Christ Church Grammar School

Science Department
Year 11 2021

ATAR PHYSICS
UNIT 1: ELECTRICAL PHYSICS
TOPIC TEST 2021

Teacher: CJO JRM PCW
(Please circle)

Time allowed for this paper
Working time for paper: 50 minutes.

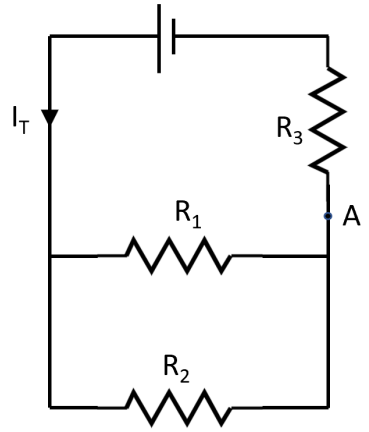
Instructions to candidates:

- You must include **all** working to be awarded full marks for a question. Answers should be expressed to 3 significant figures unless otherwise indicated.
- Marks may be deducted if diagrams are not drawn neatly with a ruler and to scale (if specified).
- Marks will be deducted for incorrect or absent units.
- **No** graphics calculators are permitted – scientific calculators only.

Mark:	/ 52
=	%

Question 1 **(8 marks)**

Consider the following circuit:



(a) Describe what would happen to happen to the total current through the circuit I_T if the following changes were made to the circuit. Explain your reasoning.

(i) An additional resistor was placed in parallel with R_2 (2 marks)

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_____

(ii) An additional resistor was placed at location A (2 marks)

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In a circuit, the total power supplied by the battery must equal the total power dissipated in the resistors. When resistors are connected in parallel across a battery, the full battery voltage is dropped across each. Voltage is proportional to electrical potential energy.

(b) Explain why the above statements can all be true but do not contradict the law of conservation of energy. (4 marks)

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Question 2 **(4 marks)**

A cell has a potential difference between its terminals of 12.0 V and it is connected to a simple circuit containing a 20.0 Ω resistor and an open switch.

Calculate the work done by the cell if the switch is closed for a period of 4.00 minutes.

Question 3 **(6 marks)**

A hair dryer has a very high current draw compared to most handheld appliances. A hair dryer designed to operate in Australia, connected to a 240 V power supply, is rated at 2,400 W.

(a) Calculate the current draw that would be expected when the hair dryer is operated in Australia.
(2 marks)

(b) Calculate the current draw if the same hair dryer was taken to the USA and plugged in to a 110 V power supply.
(4 marks)

Question 4 **(7 marks)**

You are provided with five resistors, each of 2.00 Ω. Show how to connect them to produce an effective resistance of 5.00 Ω, using five or fewer resistors.

(a) Draw in the space below, so that points A and B are at either end of the effective resistance. Label the resistors in your diagram R1, R2, R3 ….etc. If you used fewer resistors, use fewer labels.

(3 marks)

The resistor network you have drawn is now constructed and connected correctly to a 9.00 V power supply.

(b) Calculate the voltage drop across each of the resistors and write the value in the table below. If you used fewer than five resistors, leave the unused resistor box(es) blank.

(4 marks)

Resistor	Voltage drop (V)
R1	
R2	
R3	
R4	
R5	

Question 5 **(7 marks)**

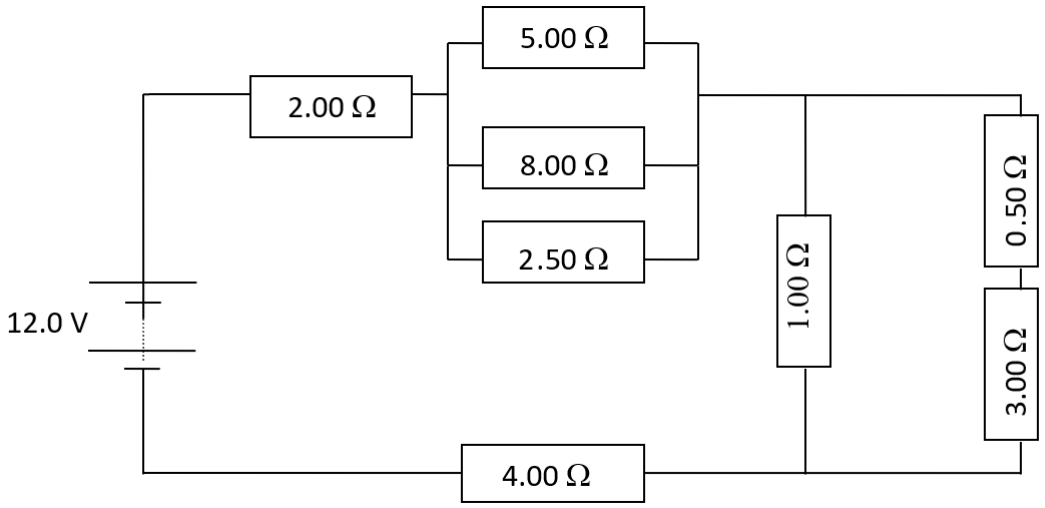
Narendra and Susan are discussing the best way to roast their chicken dinner. Narendra wants to eat as soon as possible and wants the quickest cooking time, and Susan wants to use the cheapest option that uses the least energy. The dinner will take approximately 4.60×10^5 J of energy to cook. The options are as follows:

Appliance	Power Rating (kW)	Efficiency
Oven	2.00	50.0 %
Electric Frying Pan	1.20	75.0 %

Determine which option Narendra and Susan should each choose. Fully justify your response through calculation by determining cooking time and energy consumption for both options.

Question 6 **(14 marks)**

Consider the following complex circuit diagram below:



(a) Show that that the total resistance of the circuit is 8.16 Ω.

(4 marks)

(b) Calculate the current that flows through the 8.00 Ω resistor.

(4 marks)

(c) Calculate the voltage drop across the 0.50 Ω resistor.

(6 marks)

PLEASE TURN OVER

Question 7 **(6 marks)**

Many workplaces do not allow the use of power boards (with multiple general power outlets) as they can introduce an electrical hazard.

(a) Explain why this is the case and what hazard these workplaces are trying to avoid.

(2 marks)

Power boards designed for interior use can also become an electrical hazard if used outside, particularly during wet weather.

(b) On a rainy day, Tom left a live power board outside and noticed that all his appliances suddenly stopped working. Explain what has likely occurred with reference to your knowledge of household safety devices, and what hazard has been avoided.

(4 marks)

END OF TEST