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**NATIONAL UNIVERSITY OF SCIENCES AND TECHNOLOGY**

**Applied Physics (PHY-102)**

**Instructor: Muhammad Imran Malik**

**Lab 5: Ripple Generator and Compond Pendulum**

**Class: BEE-12C**

**Dated: 9/01/2021**

**Group 2**

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**Assignment**

**Question 1:**

Differentiate between simple pendulum and compound pendulum.

**Answer:**

|  |  |
| --- | --- |
| Simple Pendulum | Compound Pendulum |
| Definition | |
| It consists of a point mass, suspended by a weightless inextensible thread, free to vibrate without friction. | It is any rigid body free to rotate about a fixed horizontal axis. By definition, any pendulum that is not a Simple Pendulum is a Compound Pendulum. |
| Characteristics | |
| The mass of a Simple Pendulum is much smaller than the length between C.O.G and point of suspension and is wholly concentrated in the centre of gravity. | The mass of a Simple Pendulum is comparable to the length between C.O.G and point of suspension and is concentrated throughout the object. |
| Time Period | |
| Time Period of a Simple Pendulum is given by: | Time Period of a Compound Pendulum is given by: |
| Appearance | |
| Oscillation of a Simple Pendulum |  |

**Question 2:**

Calculate time period of a compound pendulum having moment of inertia 50 kilogram-meter square and force acting on that body is 20N.

* Given;

I = 50 kg m2

F = 20 N

* Calculations;

**m** = F / g = 20 / 9.8 = **2.04 kg**

As I = (1/3) ML2,

**L** = (3 I / M)1/2 = (3 (50) / (2.04kg))1/2 = **8.57 m**

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**Answer*:***

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**Question 3:**

Derive the relationship between radius of curvature and focal length.

**Answer:**

**Definitions:**

* **Radius of Curvature:**

The distance from the pole, acting as the origin, to the center of curvature is called the **radius of curvature.**

* **Focal Length:**

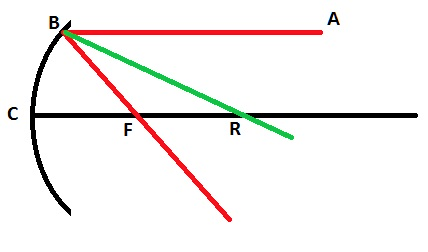
The distance from the pole to the focal point is called the **focal length**. The focal length of a spherical mirror is then approximately half its radius of curvature.

* **Relation**

Where *f* is the focal length and *r is the radius of curvature.*

* **Derivation**

We shall derive this relation with the help of the following diagram;



Here;

***CF = Focal Length***

***RC = Radius of Curvature***

***AB = Hitting of the Light***

***BF = Reflection of Light***

***BR = Radial Line of Circle***

**Explanation**:

The **Red Line AB** is the hitting of light and **BF** is its reflection. The **Green Line BR** by definition, is always perpendicular to the lens. Hence, it bisects the reflection of the light ∠**ABF** into two equal parts. **∠ABR** and **∠RBF** are thus equal. Through alternate angle property, **∠BRF** must also be same. Thus, it is an isosceles triangle, with equal sides being **BF** and **RF**. For small lens, **BF** and CF is also equal.

By observation,

***RC = RF + CF***

***RC = BF + CF ∴ RF = BF of isosceles triangle***

***RC = CF + CF ∴ BF = CF for small lens***

***RC = 2 CF***

By symbolic representation,

**∴ *r* =2 *f***

**∴ *f* = *r*/2**

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**Question 4:**

If a time taken by a flamingo to move up and down in an ocean is 3 seconds, calculate the velocity of that ocean wave if the distance between wave crests is taken 5.0m.

* Given;

T = 3 s

λ = 5 m

* Calculations;

f = 1/T = 1/3 = 0.33 Hz

v = f λ

v = (0.33) \* (5)

**Answer: v = 1.667 m/s**