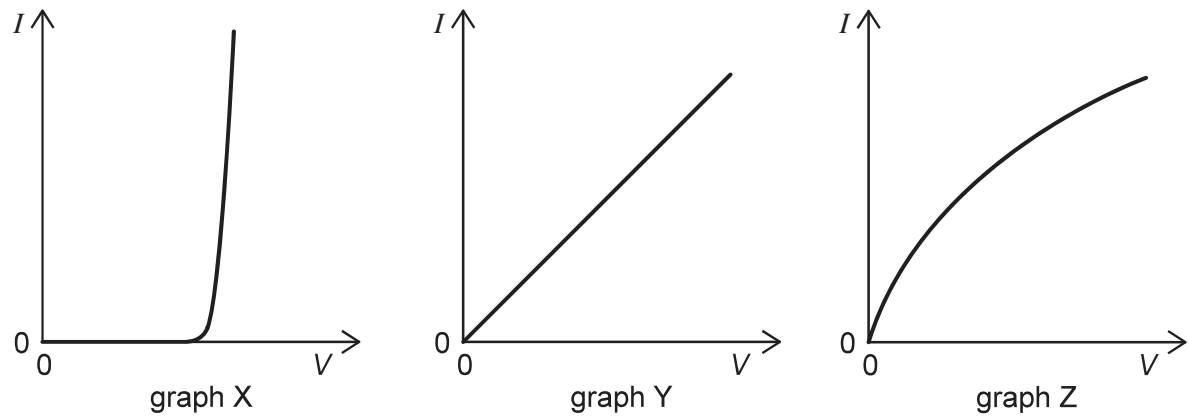


1 The graphs show the variation with potential difference V of the current I for three circuit elements.

9702/1/M/J/02/Q30



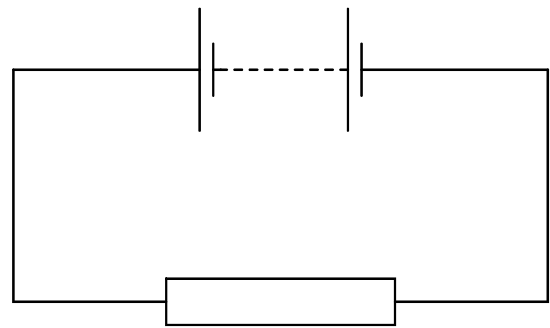
The three circuit elements are a metal wire at constant temperature, a semiconductor diode and a filament lamp.

Which row of the table correctly identifies these graphs?

	metal wire at constant temperature	semiconductor diode	filament lamp
	X	Z	Y
	Y	X	Z
	Y	Z	X
	Z	X	Y

2 In the circuit below, the battery converts an amount E of chemical energy to electrical energy when charge Q passes through the resistor in time t .

9702/1/M/J/02/Q31



Which expressions give the e.m.f. of the battery and the current in the resistor?

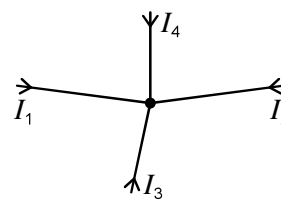
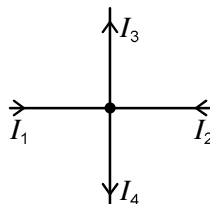
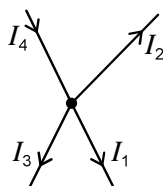
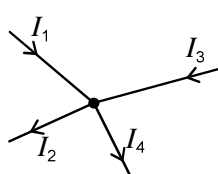
	e.m.f.	current
	EQ	Q/t
	EQ	Qt
	E/Q	Q/t
	E/Q	Qt

- 3 The diagrams show connected wires which carry currents I_1 , I_2 , I_3 and I_4 .

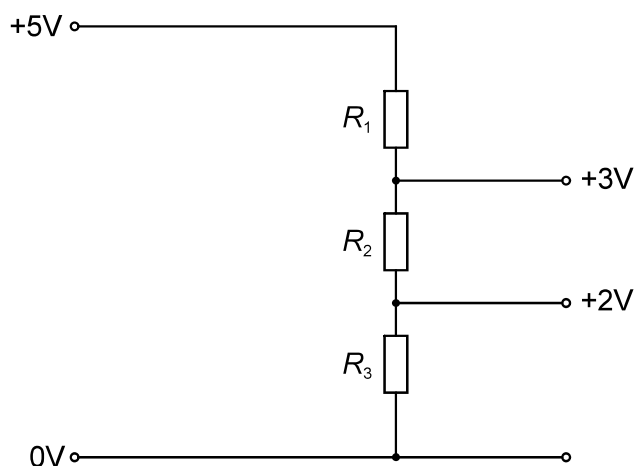
9702/1/M/J/02/Q33

The currents are related by the equation $I_1 + I_2 = I_3 + I_4$.

To which diagram does this equation apply?



- 4 A potential divider is used to give outputs of 2 V and 3 V from a 5 V source, as shown. 9702/1/M/J/02/Q35



What are possible values for the resistances R_1 , R_2 and R_3 ?

	$R_1/\text{k}\Omega$	$R_2/\text{k}\Omega$	$R_3/\text{k}\Omega$
	2	1	5
	3	2	2
	4	2	4
	4	6	10

- 5 Which equation is used to define resistance?

9702/1/O/N/02/Q30

power = (current)² resistance

resistivity = resistance area ÷ length

potential difference = current resistance

energy = (current)² resistance time

- 6 When four identical lamps P, Q, R and S are connected as shown in diagram 1, they have normal brightness.

9702/1/M/J/02/Q34

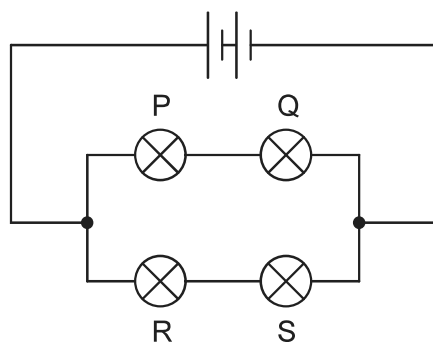


diagram 1

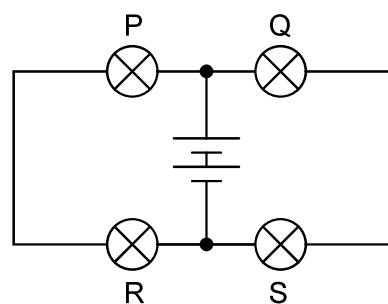


diagram 2

When the four lamps are connected as shown in diagram 2, which statement is correct?

- The lamps do not light.
- The lamps are less bright than normal.
- The lamps have normal brightness.
- The lamps are brighter than normal.

- 7 The filament of a 240 V, 100 W electric lamp heats up from room temperature to its operating temperature. As it heats up, its resistance increases by a factor of 16.

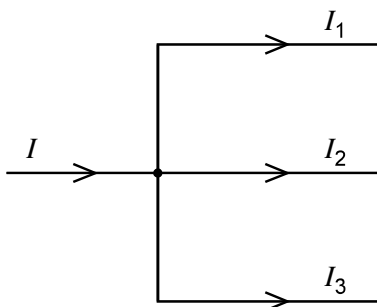
9702/1/M/J/02/Q32

What is the resistance of this lamp at room temperature?

- 36 Ω 580 Ω 1.5 k Ω 9.2 k Ω

- 8 At a circuit junction, a current I divides into currents I_1 , I_2 and I_3 .

9702/1/O/N/02/Q33



These currents are related by the equation

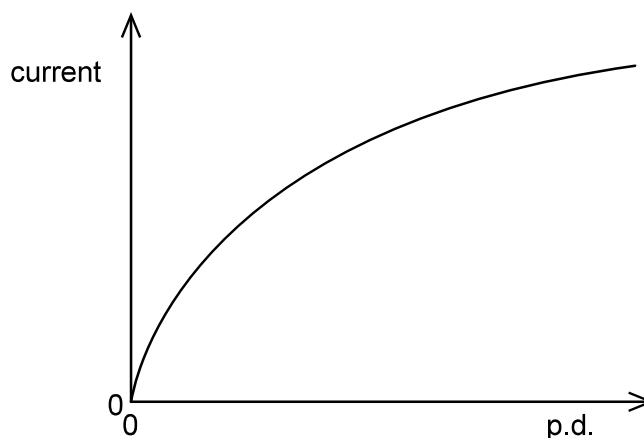
$$I = I_1 + I_2 + I_3.$$

Which law does this statement illustrate and on what principle is the law based?

- Kirchhoff's first law based on conservation of charge
- Kirchhoff's first law based on conservation of energy
- Kirchhoff's second law based on conservation of charge
- Kirchhoff's second law based on conservation of energy

- 9 The graph shows how the current through a lamp filament varies with the potential difference across it.

9702/1/O/N/02/Q31



Which statement explains the shape of this graph?

- As the filament temperature rises, electrons can pass more easily through the filament.
- It takes time for the filament to reach its working temperature.
- The power output of the filament is proportional to the square of the current through it.
- The resistance of the filament increases with a rise in temperature.

- 10 The combined resistance R_T of two resistors of resistances R_1 and R_2 connected in parallel is given by the formula

9702/1/O/N/02/Q34

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$$

Which statement is used in the derivation of this formula?

- The currents through the two resistors are equal.
- The potential difference across each resistor is the same.
- The supply current is split between the two resistors in the same ratio as the ratio of their resistances.
- The total power dissipated is the sum of the powers dissipated in the two resistors separately.

- 11 The sum of the electrical currents into a point in a circuit is equal to the sum of the currents out of the point.

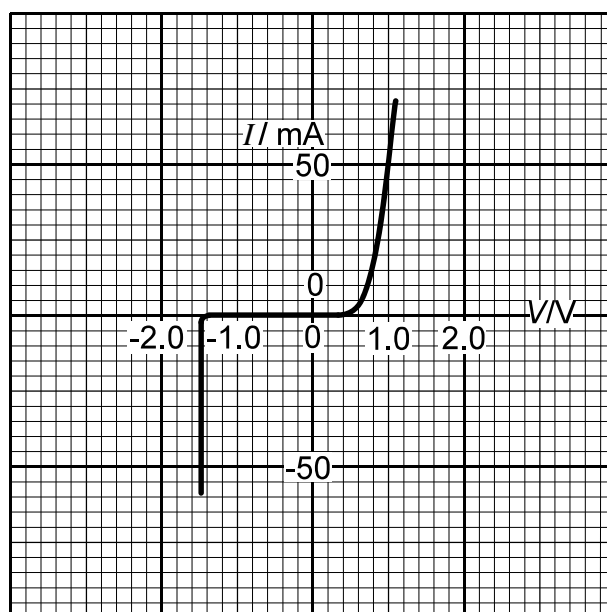
9702/01/M/J/03/Q31

Which of the following is correct?

- This is Kirchhoff's first law, which results from the conservation of charge.
- This is Kirchhoff's first law, which results from the conservation of energy.
- This is Kirchhoff's second law, which results from the conservation of charge.
- This is Kirchhoff's second law, which results from the conservation of energy.

- 12 The variation with potential difference V of the current I in a semiconductor diode is shown below.

9702/1/O/N/02/Q32

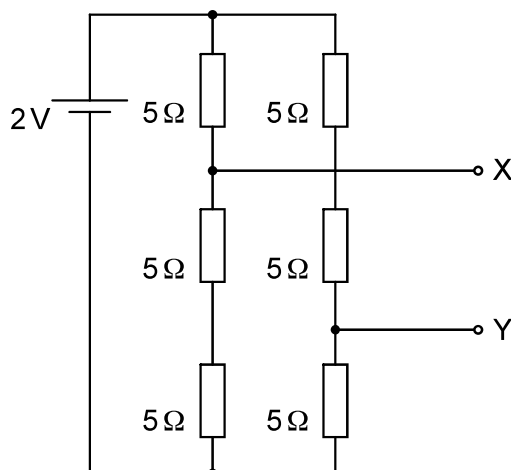


What is the resistance of the diode for applied potential differences of $+1.0\text{ V}$ and -1.0 V ?

	resistance	
	at $+1.0\text{ V}$	at -1.0 V
	$20\ \Omega$	infinite
	$20\ \Omega$	zero
	$0.05\ \Omega$	infinite
	$0.05\ \Omega$	zero

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

9702/1/O/N/02/Q36



What is the potential difference between terminals X and Y?

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

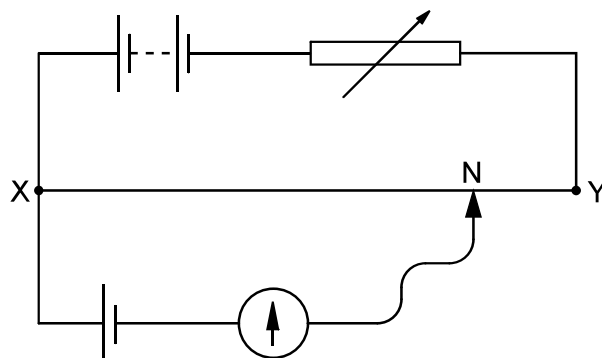
$$\frac{8}{9}\text{ V}$$

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

$$2\text{ V}$$

- 14** In the potentiometer circuit below, the moveable contact is placed at N on the bare wire XY, such that the galvanometer shows zero deflection.

9702/11/O/N/02/Q35



The resistance of the variable resistor is now increased.

What is the effect of this increase on the potential difference across the wire XY and on the position of the moveable contact for zero deflection?

	potential difference across XY	position of moveable contact
	increases	nearer to X
	increases	nearer to Y
	decreases	nearer to X
	decreases	nearer to Y

- 15** The current in a component is reduced uniformly from 100 mA to 20 mA over a period of 8.0 s .

9702/01/M/J/03/Q30

What is the charge that flows during this time?

160 mC

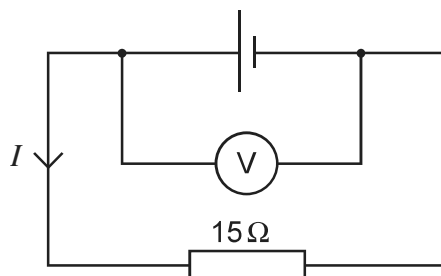
320 mC

480 mC

640 mC

- 16** The e.m.f. of the cell in the following circuit is 9.0 V . The reading on the high-resistance voltmeter is 7.5 V .

9702/01/M/J/08/Q32



What is the current I ?

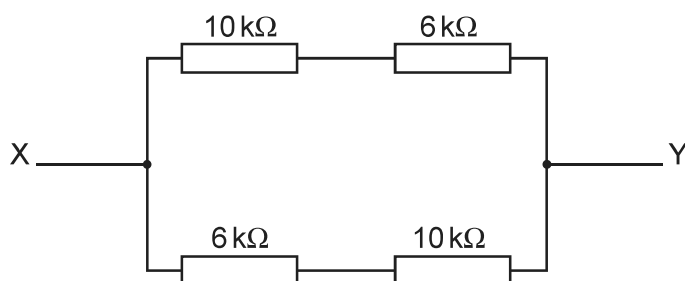
0.1 A

0.5 A

0.6 A

2.0 A

- 17 The diagram shows an arrangement of four resistors.

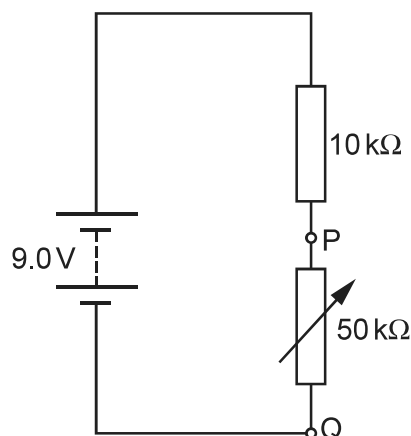


What is the resistance between X and Y?

- 4 kΩ 8 kΩ 16 kΩ 32 kΩ

- 18 The diagram shows a potential divider connected to a 9.0 V supply of negligible internal resistance.

9702/01/M/J/03/Q34



What range of voltages can be obtained between P and Q?

- zero to 1.5 V
zero to 7.5 V
1.5 V to 7.5 V
1.5 V to 9.0 V

- 19 A wire carries a current of 2.0 amperes for 1.0 hour.

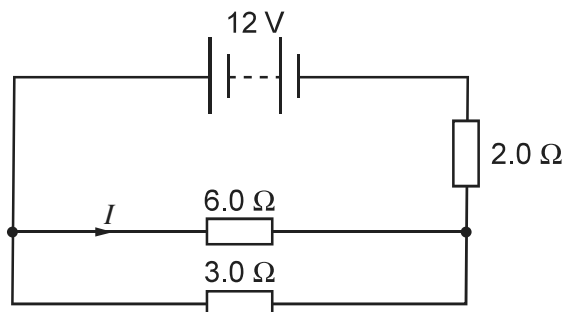
9702/01/O/N/03/Q30

How many electrons pass a point in the wire in this time?

- 1.2 10^{-15}
7.2 10^3
1.3 10^{19}
4.5 10^{22}

20 The diagram shows a circuit in which the battery has negligible internal resistance.

9702/01/O/N/03/Q31



What is the value of the current I ?

1.0 A

1.6 A

2.0 A

3.0 A

21

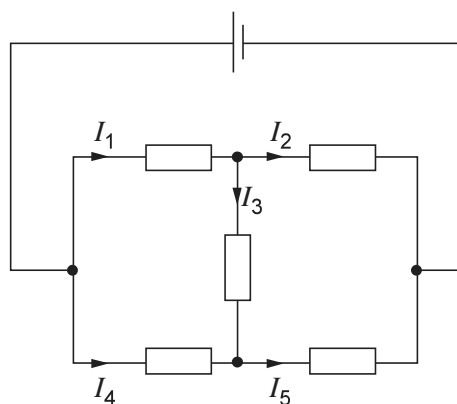
/Q31

—

—

22 The diagram shows currents I_1 , I_2 , I_3 , I_4 and I_5 in different branches of a circuit.

9702/01/O/N/03/Q32



Which one of the following is correct?

$$I_1 = I_2 + I_3$$

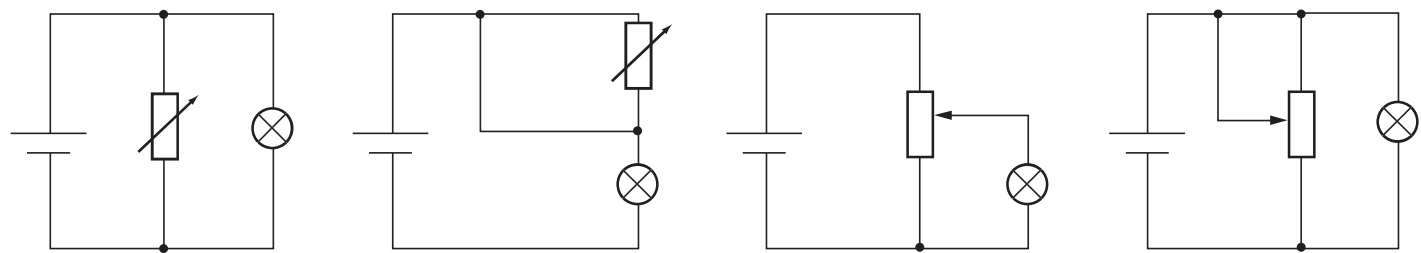
$$I_2 = I_1 + I_3$$

$$I_3 = I_4 + I_5$$

$$I_4 = I_5 + I_3$$

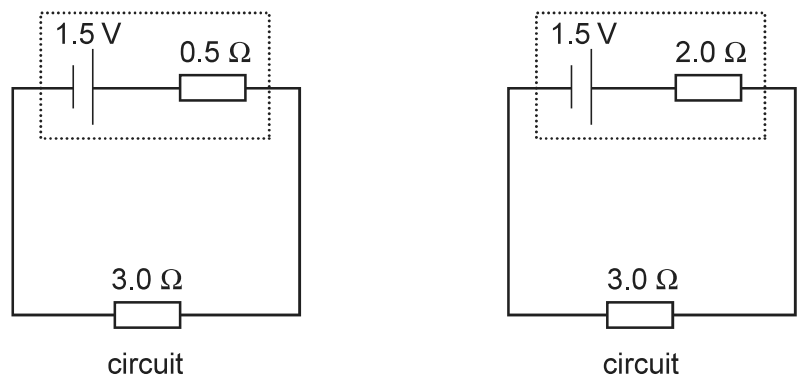
23 Which diagram shows a potential divider circuit that can vary the voltage across the lamp?

9702/01/O/N/03/Q33



24 The diagram shows two circuits. In these circuits, only the internal resistances differ.

9702/01/O/N/03/Q34



Which line in the table is correct?

	potential difference across $3.0\ \Omega$ resistor	power dissipated in $3.0\ \Omega$ resistor
	greater in X than in Y	less in X than in Y
	greater in X than in Y	greater in X than in Y
	less in X than in Y	less in X than in Y
	less in X than in Y	greater in X than in Y

25

/Q32

26

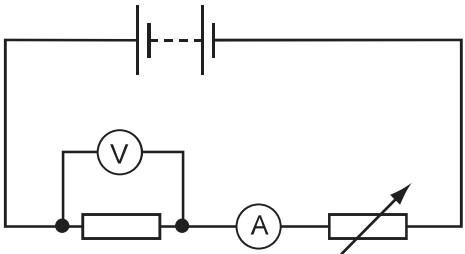
/Q34

27

/Q33

28

/Q35



--	--	--	--

29

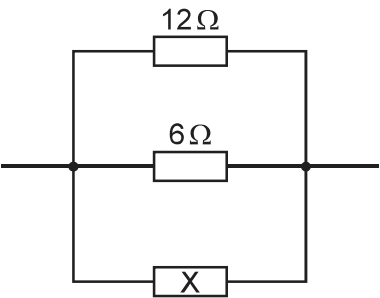
/Q36

--	--	--	--

30

Ω

/Q37



Ω

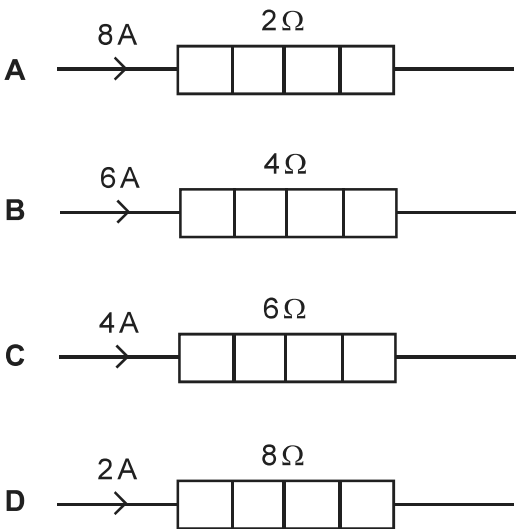
Ω

Ω

Ω

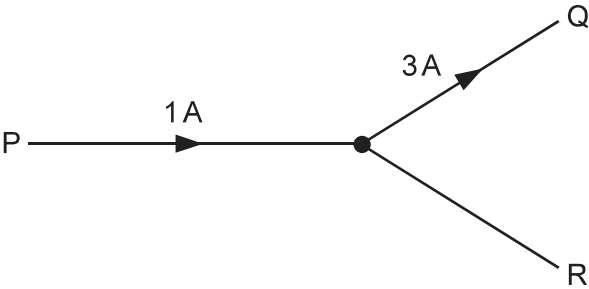
31

/Q32



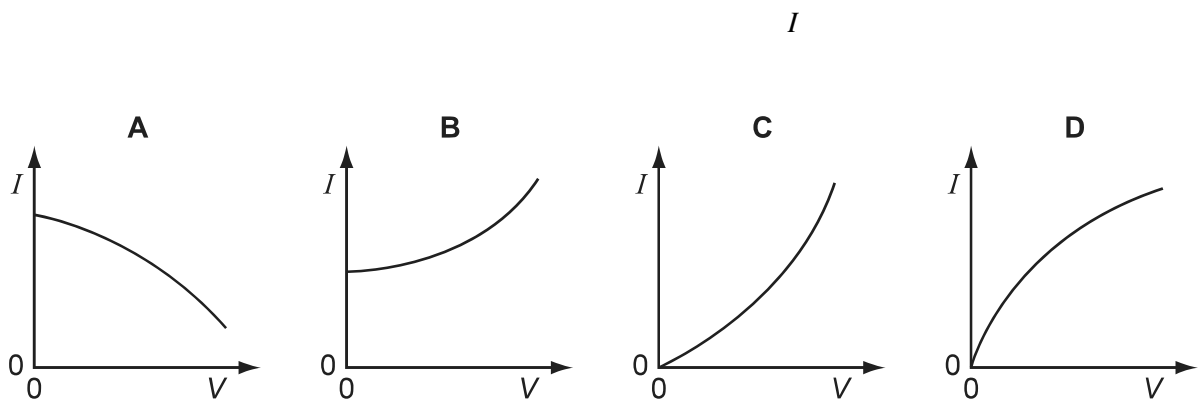
32

/Q35



33

/Q34



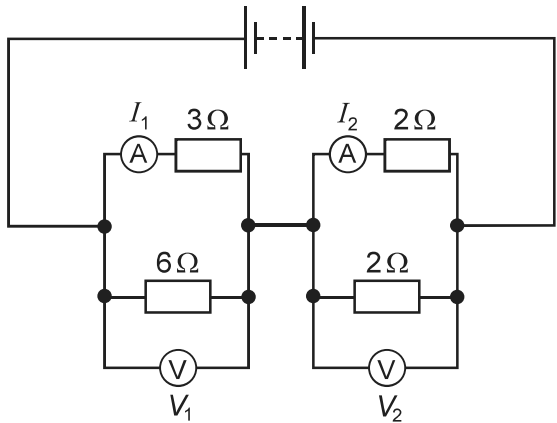
34

/Q33



35 I

/Q37

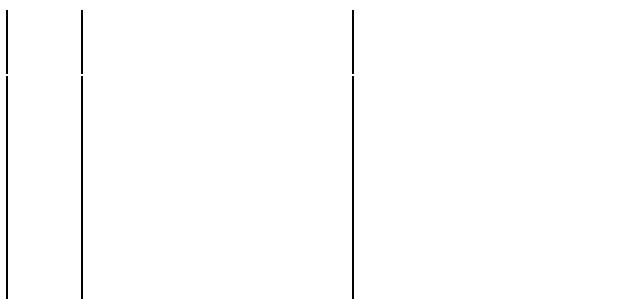
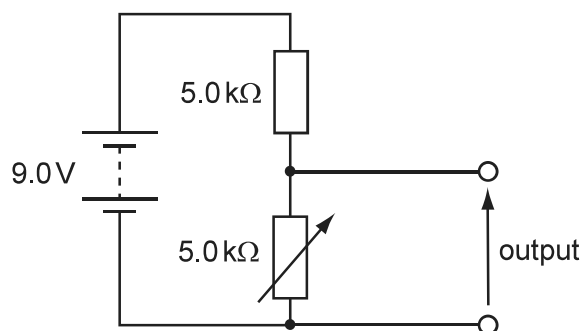


$I \quad I$

$I \quad I$
 $I \quad I$
 $I \quad I$
 $I \quad I$

36

/Q36



37

/Q32

38

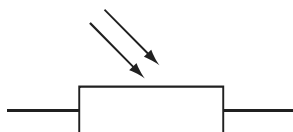
 I

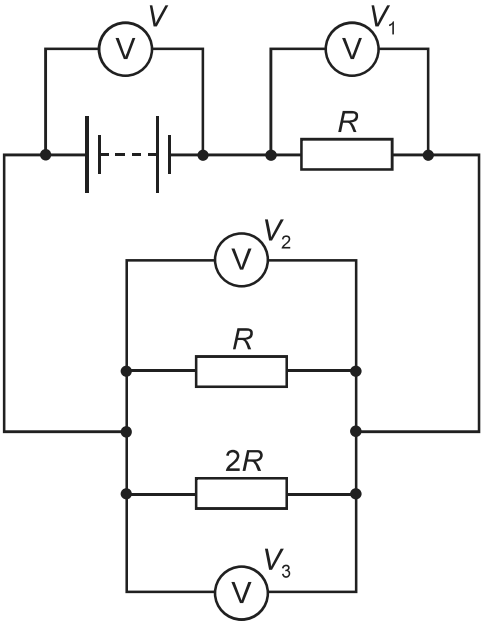
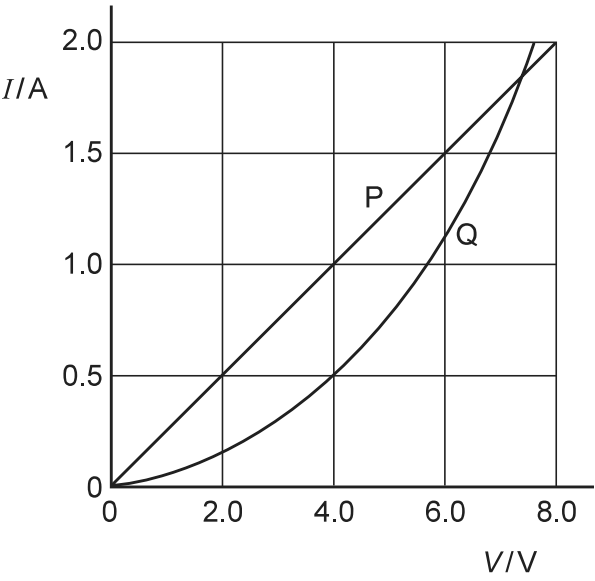
/Q33

—

39

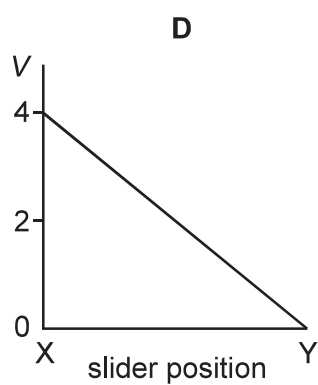
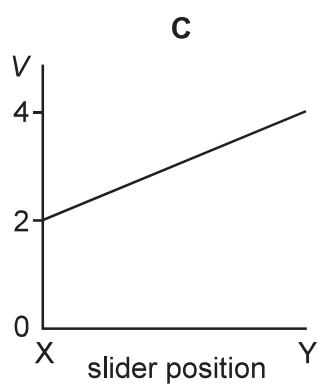
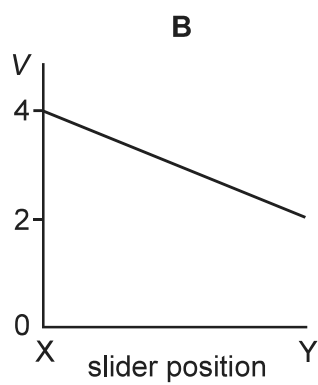
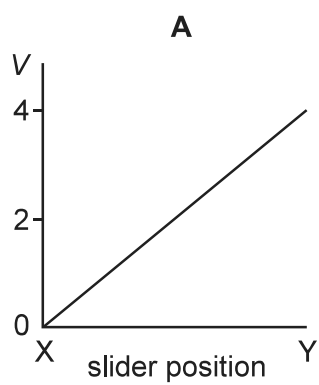
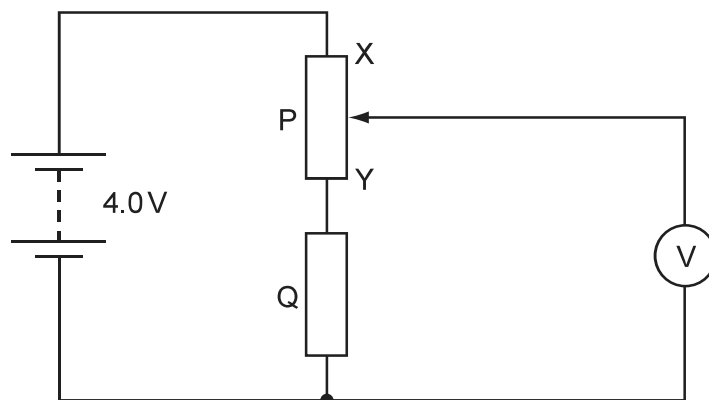
/Q35





42 *I* Ω Ω

/Q37



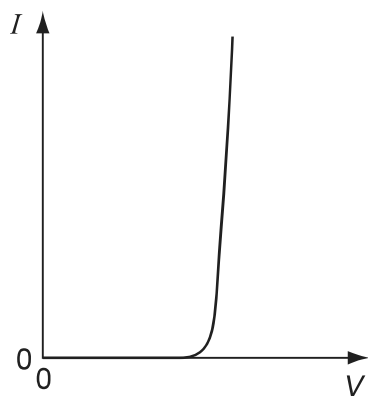
43

/Q32

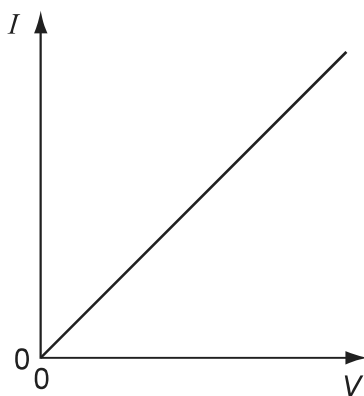
44

I

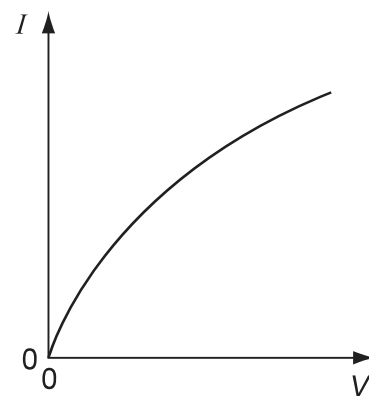
/Q32



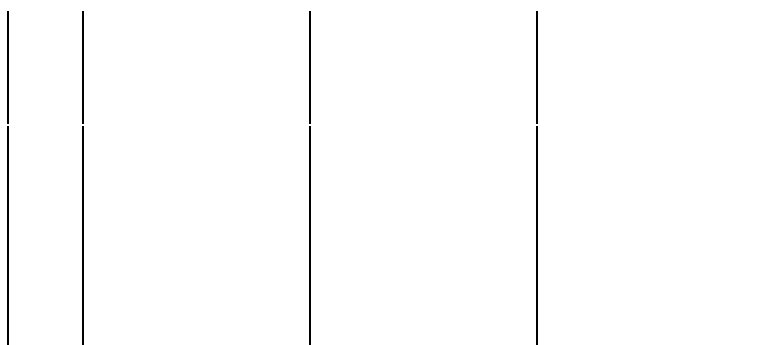
graph X



graph Y

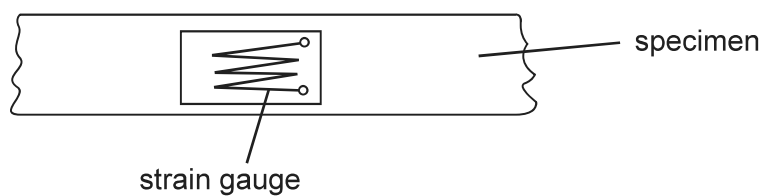


graph Z



45

/Q33

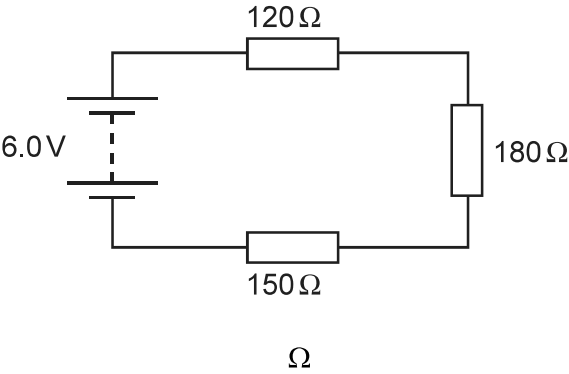
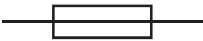
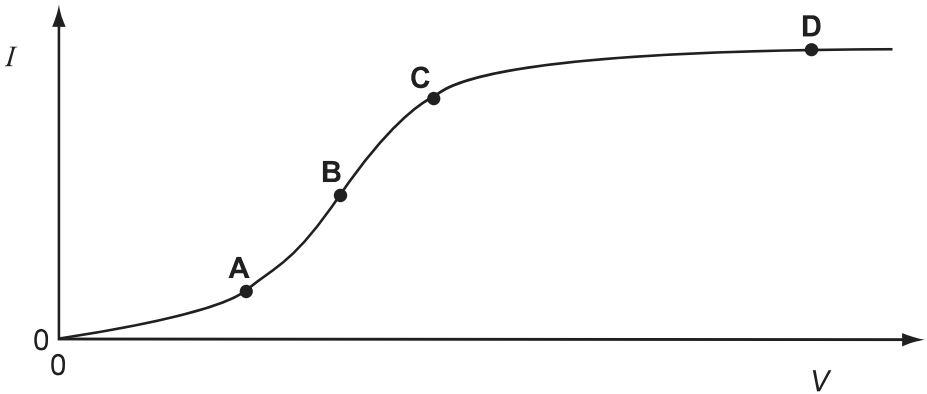


I

I

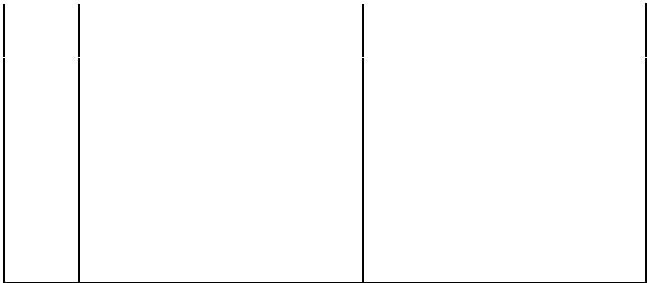
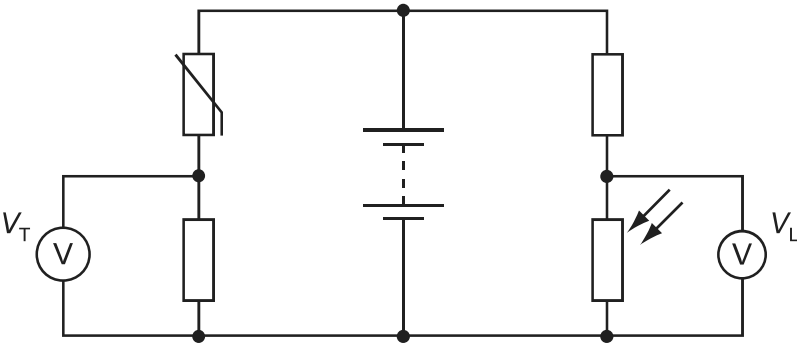
I

I



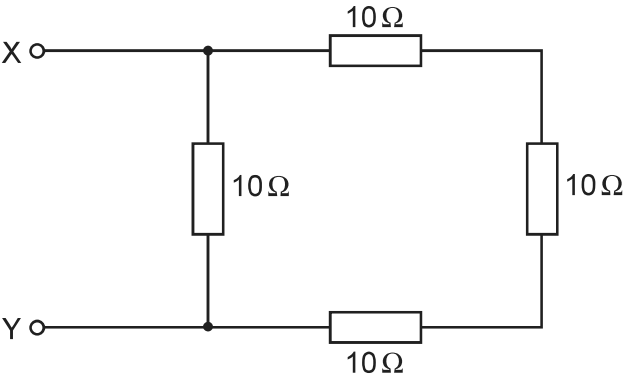
50 *I*

/Q37



51

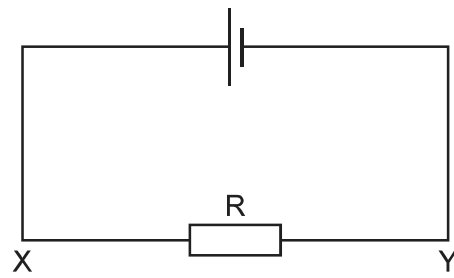
/Q35



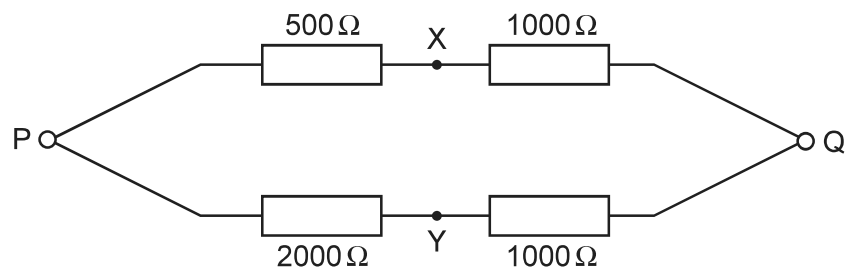
Ω
 Ω Ω
 Ω Ω

Ω

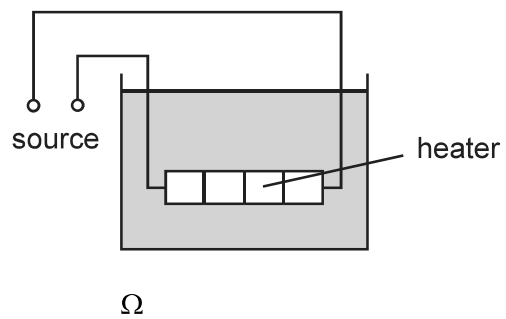
52



53



54



Ω.

55

/Q36

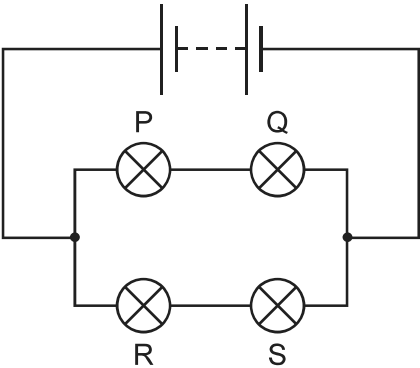


diagram 1

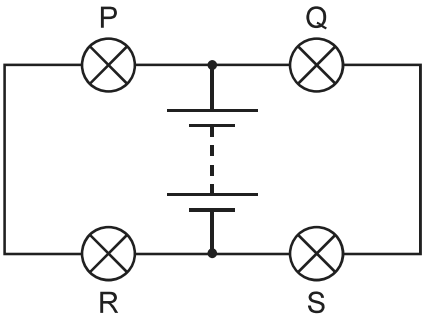
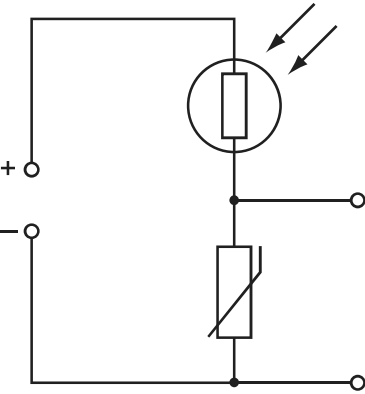


diagram 2

56

/Q37

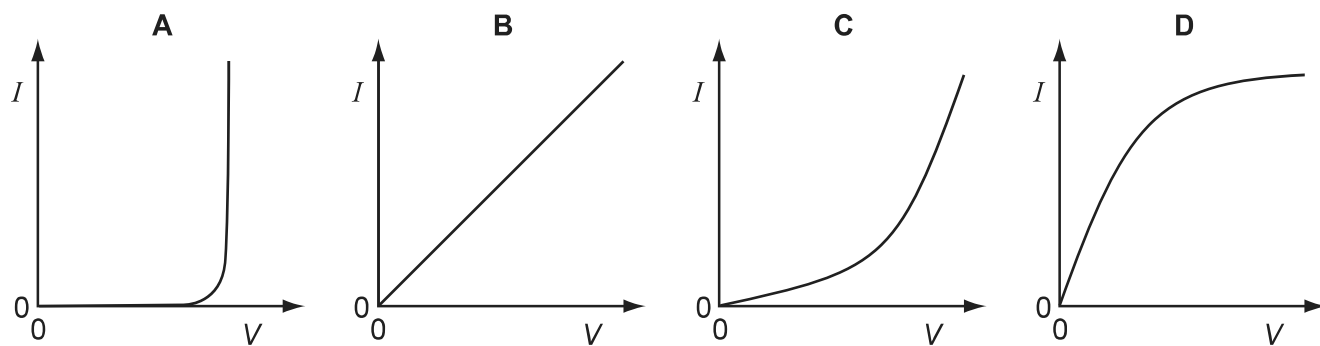


--	--	--	--

57

 I

/Q32

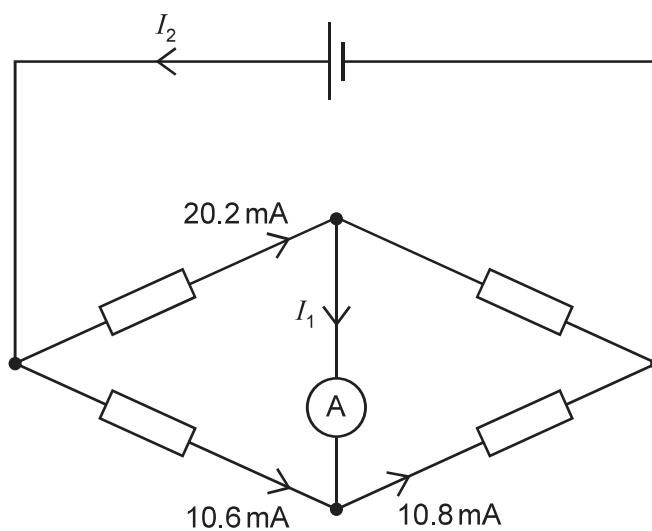


58

/Q35

59

/Q36

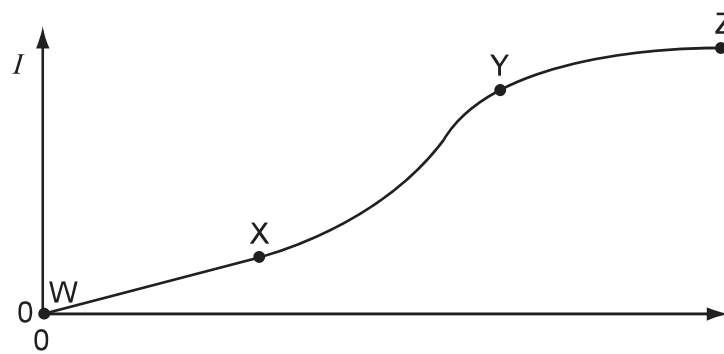
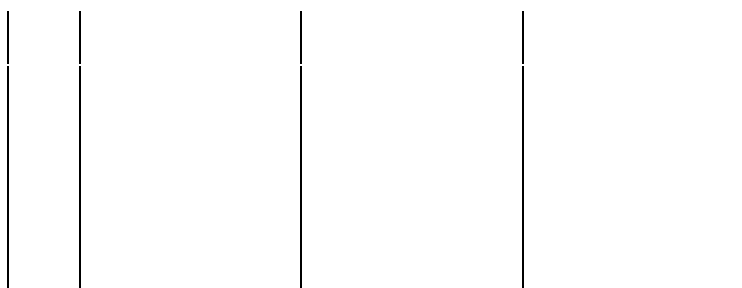


I		I	
	I		I

60

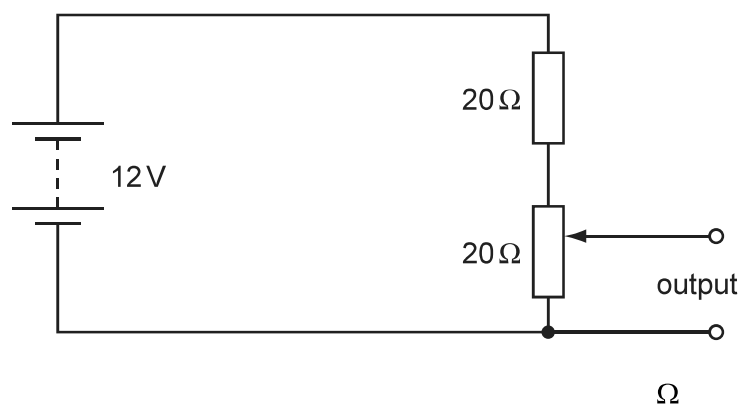
 I I

/Q33

 I 

61

/Q34



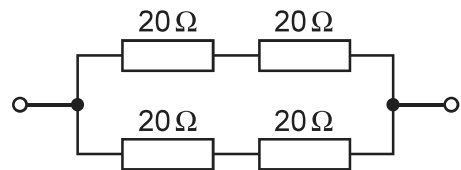
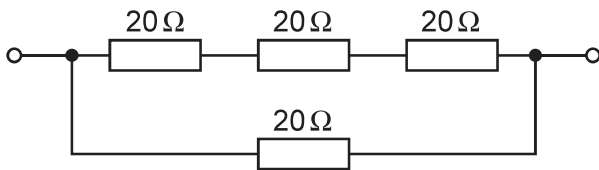
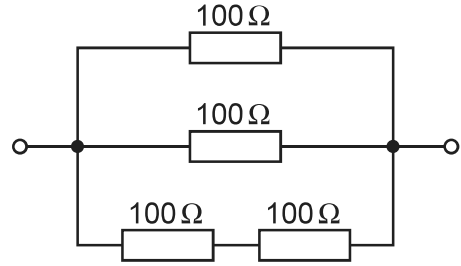
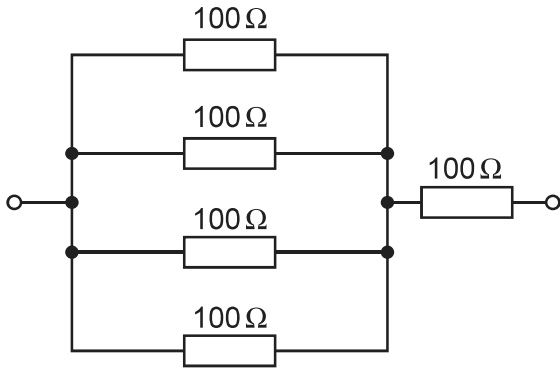
62

/Q32

63

Ω

/Q37

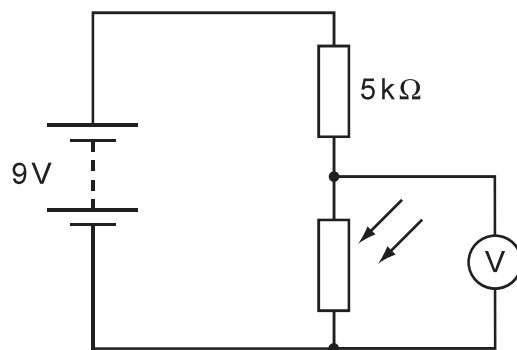


64

/Q31

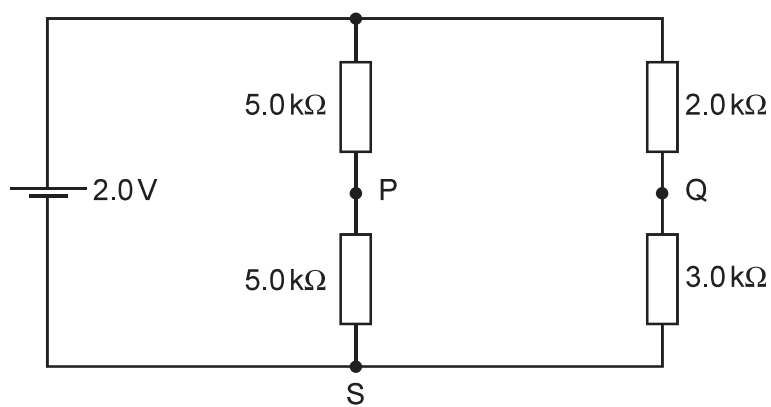
65

/Q34



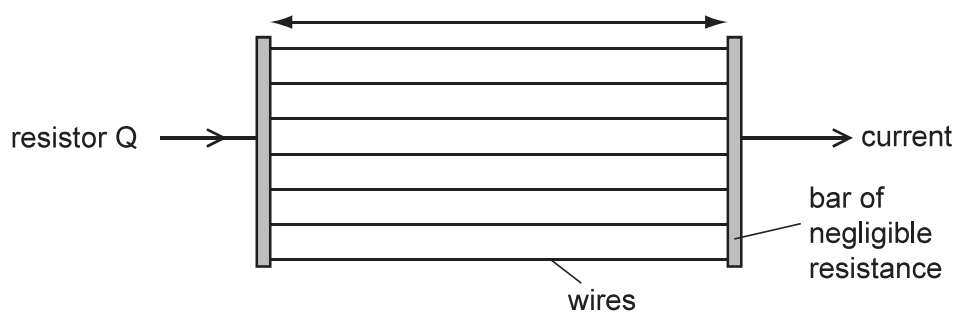
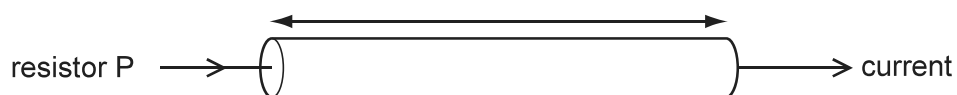
66

/Q33



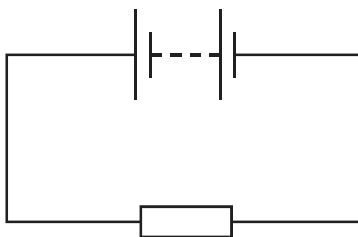
67

/Q37



68 *I*

/Q35

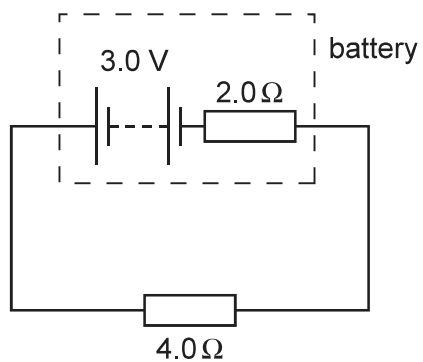


--	--	--	--

69

 Ω

/Q36

 Ω

--	--	--	--

70

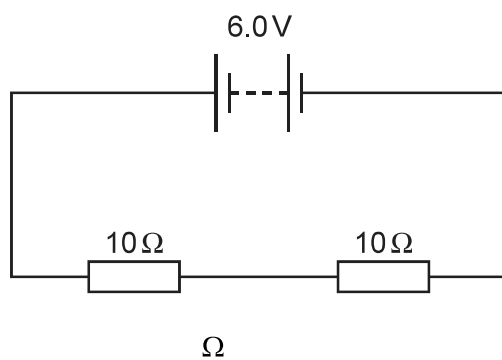
/Q31

—

71

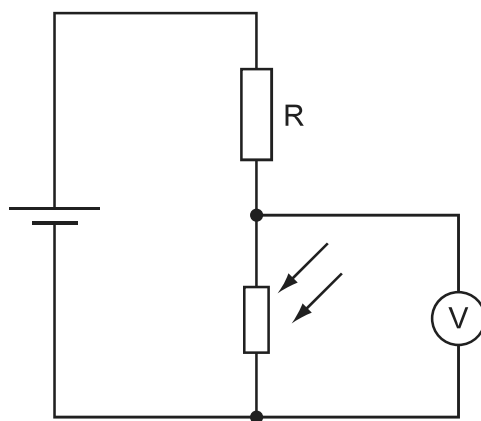
 Ω

/Q30



72

/Q32



73

 I

/Q32

 $-I$

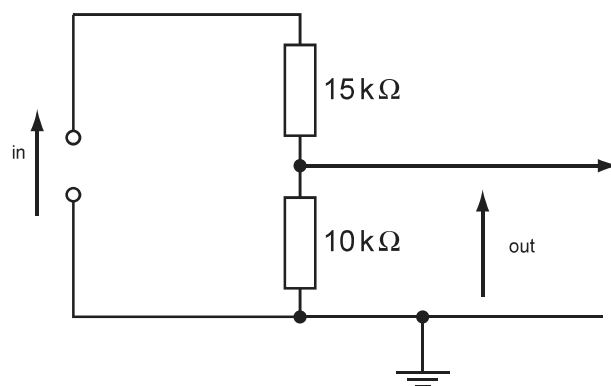
—

—

74

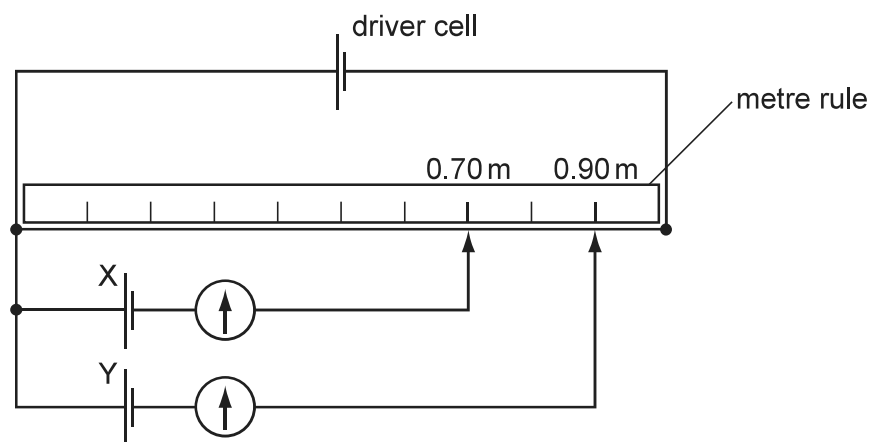
I

/Q33



75

/Q34

*I*

76

/Q28

diagram 1

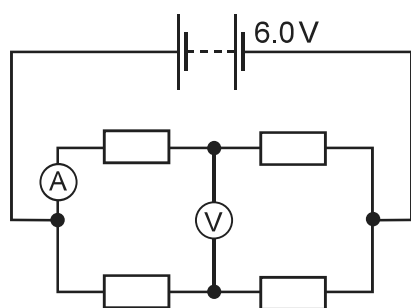
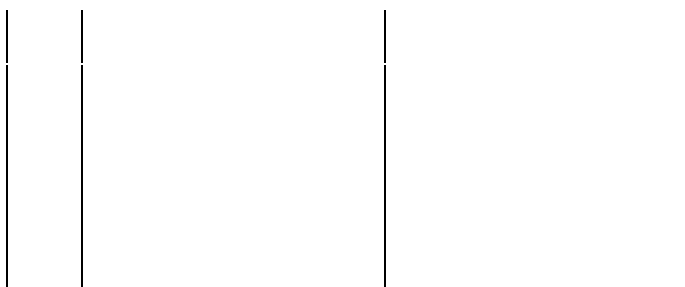
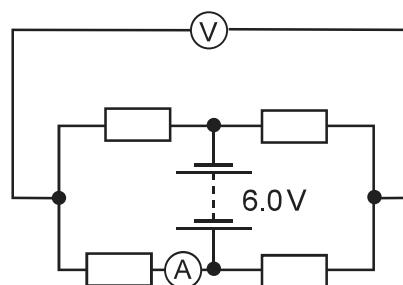


diagram 2

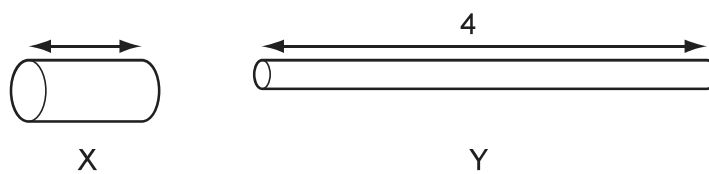


78

/Q33

79

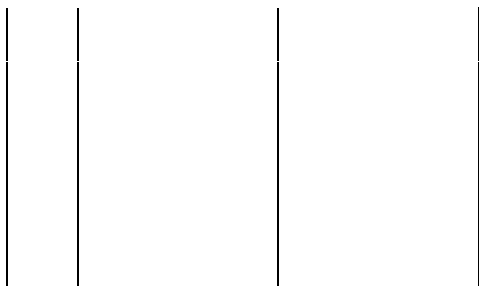
/Q34



80

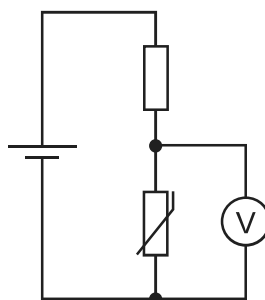
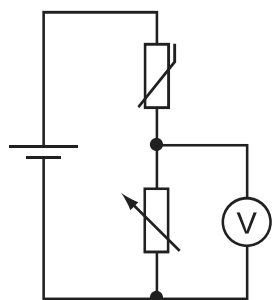
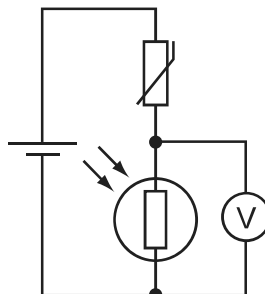
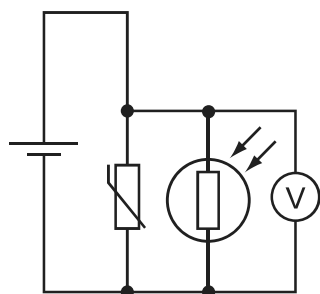
/Q34

81



82

/Q36

 I 

83

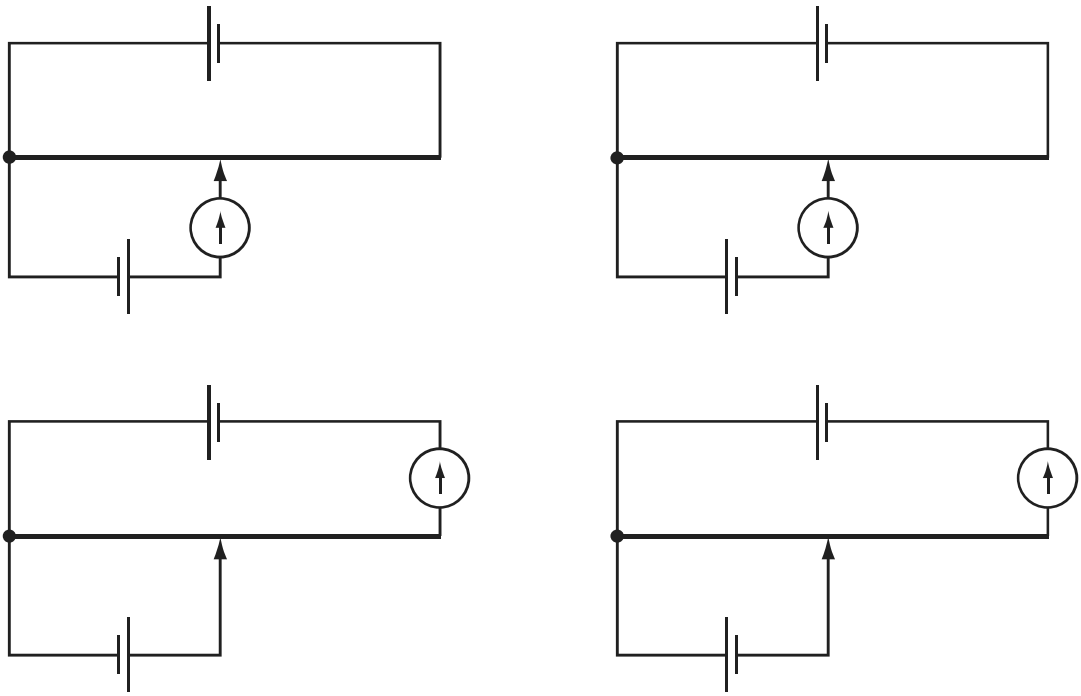
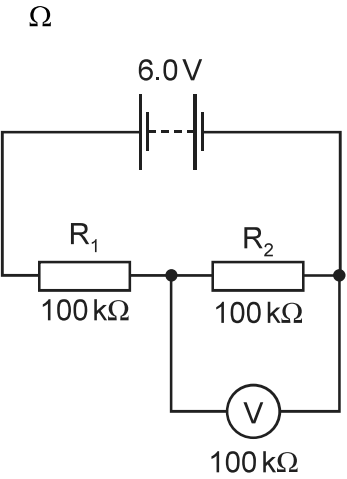
/Q31

—

—

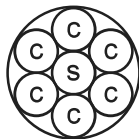
—

—



87

/Q32



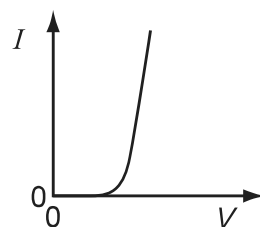
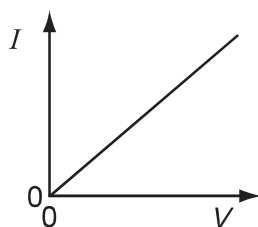
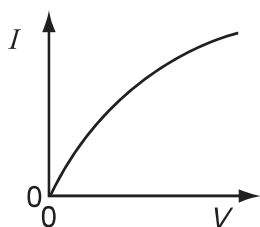
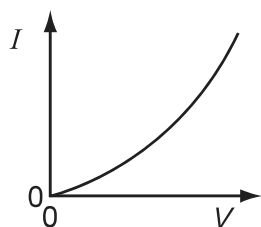
Ω Ω

Ω Ω Ω Ω

88

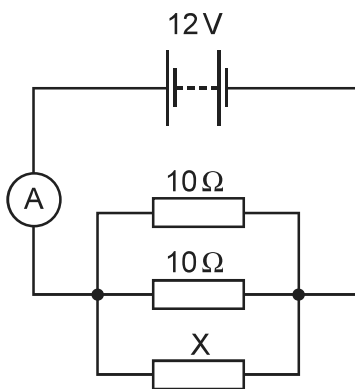
 I

/Q33



89

/Q35



Ω Ω Ω Ω

90

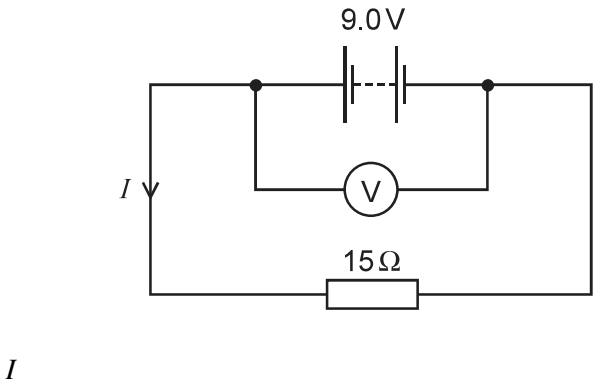
/Q33

—

—

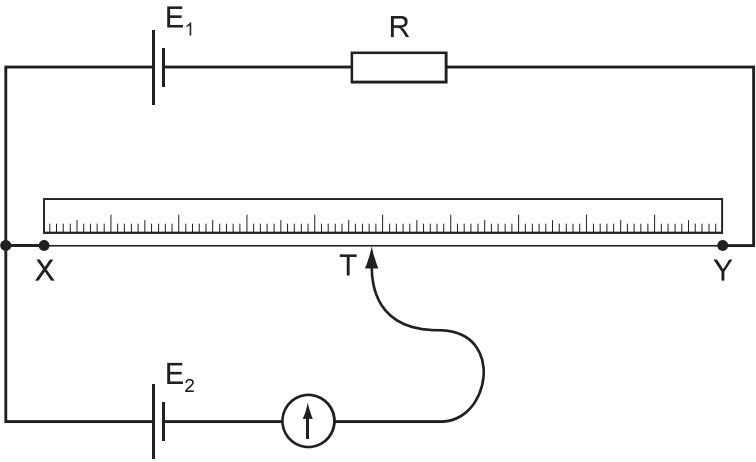
91

/Q36



92

/Q37



I

93

/Q31

Ω Ω Ω Ω

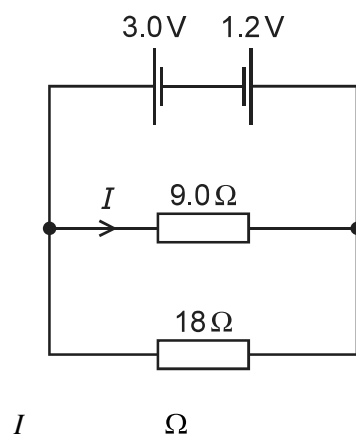
94

/Q32

95

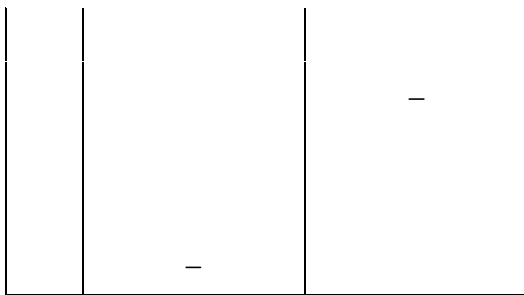
 Ω Ω

/Q33



96

/Q30



97

 Ω .

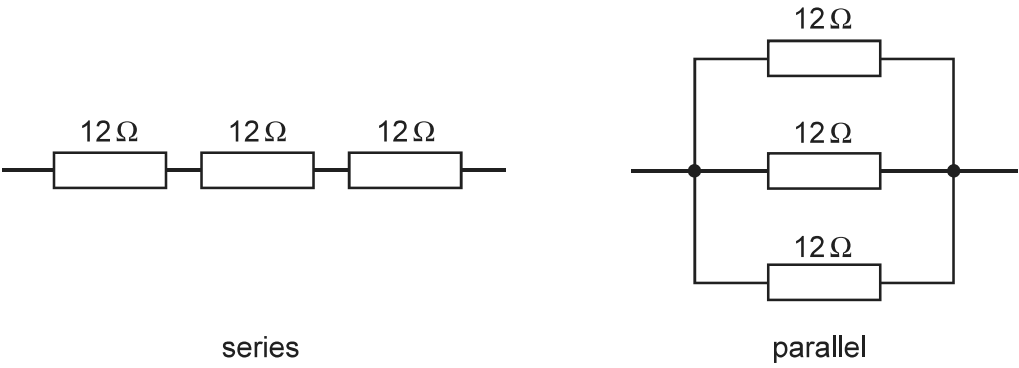
/Q35

 I Ω

98

Ω

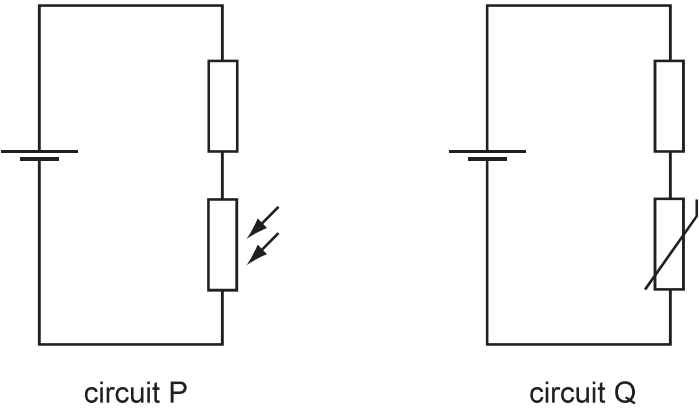
/Q34



	Ω	Ω	
	Ω	Ω	
	Ω	Ω	
	Ω	Ω	

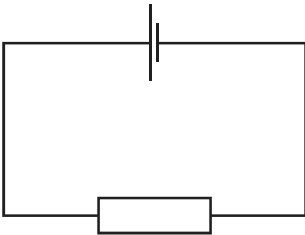
99

/Q35



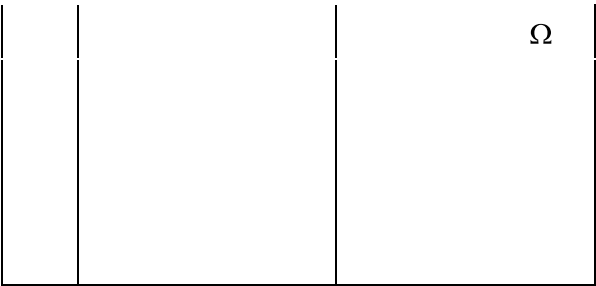
100

/Q30



101

/Q31



102

Ω

/Q32

Ω

103

Ω .

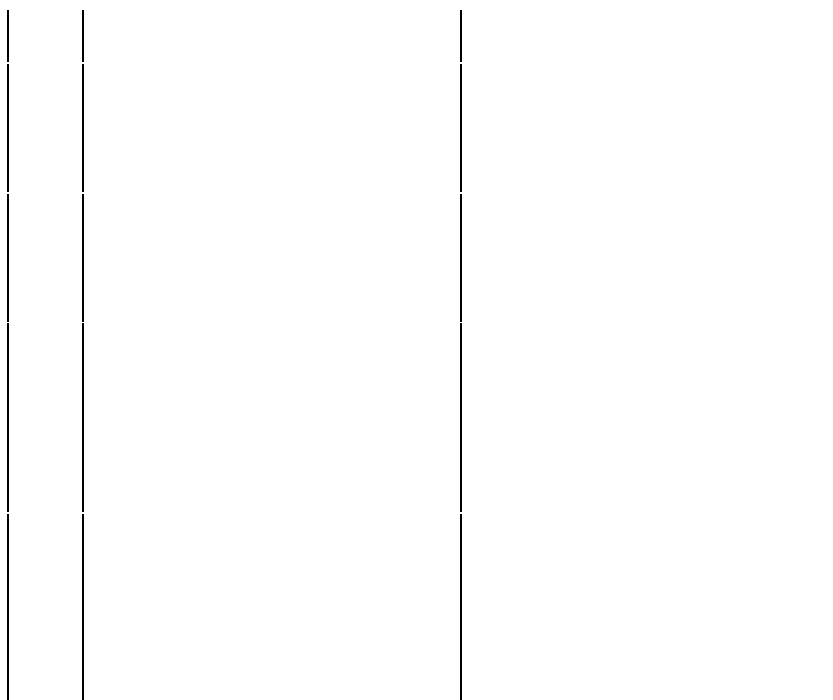
/Q33

I

Ω

104

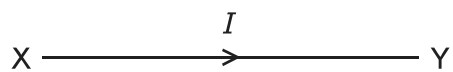
/Q33



105

 I

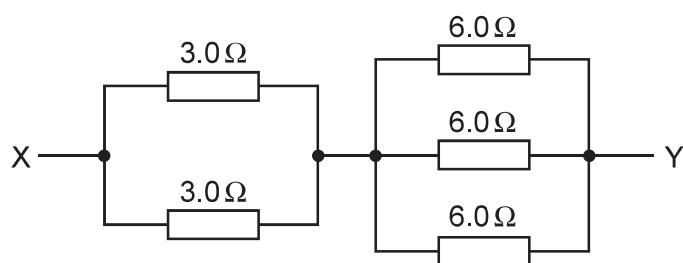
/Q34



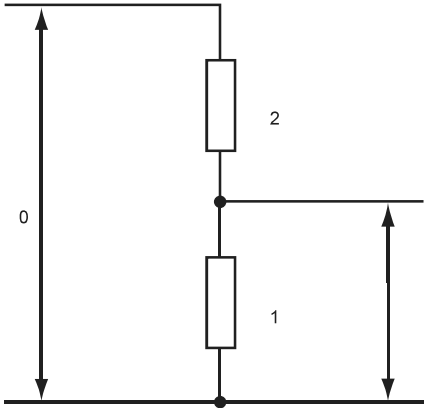
106

 Ω Ω

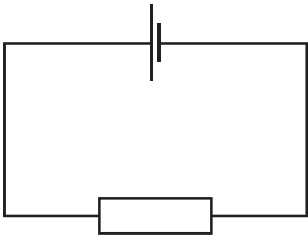
/Q36

 Ω Ω Ω Ω

/Q35



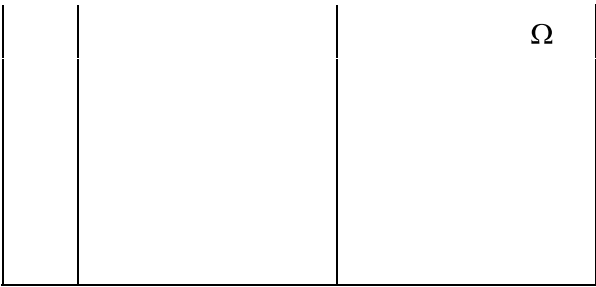
/Q29



/Q31

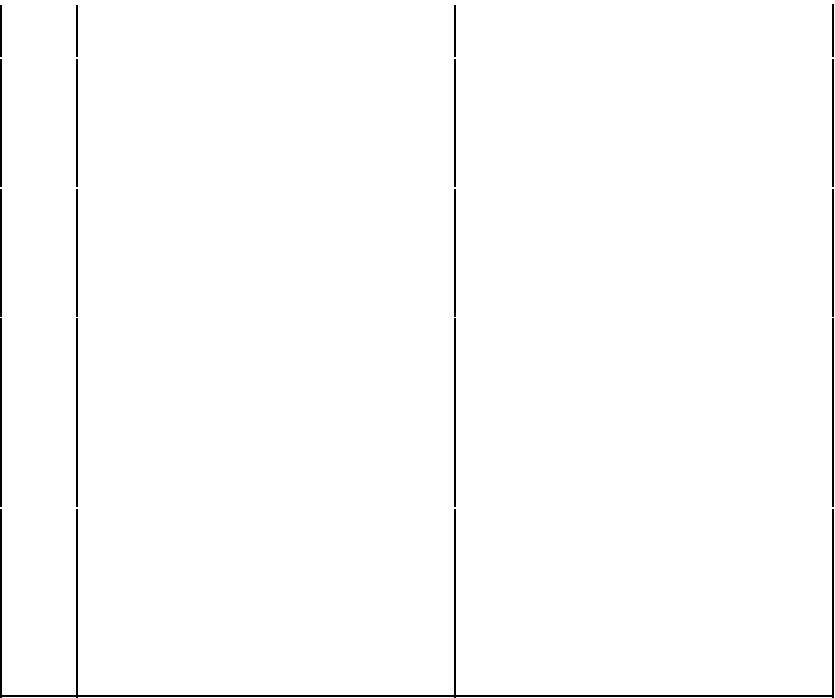
110

/Q30



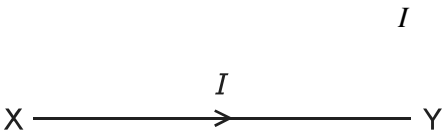
111

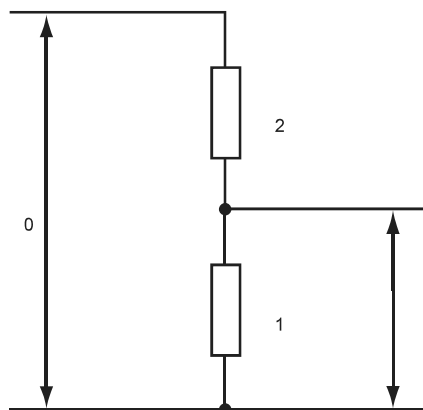
/Q32



112

/Q33

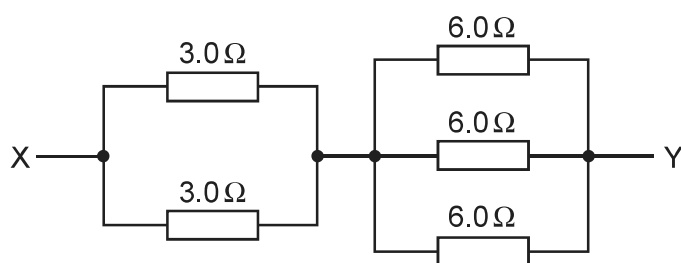




114

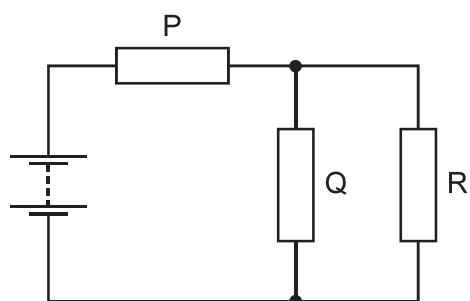
 Ω Ω

/Q35

 Ω Ω Ω Ω

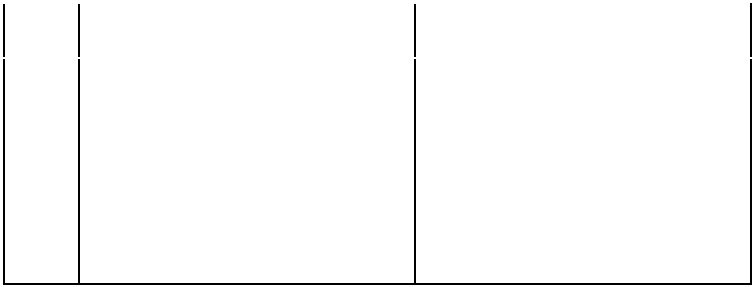
115

/Q33



116

/Q32



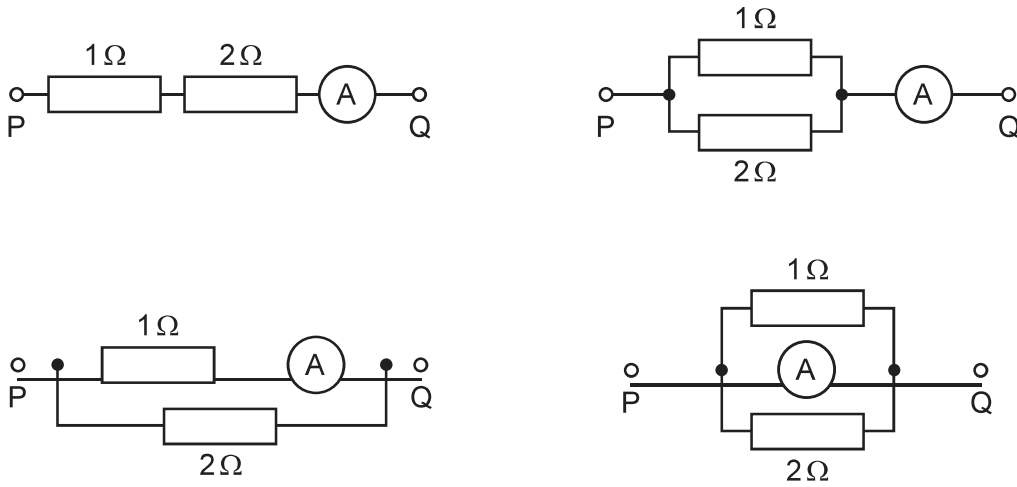
117 *I*

/Q34

118 *I*

Ω .

/Q36



119

/Q36

Ω

Ω

Ω

Ω

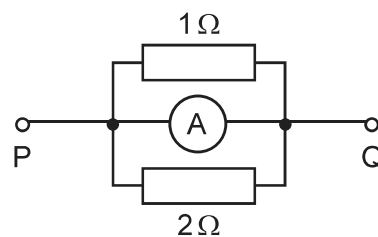
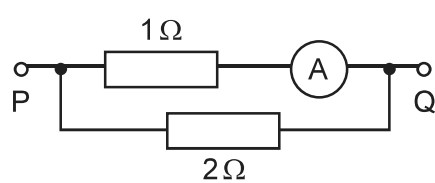
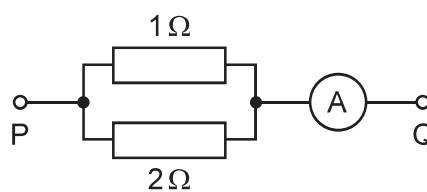
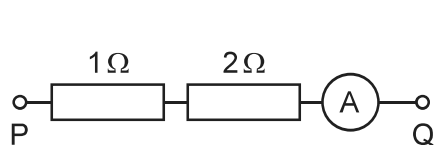
120

/Q30

--	--	--

121 *I* Ω .

/Q32



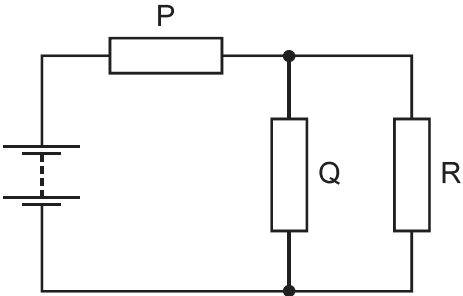
122

/Q33

--	--	--

123

/Q34



124 I

/Q35

125

Ω .

/Q31

I

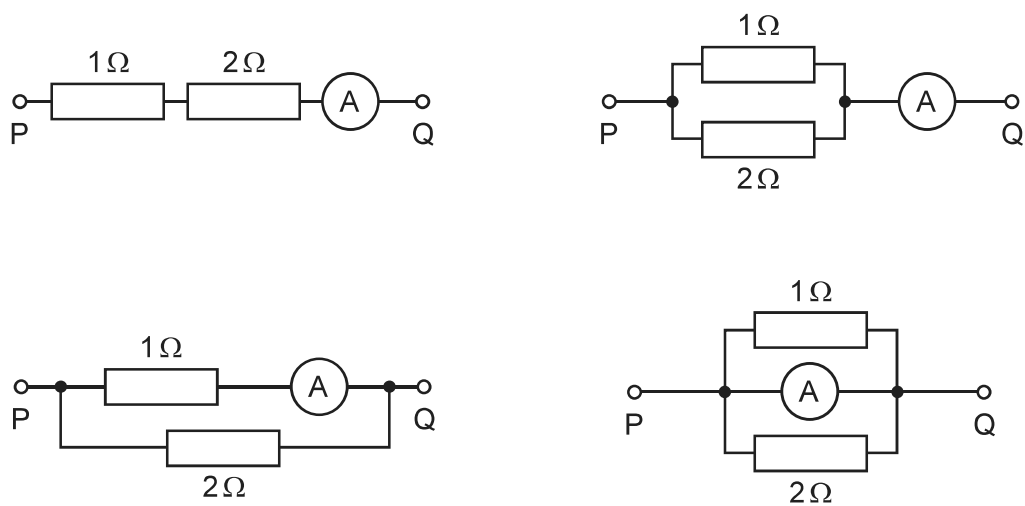
Ω

126 I

/Q36

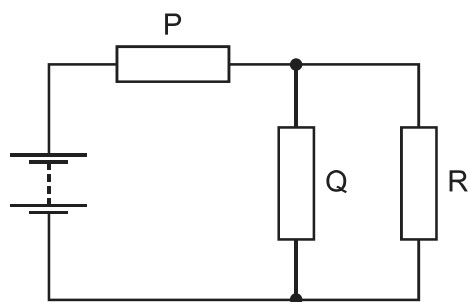
127 *I* Ω .

/Q34



128

/Q35



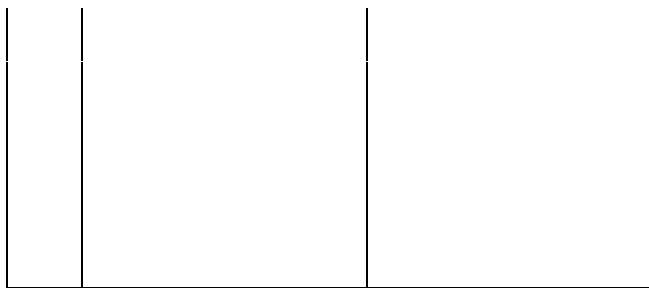
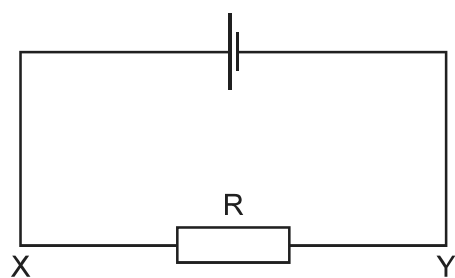
129

/Q30



130

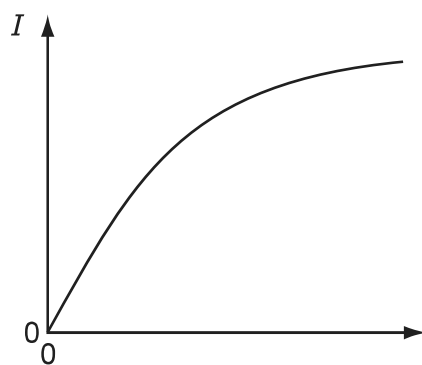
/Q31



131

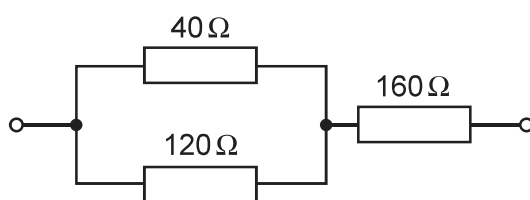
 I

/Q32



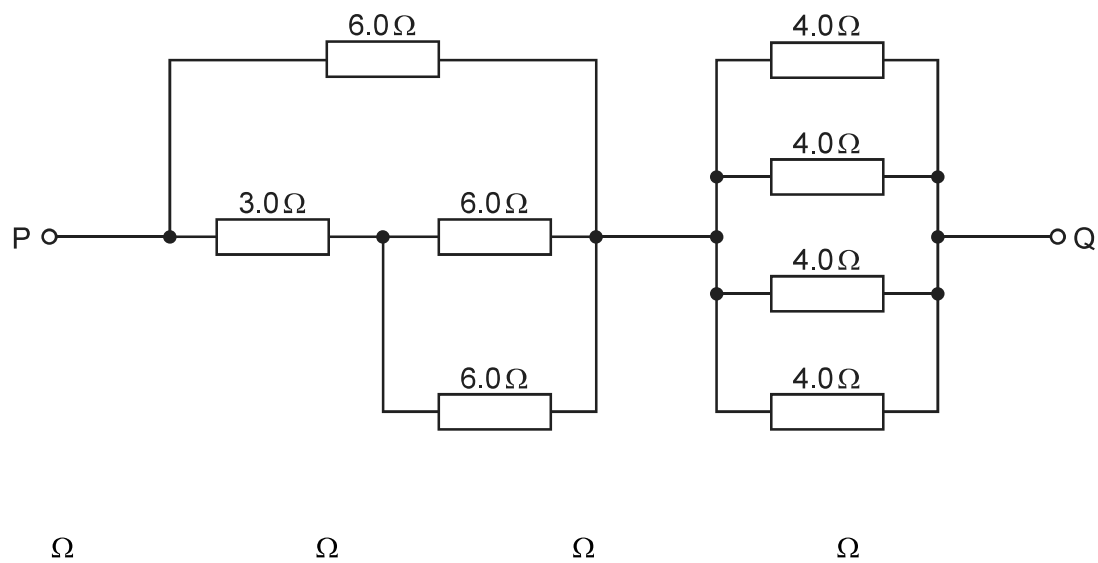
132

/Q35

 Ω Ω Ω Ω

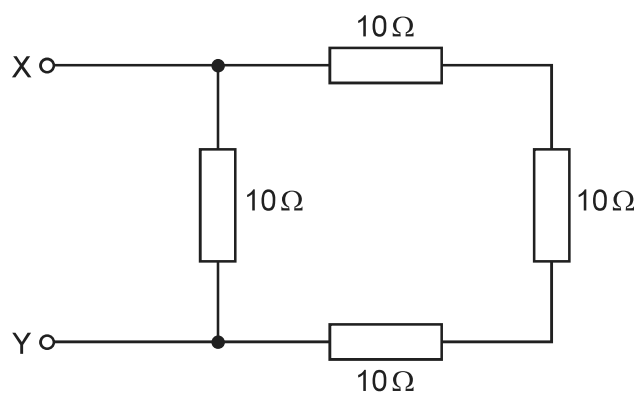
133

/Q35



134

/Q36

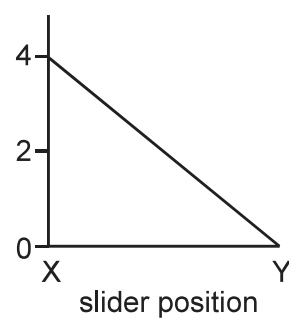
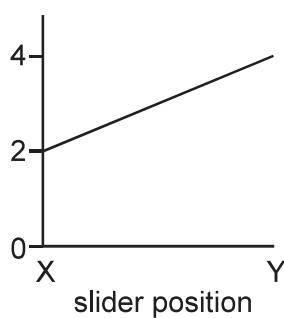
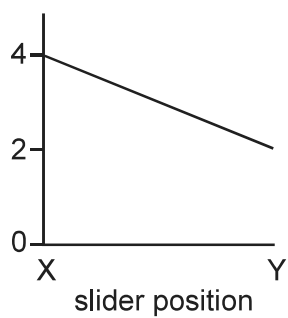
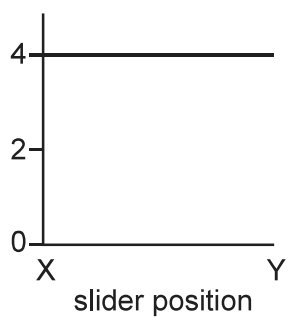
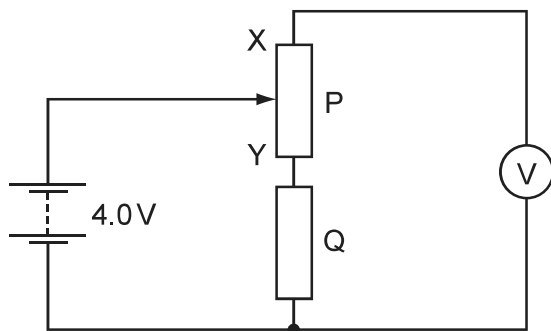
 Ω Ω Ω Ω Ω Ω

135

/Q31

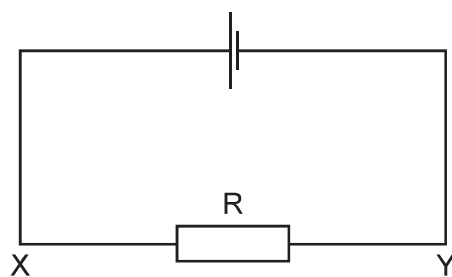
136 *I* Ω Ω

/Q37



137

/Q32



--	--	--	--

138

Ω

139

/Q31

Ω

140

/Q30

Ω

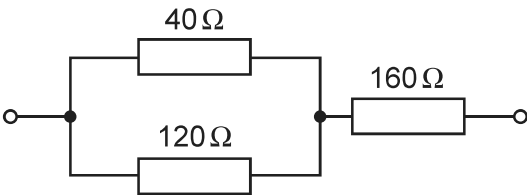
Ω

Ω

Ω

141

/Q33



Ω

Ω

Ω

Ω

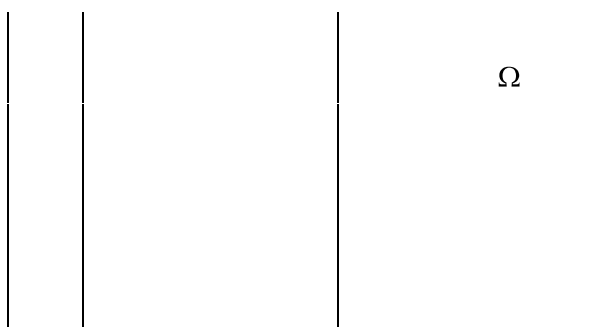
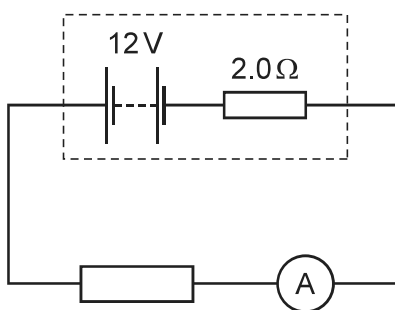
142

/Q31

143

 Ω

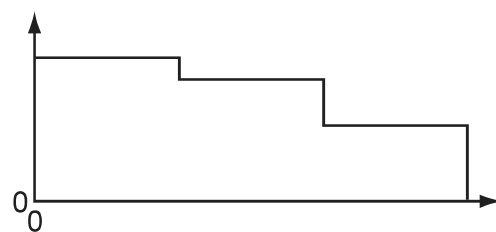
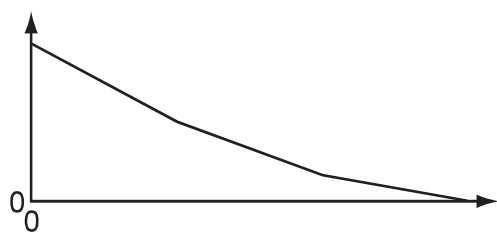
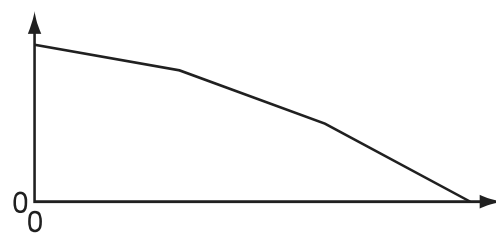
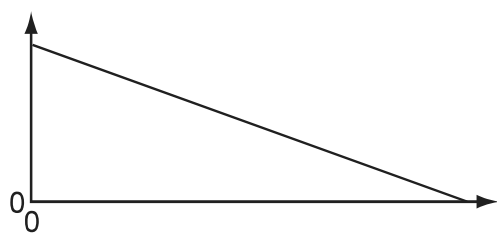
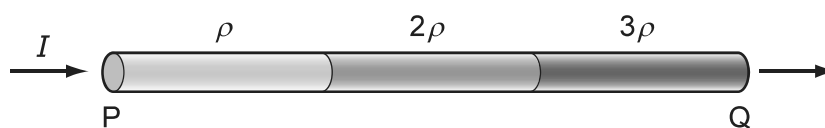
/Q33



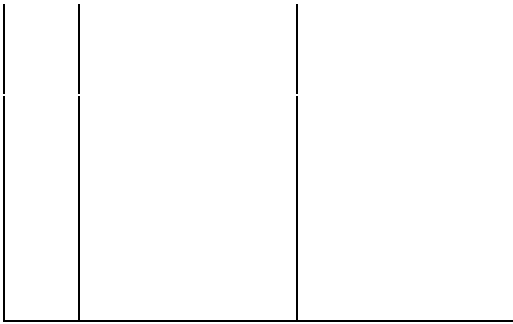
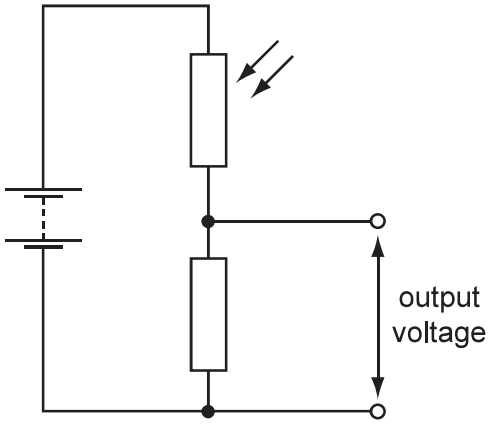
144

 $\rho \quad \rho \quad \rho$ I

/Q34



145

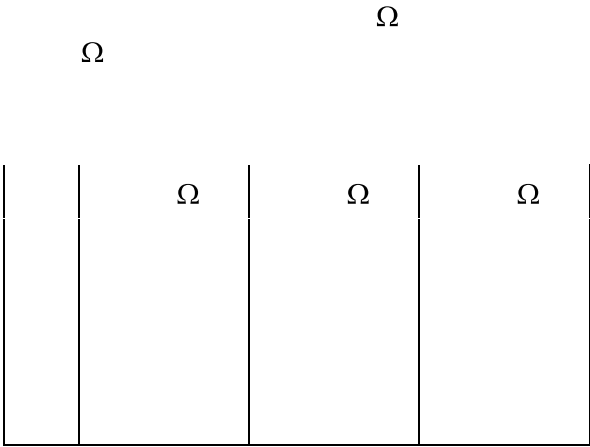


146

Ω

147

148



/Q37

149



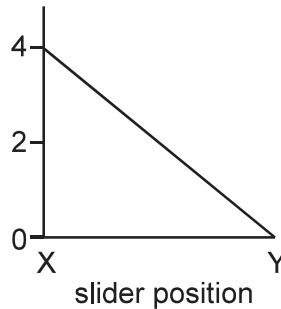
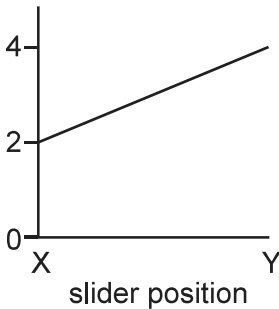
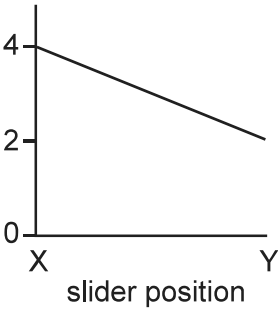
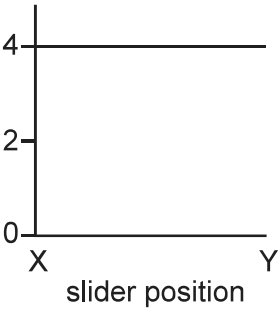
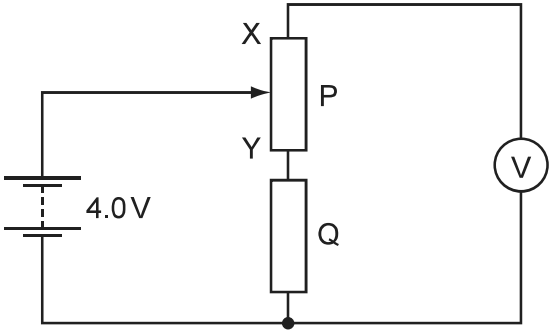
/Q34

150 I

Ω

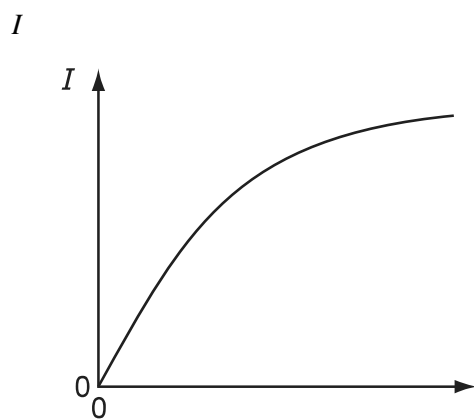
Ω

/Q35



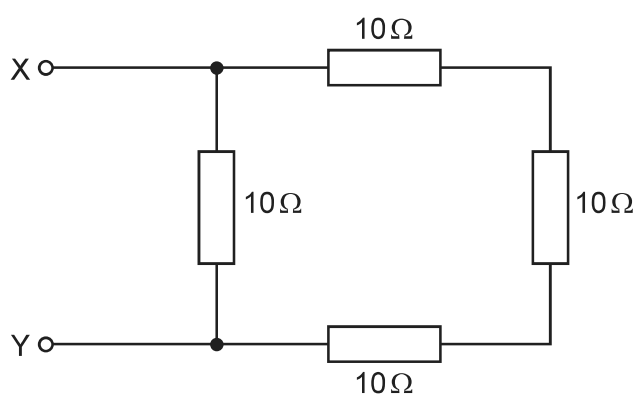
151

/Q36



152

/Q37

 Ω Ω Ω Ω Ω Ω

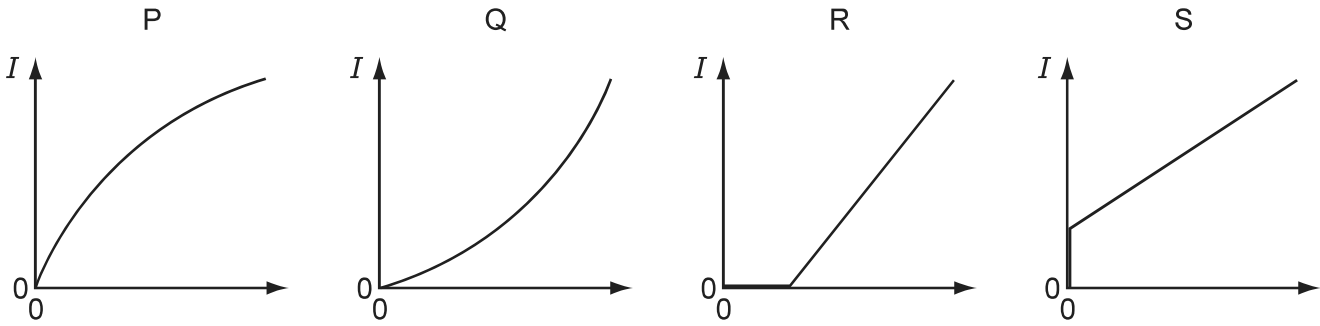
153

/Q32

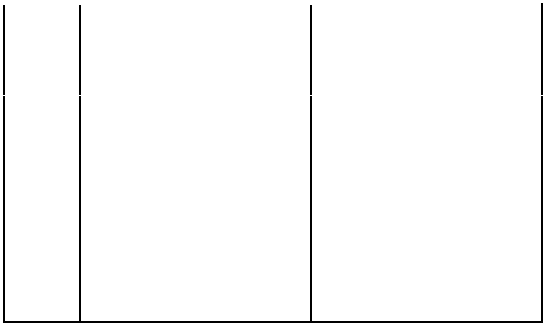
154

I

/Q33

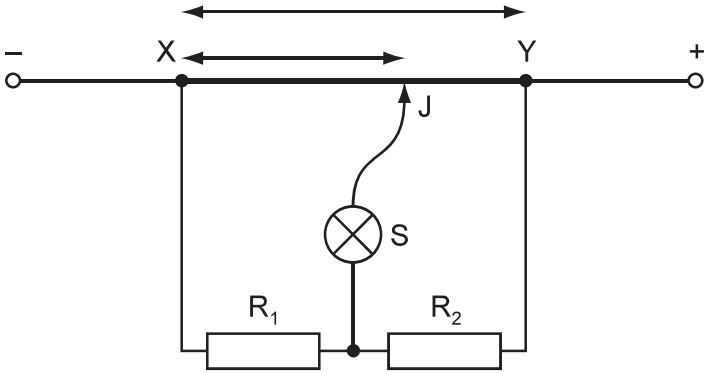


I



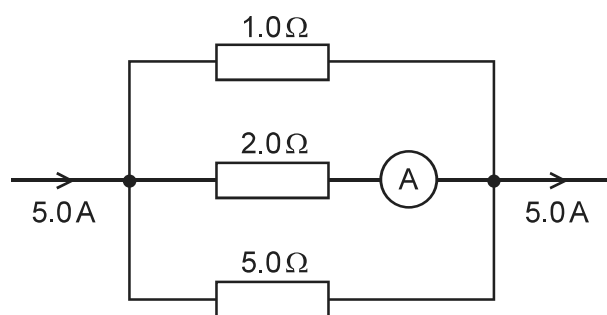
155 I

/Q37



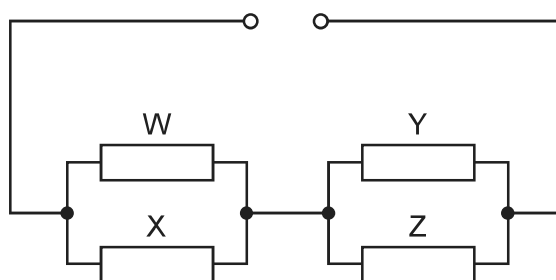
156

/Q35



157

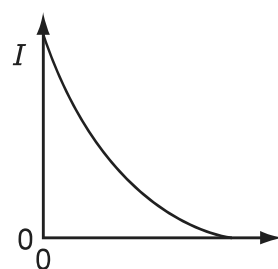
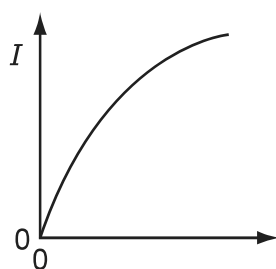
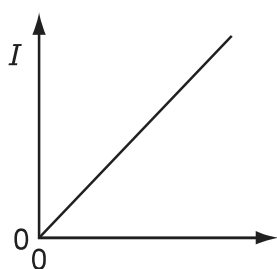
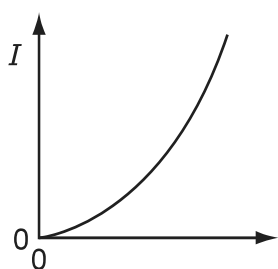
/Q36



158

 I

/Q35



159

I

/Q33

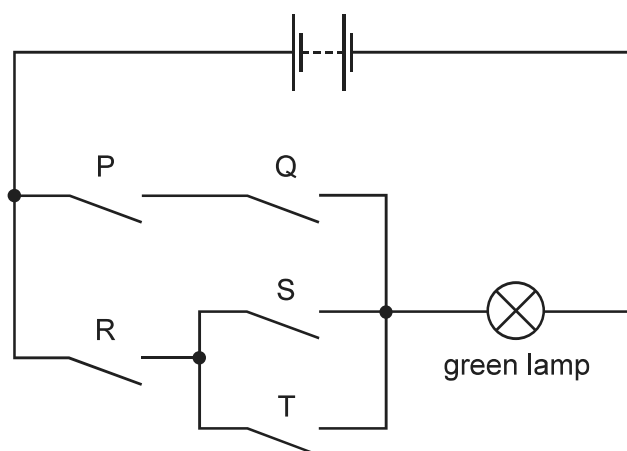
—

160

/Q34

161

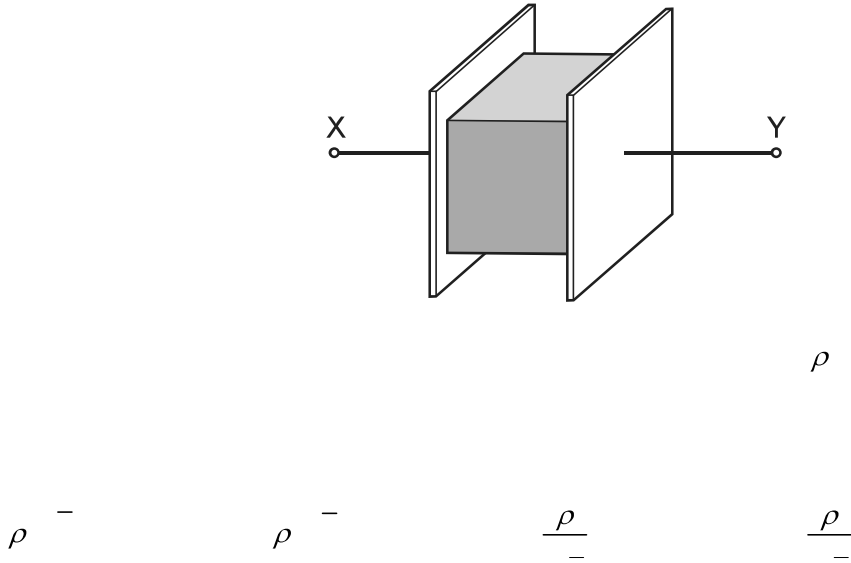
/Q36

I

--	--	--	--	--	--	--

162

/Q34

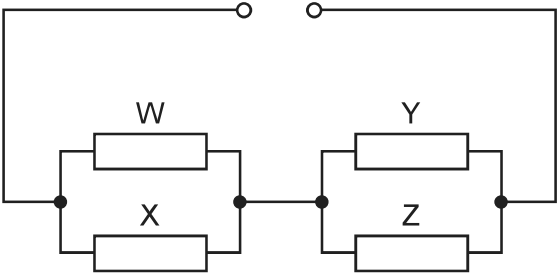


163

/Q31

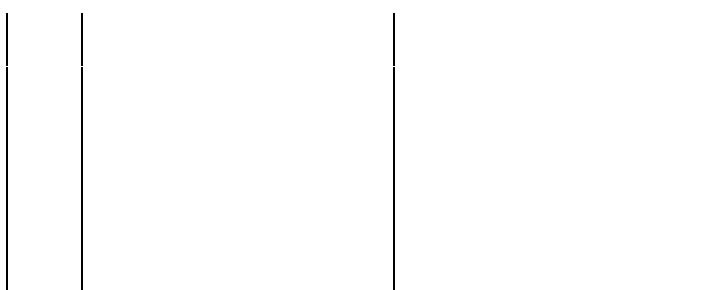
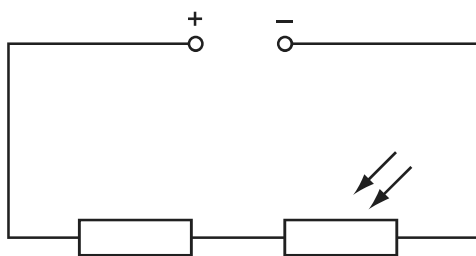
164

/Q33



165

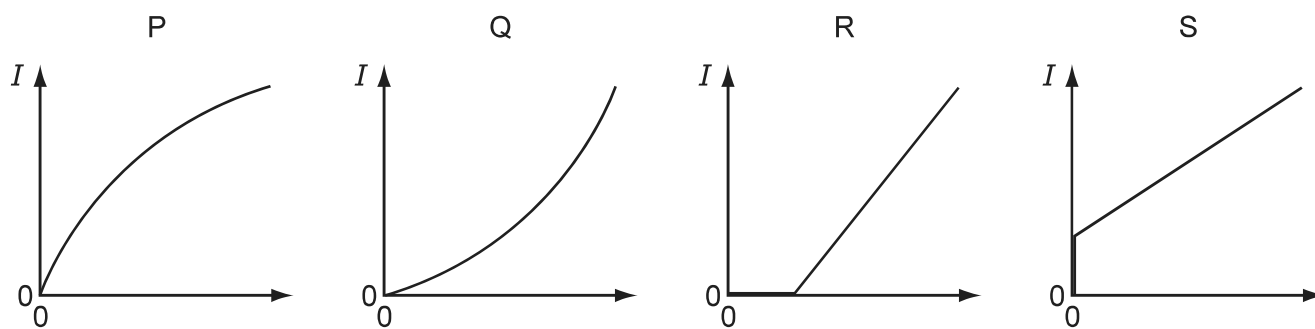
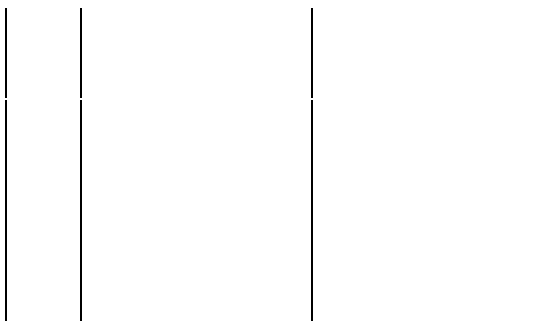
/Q37



166

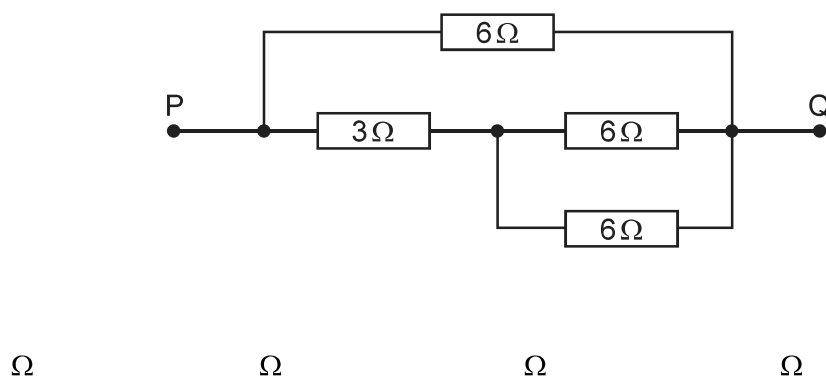
 I

/Q34

 I 

167

/Q38

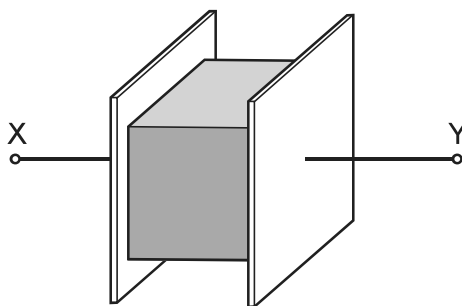


168

/Q32

169

/Q35

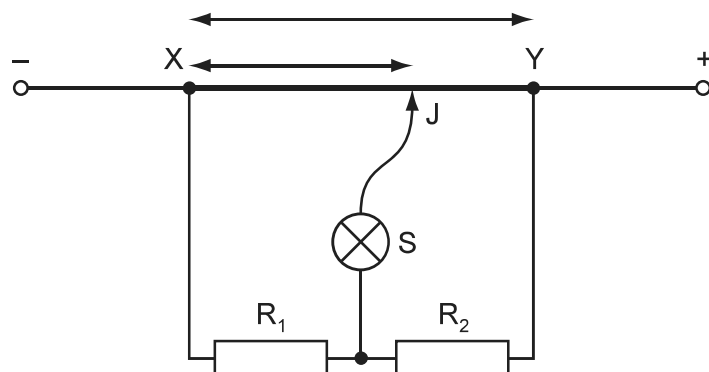
 ρ ρ ρ $\frac{\rho}{-}$ $\frac{\rho}{-}$

170

/Q35

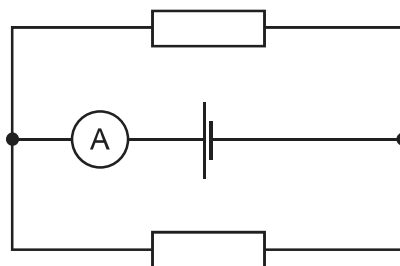
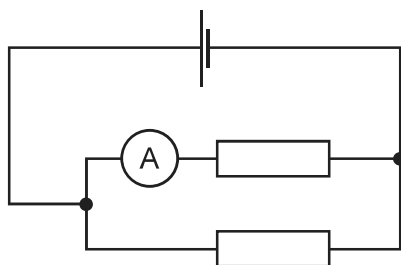
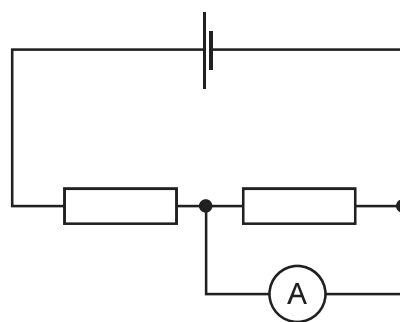
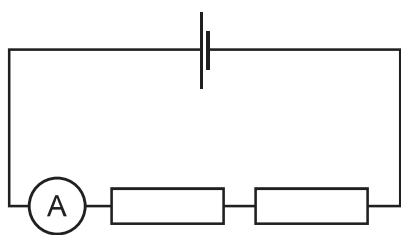
171 I

/Q36



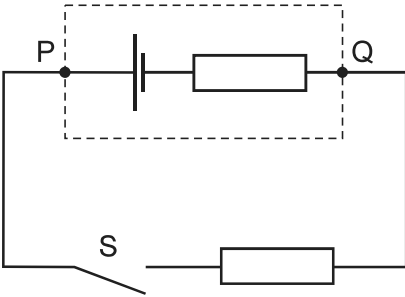
172

/Q37

 I 

173

/Q36



174

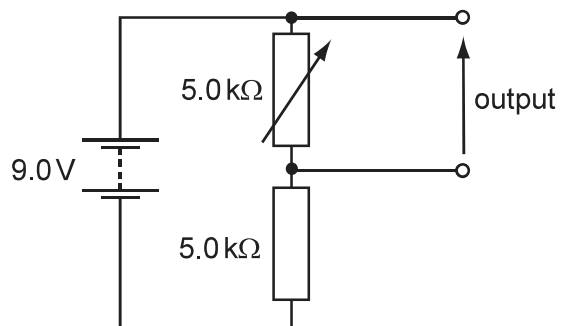
/Q34

I

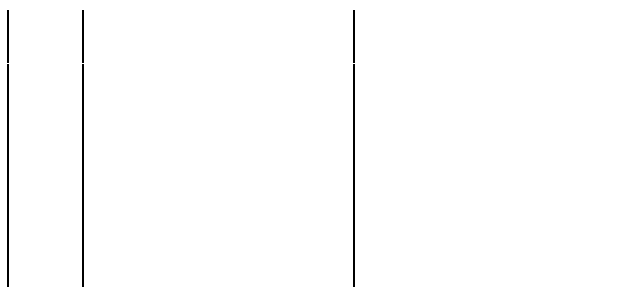
I

I

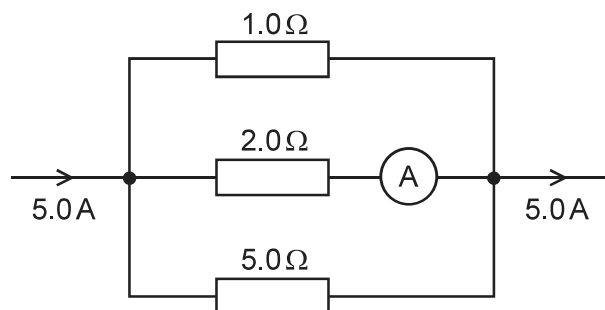
175



/Q39



176



/Q37

177

/Q33

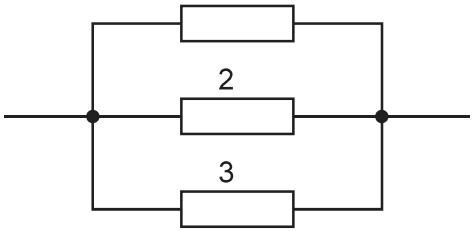
178

 Ω

/Q32

179

/Q38



I

	I	$-I$	$-I$
	I	$-I$	$-I$
	I	$-I$	$-I$
	I	I	I

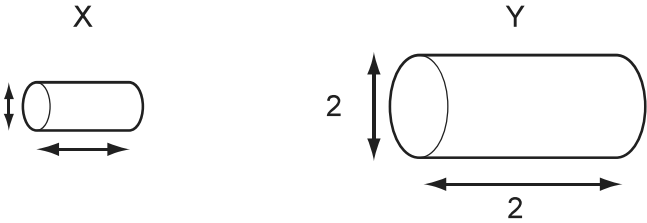
180

/Q34

— — —

181

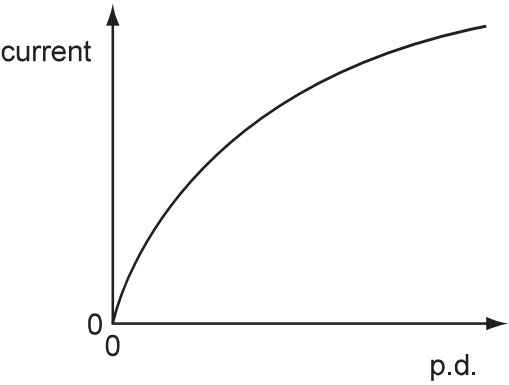
/Q34



— — — —

182

/Q33

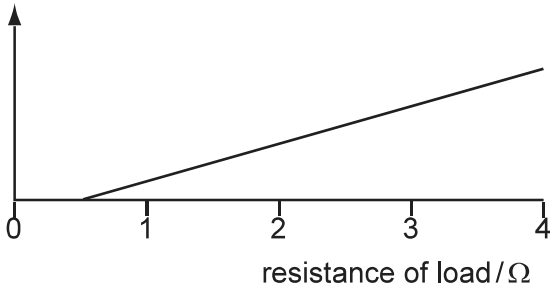
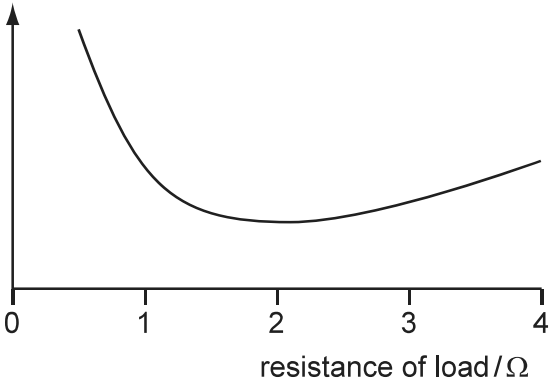


I

183

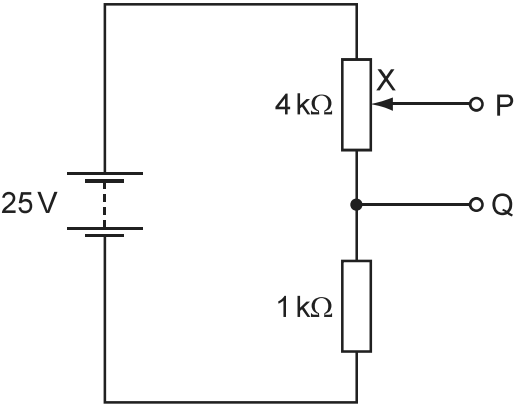
Ω
 Ω Ω

9702/12/O/N/11/Q35



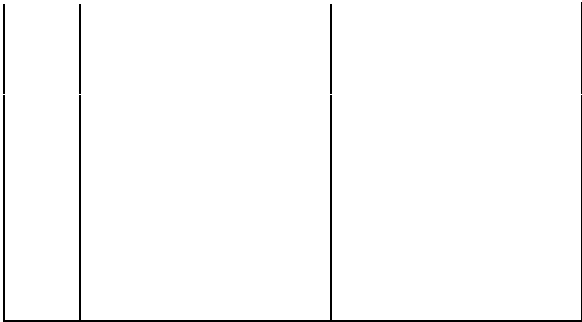
184

/Q37



185

/Q36



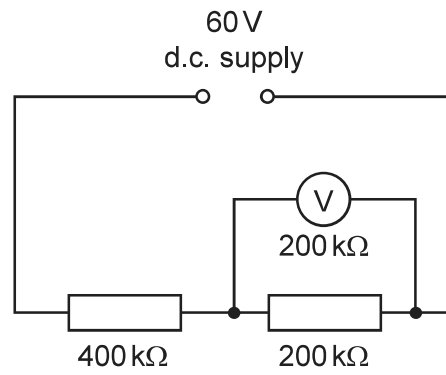
186

/Q33

187

 Ω Ω

/Q38

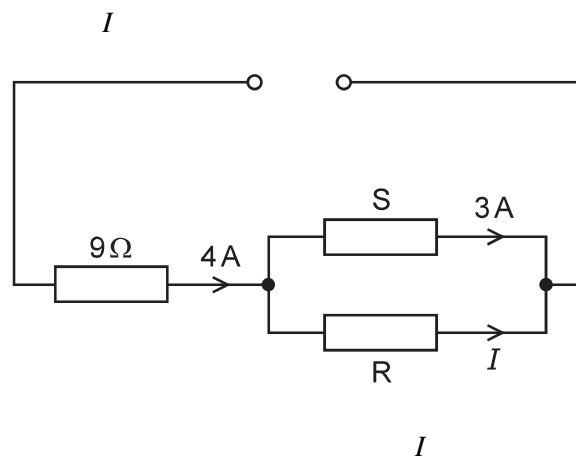
 Ω Ω

188

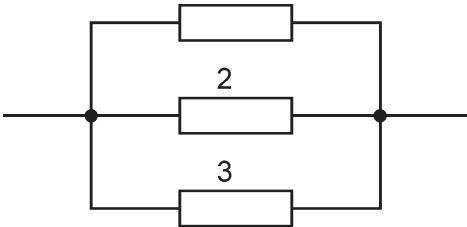
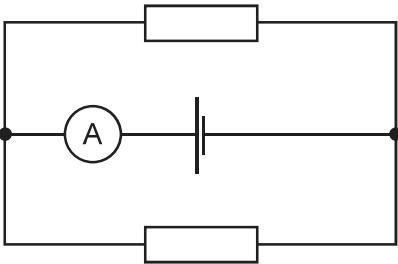
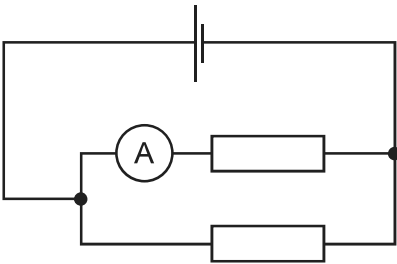
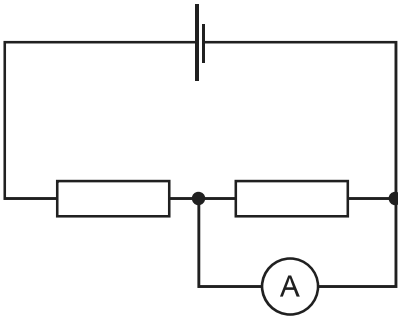
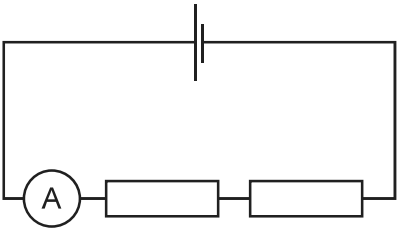
/Q34

189

/Q38



I

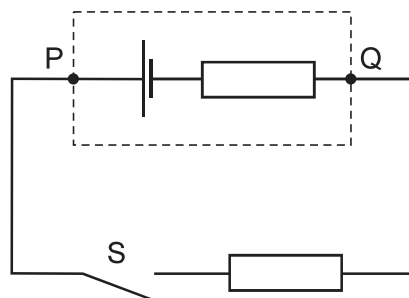


I

	<i>I</i>	$-I$	$-I$
	<i>I</i>	$-I$	$-I$
	<i>I</i>	$-I$	$-I$
	<i>I</i>	<i>I</i>	<i>I</i>

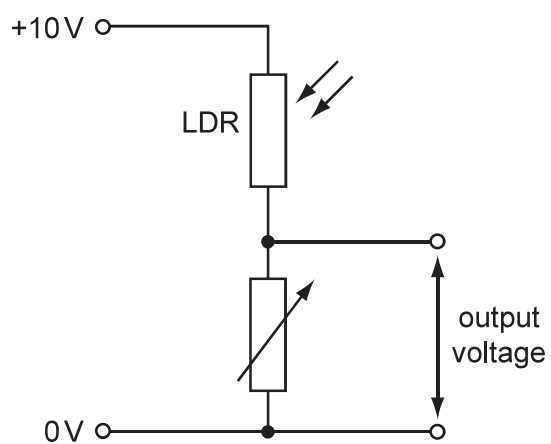
192

/Q38

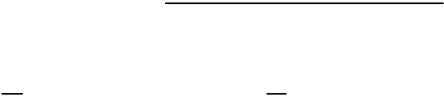
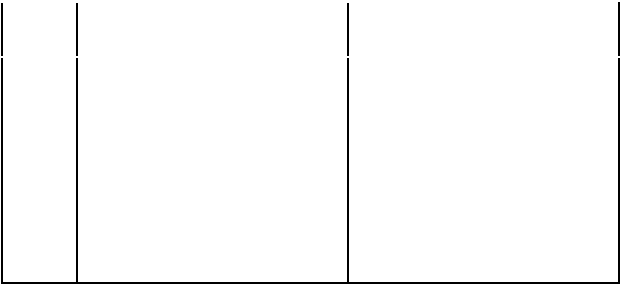
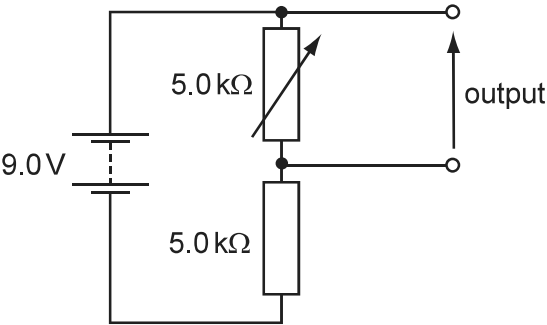


193

/Q37

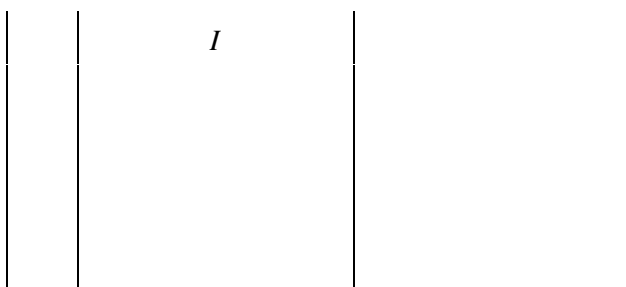
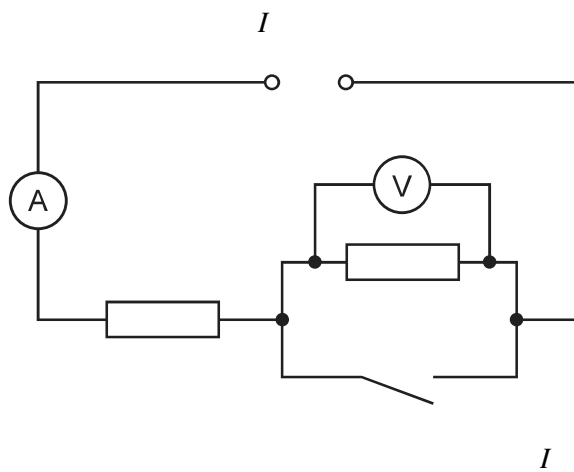


--	--	--



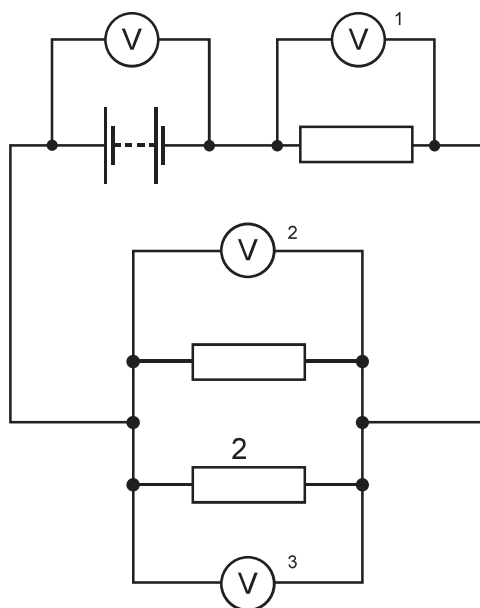
197 *I*

/Q36



198

/Q35

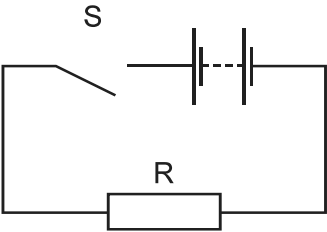


199

/Q35

200

/Q35



201

/Q32

— — —

202

/Q34

203

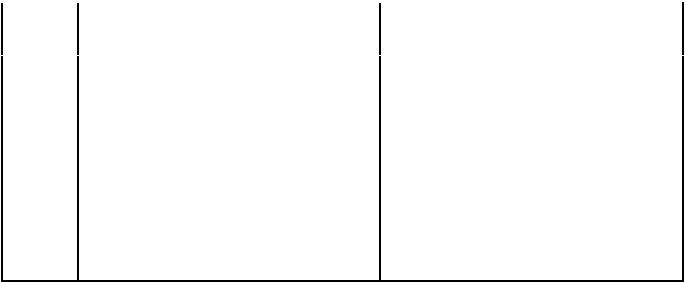
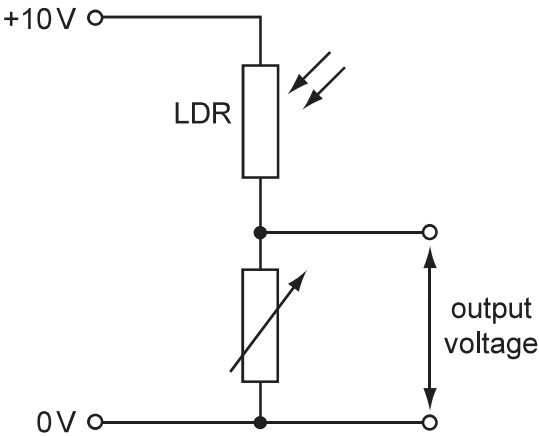
/Q39

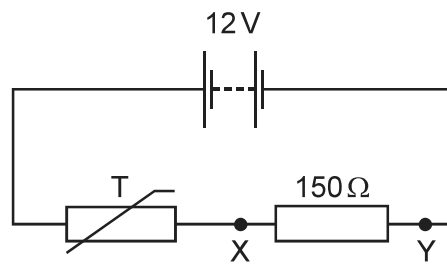
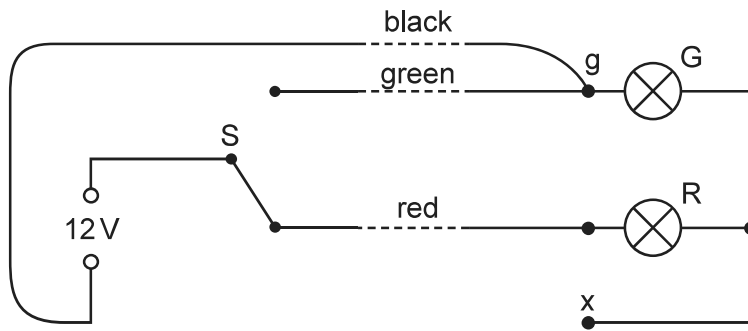
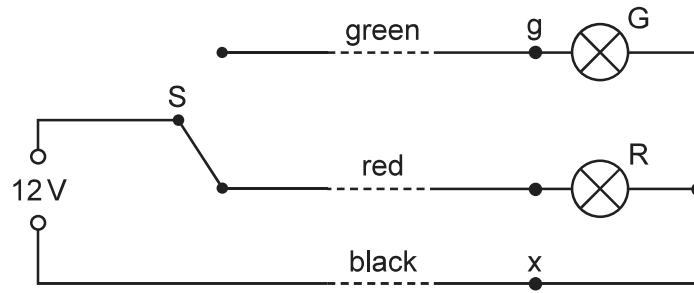
I

I
I

204

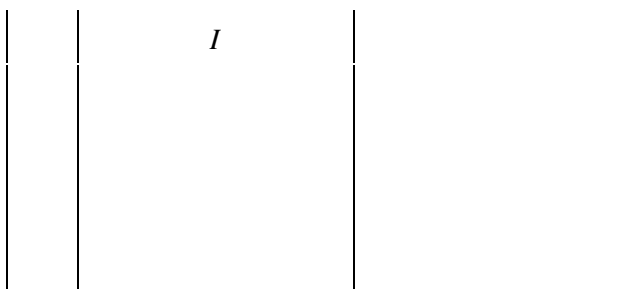
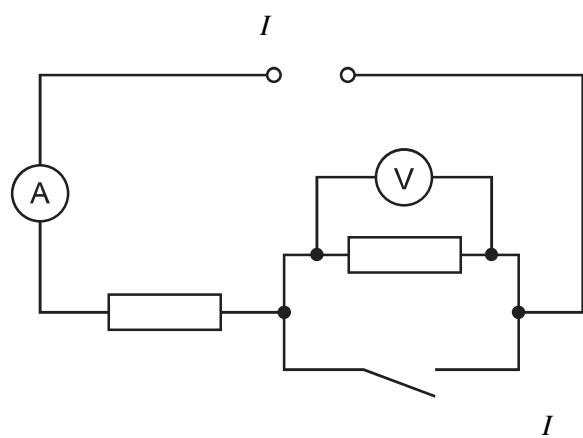
/Q38





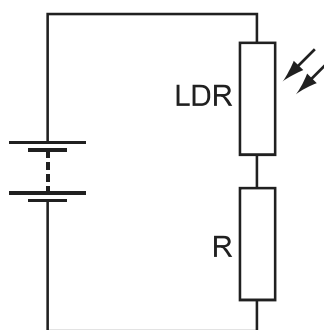
207 I

/Q35



208

/Q36



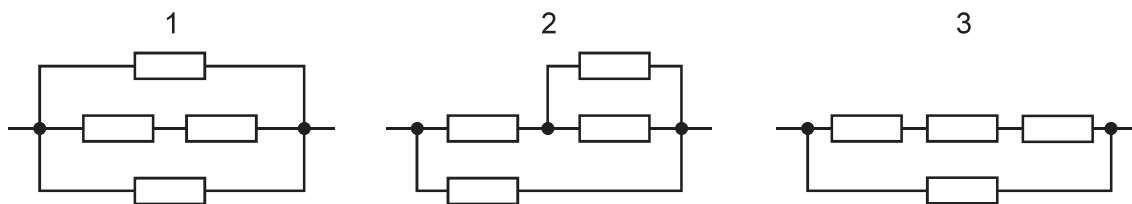
209

 I

/Q32

210

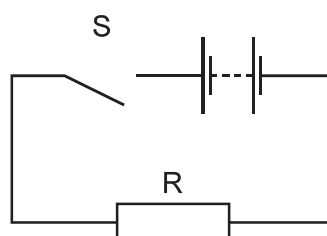
/Q38



--	--	--

211

/Q36

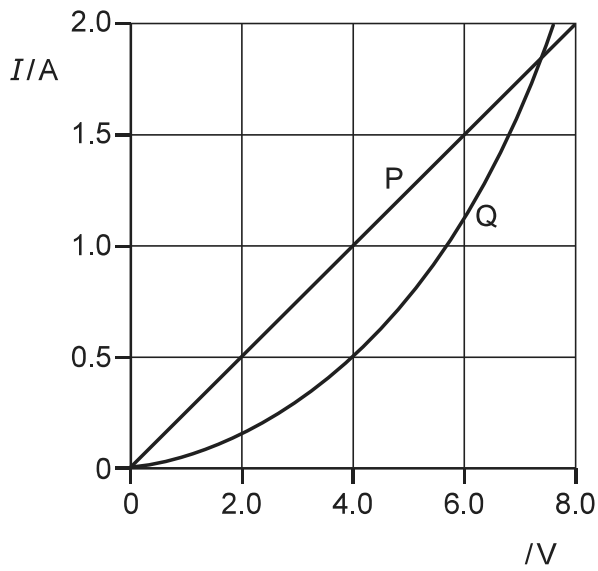
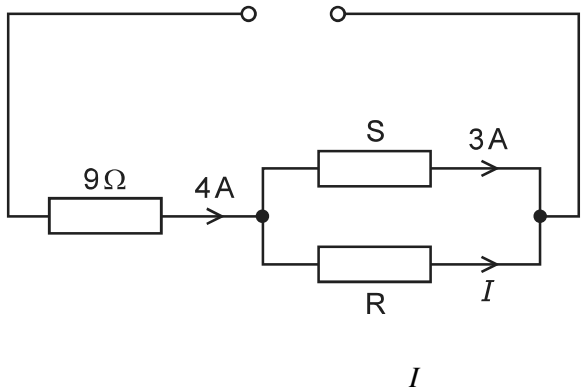


212

 Ω

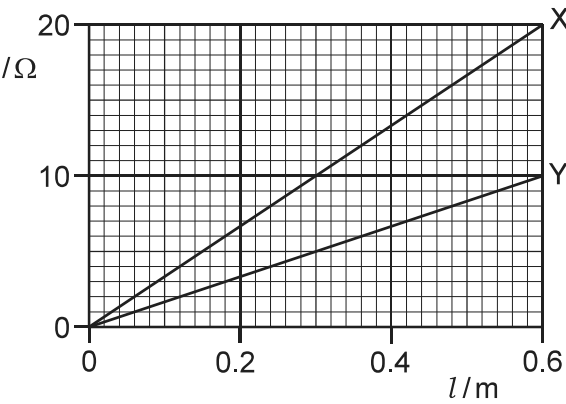
/Q33

		Ω
--	--	----------



215

/Q34



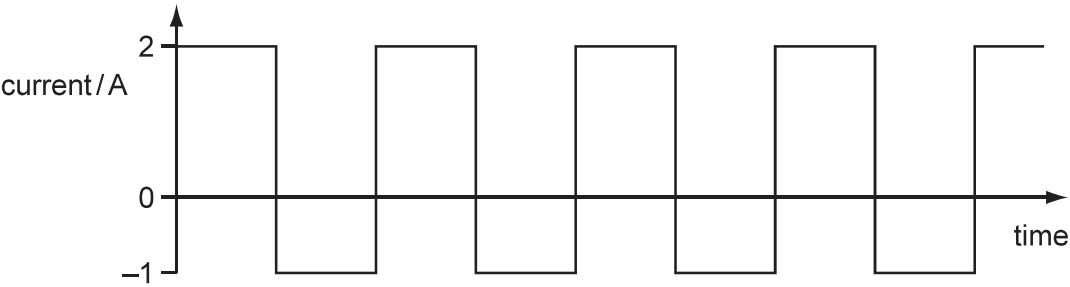
216

Ω Ω
 Ω
 Ω

/Q35

217

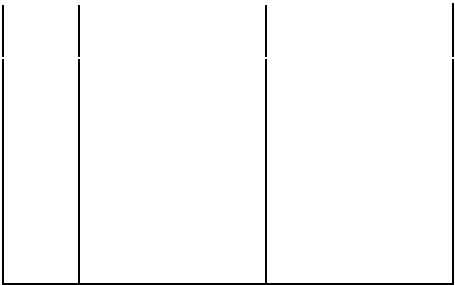
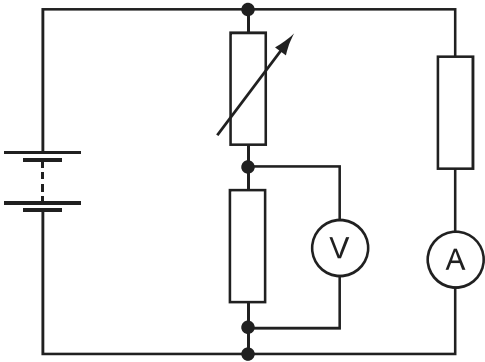
Ω



/Q36

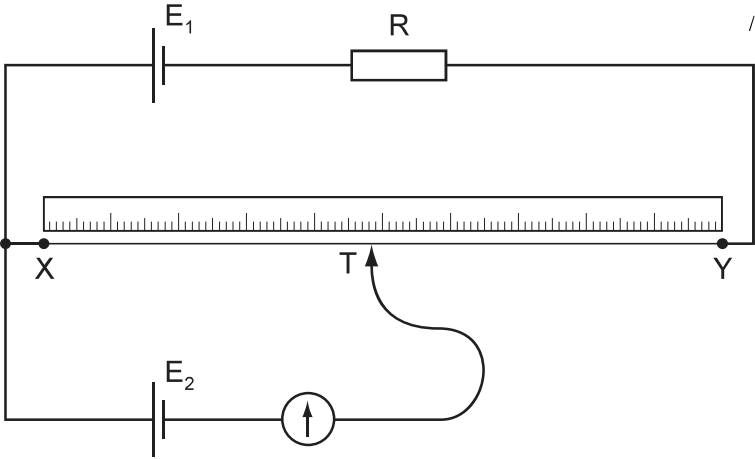
218

/Q36

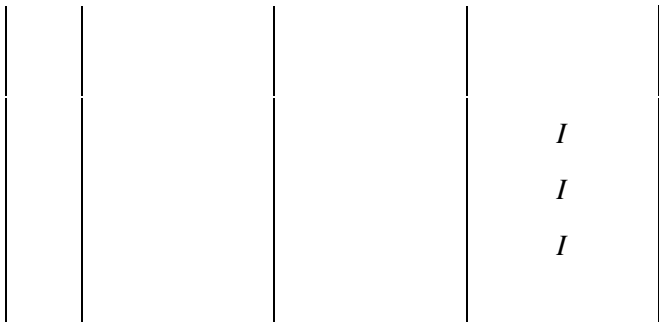
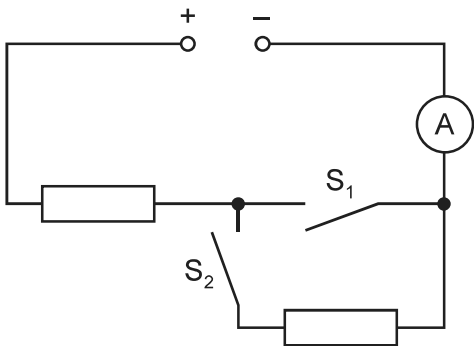
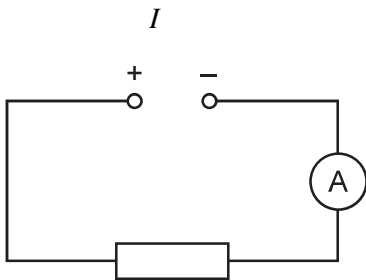


219

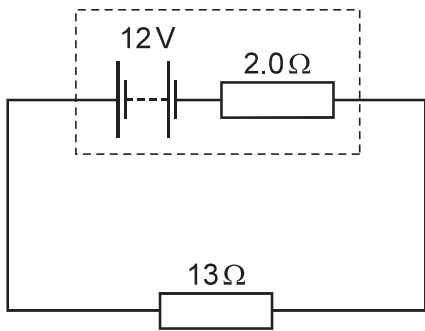
/Q37



I



Ω



Ω

222

I

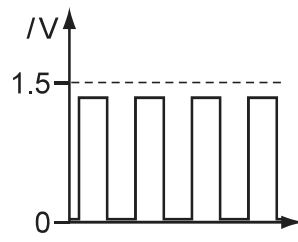
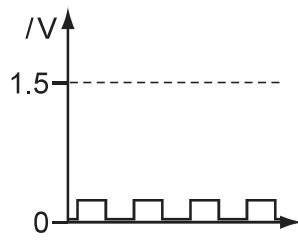
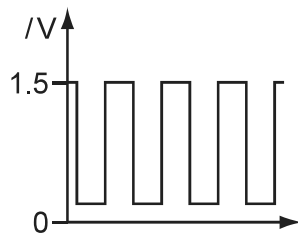
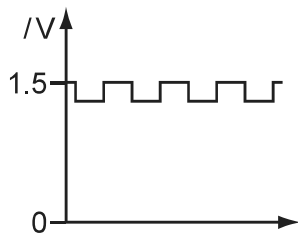
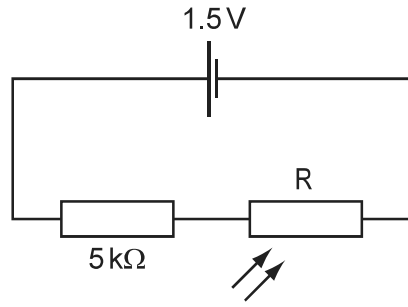
Ω

Ω

Ω

78

/Q38



223

Ω

/Q33

Ω

Ω

Ω

Ω

224

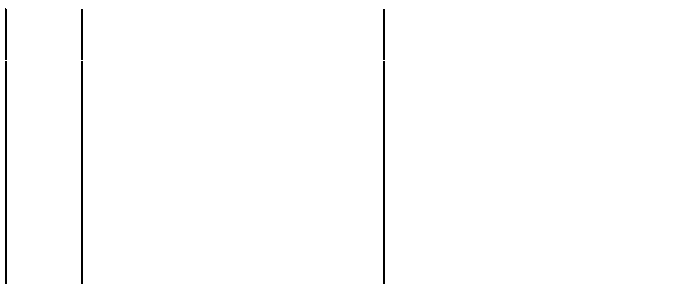
/Q34

I

I

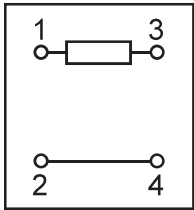
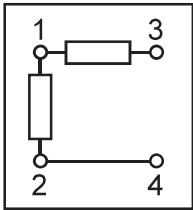
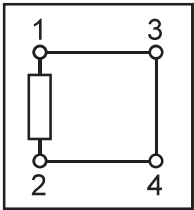
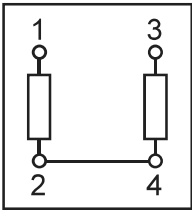
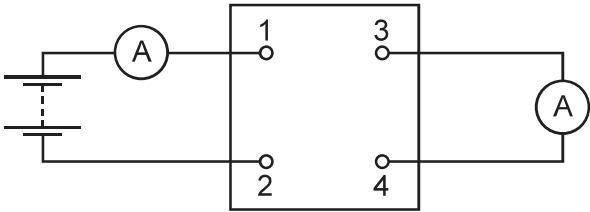
I

I



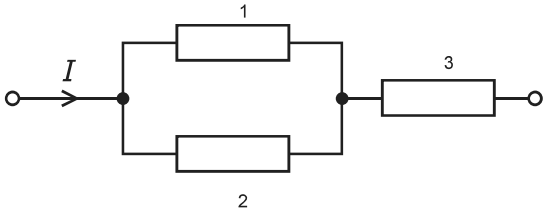
225

/Q35



226

/Q37



I

I

I

227

Ω

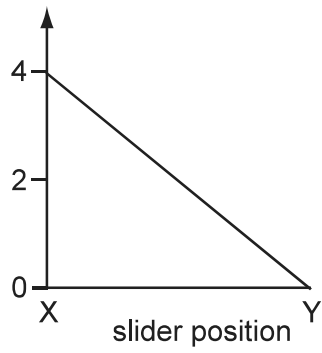
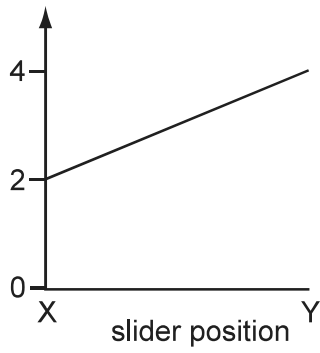
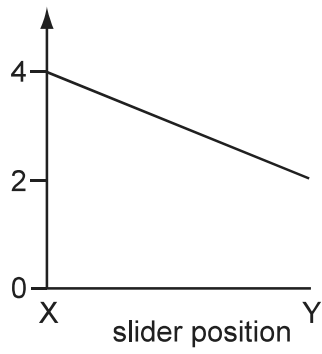
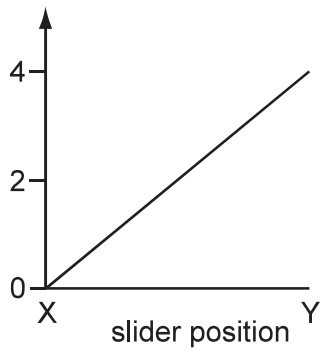
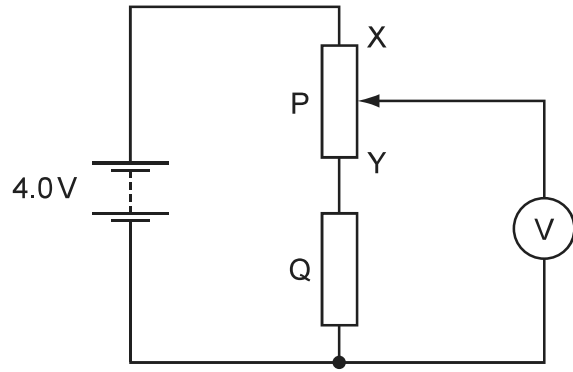
Ω

/Q33

Ω

Ω

/Q36



/Q32

Ω

Ω

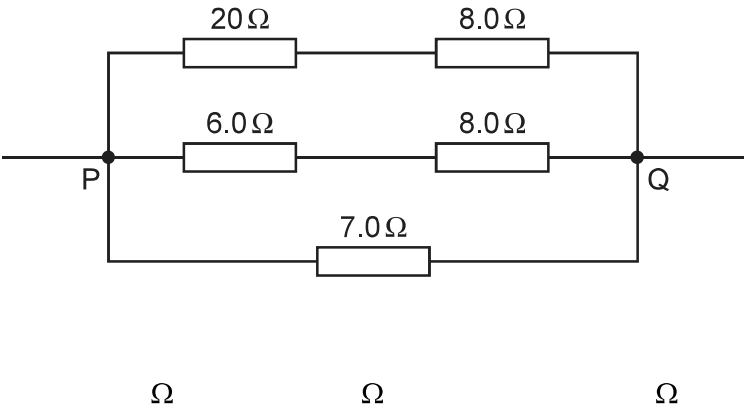
Ω

Ω

Ω

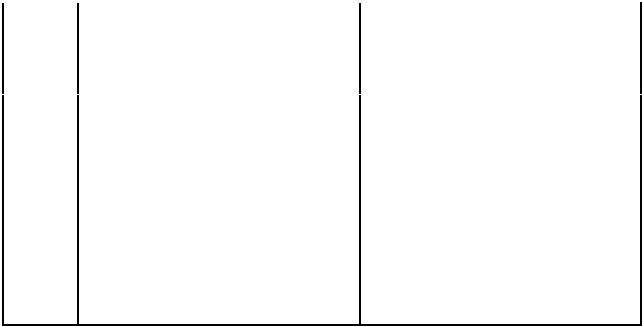
230

/Q37



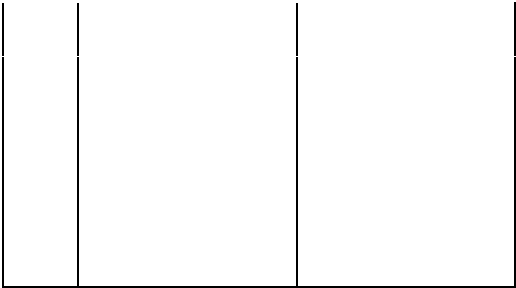
231

/Q33



232

/Q34



233

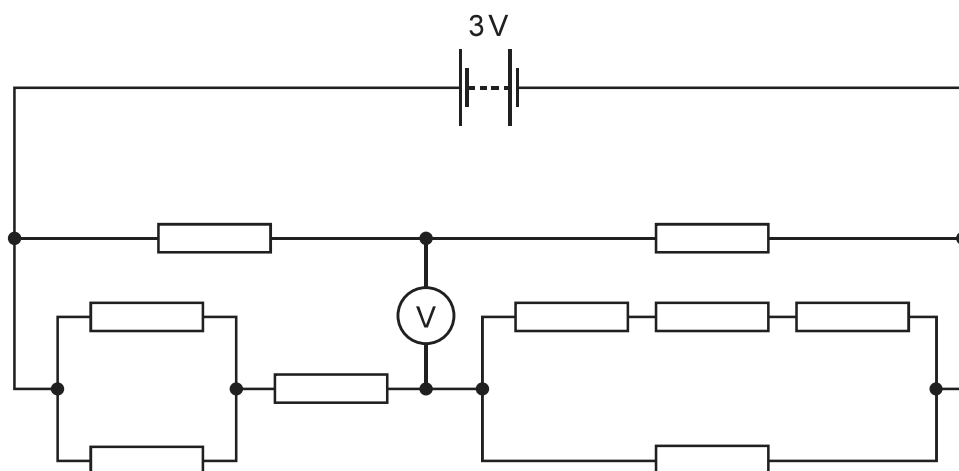
Ω

/Q34

234

 Ω

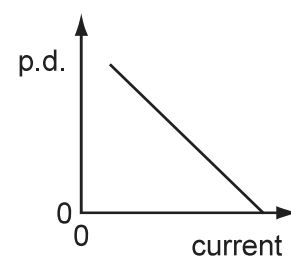
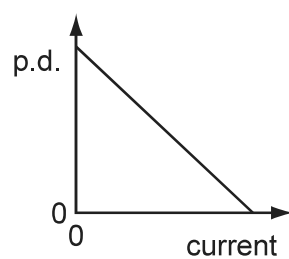
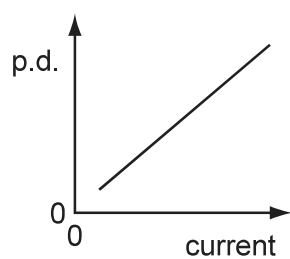
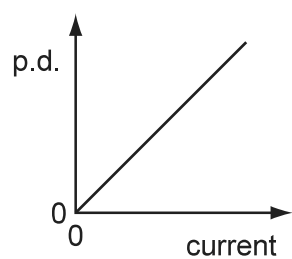
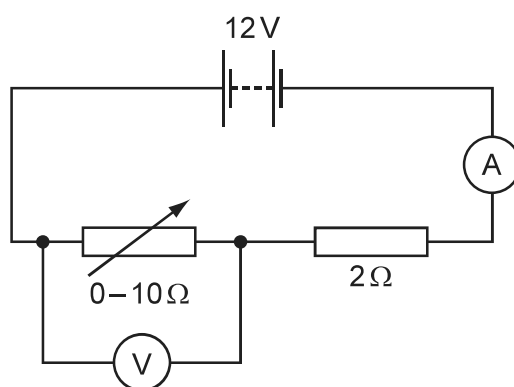
/Q35



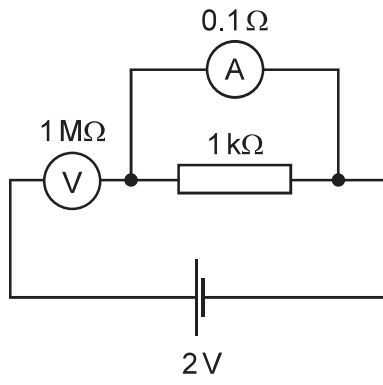
235

 Ω Ω

/Q37

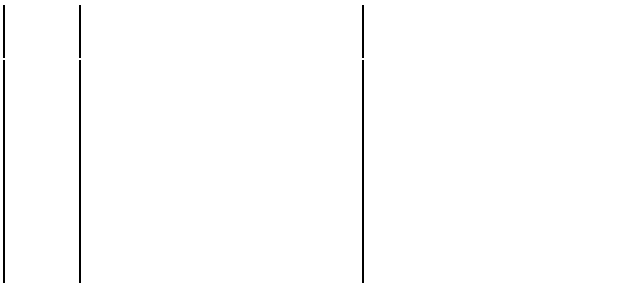
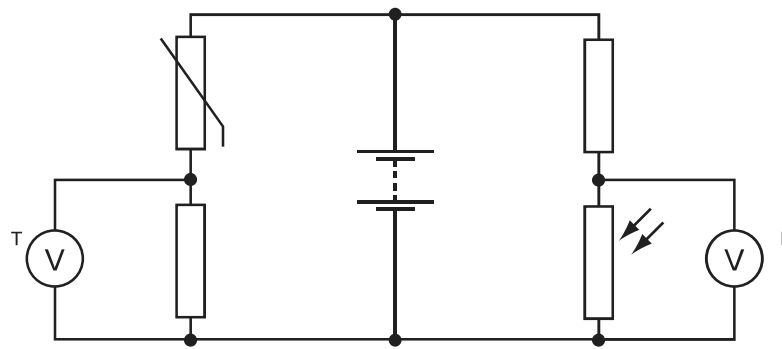


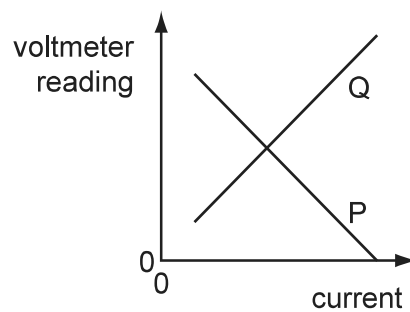
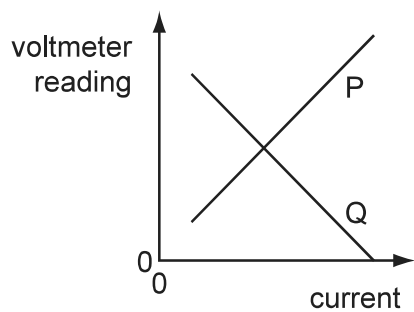
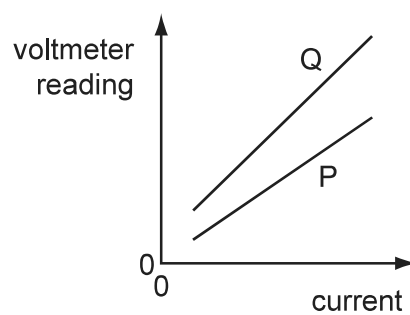
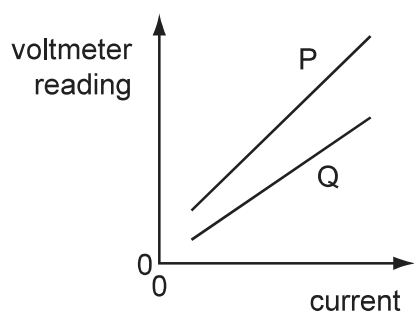
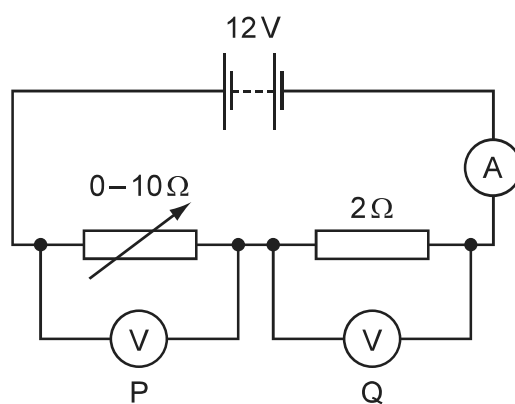
Ω



237 I

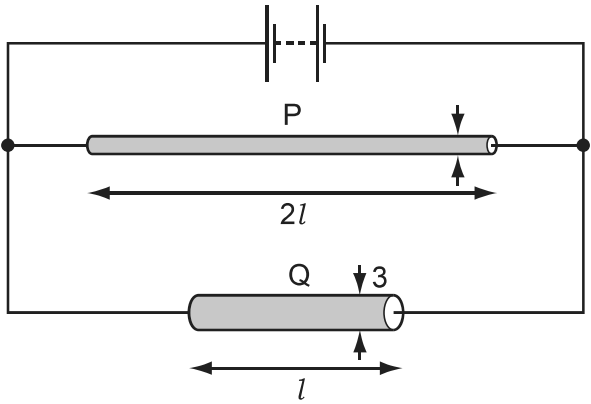
/Q38





239

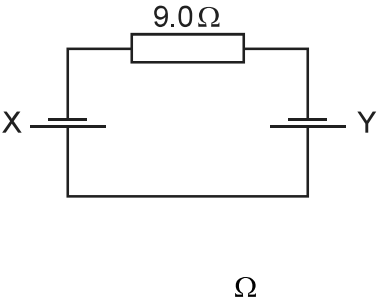
/Q35



240

Ω

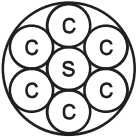
/Q31



Ω

241

/Q34



Ω

Ω

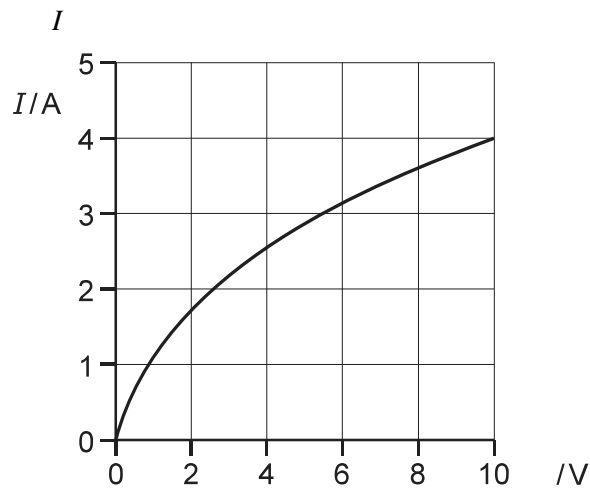
Ω

Ω

Ω

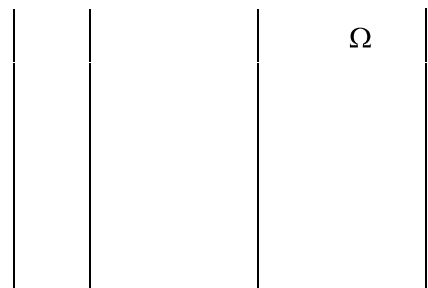
Ω

242

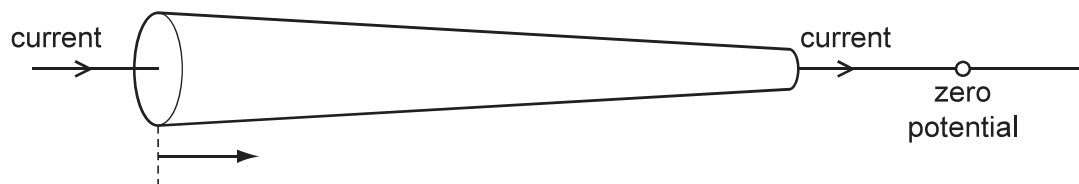


86

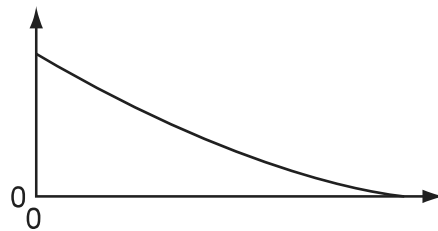
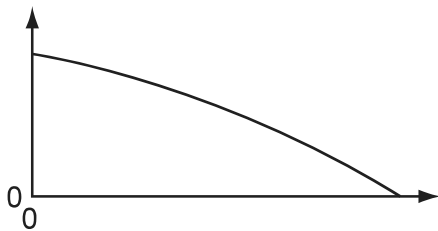
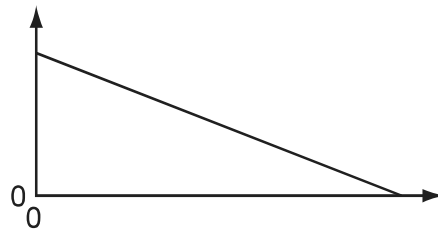
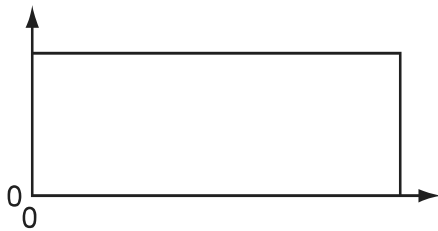
/Q33



243

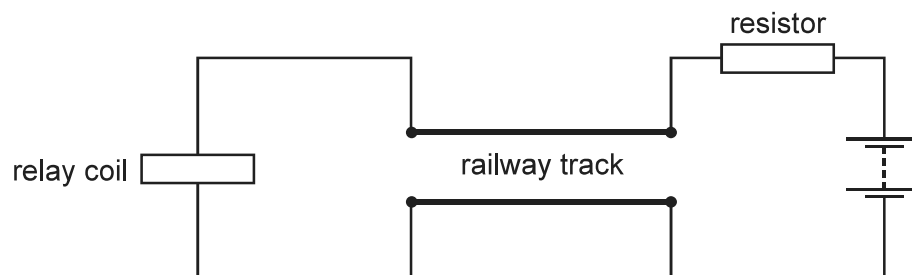


/Q32



244

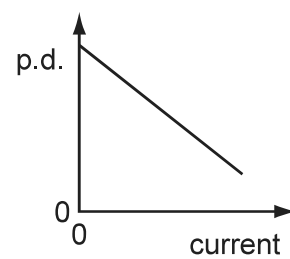
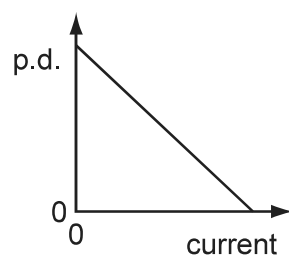
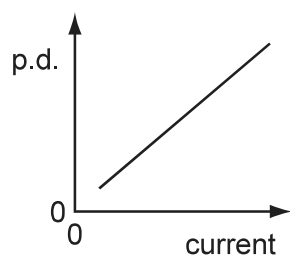
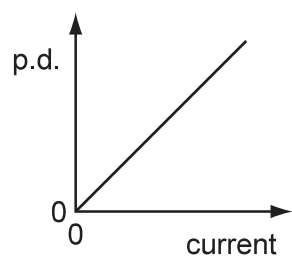
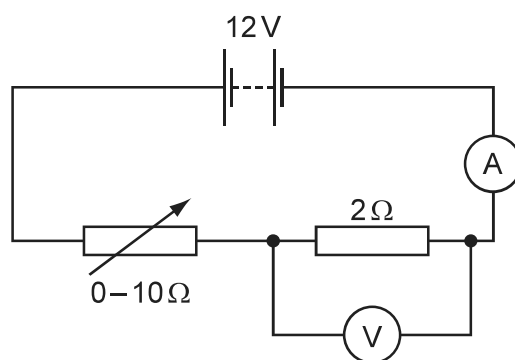
/Q35



245

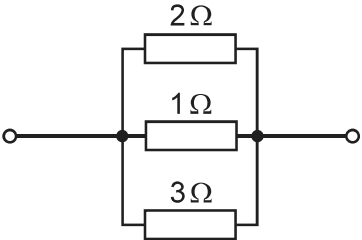
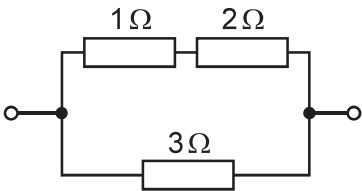
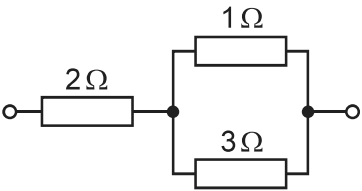
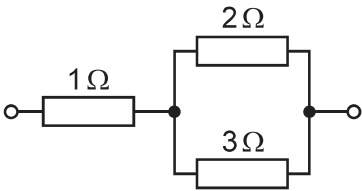
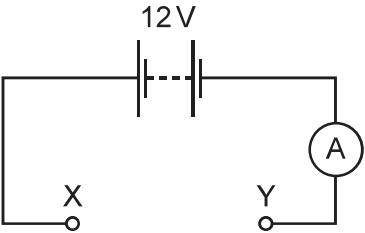
 Ω Ω

/Q36



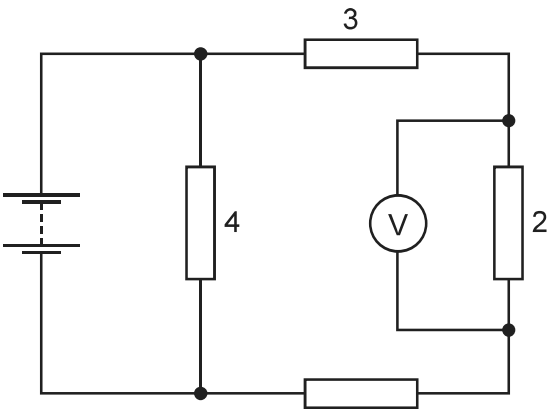
246 I

/Q37



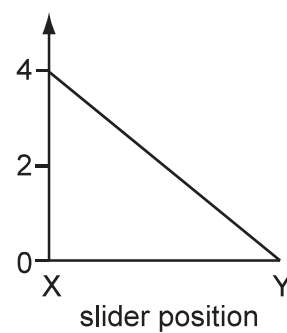
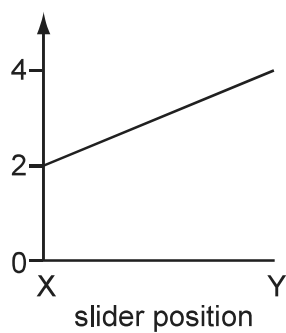
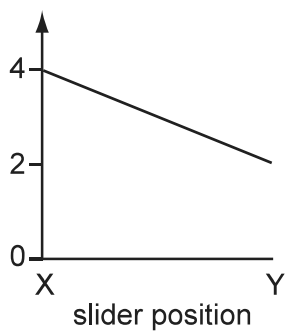
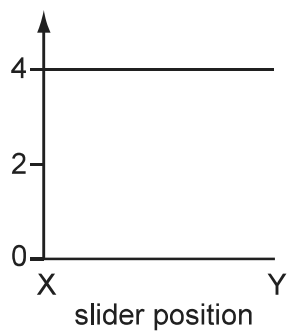
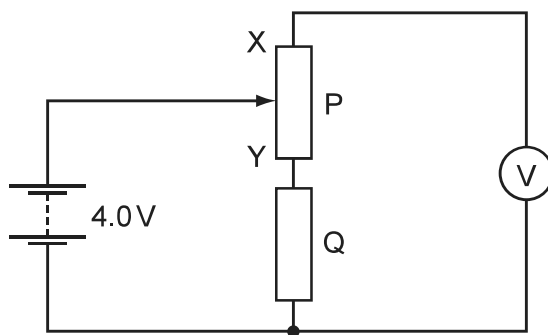
247

/Q38



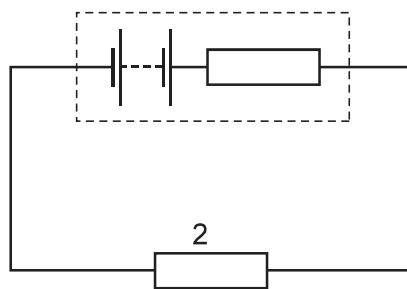
248 I Ω Ω

/Q36



249

/Q33



—

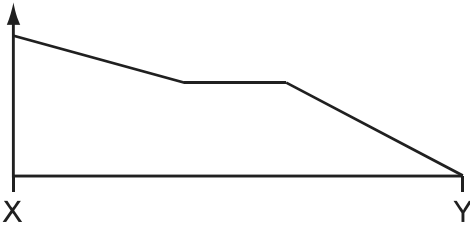
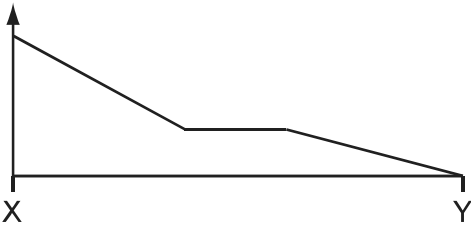
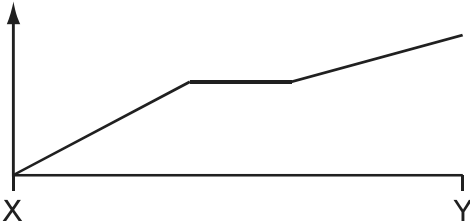
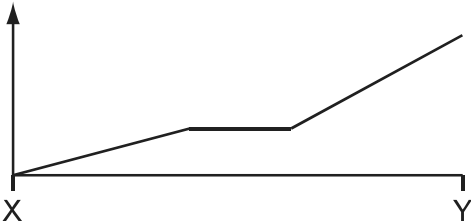
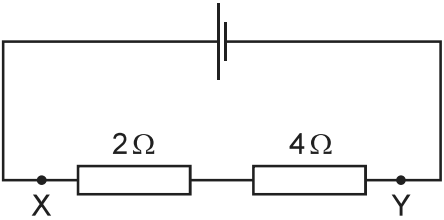
—

250

Ω

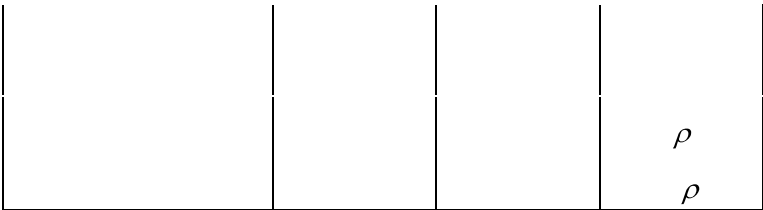
Ω

/Q37



251

/Q35



—

—

252

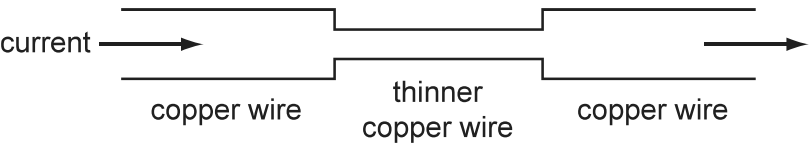
/Q32

253

/Q34

254

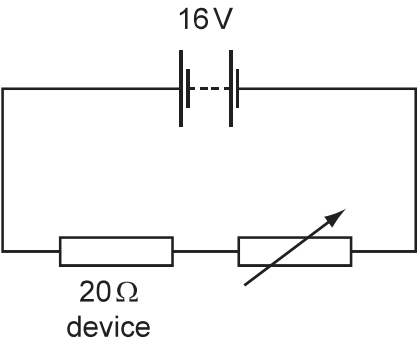
/Q33



255

Ω

/Q34



Ω

Ω

Ω

Ω

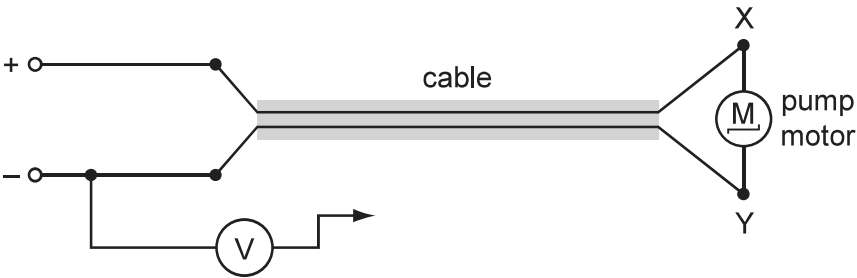
256

/Q35

—

257

/Q36



--	--	--	--

258

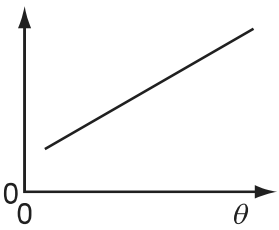
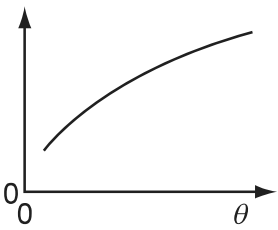
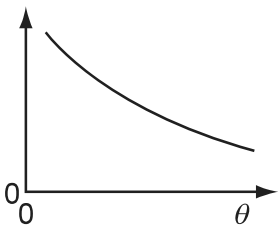
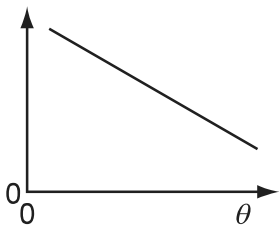
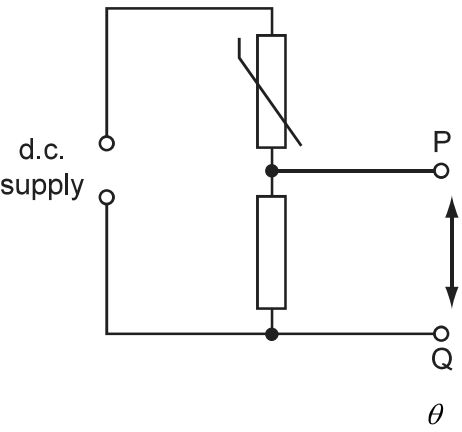
/Q33

—

—

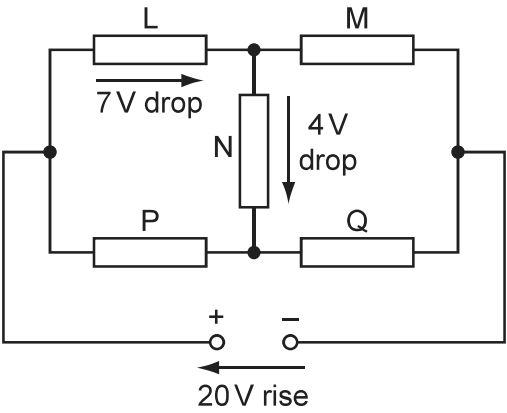
259 I

/Q37



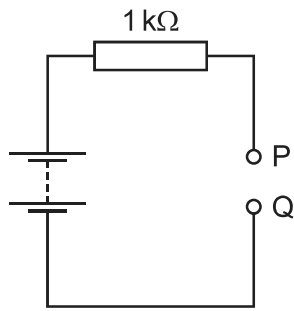
260

/Q38



--	--	--	--	--

261

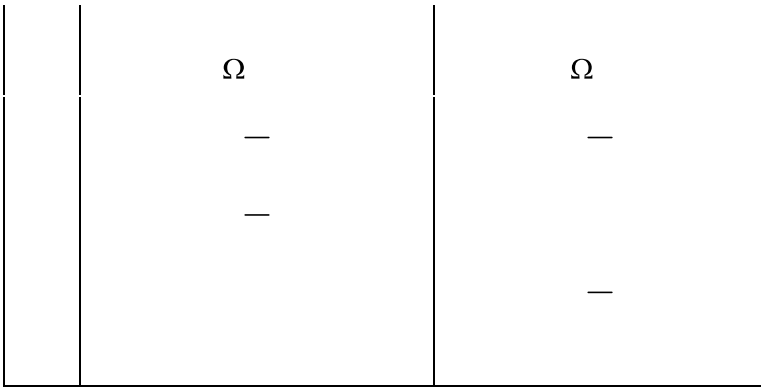


94

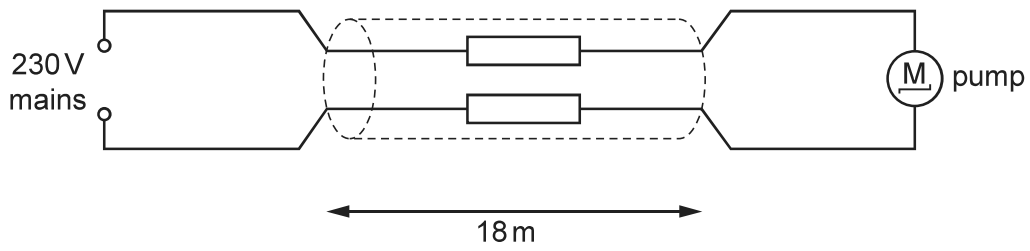
Ω
/Q30

Ω

Ω



262



/Q32

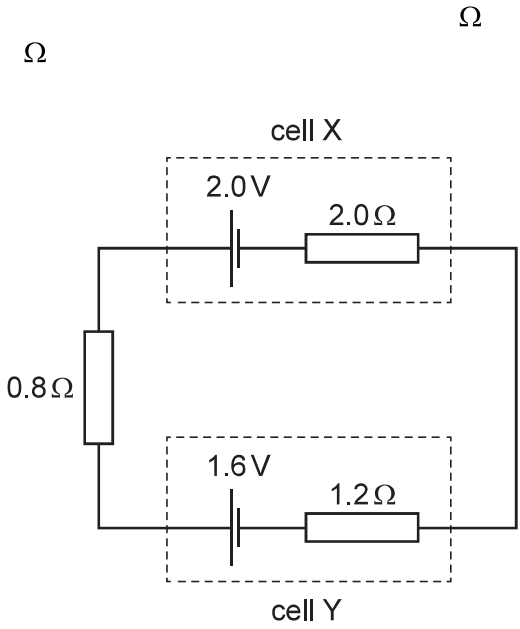
Ω

Ω

Ω

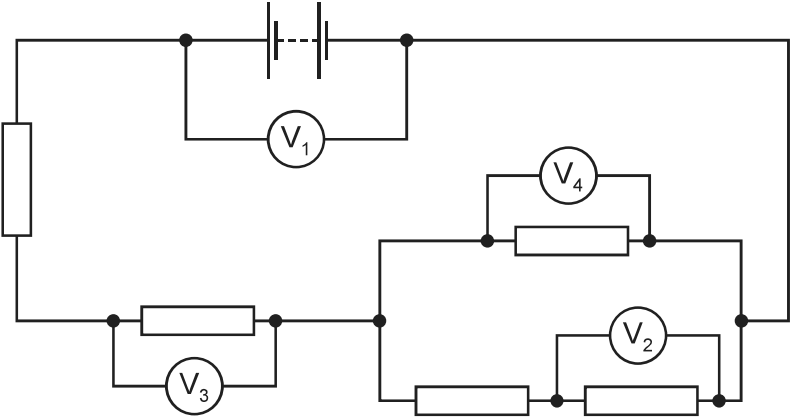
Ω

263



/Q33

264 *I*



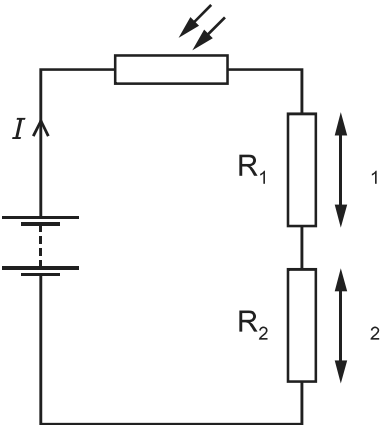
/Q36

--	--	--	--

265 *I*

I

/Q34

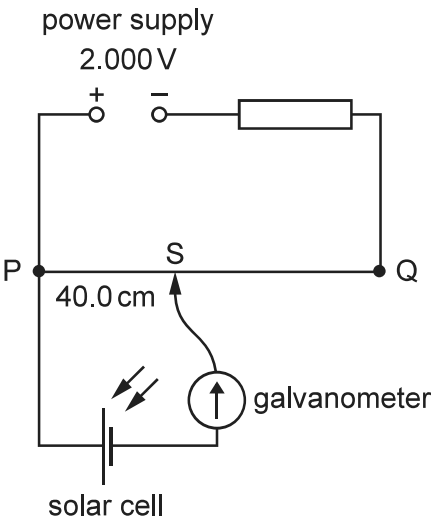


I

—

266

/Q35



Ω

Ω

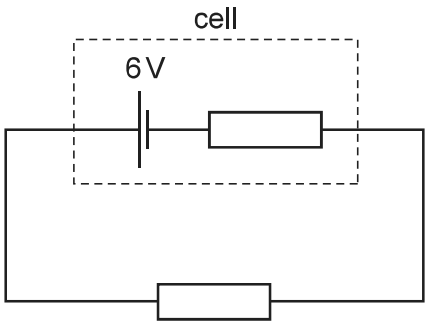
Ω

Ω

Ω

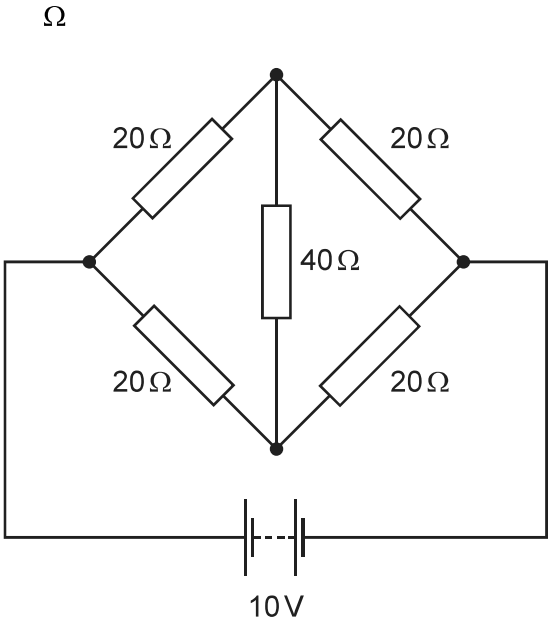
267

/Q34

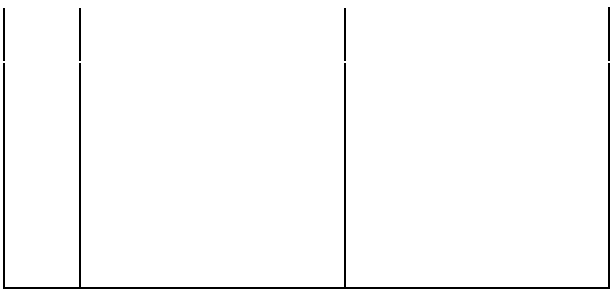
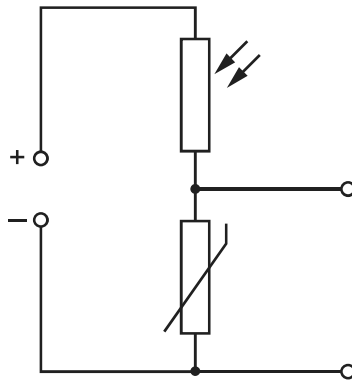


268

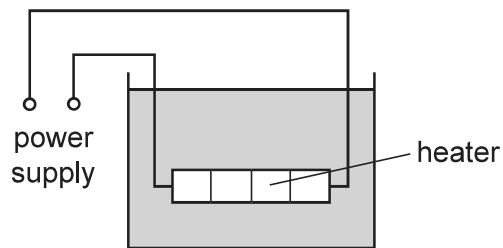
/Q37



/Q37

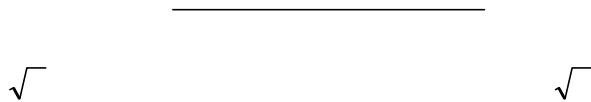


/Q35



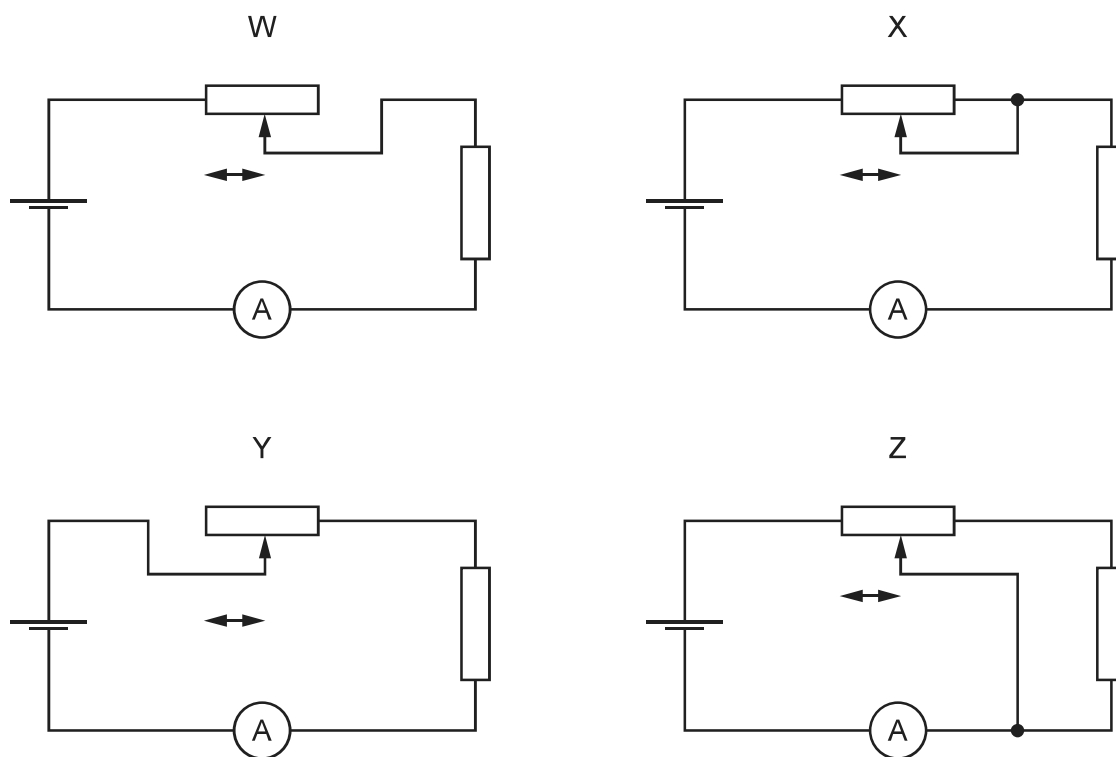
$\Omega.$ Ω

/Q31



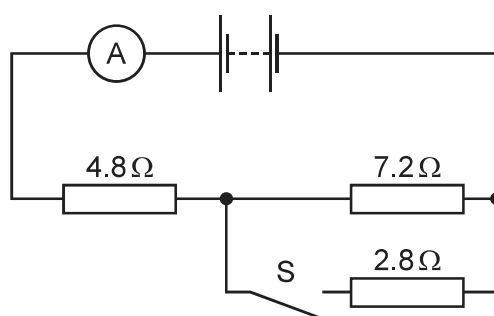
272

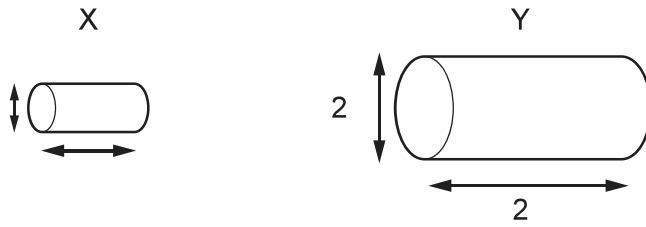
/Q36



273

/Q38



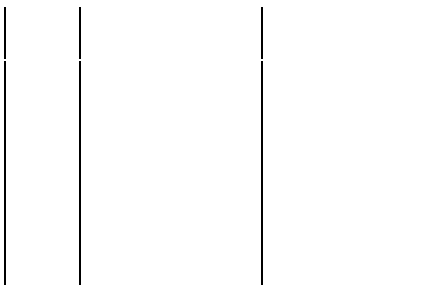
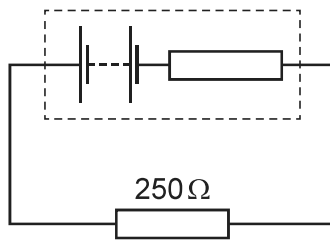


—

—

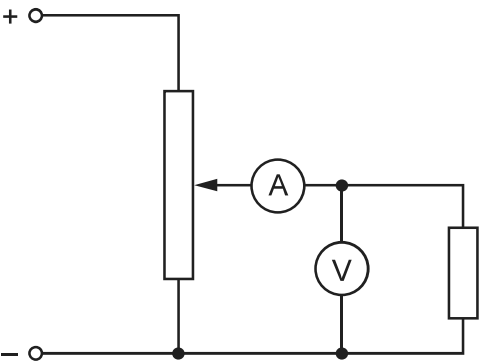
—

—



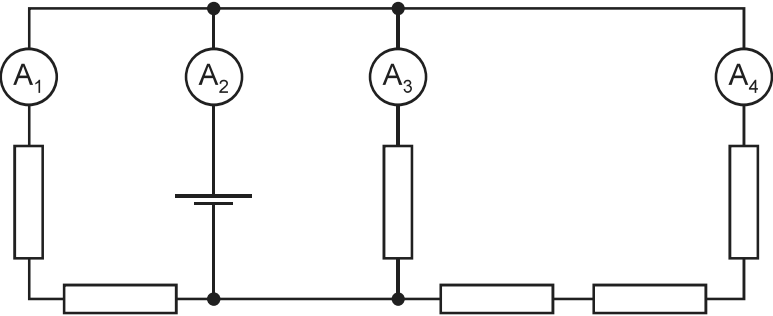
277 I

/Q33



278 I

/Q34



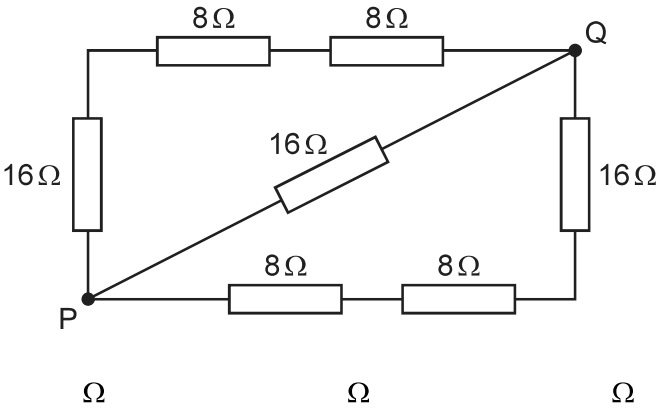
--	--	--	--	--

279

/Q35

280

/Q36



281

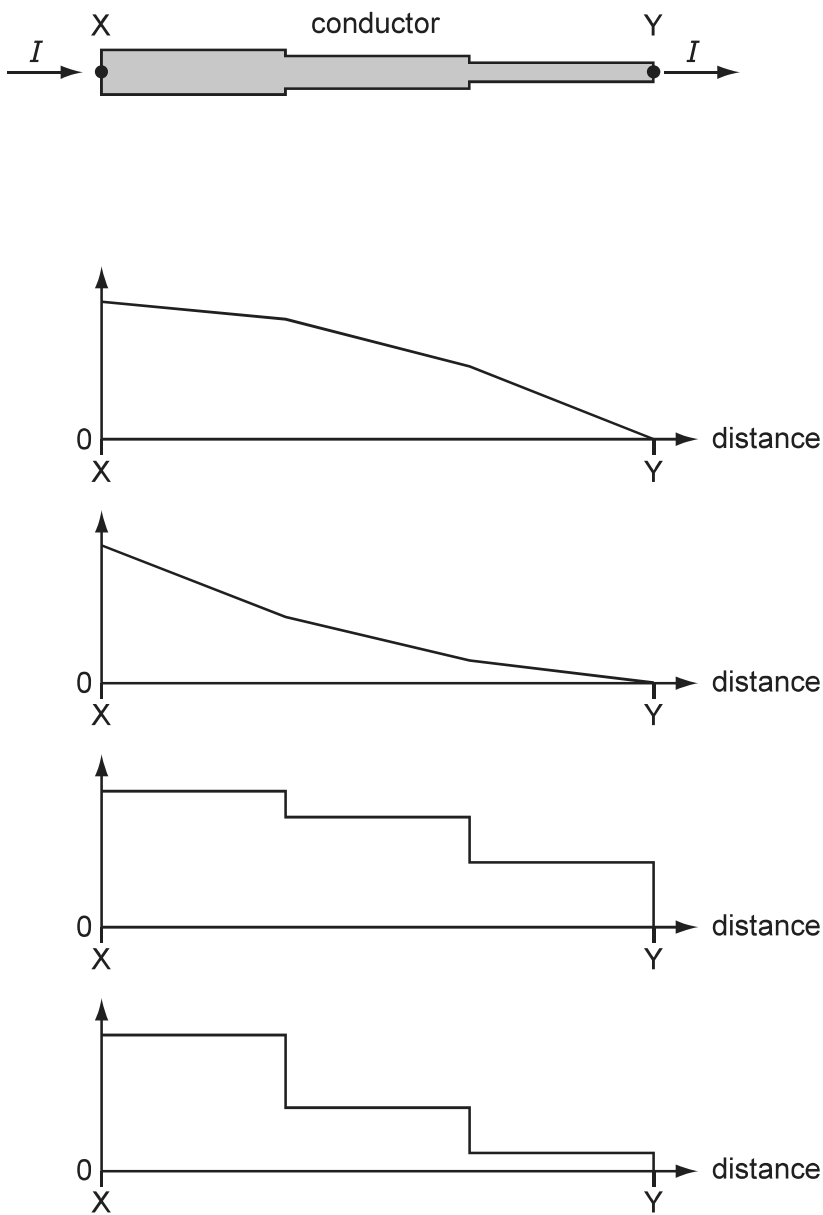
/Q35

— — —

283

 I

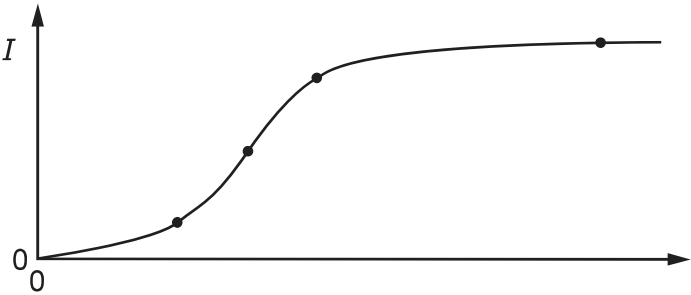
/Q33



284

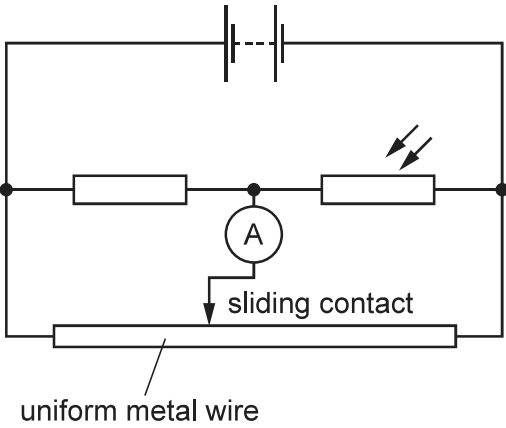
I

/Q34



285 I

/Q36



I

286

Ω

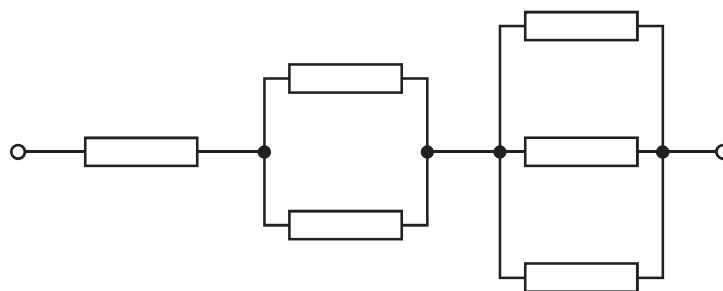
/Q33

Ω

Ω

Ω

Ω



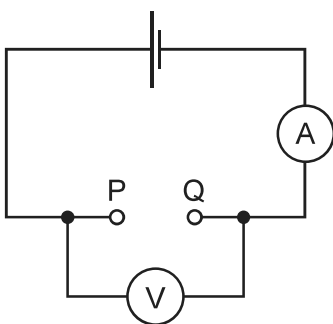
Ω

Ω

Ω

Ω

Ω



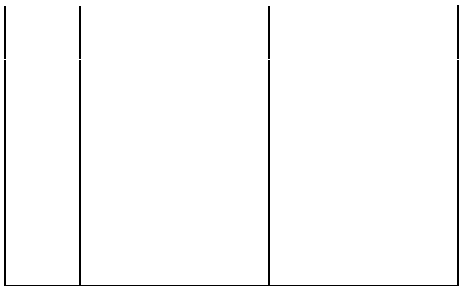
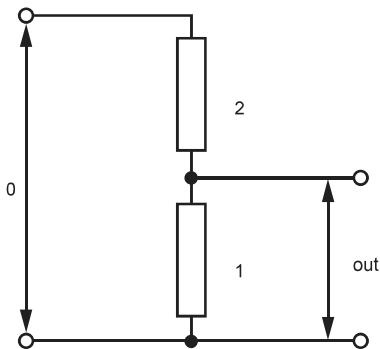
--	--	--	--

		Ω	I
--	--	----------	-----

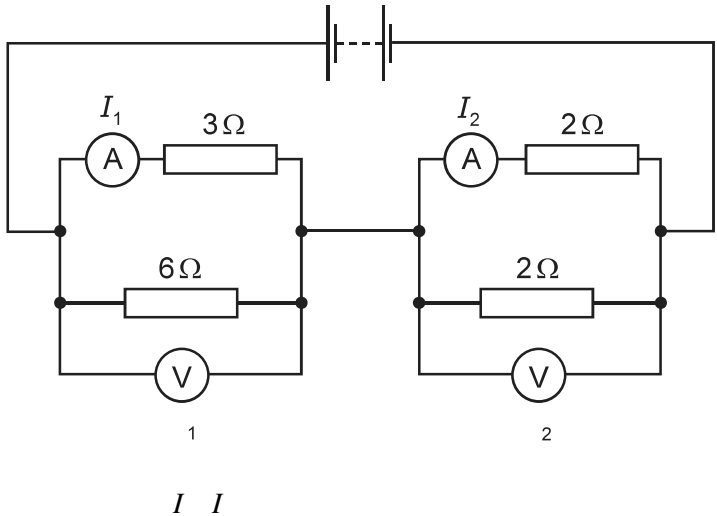
		Ω	I
--	--	----------	-----

		I	Ω
--	--	-----	----------

		I	Ω
--	--	-----	----------



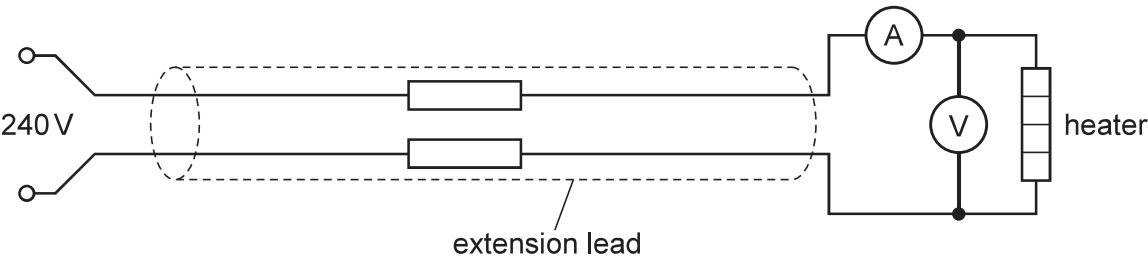
290 I



$I \quad I$
 $I \quad I$
 $I \quad I$
 $I \quad I$

291

/Q36



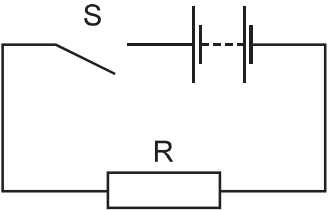
Ω Ω Ω Ω

292

/Q32

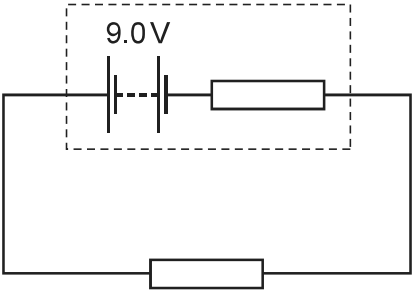
293

/Q33



294

/Q34



Ω

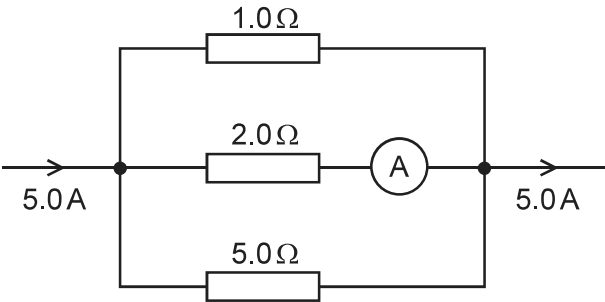
Ω

Ω

Ω

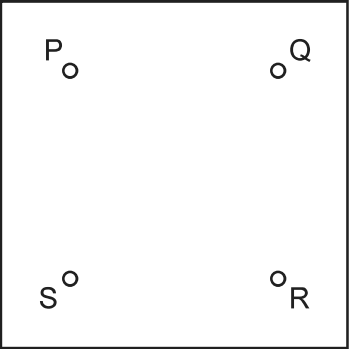
295

/Q37

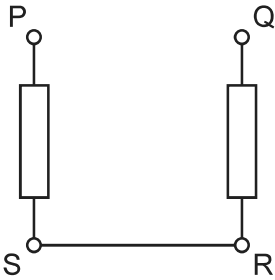
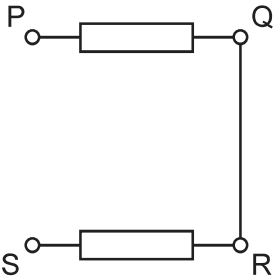
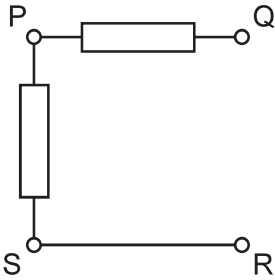
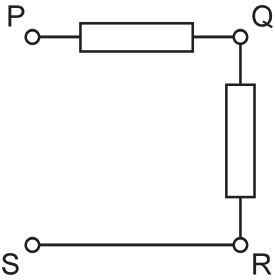


296

/Q33



—



I

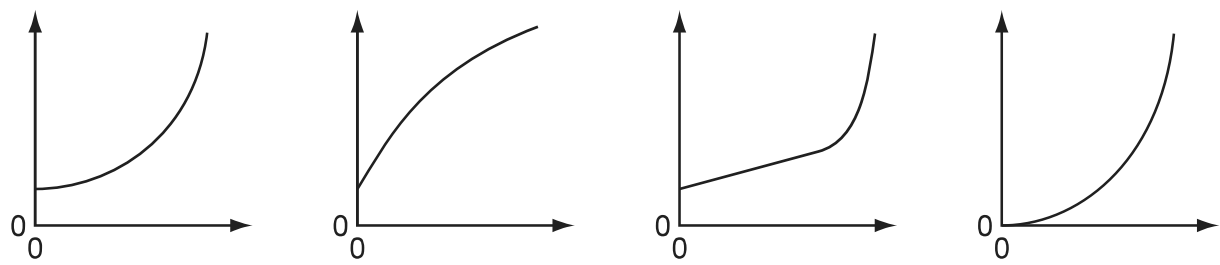
Ω

299

/Q31

300

/Q32

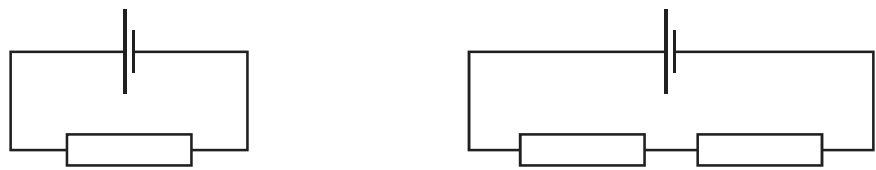


301

/Q34

302

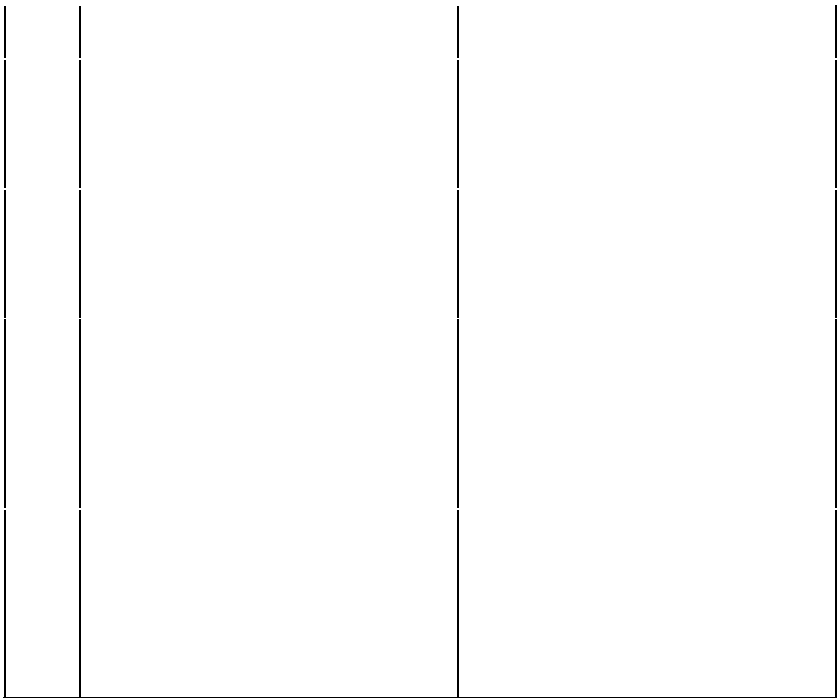
/Q33



I

—

—

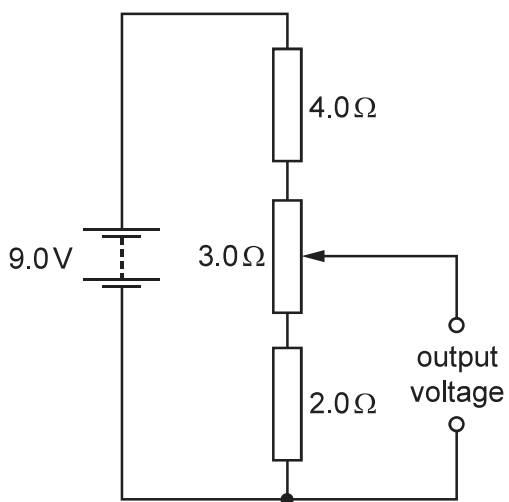


I

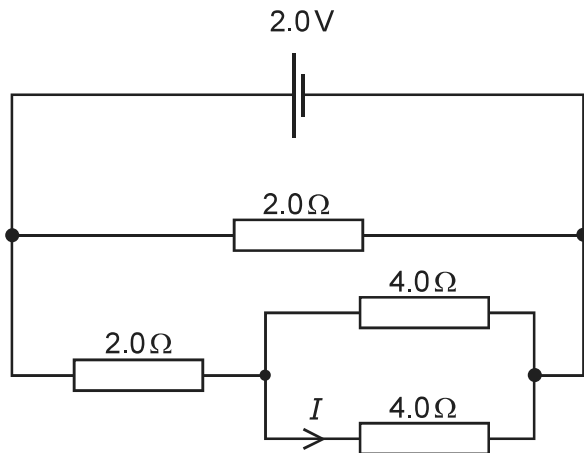
—

I

I



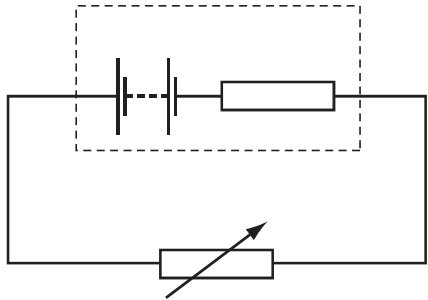
--	--	--	--



307

113

/Q36



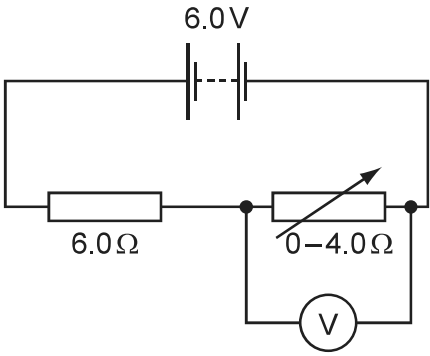
I

308

Ω

Ω

/Q37



309

/Q35

