

Course Specification

Course Name: General Physics

Course Code: PHY70

Grade: 12

Course Outline:

Topic	Number of Periods
TERM 2	
Topic 3: Electric Current and circuits (Unit 5 Module 19)	24 Periods
● Subtopic 3.1: Current and Circuits	5
● Subtopic 3.2: Using Electrical Energy	3
● Subtopic 3.3: Simple Circuits	8
● Subtopic 3.4: Applications of Circuits	8

[Pacing Link- 2024-25](#)

Textbook: Grade 12 General Physics- Al Diwan

[Lab Manual- Vernier](#)

Term 2 Physics Formula Sheet- Grade 12 General- PHY70

List of Constants and Formulae

Electric Current and Circuits:

Current and Circuits:

$$I = \frac{Q}{t}$$

$$P = IV$$

$$V = IR$$

$I = \text{current}$

$Q = \text{charge}$

 $t = \text{time}$

$P = power$

$V = \text{voltage}$

$R = resistance$

Using Electrical Energy:

$$P = IV = I^2 R = \frac{V^2}{R}$$

$$E = Pt = VIt = I^2Rt = \left(\frac{V^2}{R}\right)t$$

$E = \text{energy}$

Simple Circuits:

$$R_{eq.(series)} = R_1 + R_1 + \dots$$

$$I_{total} = \frac{V}{R_{series}}$$

$$\frac{1}{R_{eq,(parallel)}} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$$

$$R_{eq,(series)} = \text{equivalent resistance in series}$$
$$R_1 = R_1 = resistance$$
 $R_{eq,(parallel)}$

$=$ equivalent resistance in parallel

Key to Exam Coverage		
Color Code	Content	Percentage in Summative Exam
WHITE	Core- Short*	100%
YELLOW	Extended	Not Assessed in summative exam but needs to be assessed in formative tests
RED FONT	Enrichment	Not Assessed

TERM 2	
Topic 3: Electric Current and Circuits (<i>Unit 5 Module 19</i>)	
3.1 Current and circuits	
3.1.1	Define electric current and identify its SI unit as Ampere (A). $1\text{ A} = 1\text{ C/s}$
3.1.2	Identify the direction of conventional current as the direction of motion of positive charges or opposite to the flow of electrons.
3.1.3	Define an electric circuit and describe the flow of charges through it.
3.1.4	Describe the energy transformations taking place in circuits with different components.
3.1.5	Explain how charge and energy are conserved in an electric circuit.
3.1.6	Determine the magnitude of the current in terms of the rate of flow of electric charge. $I = \frac{Q}{t}$
3.1.7	Relate the electric power or rate of energy transfer to current and potential difference. $P = IV$
3.1.8	Apply the relationship between power, current and potential difference to solve numerical problems.
3.1.9	Identify what ammeters and voltmeters measure and how they are connected in a circuit.
3.1.10	Identify the commonly used circuit symbols.
3.1.11	Draw schematic circuit diagrams with different components along with ammeters and voltmeters correctly connected to measure current and voltage.
3.1.12	Define resistance and identify its SI unit as ohms (Ω).
3.1.13	State Ohm's law and apply it to simple circuits. $V = IR$
3.1.14	Explain the factors (like length, cross-sectional area, temperature and material of the conductor) that affect the resistance of a conductor.
3.1.15	Identify devices which obey Ohm's law.
3.1.16	Define resistivity and describe it as a property of a material which remains constant for any dimension.

3.1.17	Define a standard resistor as a device designed to have a specific resistance.
3.1.18	Describe two ways to control the current in a simple circuit.
3.1.19	Describe variable resistors and explain how a potentiometer can vary the current in an electric circuit.
3.1.20	Differentiate between series and parallel connections.
<i>Lab 6 – Perform an experiment to verify Ohm’s law and the factors that affect resistance (#22 Vernier manual- Physics or alternate) OR (#109 Vernier manual- Advanced Physics- Beyond Mechanics or alternate).</i>	
3.2 Using Electrical Energy	
3.2.1	Explain how electrical energy is transformed into thermal energy in a resistor.
3.2.2	Rephrase the equation of power in terms of current and resistance using Ohm’s law: Power is equal to current squared times resistance. $P = I^2 R$
3.2.3	Apply the equation of power ($P = I^2 R$) to solve numerical problems.
3.2.4	Rephrase the equation of power in terms of potential difference and resistance using Ohm’s law: Power is equal to potential difference squared divided by the resistance. $P = \frac{V^2}{R}$
3.2.5	Apply the equation of power ($P = V^2 / R$) to solve numerical problems.
3.2.6	Calculate the amount of energy transformed to thermal energy by a resistor (if power is transformed at a constant rate) using the equation. $E = Pt = VIt = I^2 Rt = \frac{V^2}{R} t$
3.2.7	Define superconductors and demonstrate their importance.
3.2.8	Explain how current in transmission lines is altered to reduce thermal energy transformations.
3.2.9	Define a kilowatt-hour as a unit for measuring electrical energy and is equal to 1000 watts delivered continuously for 3600 s (or 1h). $1kWh = 3.6 \times 10^6 J$
3.2.10	Convert energy in joules to <i>kWh</i> and calculate the consumption and cost of electrical energy used by different devices.
<i>Lab 7 – Perform experiments to measure the electrical energy used by a device like an electric motor (#27 Vernier manual- Physics or alternate).</i>	
3.3 Simple Circuits	
3.3.1	Explain the characteristics of a series circuit.
3.3.2	Calculate the equivalent resistance and the total current passing through a series circuit. $R_{series} = R_1 + R_1 + \dots$ $I_{total} = \frac{V}{R_{series}}$

3.3.3	Explain the importance of a voltage-divider circuit to achieve a desired potential difference.
3.3.4	Use the voltage divider circuit as a series circuit to calculate resistances and voltage drop across the components.
3.3.5	Solve problems to find the current, voltages and resistances in a series circuit.
3.3.6	Explain the characteristics of a parallel circuit.
3.3.7	Calculate the equivalent resistance of a parallel circuit. $\frac{1}{R_{parallel}} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$
3.3.8	State Kirchhoff's loop rule and relate it to the conservation of energy.
3.3.9	Apply Kirchhoff's loop rule to electric circuits.
3.3.10	State Kirchhoff's junction rule and relate it to the conservation of charge.
3.3.11	Apply Kirchhoff's junction rule to electric circuits.
3.3.12	Solve problems to find the current, voltages and resistances in a parallel circuit.
<i>Lab 8 – Perform experiments to investigate and compare series and parallel circuits (#23 Vernier manual-Physics or alternate).</i>	
3.4 Applications of Circuits	
3.4.1	Define a short circuit and describe its effects with examples.
3.4.2	Identify a fuse, a circuit breaker, and a ground-fault interrupter.
3.4.3	Explain how fuses, circuit breakers and ground-fault interrupters protect electric circuits and make them safe to operate.
3.4.4	Describe the wiring used for household circuits.
3.4.5	Identify the appropriate current rating of a fuse in a circuit.
3.4.6	Calculate the equivalent resistance of combined series-parallel circuits.
3.4.7	Calculate the voltage, current, and power dissipation for any resistor in a combined series-parallel circuit.
3.4.8	State the properties of voltmeters and ammeters, in terms of their resistance.
3.4.9	Identify the correct placements of ammeters and voltmeters in electric circuits.