STEM SMART Phase One, 2022

Physics Week 2 – Circuit Laws

https://isaacphysics.org/gameboards#smart_p_1_2a

https://isaacphysics.org/gameboards#smart_p_1_2b

Essential Pre-Uni Physics C4.1

GCSE - Practice (P1)
A Level - Practice (P1)

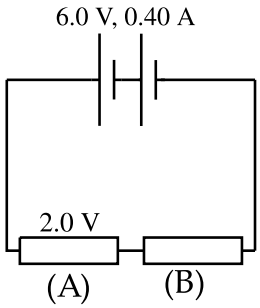

Figure 1: Circuit diagram

Part A Current in (A)

What is the current in (A)?

Part B Current in (B)

What is the current in (B)?

Part C Voltage across (B)

What is the voltage across (B)?

Essential Pre-Uni Physics C4.2

GCSE - Practice (P1)
A Level - Practice (P1)

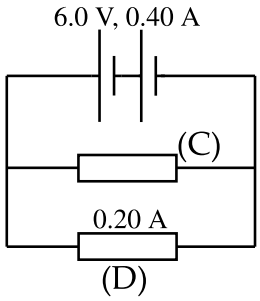

Figure 1: Circuit diagram

Part A Current in (C)

What is the current in (C)?

Part B Voltage across (C)

What is the voltage across (C)?

Part C Voltage across (D)

What is the voltage across (D)?

Essential Pre-Uni Physics C4.3

GCSE - Practice (P1)
A Level - Practice (P1)

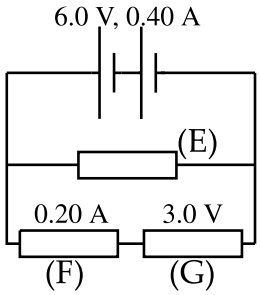

Figure 1: Circuit diagram

Part A Current in (E)

What is the current in (E)?

Part B Voltage across (E)

What is the voltage across (E)?

Part C Voltage across (F)

What is the voltage across (F)?

Part D Current in (G)

What is the current in (G)?

Essential Pre-Uni Physics C4.4

GCSE - Practice (P1)
A Level - Practice (P1)

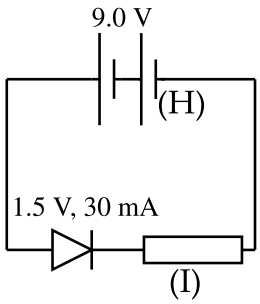

Figure 1: Circuit diagram

Part A Current in (H)

What is the current in (H)?

Part B Current in (I)

What is the current in (I)?

Part C Voltage across (I)

What is the voltage across (I)?

Essential Pre-Uni Physics C4.5

GCSE - Practice (P1)
A Level - Practice (P1)

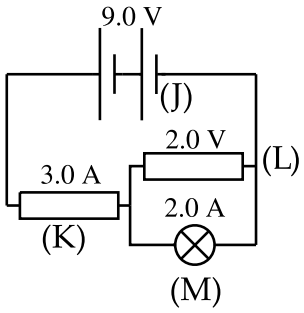

Figure 1: Circuit diagram

Part A Current in (J)

What is the current in (J)?

Part B Voltage across (K)

What is the voltage across (K)?

Part C Current in (L)

What is the current in (L)?

Part D Voltage across (M)

What is the voltage across (M)?

Essential Pre-Uni Physics C5.1

GCSE - Practice (P2)
A Level - Practice (P1)

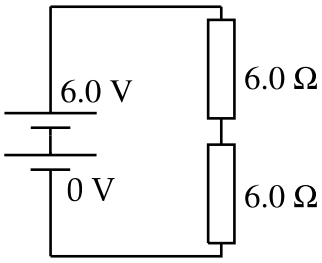

Figure 1: Circuit diagram

What is the voltage across the lower resistor in the circuit?

Essential Pre-Uni Physics C5.3

GCSE - Practice (P2)
A Level - Practice (P1)

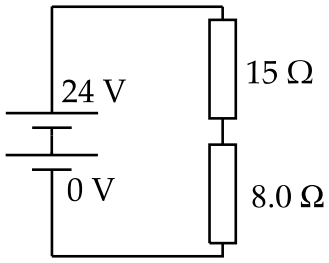

Figure 1: Circuit diagram

What is the voltage across the lower resistor in the circuit?

Essential Pre-Uni Physics C5.4

GCSE - Practice (P2)
A Level - Practice (P1)

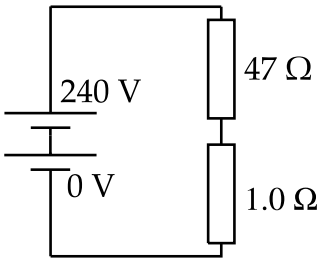

Figure 1: Circuit diagram

What is the voltage across the lower resistor in the circuit?

Essential Pre-Uni Physics C5.5

GCSE - Practice (P2)
A Level - Practice (P1)

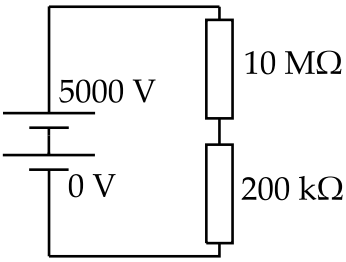

Figure 1: Circuit diagram

What is the voltage across the lower resistor in this circuit to 2 significant figures?

Essential Pre-Uni Physics C5.6

A Level - Challenge (C1)

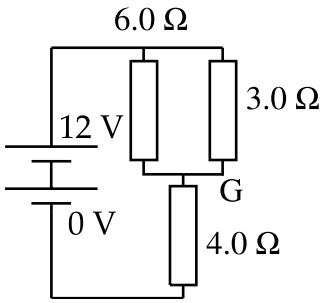

Figure 1: Circuit diagram

What is the potential at G, the junction between the two resistors in parallel and the one in series, in this circuit?

Essential Pre-Uni Physics C6.4

A Level - Challenge (C1)

A high-resistance voltmeter is connected in parallel with a portable battery used to start cars. Before the car is connected, the meter reads $12.4\,\mathrm{V}$. When the car is connected, and a $64\,\mathrm{A}$ current is flowing, the meter reads $11.5\,\mathrm{V}$.

Part A E.m.f. of the battery

What is the e.m.f. of the battery to 3 significant figures?

Part B Internal resistance of the battery

What is the internal resistance of the battery?

Essential Pre-Uni Physics C6.1

A Level - Practice (P1)

Complete the questions in the table.

e.m.f. / V	Internal resistance / Ω	Current / A	Terminal p.d. / V	Load resistance / Ω
12.0	(a)	20	10.2	
12.0	0.12	72	(b)	
230.0	0.53	(c)	227.5	
6.0	(d)		4.2	4.3
(e)	3.2		21.3	12.0

Part A Internal resistance

e.m.f. / V	Internal resistance / Ω	Current / A	Terminal p.d. / V	Load resistance / Ω
12.0	(a)	20	10.2	

a) What is the internal resistance in Ω to 2 significant figures?

Part B Terminal p.d.

e.m.f. / V	Internal resistance / Ω	Current / A	Terminal p.d. / V	Load resistance / Ω
12.0	0.12	72	(b)	

b) What is the terminal potential difference in V?

Part C Current

e.m.f. / V	Internal resistance / Ω	Current / A	Terminal p.d. / V	Load resistance / Ω
230.0	0.53	(c)	227.5	

c) What is the current in A?

Part D Internal resistance

e.m.f. / V	Internal resistance / Ω	Current / A	Terminal p.d. / V	Load resistance / Ω
6.0	(d)		4.2	4.3

d) What is the internal resistance in Ω?

Part E E.m.f

e.m.f. / V	Internal resistance / Ω	Current / A	Terminal p.d. / V	Load resistance / Ω
(e)	3.2		21.3	12.0

e) What is the e.m.f in V?

Batteries and Resistors in Parallel

In the circuit diagram shown below, $R_1 = 3.0\,\Omega$, $R_2 = 2.0\,\Omega$, $R_3 = 5.0\,\Omega$ and two ideal batteries with $V = 1.5\,\mathrm{V}$.

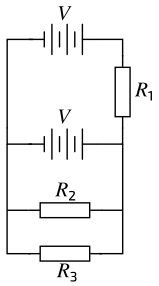

Figure 1: Circuit diagram showing two resistors and a battery in parallel, where the battery is also connected to a resistor and another battery in series.

Part A Power dissipated by a resistor

What is the power dissipated by the resistor with resistance R_1?

Part B Power dissipated by another resistor

What is the power dissipated by the resistor R_3?

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A Power Problem

GCSE - Challenge (C2)
A Level - Challenge (C1)

The circuit shown in the figure below is made up of a battery connected to a set of resistors with different values of resistance. However, if a power of over $2.00\,\mathrm{W}$ is dissipated in one of these resistors, that resistor will fail.

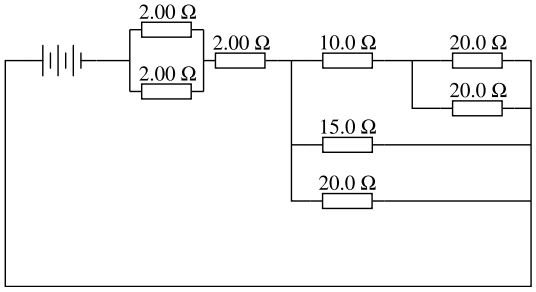

Figure 1: Circuit diagram showing a resistor network with the resistance values on the resistors.

What is the maximum voltage of the battery that can be used without any of the resistors failing?

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