Higher
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Wheatstone Bridge
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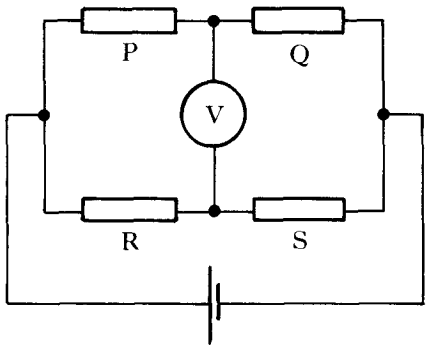
Past Paper questions
1991 - 2010

1993 Q33

The diagram below shows a **balanced** Wheatstone bridge circuit with four resistors P, Q, R and S.

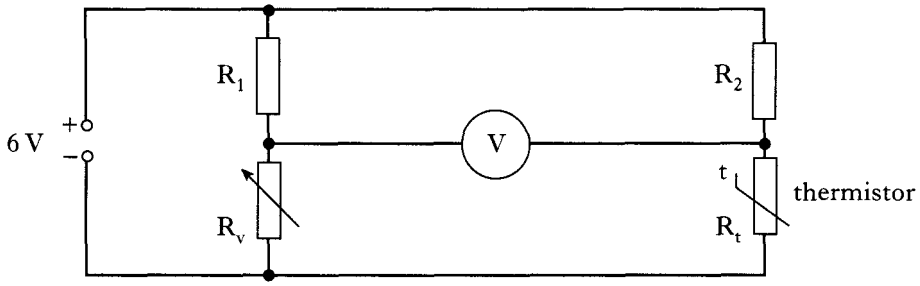


(a) Explain what is meant by a **balanced** Wheatstone bridge.

(b) After a period of use, the p.d. across the battery in the circuit decreases to half its original value.
What effect does this have on the reading on the voltmeter?
Justify your answer.

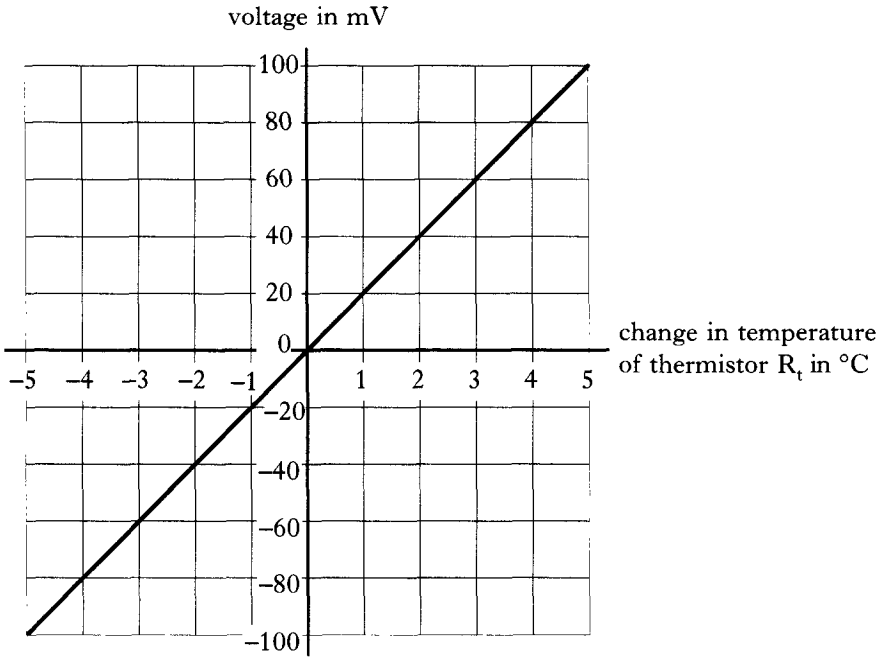
1998 Q34

The Wheatstone bridge shown below is balanced.



(a) R_1 has a resistance of 3.3 kΩ, R_2 has a resistance of 2.2 kΩ and the variable resistor R_V is set at 225 Ω. Calculate the resistance of the thermistor R_t.

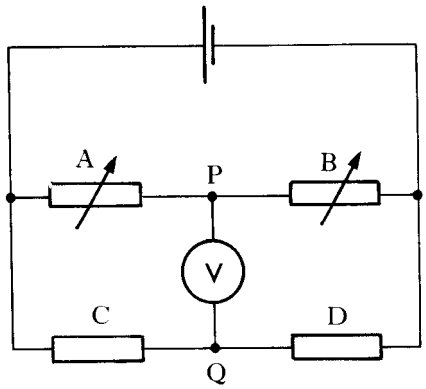
(b) The graph below shows what happens to the reading on the voltmeter as the temperature of thermistor R_t is changed.



The bridge was initially balanced at 20ºC.
The temperature of R_t is increased until the reading on the voltmeter is 80 mV.
What is the new temperature of the thermistor R_t?

1994 Q5 (b)

(b) A Wheatstone bridge circuit is shown below.



(i) How are the resistances of A, B, C and D related when the bridge is balanced,

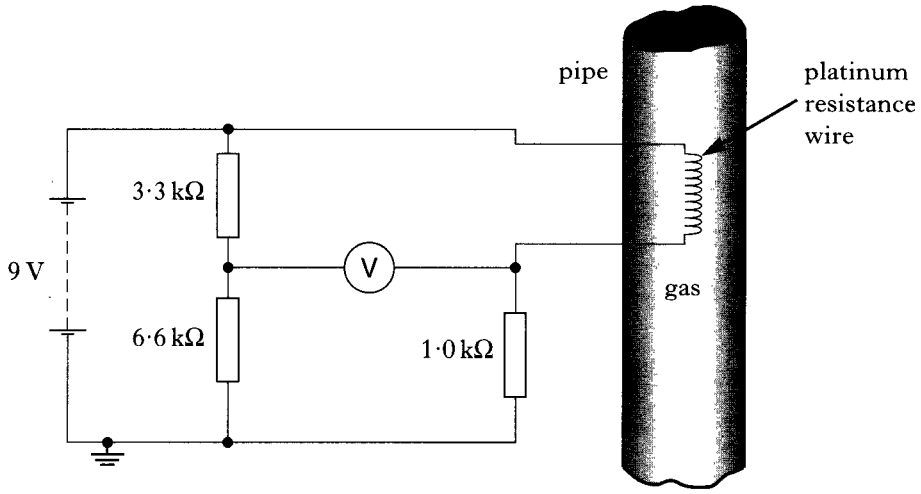
(ii) C and D are fixed resistors, each of value 120 Ω.
The resistors A and B are variable and each is initially set at 120 Ω.
The voltmeter is used to measure the p.d. between the points P and Q.
Small changes are made to the resistances of A and B, and the various values are shown in the table below.

Resistance of A/Ω	Resistance of B/Ω	Voltmeter reading/mV
120	120	
121	120	−21
121	121	
121	122	
121	119	

Copy and complete the last column of the table to show the voltmeter readings (including sign) that you would expect for each of the remaining sets of resistance values.

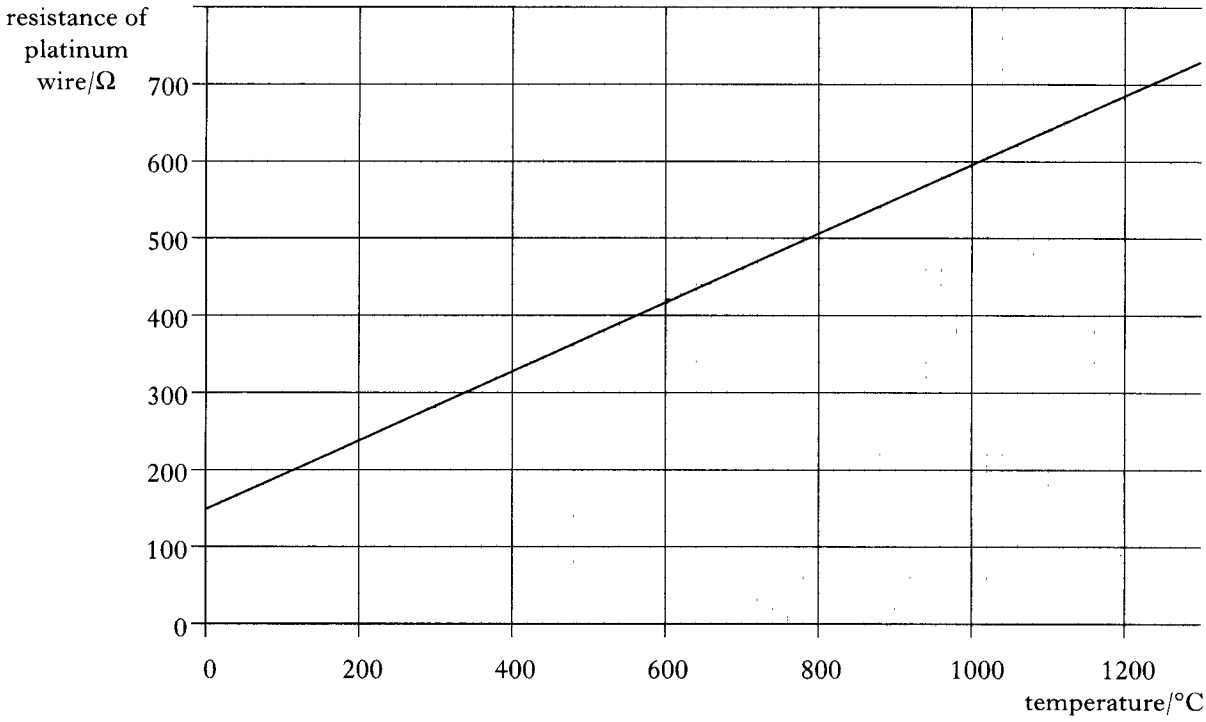
1996 Q5

A Wheatstone bridge is used to monitor the temperature of gas in a pipe.
A length of platinum resistance wire forms one part of the Wheatstone bridge circuit.
The wire is inserted into the pipe containing the gas as shown below.
The 9 V supply has negligible internal resistance.



(a) (i) The bridge is initially balanced. What is the reading on the voltmeter?
(ii) Calculate the resistance of the platinum wire.

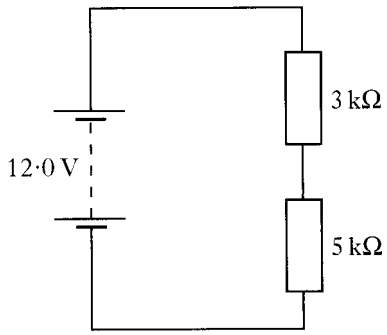
(b) The graph below shows how the resistance of the platinum wire varies with temperature.



The temperature of the gas and the platinum wire is changed to 600 ºC.
The Wheatstone bridge is now out of balance.
(i) What is the resistance of the platinum wire at 600 ºC?
(ii) Calculate the p.d. across the 1.0 kΩ resistor.
(iii) Calculate the reading on the voltmeter.

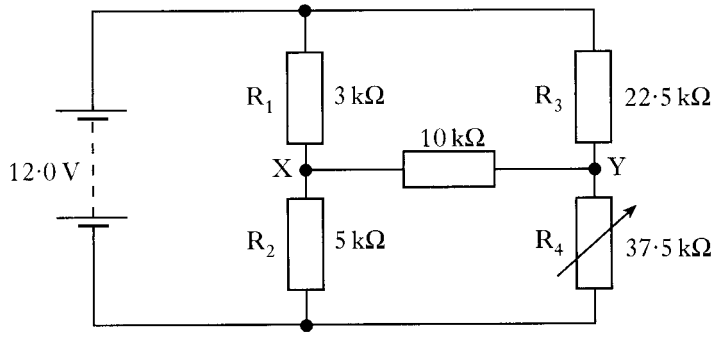
2001 Q6

A battery of e.m.f. of 12.0 V and negligible internal resistance is connected as shown in the following circuit.



(a) Calculate the p.d. across the 5 kΩ resistor.

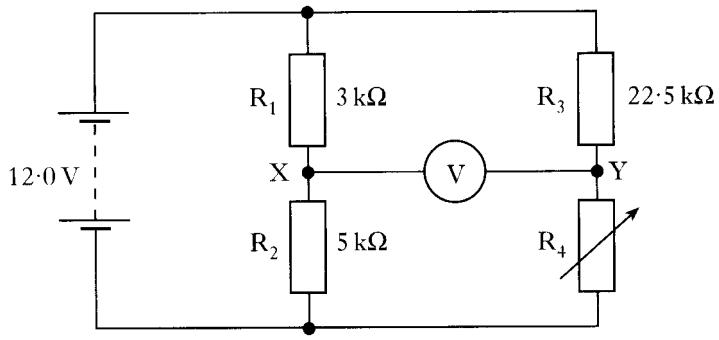
(b) Two further resistors and a variable resistor are added to the circuit to form a Wheatstone bridge circuit.



(i) What is the relationship between the resistances of R_1, R_2, R_3 and R_4 when the Wheatstone bridge is balanced?

(ii) Show by calculation that the current in the 10 kΩ resistor is zero.

(iii) The 10 kΩ resistor is now replaced by a digital voltmeter as shown.



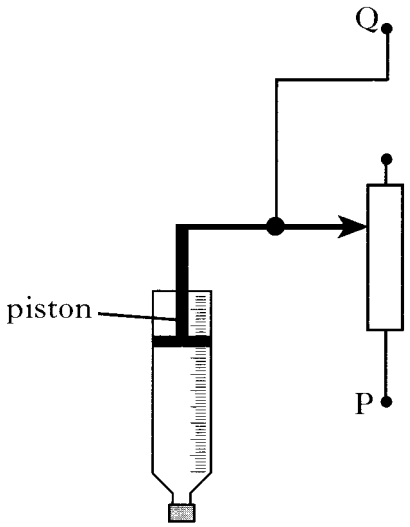
The variable resistor R_4 is set to 37.2 kΩ and the p.d. between points X and Y is measured. The resistance of R_4 is then altered to the values shown in the table.

Resistance of R_4/kΩ	*Voltmeter reading*/mV
37·2	−22·5
37·3	
37·4	
37·5	
37·6	

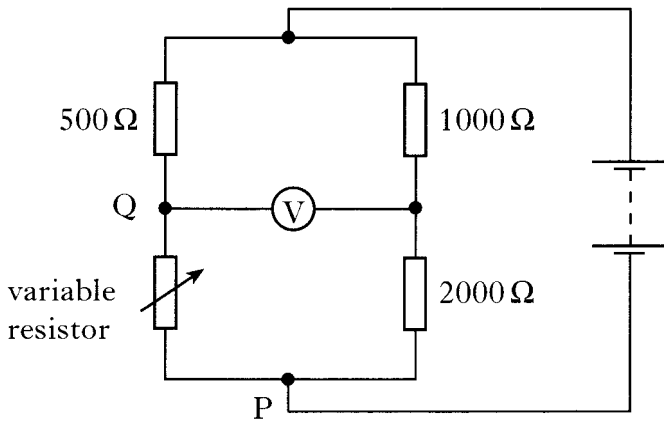
Copy the table and complete the second column to show the voltmeter readings, including sign, that would be obtained for each of the remaining resistance values.

2005 Q24. (part)

(b) An alternative to measuring the volume using the scale on the syringe, is to connect the piston of the syringe to a variable resistor.



The variable resistor forms part of the circuit shown.



The reading on the voltmeter is 0 V when the temperature of the air in the syringe is 50°C.

(i) Calculate the resistance of the variable resistor at this temperature.

(ii) The temperature of the gas in the syringe changes from just below to just above 50°C. This causes the resistance of the variable resistor to change by a small amount. Sketch a graph of the reading on the centre-zero voltmeter against the change in resistance of the variable resistor. Numerical values are not required on either axis.