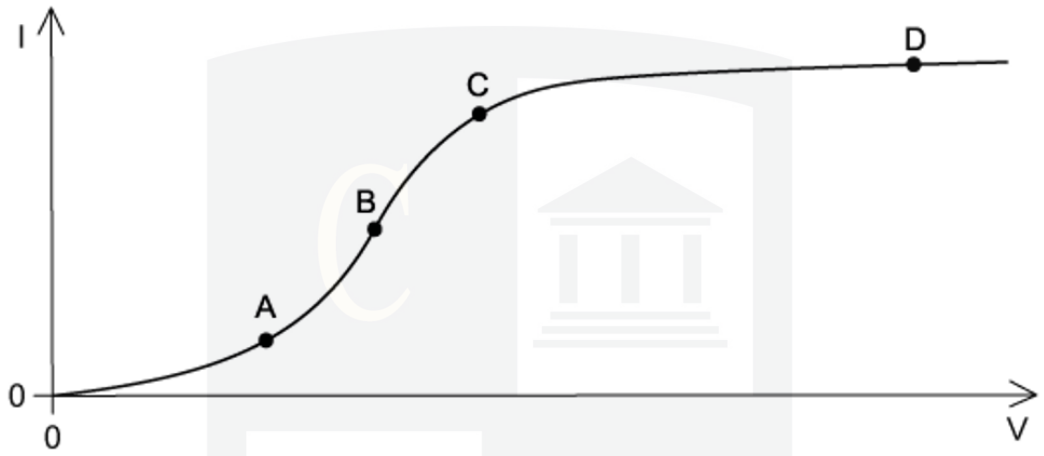
	metal wire at constant temperature	semiconductor diode	filament lamp
A	X	Z	Y
B	Y	X	Z
C	Y	Z	X
D	Z	X	Y

[1 mark]

Question 16

The graph shows how the electric current I through a conducting liquid varies with the potential difference V across it.

At which point on the graph does the liquid have the smallest resistance?



[1 mark]

Question 17

The resistance R of a resistor is determined by measuring the potential difference V across it and the current I in it. The value of R is then calculated using the equation

$$R = \frac{V}{I}$$

The values measured are V = 1.00 ± 0.05 V and I = 0.50 ± 0.01 A.

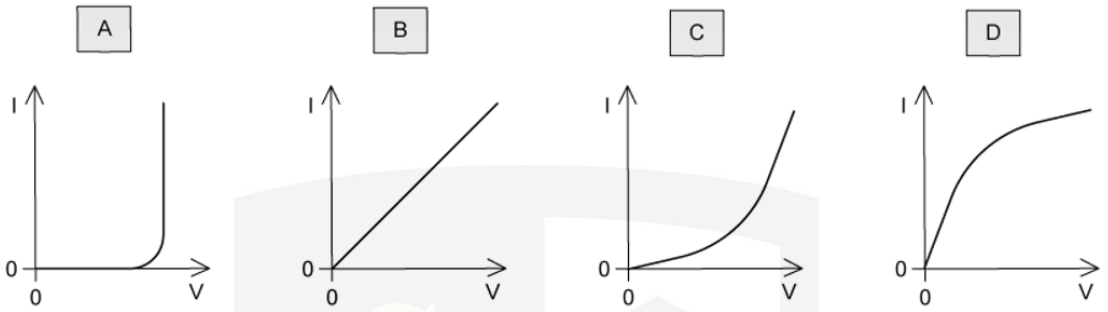
What is the percentage uncertainty in the value of R?

A 2.5 % **B** 3.0 % **C** 7.0 % **D** 10.0 %

[1 mark]

Question 18

Which graph shows the I–V characteristic of a filament lamp?



[1 mark]

Question 19

What is the unit of resistance when expressed in SI base units?

A kg m^2 s^{-2} A^{-1}

B kg m^2 s^{-3} A^{-2}

C kg m s^{-2} A^{-1}

D kg m s^{-3} A^{-1}

[1 mark]

Question 20

Which equation is used to define resistance?

A energy = (current)^2 × resistance × time

B potential difference = current × resistance

C power = (current)^2 × resistance

D resistivity = resistance × area ÷ length

[1 mark]