

GCSE Physics (9 – 1)

Resistance in series and parallel circuits

Name:

Group:

Instructions

- Read each question carefully before you begin to answer it.
- Use black ink or black ball-point pen for your answers.
- Fill in the boxes at the top of this page with your name and group.
- Attempt to answer every question in the booklet.
- Answer the questions in the spaces provided – there may be more space than you need in some answer spaces.
- Calculators may be used for this booklet.
- For any calculations, you **must** show all your working.
- Any and all drawings or graphs should be completed in pencil.



For markers use	
Question	Mark
Task 1	/6
Task 2	/8
1	/6
2	/6
3	/8
4	/9
5	/6
6	/6
Total	/55
%	
Grade	

Information

- The maximum mark for this paper is 55 marks.
- The marks for each question are shown in brackets.
- Please be aware that good English and clear presentation are required in your answers.



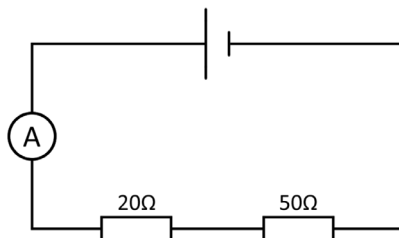
This question booklet deals with calculating the resistance in series and parallel circuits. Let's do these circuits one at a time and practise loads of them 😊 Let's start with resistance in series circuits.

Skill 1: calculating resistance in a series circuit

It's a nice question to get and it's a lot easier than it looks 😊

Method: we simply add together all of the resistances that we are given. Check out the example below.

Example 1: a student builds a series circuit and wants to calculate the total resistance of the circuit.



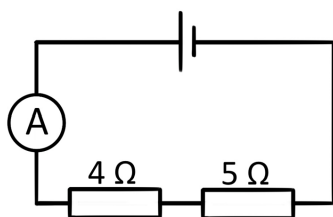
$$\text{Resistance} = 20\ \Omega + 50\ \Omega$$

$$\text{Resistance} = 70\ \Omega$$

That's it 😊 Let's get into them!

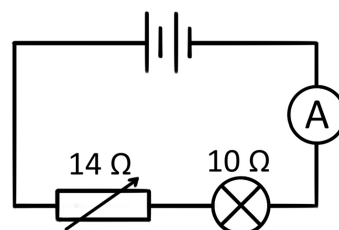
Task 1: calculating the total resistance of a series circuit

For each of the following circuits determine the total resistance of the circuit.



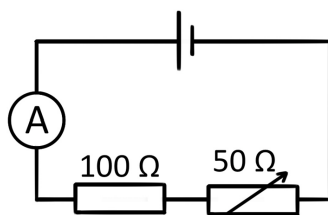
..... Ω

(1 mark)



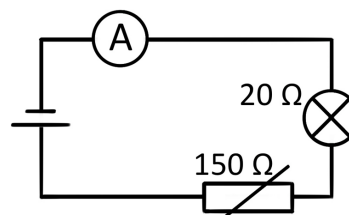
..... Ω

(1 mark)



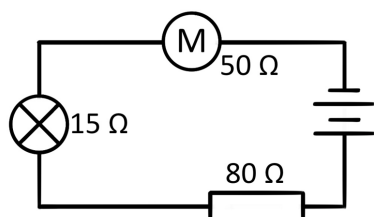
..... Ω

(1 mark)



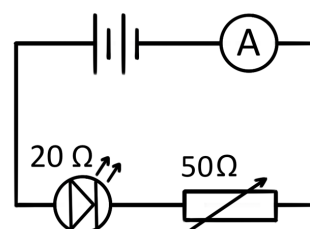
..... Ω

(1 mark)



..... Ω

(1 mark)



..... Ω

(1 mark)

(Total for Task 1 is 6 marks)

Skill 2: calculating resistance in a parallel circuit

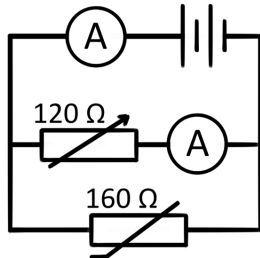
Method: use the following equation

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

I know it looks like a bit of a hard to use equation but it's actually fine 😊

R_T means the resistance total. R_1 is the resistance of the first resistor and R_2 is the resistance of the second resistor.

Example 2: a student builds the parallel circuit below and calculates the total resistance of the circuit.



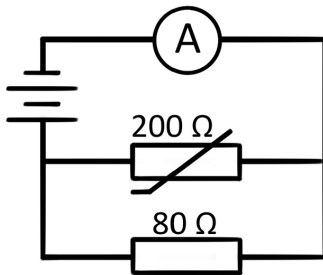
$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$\frac{1}{R_T} = \frac{1}{120} + \frac{1}{160} \qquad \frac{1}{R_T} = \frac{1}{120} + \frac{1}{160} = \frac{7}{480}$$

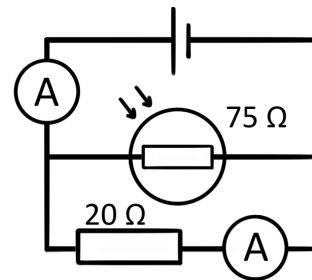
$$RT = 1 \div \frac{7}{480} \qquad RT = 68.60 \, \Omega$$

Task 2: calculating the total resistance of a parallel circuit

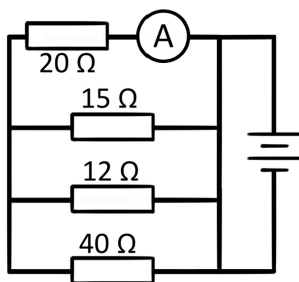
For each of the following circuits determine the total resistance of the circuit.



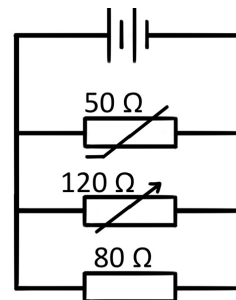
..... Ω (2 marks)



..... Ω (2 marks)



..... Ω (2 marks)



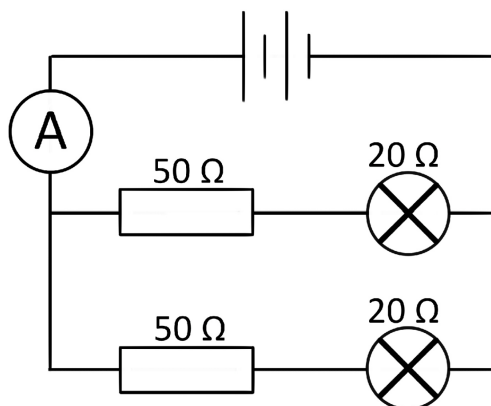
..... Ω (2 marks)

(Total for Task 2 is 8 marks)

Task 3: Resistance in Parallel Circuits

Some extra practice for you 😊

1. A student builds the circuit shown in the figure below.



- a) Calculate the total resistance of the top branch of the circuit.

..... Ω
(1 mark)

- b) Calculate the total resistance of the whole circuit.
Show your working.

..... Ω
(3 marks)

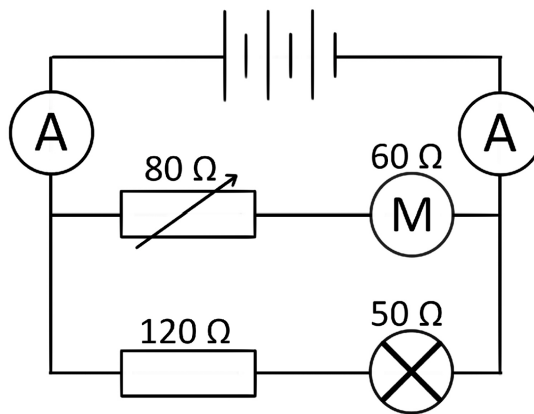
- c) State how the current through the top bulb compares to the current through the bottom bulb.
Give a reason for your answer.

.....
.....
.....
.....
.....

(2 marks)

(Total for Question 1 is 6 marks)

2. A student builds the parallel circuit shown in the figure below.



a) Name the component in the top branch that has a resistance of $80\ \Omega$.

.....
(1 mark)

b) The circuit contains two ammeters. A student states

"The ammeter on the right will show a lower reading than the ammeter on the left because the components have used up some of the current."

Explain why the student is incorrect.

.....

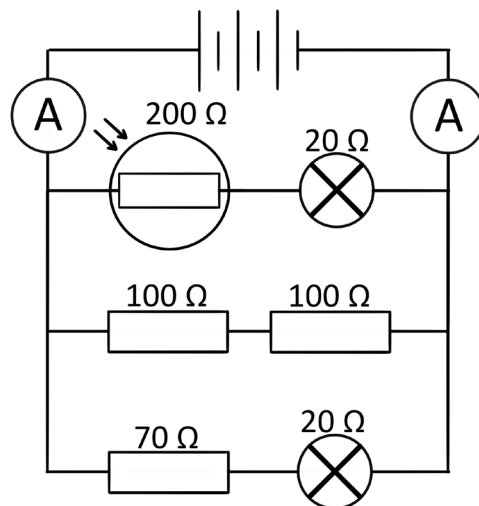
 (2 marks)

c) Determine the total resistance of the entire circuit.
Show your working. Give your answer to 1 decimal place.

..... Ω
(3 marks)

(Total for Question 2 is 6 marks)

3. A student builds the parallel circuit shown below. It contains three branches.



a) Name the component in the top branch that has a resistance of $200\ \Omega$. (1 mark)

.....
(1 mark)

b) Calculate the total resistance of the middle branch.

..... Ω
(1 mark)

c) The battery supplies a potential difference of 9 V .
Calculate the current flowing through the middle branch only.
Show your working and include the correct unit.

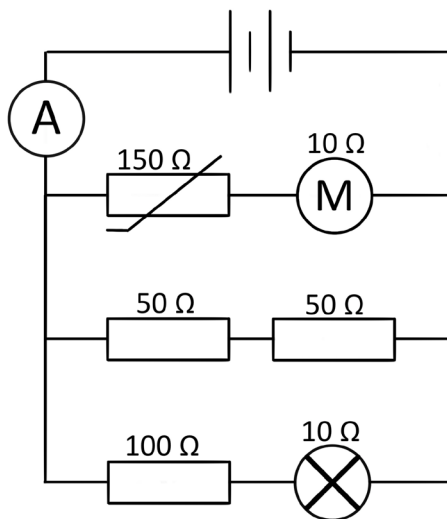
.....
(3 marks)

d) A bright light is shone onto the circuit. State what will happen to the reading on the ammeters.
Explain your answer.

.....
.....
.....
.....
.....
.....
(3 marks)

(Total for Question 3 is 8 marks)

4. A student is investigating the circuit shown in the figure below.



a) State the name of the component in the top branch that has a resistance of $150\ \Omega$.

.....
(1 mark)

b) Calculate the total resistance of the middle branch. (1 mark)

..... Ω
(1 mark)

c) Calculate the total resistance of the whole circuit.
Show your working clearly. Give your answer to 1 decimal place.

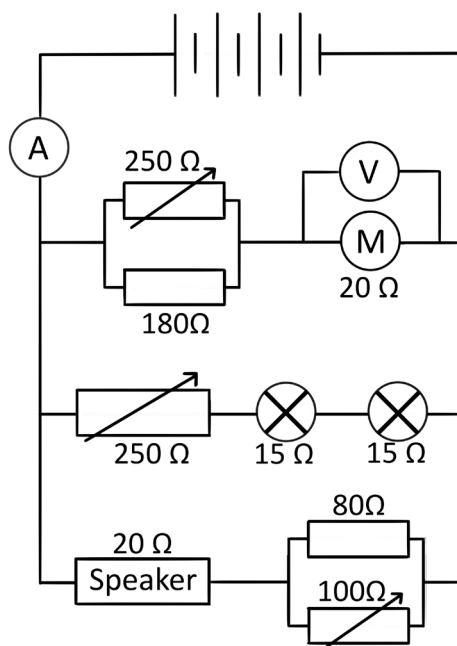
..... Ω
(4 marks)

d) The circuit is moved into a colder room.
Explain what will happen to the amount of current flowing through the motor in the top branch.

.....
.....
.....
.....
.....
.....
(3 marks)

(Total for Question 4 is 9 marks)

5. A student builds the parallel circuit shown in the figure below.



- a) Calculate the total resistance of the whole circuit.
Show your working clearly. Give your answer to 1 decimal place.

..... Ω
(4 marks)

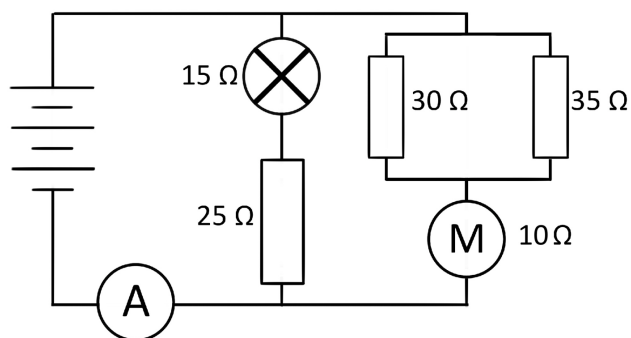
- b) The battery supplies a total current of 1.5 A to the circuit (the ammeter reading).
The top branch draws 0.4 A and the middle branch draws 0.6 A.
Calculate the current flowing through the speaker in the bottom branch.

..... A
(2 marks)

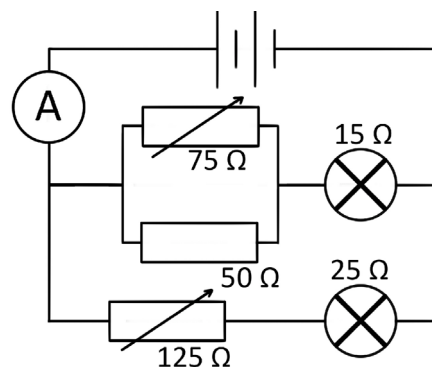
(Total for Question 5 is 6 marks)

6. A teacher set up two different parallel circuits for a practical.
These circuits, circuit A and circuit B are shown in the figure below.

Show, using calculations, which circuit has the greatest resistance.



Circuit A



Circuit B

..... Ω

(6 marks)

(Total for Question 6 is 6 marks)