

GCSE Physics (9 – 1)

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
1	/5
2	/6
3	/6
4	/6
5	/5
6	/6
Total	/46
%	
Grade	

Information

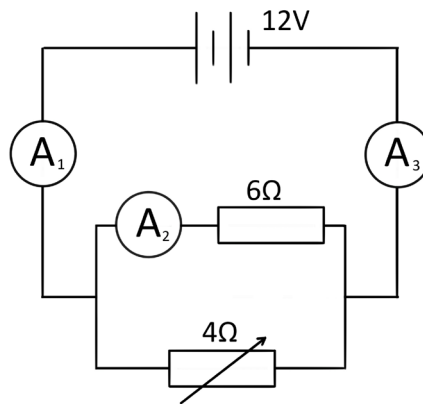
- The maximum mark for this paper is 46 marks.
- The marks for each question are shown in brackets.
- Please be aware that good English and clear presentation are required in your answers.



1. In a parallel circuit, components are connected across separate branches, meaning the total current splits but the potential difference remains the same across each branch.

For each of the following questions **circle** the letter of the correct answer.

- a) The circuit in the figure below shown contains three ammeters A_1 , A_2 and A_3 . Which ammeter has the largest reading?



- | | | | |
|----------|----------|----------|---------------|
| A | B | C | D |
| A1 | A2 | A3 | All the same. |

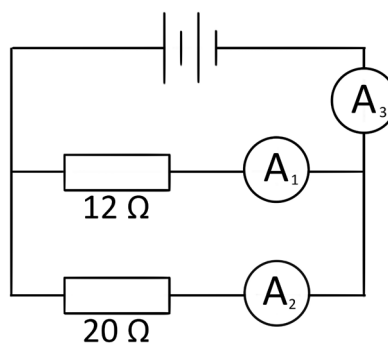
(1 mark)

- b) A student connects a 9 V battery to three identical lamps connected in parallel. What is the potential difference across the second lamp?

- | | | | |
|----------|----------|----------|----------|
| A | B | C | D |
| 3 V | 4.5 V | 9 V | 27 V |

(1 mark)

- c) A student set up a parallel circuit with two branches using one resistor on each branch. The figure below shows the two resistors connected in a circuit.



- | | | | |
|--------------|---------------|---------------|---------------|
| A | B | C | D |
| 7.5 Ω | 11.0 Ω | 14.0 Ω | 22.0 Ω |

(1 mark)

d) A $10\ \Omega$ resistor and a $40\ \Omega$ resistor are connected in parallel.

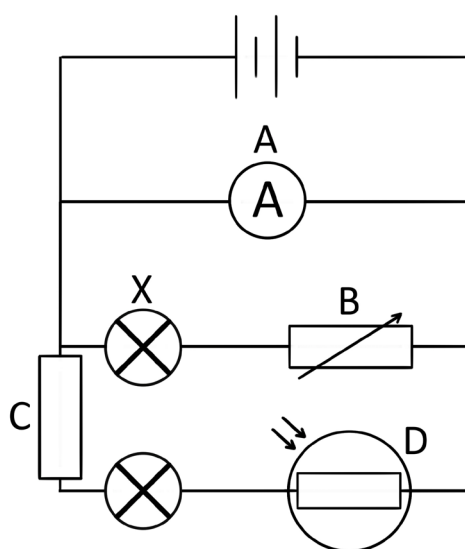
Which statement about the total combined resistance of this arrangement is correct?

- A** It is less than $10\ \Omega$.
- B** It is exactly $25\ \Omega$.
- C** It is exactly $50\ \Omega$.
- D** It is greater than $50\ \Omega$.

(1 mark)

e) The figure below shows a parallel circuit.

Which labelled component in the circuit shown controls the brightness of lamp X?



A

B

C

D

(1 mark)

f) A parallel circuit has two branches. The total current leaving the power supply is 1.5 A . The current flowing through the first branch is 0.6 A .

What is the current flowing through the second branch?

A

B

C

D

0.6 A

0.9 A

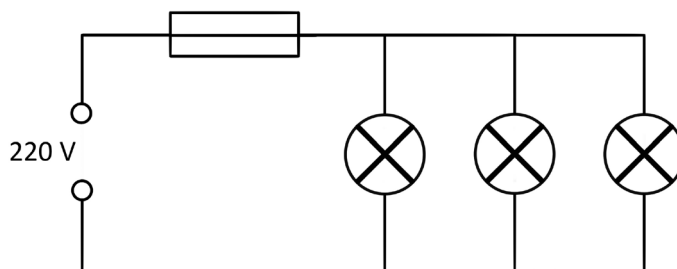
1.5 A

2.1 A

(1 mark)

(Total for Question 1 is 6 marks)

2. The figure below shows 3 lamps and a fuse connected in a parallel circuit to a power supply.



The potential difference of the supply is 220 V. Each lamp has a power rating of 110 W.

- a) Calculate the current flowing through one of the lamps.

Current = ... A
(1 mark)

- b) Calculate the total current flowing through the fuse when all 3 lamps are switched on.

Current = ... A
(1 mark)

- c) The rating of the fuse is 5.0 A.

Calculate the maximum number of these lamps, all in parallel, that could be connected without the fuse melting.

Number = ... A
(2 marks)

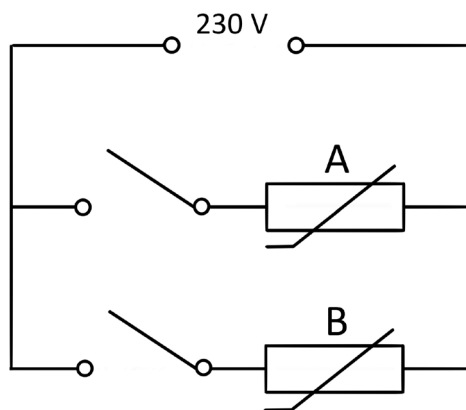
- d) While the circuit is switched on, the filament of one of the lamps breaks, so the lamp goes out. State and explain the effect of this broken lamp on the brightness of the remaining two lamps.

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(2 marks)

(Total for Question 2 is 6 marks)

3. The electrical circuit in a temperature control system contains two thermistors, A and B, connected in parallel. The figure below shows the circuit.



When both switches are closed, the current in thermistor A is 0.15 A.

- a) Calculate the power developed in thermistor A.

Power = ... W
(2 marks)

- b) The resistance of thermistor A is three times the resistance of thermistor B.
Determine the total resistance of the circuit.

Total resistance = ... Ω
(4 marks)

(Total for Question 3 is 6 marks)

4. A homeowner is having an extension built on their house and needs to install three new ceiling lights.

The electrician explains that the ceiling lights should be wired in a parallel circuit, rather than a series circuit.

Compare the advantages and disadvantages of connecting the lights in a parallel circuit rather than a series circuit.

[illegible]

(6 marks)

(Total for Question 4 is 6 marks)

5. A student is designing an electrical circuit for a model car.
The circuit must contain a battery, a motor, and a filament lamp.

Draw a circuit diagram for the student's design.

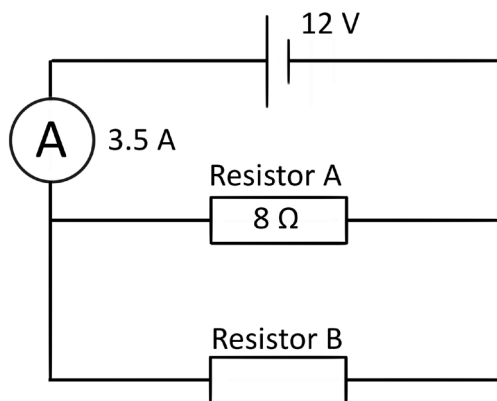
Your diagram should have the following:

- The motor and the filament lamp must be connected in parallel with each other.
- A single switch must be able to turn both the motor and the lamp on and off at the same time.
- An ammeter must be placed to measure the current flowing through the motor only.
- A voltmeter must be placed to measure the potential difference across the battery.

(5 marks)

(Total for Question 5 is 5 marks)

6. The circuit diagram shows two resistors, A and B, connected in parallel to a 12 V battery. The total current leaving the battery is 3.5 A. The resistance of resistor A is $8.0\ \Omega$



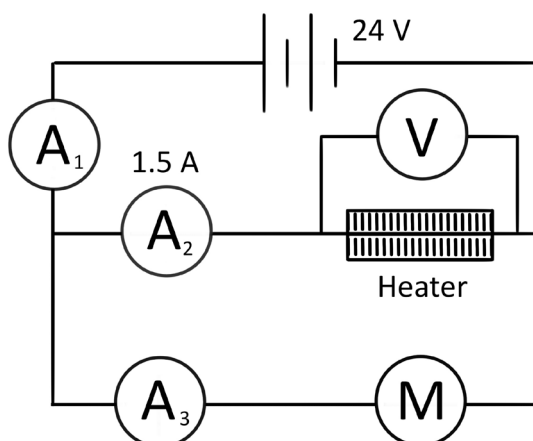
Calculate the total energy transferred by resistor B when the circuit is switched on for 5 minutes.
Use the correct physics equations from your data sheet.

Energy transferred = ... J
(5 marks)

(Total for Question 6 is 5 marks)

7. A student builds the circuit shown in the figure below to investigate the properties of a heater and a motor connected in parallel.

The circuit is connected to a 24 V battery. Several of the meter readings are missing.



- a) State the reading that should be shown on voltmeter V1.

Reading on V1 = ... V
(1 mark)

- b) Use your answer to part (a) and the reading on ammeter A2 to calculate the resistance of the heater.

Resistance = ... Ω
(3 marks)

- c) The electric motor in the bottom branch operates with a power output of 108 W.
Calculate the current flowing through the motor. This is the missing reading for ammeter A3.

Reading on A3 = ... A
(3 marks)

- d) The student leaves the circuit switched on for 10 minutes.

Calculate the total charge that flows through the battery during this time.

Total charge = ... C
(3 marks)

- e) The student adds a third branch to the circuit containing a filament lamp.

Explain what happens to the total resistance of the circuit and the reading on ammeter A1.

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(2 marks)

(Total for Question 7 is 13 marks)