



MYP 4&5 Physics - 3 - copy

Subject	Grade	Points
Physics	MYP 5	<div>A 27</div> <div>B 29</div> <div>C 21</div> <div>D 23</div>

Question 1

Knowing and understanding

This task (questions 1 to 3) addresses the key concept of **relationships** and focuses on **criterion A** (Knowing and understanding).

The voltage across a conductor is determined by the product of current and resistance.

Ohm's Law is a formula used to calculate the relationship between voltage, current and resistance in an electrical circuit. If two of these values are known, technicians can reconfigure Ohm's Law to calculate the third. Resistance cannot be measured in an operating circuit, so Ohm's Law is especially useful when it needs to be calculated. Rather than shutting off the circuit to measure resistance, a technician can determine R using the variation of Ohm's Law.

Q 1.1 If a charge of 1600 millicoulomb is passing through a conductor in 1 second. **Calculate** the current passing through the conductor. Use proper units to present your answer.

A 1

D 1

Words: 0

Q 1.2 Ohm's law is not valid for every conductor. **Justify** this statement.

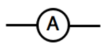


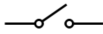

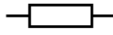

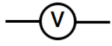
A 1

Words: 0

Q 1.3 **Identify** the circuit components from the given list and match them with their appropriate names.

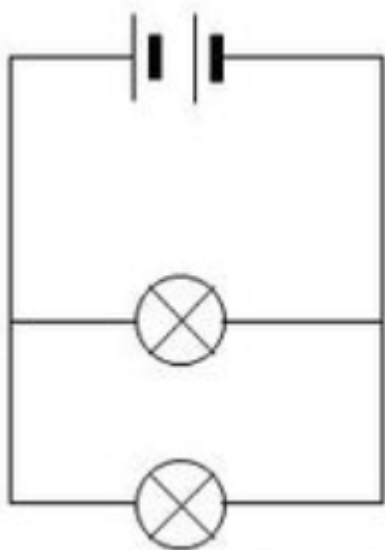
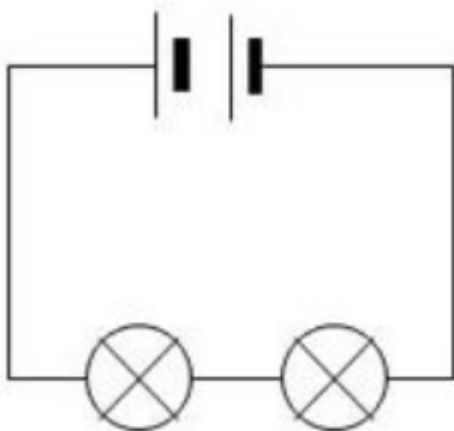
A 3

Open switch	Ammeter	Variable resistor	Cell
Voltmeter	LED	Resistor	Battery

Q 1.4 With reference to how the bulbs are connected in the circuit, **identify** the given circuits. Also **list one** advantage and disadvantage of both the circuits.

A 3



Circuit 1:

Circuit 2:

Words: 0

Q 1.5 **Find** the current flowing in both the circuits if the battery supplies a potential difference of 6 V and each bulb offers a resistance of 2 ohm.

A 4

Words: 0

Q 1.6 The resistance offered by a conductor is 4 ohms. If the length of the conductor is doubled and its area of cross section is made $\frac{1}{4}$ of the initial value, **calculate** the new resistance offered by the conductor. You should include the units in your answer.

A 2

Words: 0

Question 2

A magnet is a material or object that produces a magnetic field. This magnetic field is invisible but is responsible for the most notable property of a magnet.

Magnetism is the force exerted by magnets where they attract or sometimes repel other magnetic materials.

Video 1

Permanent Magnet effect on a compass



00:00/00:33

Q 2.1 **State** why the magnetic needle inside the compass showed deflection?

A 1

Words: 0

Q 2.2

A 2

Select the correct option to complete the statements.

Magnetic field lines start from pole and ends at pole outside the magnet.

Magnetic field lines cross each other.

The field strength is proportional to the line density in a particular area.

Video 2.2

Video 1



Q 2.3 **Describe** the reason behind the soft iron piece achieving magnetism.

A 2

Words: 0

Q 2.4 **Suggest** what would have happened if every time someone tried rubbing it with alternate poles?

A 1

Words: 0

Question 3

An electromagnet is a magnet created by the flow of electric current through a coil of wire, exhibiting magnetic properties.

An electromagnet is a type of magnet in which the magnetic field is produced by an electric current. Electromagnets are different from permanent magnets as the former's magnetic properties can be switched on and off according to the need.

Video 3.1

A simple electromagnet is shown here

Video 1

DIY Super Electromagnet



00:00/00:20

Q 3.1 **Suggest** how the hammer was attracted by the coil.

A 1

Words: 0

Q 3.2 **List two** applications of electromagnets.

A 2

Words: 0

Video 3.2

Video 1

Demonstration of Electromagnetic Induction - IGCSE Physics



00:00/01:06

Q 3.3 **State** the change in the galvanometer reading when:

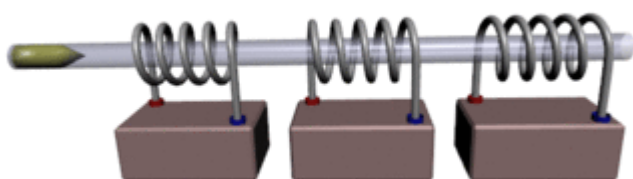
A 3

- Magnet is inverted
- Magnet is brought away from the coil
- The magnet is replaced by another conducting coil.

Words: 0

Q 3.4 **State** the direction of magnetic field if the current in each coil is moving clockwise.

A 1



Words: 0

Question 4

Investigation skills

This task (questions 4 to 7) addresses the key concept of **change** and focuses on **criterion B** (Inquiring and designing) and **criterion C** (Processing and evaluating). In this task, you will investigate relationships in physics.

Exploring how light bends and changes direction when it moves from one medium to another.

A student decides to investigate the phenomenon of refraction. For that she collects the angle of refraction corresponding to different angle of incidence. She prepares an interface of glass and air and starts her investigation

Q 4.1 **State** a question to be tested in this investigation.

B 1

Words: 0

Q 4.2 **Formulate** and **explain** appropriate hypothesis which can be tested in this investigation.

B 3

Words: 0

Q 4.3 **State** the dependent, independent and **one** control variables of the investigation.

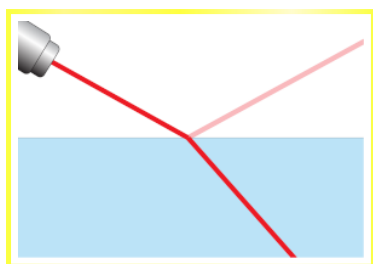
B 3

Words: 0

Simulation 4.1

The simulation presents the experiment the student performed.
Proceed further using the Intro tab of the simulation

Simulation 1



Intro



Prisms



More Tools

PhET

Q 4.4 **Measure** the values for the experiment and **present** in a tabular form.

C 4

Words: 0

Q 4.5 **Discuss** whether or not the data you have collected is supporting your hypothesis.

C 3

Words: 0

Q 4.6 **Suggest** any extension to this investigation.

C 1

Words: 0

Question 5

Exploring how light bends and changes its path when crossing the boundaries between different materials.

The student after the initial investigation decided to check the phenomenon of refraction in different media interfaces.

Q 5.1 **State** a question that could be answered in this investigation.

B 1

Words: 0

Q 5.2 **Formulate** and **explain** a hypothesis that can be tested using this investigation.

B 3

Words: 0

Q 5.3 **Outline** the variables involved in this investigation.

B 4

Words: 0

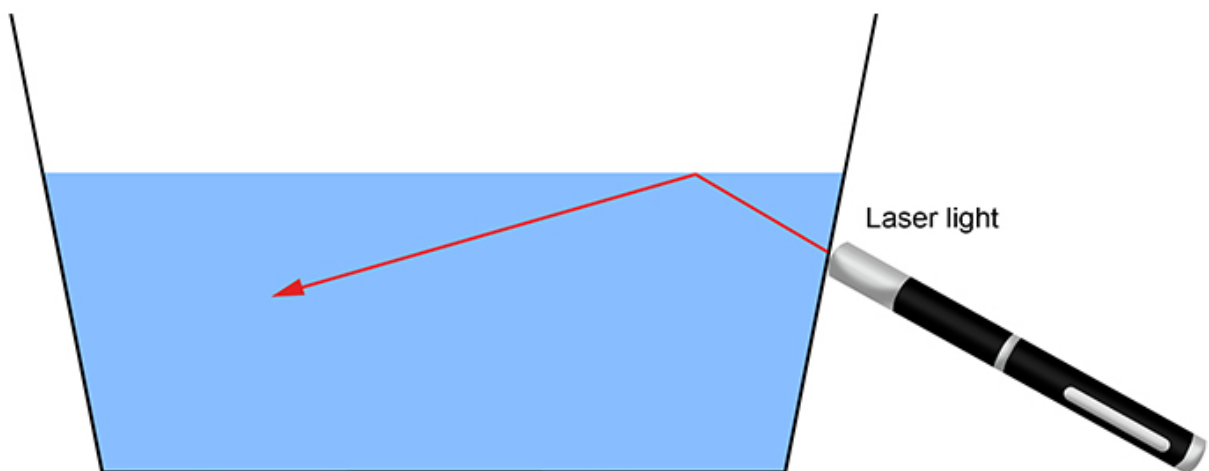
Question 6

Total internal reflection is where light trapped within a medium due to angle constraints, leads to complete reflection at the interface.

An MYP student while travelling through the deserts of Saudi Arabia observed that he could see patches of water some miles from him but disappeared when he reached near it. When asked about it his teacher informed him that this was due to an optical phenomenon known as total internal reflection. He decided to investigate the phenomenon and to determine the angle above which the phenomenon is taking place in different interfaces.

For that he arranged a stand, a laser light, a transparent tank and different liquids.

Image 1



Q 6.1 **Suggest** and **justify** one additional piece of equipment he will need to perform this experiment.

B 2

Words: 0

Q 6.2 **State** one variable that he needs to control. **Describe** how and why this variable should be controlled.

B 2

Words: 0

The table contain the data the student has collected in his investigation.

N1	N2	Theta(in degrees)
1.5	1.0	41.81
1.3	1.0	50.28
1.1	1.0	65.38
1.7	1.0	36.03

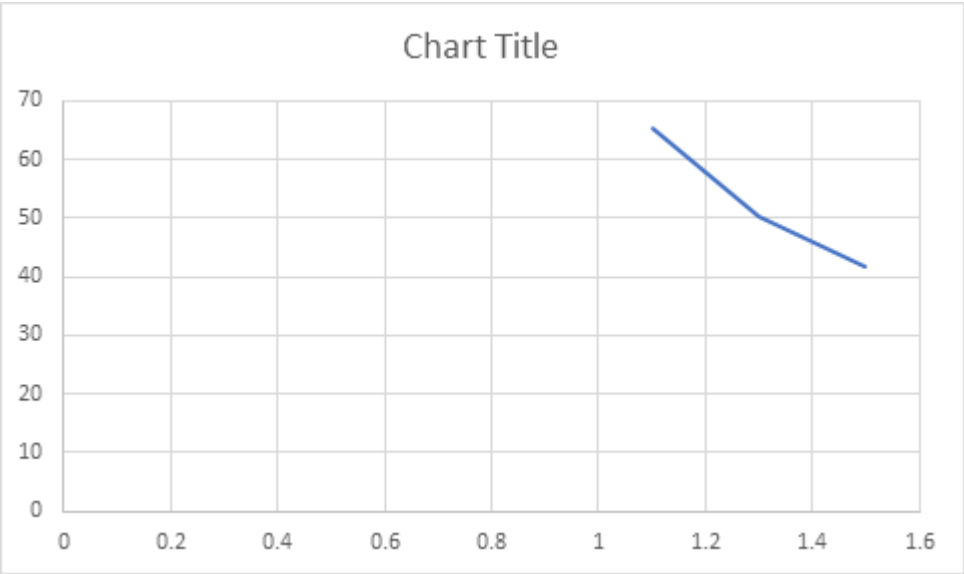
Q 6.3 **Interpret** the given data and **summarize** your conclusions.

C 3

Words: 0

Q 6.4 The student plots a graph using the recorded values

C 3

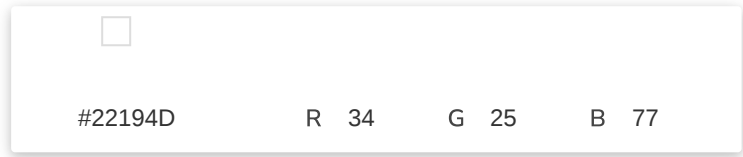
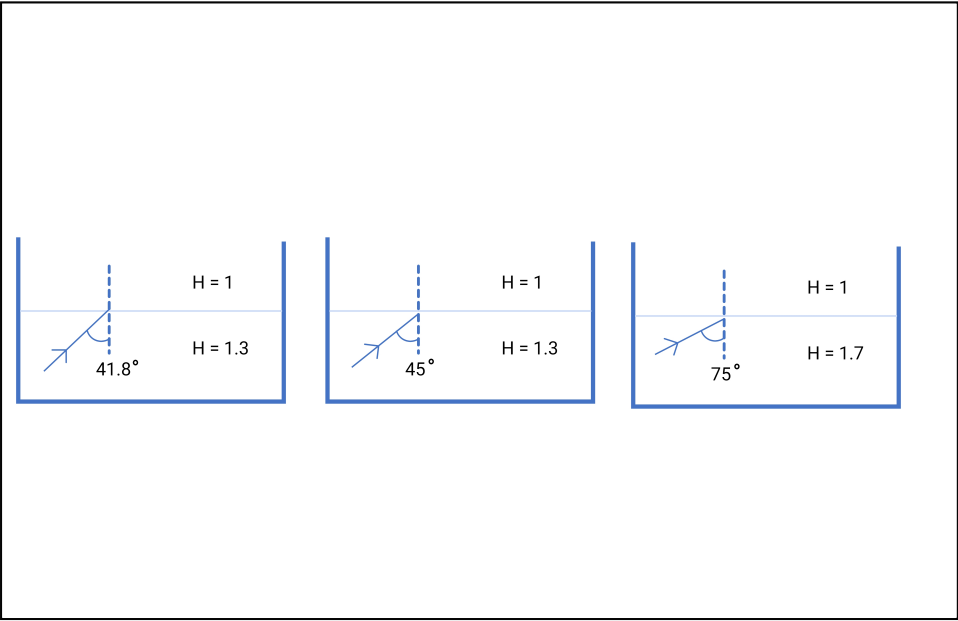


He forgets to mention the X and Y axis in the plot. **Determine** the X and Y axis. You should also provide an appropriate chart title.

Words: 0

C 4

Q 6.5 Using the recorded values, **draw** the path of the light rays in the following ray diagrams. **Justify** your answer. Let H represent the refractive index of the medium.



C 2

Q 6.6 **Discuss** the validity of the method of investigation.

Words: 0

C 1

Q 6.7 **Suggest** an extension to this investigation.

Words: 0

Question 7

Lateral Displacement is the sideways shifting of light as it traverses through a transparent medium at an angle.

The perpendicular shift in the path of light when it emerges out from the refracting medium is known as lateral displacement.

While studying about lateral displacement, a student gave a statement on it. He said, "The lateral displacement of a light ray when travelling through a glass slab depends on the angle at which the light ray enters the glass slab."

Some of the equipment he used for the investigation is given below.



Q 7.1 In order to test this hypothesis, **design** a scientific investigation stating the different variables involved in it. In your answer you should include: B 10

- The variables involved in it
- The list of equipment you will use
- The method you will follow
- How you will collect sufficient data

Words: 0

Question 8

Applying science

The global context is **orientation in space and time**. This task (questions 8 and 9) addresses the key concept of **systems** and assesses **criterion D** (Reflecting on the impacts of science).

GPS is transforming the way we interact and communicate with our surroundings.

Video 8.1

Video 1

Unravelling the Mystery of GNSS: What Impact Does It Have on Our Li...



00:00/02:47

Q 8.1 **State** the type of electromagnetic wave used for satellite communication.

D 1

Words: 0

Q 8.2 **Discuss** and **evaluate** the implications of this type of technological advance in relation to the fairness and inclusiveness in the global community. In your answer you should consider:

D 11

- The ethical implications
- The social implications
- A concluding appraisal

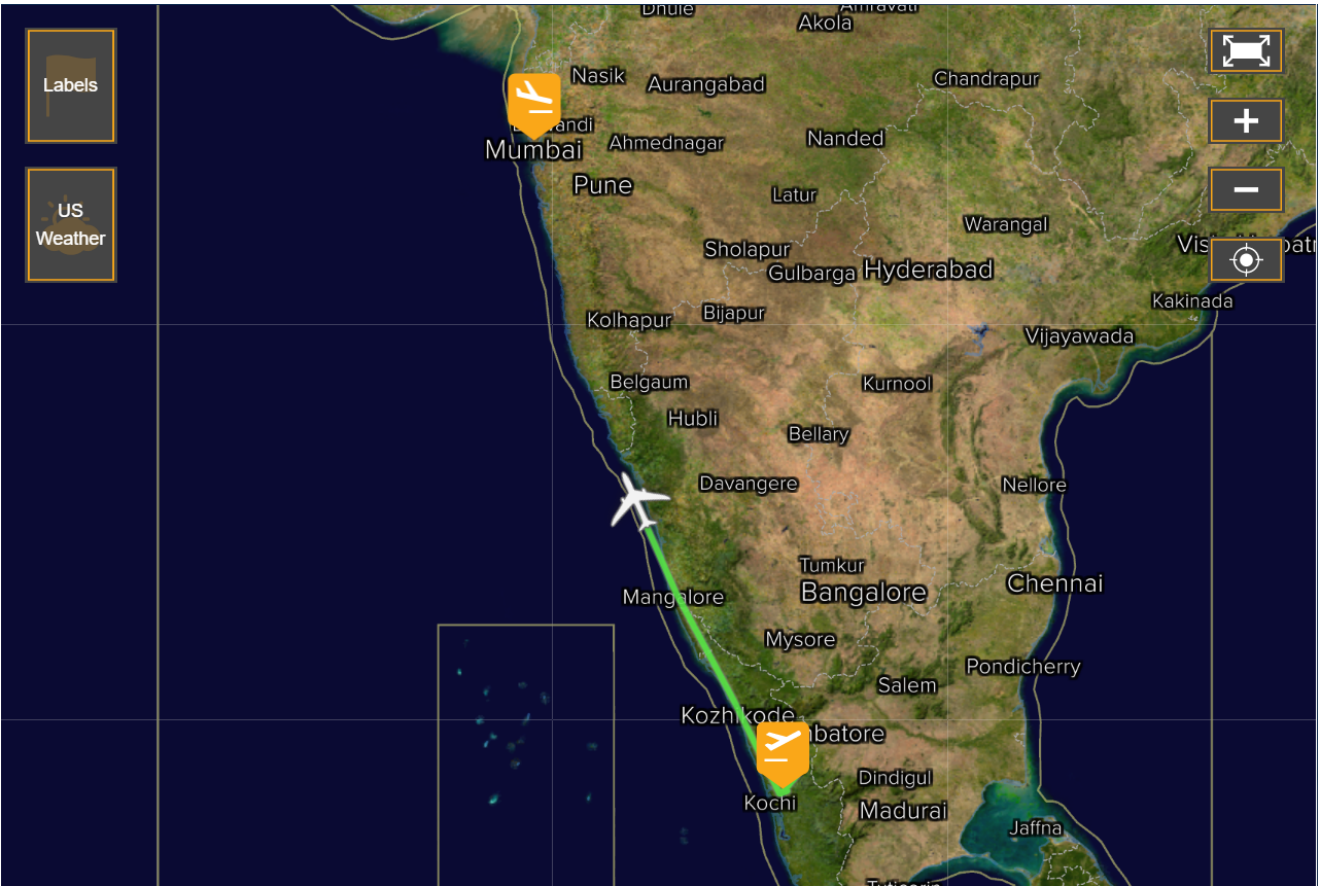
Words: 0

Question 9

GPS: Satellites paving your way.

The flight status of an aeroplane travelling from one city to another in India is given.

Image 1



Q 9.1 Apart from tracking, **suggest two** different applications where GPS is used.

D 2

Words: 0

Q 9.2 Using information from the image and your wider MYP knowledge, **discuss** and **evaluate** the use of GPS in the application identified in Q 9.1. In your answer you should include:

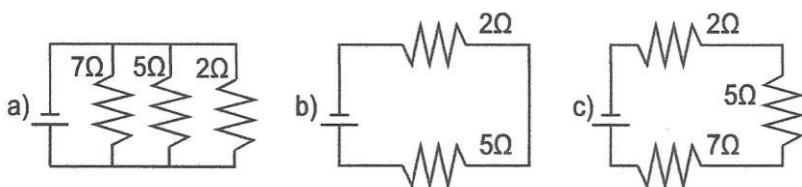
D 8

- Why GPS is important in your application
- The advantages of having this application in real world
- The disadvantages of having this application in real world
- Social and political factors
- Economic factors

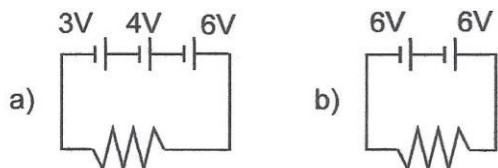
Words: 0

CIRCUITS WORKSHEET

1. Determine the equivalent (total) resistance for each of the following circuits below.

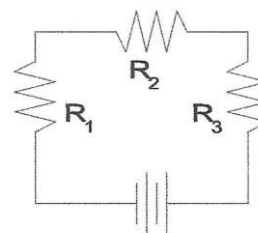


2. Determine the total voltage (electric potential) for each of the following circuits below.



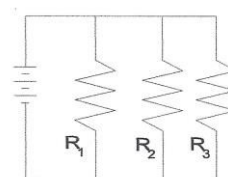
3. Fill out the table for the circuit diagramed at the right.

Circuit Position	Voltage (V)	Current (A)	Resistance (Ω)
1			10.0
2			20.0
3			30.0
Total	6.00		



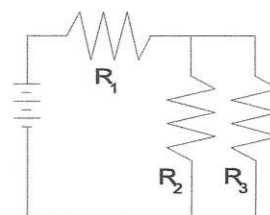
4. Fill out the table for the circuit diagramed at the right.

Circuit Position	Voltage (V)	Current (A)	Resistance (Ω)
1			10.0
2			20.0
3			30.0
Total	6.00		



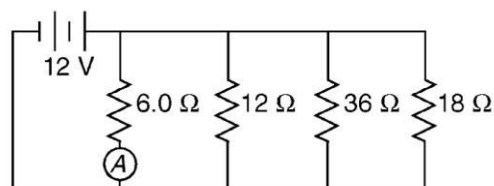
5. Fill out the table for the circuit diagramed at the right.

Circuit Position	Voltage (V)	Current (A)	Resistance (Ω)
1			10.0
2			20.0
3			30.0
Total	6.00		



Questions 6 and 7 refer to the following:

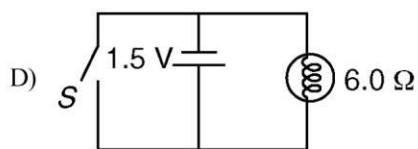
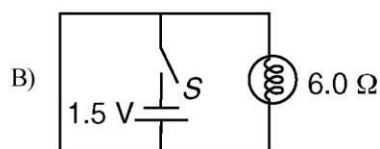
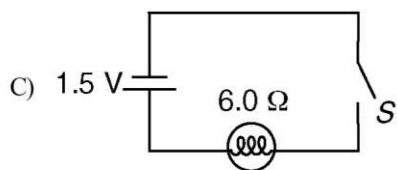
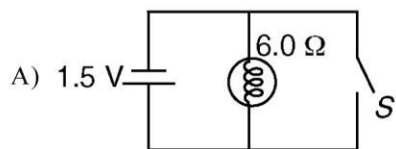
The diagram to the right represents an electric circuit consisting of four resistors and a 12-volt battery.



6) What is the equivalent resistance of the circuit shown?

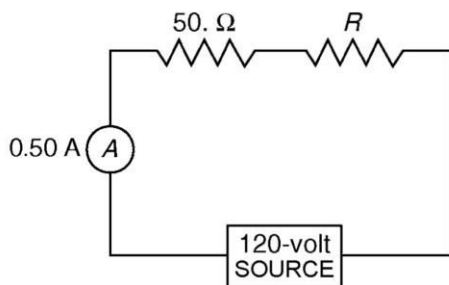
7) What is the current measured by ammeter A shown in the diagram?

8) A 6.0-ohm lamp requires 0.25 ampere of current to operate. In which circuit below would the lamp operate correctly when switch S is closed?



Questions 9 and 10 refer to the following:

A 50.-ohm resistor, an unknown resistor R , a 120-volt source, and an ammeter are connected in a complete circuit. The ammeter reads 0.50 ampere.

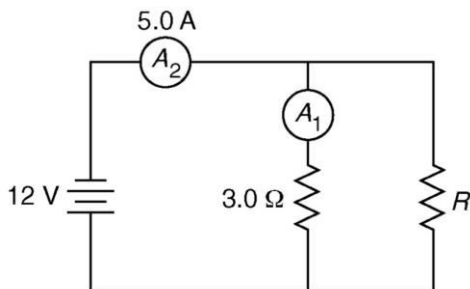


9) Calculate the equivalent resistance of the circuit shown.

10) Determine the resistance of resistor R shown in the diagram.

Questions 11 through 13 refer to the following:

A 3.0-ohm resistor, an unknown resistor, R , and two ammeters, A_1 and A_2 , are connected as shown below with a 12-volt source. Ammeter A_2 reads a current of 5.0 amperes.



11) Determine the equivalent resistance of the circuit shown.

12) Calculate the current measured by ammeter A_1 in the diagram shown.

13) Calculate the resistance of the unknown resistor, R in the diagram shown.

14. The load across a 50.0-V battery consists of a series combination of two lamps with resistances of $125\ \Omega$ and $225\ \Omega$.
- Find the total resistance of the circuit.
 - Find the current in the circuit.
 - Find the potential difference across the $125\text{-}\Omega$ lamp.
15. The load across a 12-V battery consists of a series combination of three resistances are $15\ \Omega$, $21\ \Omega$, and $24\ \Omega$, respectively.
- Draw the circuit diagram.
 - What is the total resistance of the load?
 - What is the magnitude of the circuit current?
16. The load across a 40-V battery consists of a series combination of three resistances R_1 , R_2 , and R_3 . R_1 is $240\ \Omega$ and R_3 is $120\ \Omega$. The potential difference across R_1 is 24 V.
- Find the current in the circuit.
 - Find the equivalent resistance of the circuit.
 - Find the resistance of R_2 .
17. The load across a 12-V battery consists of a series combination of three resistances R_1 , R_2 , and R_3 . R_1 is $210\ \Omega$, R_2 is $350\ \Omega$, and R_3 is $120\ \Omega$.
- Find the equivalent resistance of the circuit.
 - Find the current in the circuit.
 - Find the potential difference across R_3 .
18. Two resistances, one $12\ \Omega$ and the other $18\ \Omega$, are connected in parallel. What is the equivalent resistance of the parallel combination?
19. Three resistances of $12\ \Omega$ each are connected in parallel. What is the equivalent resistance?
20. Two resistances, one $62\ \Omega$ and the other $88\ \Omega$, are connected in parallel. The resistors are then connected to a 12-V battery.
- What is the equivalent resistance of the parallel combination?
 - What is the current through each resistor?
21. A 110-V household circuit that contains an 1800-W microwave, a 1000-W toaster, and an 800-W coffeemaker is connected to a 20-A fuse. Determine the current. Will the fuse melt if the microwave and the coffeemaker are both on?

22. A $35\text{-}\Omega$, $55\text{-}\Omega$, and $85\text{-}\Omega$ resistor are connected in parallel. The resistors are then connected to a 35-V battery.
- What is the equivalent resistance of the parallel combination?
 - What is the current through each resistor?
23. Resistors R_1 , R_2 , and R_3 have resistances of $15.0\ \Omega$, $9.0\ \Omega$, and $8.0\ \Omega$ respectively. R_1 and R_2 are connected in series, and their combination is in parallel with R_3 to form a load across a 6.0-V battery.
- Draw the circuit diagram.
 - What is the total resistance of the load?
 - What is the current in R_3 ?
 - What is the potential difference across R_2 ?
24. A $15.0\text{-}\Omega$ resistor is connected in series to a 120-V generator and two $10.0\text{-}\Omega$ resistors that are connected in parallel to each other.
- Draw the circuit diagram.
 - What is the total resistance of the load?
 - What is the magnitude of the circuit current?
 - What is the current in one of the $10.0\text{-}\Omega$ resistors?
 - What is the potential difference across the $15.0\text{-}\Omega$ resistor?

Answers

- | | | |
|---|------------------------|------------------------|
| 1a) $1.2\ \Omega$ | 1b) $7\ \Omega$ | 1c) $14\ \Omega$ |
| 2a) $13\ \text{V}$ | 2b) $12\ \text{V}$ | 6) $3.0\ \Omega$ |
| 7) $2.0\ \text{A}$ | 8) C | 9) $240\ \Omega$ |
| 10) $190\ \Omega$ | 11) $2.4\ \Omega$ | 12) $4.0\ \text{A}$ |
| 13) $12\ \Omega$ | 14a) $350.\ \Omega$ | 14b) $0.143\ \text{A}$ |
| 14c) $17.9\ \text{V}$ | 15b) $60.\ \Omega$ | 15c) $0.20\ \text{A}$ |
| 16a) $0.10\ \text{A}$ | 16b) $400\ \Omega$ | 16c) $40.\ \Omega$ |
| 17a) $680\ \Omega$ | 17b) $0.018\ \text{A}$ | 17c) $2.2\ \text{V}$ |
| 18) $7.2\ \Omega$ | 19) $4.0\ \Omega$ | 20a) $36\ \Omega$ |
| 20b) $I_{62\Omega} = 0.19\ \text{A}$; $I_{88\Omega} = 0.14\ \text{A}$ | | |
| 21) $I = 23.6\ \text{A}$ so fuse will melt | 22a) $17\ \Omega$ | |
| 22b) $I_{35\Omega} = 1.0\ \text{A}$; $I_{55\Omega} = 0.64\ \text{A}$; $I_{85\Omega} = 0.41\ \text{A}$ | | |
| 23b) $6.0\ \Omega$ | 23c) $0.75\ \text{A}$ | 23d) $2.3\ \text{V}$ |
| 24b) $20.0\ \Omega$ | 24c) $6.0\ \text{A}$ | 24d) $3.0\ \text{A}$ |
| 24e) $90.\ \text{V}$ | | |

ACTIVITY: Investigating conductors

■ ATL

- Critical-thinking skills: Gather and organize relevant information to formulate an argument
- Creative-thinking skills: Make guesses, ask 'what if?' questions and generate testable hypotheses

In pairs or in groups: You will design and carry out an investigation to determine the factors affecting the resistance of a metal conductor.

Inquiry question: What factors affect the resistance of a metal conductor?

Electrical systems need high-quality conductors with low resistance to work efficiently – otherwise electrical energy is wasted when it is transformed, due to resistance in the conductors. Computer network cabling systems are an example of an electrical system where this is very important.

Research what conductors are used in computer network cabling systems. Using what you have learned, **design** an investigation to find out what factors affect the resistance of this kind of metal conductor.

Using the findings of your investigation, write a report for your school on the best kinds of network cabling to use. **Outline** the problem that the cabling must overcome, and **describe** the characteristics that the cables should have. Research some of the materials used in real computer network cabling, and so **suggest** some of the limitations of the cabling you have chosen and how these might affect the choice of conducting material to use.

In your report, be sure to use the scientific terminology you have learned in this chapter accurately. **Document** any sources of information you used for research in line with your school's research guidelines.

◆ Assessment opportunities

- ◆ This activity can be assessed using Criterion B: Inquiring and designing, Criterion C: Processing and evaluating, and Criterion D: Reflecting on the impacts of science.

Resistance and Resistivity Worksheet

Material	Resistivity (ρ) Ωm
Aluminum	2.82×10^{-8}
Copper	1.72×10^{-8}
Silver	1.59×10^{-8}
Carbon	3.5×10^{-5}
Teflon	1×10^{16}
Rubber (hard)	$10^{13} - 10^{16}$
Maple wood	30×10^{10}
Silicon	20 - 2300

Assume the problems below are at the same temperature as the table above.

1. What is the resistance of a 30 m silver wire with a 2 mm diameter?
2. A carbon wire with a 3 mm diameter has a resistance of 100 ohms. How long is the wire?
3. A 200 m long aluminum wire has the same resistance and cross-sectional area as a carbon wire. What is the length of the carbon wire?



OAKRIDGE INTERNATIONAL SCHOOL

Revision Worksheet

Subject :

Topic: Electricity

Grade: MYP 5

Section-A

(Easy to answer and structured questions)

1. How are different electric appliances connected in a house?
2. What is the resistance of an ideal ammeter?
3. A wire of resistivity ρ is stretched to double its length. What will be its new resistance?
4. What is the law of combination of resistances in parallel?
5. What is the other name of electric potential?
6. Give the symbol of fixed resistance and variable resistance.
7. Define the unit of resistance.
8. 1 m V is equal to (a) 1 volt (b) 1000 volt (c) 1/1000 volt (d) 1/10000 volt
9. Which of the following charge is not possible?
(a) $1.6 \times 10^{-19} \text{ C}$ (b) $0.2 \times 10^{-19} \text{ C}$ (c) $0.35 \times 10^{-19} \text{ C}$ (d) $0.1 \times 1.6 \times 10^{-19} \text{ C}$
10. On what factors does resistivity of material depend?
11. Name two special characteristics of heater coil.
12. 10 electrons are removed from a neutral body. The charge acquired by a body is (a) $1.6 \times 10^{-18} \text{ C}$ (B) $1.6 \times 10^{-20} \text{ C}$ (C) $-1.6 \times 10^{-18} \text{ C}$ (d) 10 C
13. Differentiate between resistor and resistance.
14. What do you mean by the potential difference? Write and define its unit.

Section B

(Higher order questions)

Q.1. A torch bulb is rated at 3V and 600mA. Calculate it's a) Power b) Resistance c) Energy consumed if it is lighted for 4 Hrs.

Q.2. Which will offer more resistance a 50W lamp or 25W lamp bulb and how many times?

Q.3. Two identical resistors each of resistance 10 ohm are connected 1) in series 2) in parallel, in line to a battery of 6volts. Calculate the ratio of power consumed in the combination of resistors in the two cases.

Q.4. A bulb is rated at 220V- 100W. What is its resistance? Five such bulbs burn for 4 hrs. What is the energy consumed? Calculate the cost if the rate is 50paise per unit?

Q.5. Express ohm's law mathematically. Draw a circuit diagram to verify Ohm's law. Present the relationship between the voltage applied across a conductor and the current flowing through it graphically.

Q. 6 Two lamps rated 100W, 220V and 25W, 220V are connected in parallel to 220V supply. Calculate the total current through the circuit.

Q7. How much power is used by a contact lens heating unit that draws 0.070 A of current from a 120 V line?

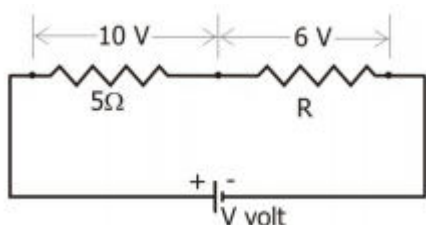
Q 8. Find the resistance of a 1400 W microwave oven and a 150 W electric can opener which are designed to run on 120V?

Q 9 An electric motor has a resistance of $0.25\ \Omega$ and produces 100 W of power. How much current does it draw? If the motor works for 30 minutes, calculate the electrical energy consumed.

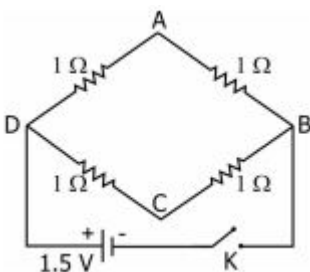
Section C

(Application / Higher order questions with multiple concepts/Olympiad/Asset)

1. What will be the new resistance if a wire of resistance 80 ohm is bent into a circular form?
2. Calculate the ratio of series to parallel combination if there are n number of resistances.
3. A resistance of 6 ohms is connected in series with another resistance of 4 ohms. A potential difference of 20 volts is applied across the combination. Calculate the current through the circuit and potential difference across the 6 ohm resistance.
4. Two resistances are connected in series as shown in the fig.
 - (i) What is the current through the 5 ohm resistance?
 - (ii) What is the current through R ?
 - (iii) What is the value of R ?
 - (iv) What is the value of V ?



5. Calculate the effective resistance in the diagram shown in figure.



Transformers Worksheet

$$\frac{V_P}{V_S} = \frac{N_P}{N_S}$$

Directions: Solve each of the following problems using GUFSSA.

1. A step-down transformer has 2680 turns in its primary. When the voltage across the primary is 5850 V, the voltage across the secondary is 120 V. How many turn are in the secondary?
55 turns
2. A step-up transformer used in an automobile has a voltage of 12 V across its primary and a voltage across its secondary of 2×10^4 V. If the number of turns across the primary is 21, what is the number of turns in the secondary?
 3.5×10^4 turns
3. A step-up transformer for electric power creates 119,340 V across the secondary. If the voltage across the primary is 117 V and the number of turns in the secondary is 25,500, what is the number of turns in the primary?
25 turns
4. A step-down transformer has 525 turns in the secondary and 12,500 turns in its primary. If the voltage across the primary is 3510 V, what is the voltage across the secondary?
147 V
5. A step-up transformer is used on a 120 V line. If the primary has 75 turns and the secondary has 1500 turns, what is the voltage across the secondary?
2400 V
6. A transformer has 1400 turns on the primary and 140 turns on the secondary. What is the voltage across the primary if the secondary voltage is 6.9×10^3 V.
 6.9×10^4 V
7. An electric doorbell uses 12 V to operate. A transformer powered from a 120 V outlet has 500 turns. How many turns are in the secondary?
50 turns
8. A model electric train requires 6 V operate. When connected to a 120 V outlet, a transformer is needed to step the voltage down. If the primary has 240 turns, how many turns are in the secondary?
12 turns
9. A cell phone recharger has 1440 turns in its primary and 60 turns on its secondary. If the input voltage is 120 V, what is the output voltage?
5 V
10. A battery recharger for a laptop computer steps down the outlet voltage of 120 V to recharge the battery. If the number of turns in the primary is 3120 and the number of turns in the secondary is 507, what is the voltage output of the recharger?
19.5 V