

With
ANSWERS
TESTS &
ASSIGNMENTS
PHYSICS XI

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FORMAN CHRISTIAN COLLEGE, Lahore.

PHYSICS 1st Year

Name _____ Roll No. _____ Date _____

TICK THE CORRECT ANSWER

1	The study of physics deals with a) structure of space & time, b) laws of motion, c) the forces in universe, <input checked="" type="checkbox"/> d) all of these
2	How many frontiers of fundamental science are? a) one, b) two, <input checked="" type="checkbox"/> c) three, d) four
3	Overlapping of physics and other fields gave birth to a) biophysics, b) health sciences, c) astrophysics, <input checked="" type="checkbox"/> d) all of these
4	Branch of physics which deals with velocities approaching the velocity of light is, a) wave mechanics, <input checked="" type="checkbox"/> b) relativities mechanics, c) space physics, d) classical mechanics
5	The most basic branch of physics is a) geophysics, b) thermodynamics, <input checked="" type="checkbox"/> c) mechanics, d) particle physics

FILL IN THE BLANKS

1	Physics is the discipline of science, which tells us about space, time and <u>matter</u> .
2	Relativistic mechanics deals with <u>velocities</u> approaching that of light.
3	Physical sciences deal with the study of <u>non-living</u> things.
4	Speed of light in free space is <u>$3 \times 10^8 \text{ m s}^{-1}$</u>
5	Light year is SI unit of <u>distance</u>

TRUE/FALSE STATEMENTS

1	Physical chemistry is not the branch of physics.	<input checked="" type="checkbox"/> True/ <input checked="" type="checkbox"/> False
2	Physics plays a vital role in development of technology and engineering.	<input checked="" type="checkbox"/> True/ <input checked="" type="checkbox"/> False
3	Square brackets are used for writing dimensions of any physical quantity.	<input checked="" type="checkbox"/> True/ <input checked="" type="checkbox"/> False
4	Radian is supplementary unit of plane angle	<input checked="" type="checkbox"/> True/ <input checked="" type="checkbox"/> False
5	The age of universe is 5×10^{11} sec	<input checked="" type="checkbox"/> True/ <input checked="" type="checkbox"/> False

MATCH THE COLUMNS

Match the column A with column B and write correct answer in column C.

Column A	Column B	Column C
1. Derived quantity of force in SI	a. 0.1 cm	1-c
2. Least count of meter rod	b. 10^{-10} m	2-a
3. Diameter of an atom	c. Newton	3-b
4. Light intensity is measured	d. MLT^{-2}	4-e
5. Dimensions of force	e. candela	5-d

SHORT ANSWERS TO QUESTIONS

Write brief answers of each question in the space provided.

- What is physical quantity? The quantity in terms of which, the laws of physics are expressed. e.g. mass, length & time.
- When an equation is dimensionally correct? When dimensions of both sides of the equation are the same.
- What do you mean by unit? A unit is a standard, which is used for the measurement of a physical quantity.
- How random error is reduced? Random error can be reduced by repeating the measurement several times and taking an average.
- State the principle of homogeneity of dimensions? To show that the dimensions of the quantities on both sides of the equation are the same, for checking its correctness.

FORMAN CHRISTIAN COLLEGE, Lahore.

PHYSICS 1st Year

Name _____ Roll No. _____ Date _____

TICK THE CORRECT ANSWER

1	The study of nature is classified into a) one branch, <input checked="" type="checkbox"/> two branches, c) three branches, d) four branches
2	The branch of science deals with the properties of matter and energy is called : a) biology, <input checked="" type="checkbox"/> physics, c) chemistry, d) astronomy
3	Identify which out of the following is not the branch of physics? a) biophysics, b) nuclear physics, c) astrophysics, <input checked="" type="checkbox"/> physical chemistry
4	Branch of physics which deals with structure and properties of atom is a) sound, b) optics, c) molecular physics, <input checked="" type="checkbox"/> atomic physics
5	The branch of physics which deals with the atomic nuclei is called a) mechanics, b) medical physics, c) solid state physics, <input checked="" type="checkbox"/> nuclear physics

FILL IN THE BLANKS

1	Physics deals with study of <u>matter</u> and <u>energy</u> and the relationship between them
2	The knowledge which is based upon the principle of observations and experiments is called <u>Science</u>
3	Biological sciences deals with the study of <u>living</u> things.
4	Unit of work in SI units is <u>Joule</u>
5	The chips are made of <u>Silicon</u>

TRUE/FALSE STATEMENTS

1	Physics is the most fundamental of all the sciences.	<input checked="" type="checkbox"/> True/False
2	Nuclear physics deals with particles.	<input checked="" type="checkbox"/> True/False
3	The numbers other than the power of ten are called scientific notation.	<input checked="" type="checkbox"/> True/False
4	Velocity, acceleration and mass are derived quantities.	<input checked="" type="checkbox"/> True/False
5	The branch of physics that deals with atomic nuclei is called mechanics.	<input checked="" type="checkbox"/> True/False

MATCH THE COLUMNS

Match the column A with column B and write correct answer in column C.

Column A	Column B	Column C
1. Foundation of physics is based upon	a. plane angle	1-b
2. System International consists of	b. Physical quantities	2-c
3. Radian is the	c. solid angle	3-a
4. Steradian is the	d. LT^{-1}	4-c
5. The dimensions of velocity	e. three kinds of units	5-d

SHORT ANSWERS TO QUESTIONS

Write brief answers of each question in the space provided.

- What is Physics? Physics deals with the study of matter & energy and relationship between them.
- What are significant figures? In any measurement the accurately known digits and first doubtful digit.
- What does base unit mean? A base unit is one which is not derived from other units.
- Are radian and steradian base units of system international? No. Radian & steradian are supplementary units of system international.
- Is it possible to have two quantities with the same dimensions but different units? Yes. Two quantities having same dimensions can have different units. e.g. Work & torque, momentum & impulse.

Forman Christian College, Lahore.

ASSIGNMENT No. 1

Roll No. _____ Physics 1st Year

Name _____ Section _____

Q. No. 1. Tick the correct answer.

- S.I. unit of Pressure is
a) N m^2 b) N m ☒ c) N m^{-2} d) N m^{-1}
- One Pico is equal to
a) 10^{-8} b) 10^{-9} c) 10^{-10} ☒ d) 10^{-12}
- Least count of a screw gauge is
a) 0.1 cm b) 0.01 cm ☒ c) 0.001 cm d) 0.0001 cm
- Dimension of Angular Momentum is
☒ a) $\text{ML}^2 \text{T}^{-1}$ b) $\text{ML}^2 \text{T}^{-2}$ c) MLT d) $\text{ML}^2 \text{T}^2$
- An example of base quantity is
a) velocity b) acceleration ☒ c) length d) force --(5)

Q. No. 2. Prove that

- 1 light year = $9.46 \times 10^{15} \text{ m}$ $[3 \times 10^8 \times 365 \times 24 \times 60 \times 60 = \dots]$
- 1 Radian = 57.3° $[1 \text{ rad} = \frac{360^\circ}{2\pi} = \dots]$
- $1 \text{ mm}^3 = 10^{-9} \text{ m}^3$ $[1 \text{ mm} = 10^{-3} \text{ m} \Rightarrow 1 \text{ mm}^3 = 10^{-3} \times 10^{-3} \times 10^{-3} \text{ m}^3 = 10^{-9} \text{ m}^3]$
- Convert 0.00023 into Scientific Notation $[2.3 \times 10^{-4}]$ --(5)

Q. No. 3. Define the following

- Radian
 - Steradian
 - Significant Figures
 - Meter
 - Kilogram
- (5)

Error = Negligence & Faulty app. Uncertainty = Limitation of an instrument.
Q. No. 4. a) Define the term Error and Uncertainty.

Explain with examples.

(4)

$$(mgh) = mv^2$$

b) Prove that $E = mc^2$ is dimensionally consistent. $\alpha \text{ MLT}^{-2} \text{ L} = \text{ML}^2 \text{T}^{-2}$

c) The speed v of sound waves through a medium may be assumed

$$\text{to depend on } v = \sqrt{\frac{E}{\rho}} = \sqrt{\frac{F/A}{\Delta L/L \cdot m/V}} = \sqrt{\frac{E}{A} \times \frac{\Delta L}{L} \times \frac{V}{m}} = \sqrt{\frac{[\text{MLT}^{-2}][\text{L}][\text{L}^3]}{[\text{L}^2][\text{L}][\text{m}]}}$$

i) density of the medium

ii) Modulus of Elasticity E which is the ratio of stress to strain

Deduce by the method of Dimensions the Formula for the speed of sound. $= \sqrt{[\text{L}^2 \text{T}^{-2}]} = \text{LT}^{-1}$ --(10)

(3)

d) Define Relativistic Mechanics. (1)

*It is the mechanics based on theory of relativity. [5+5+5+10 = 25]
leads space-time concept.*

Forman Christian College, Lahore.

ASSIGNMENT No. 2

Roll No. _____ Physics 1st Year

Name _____

Section _____

Q. No. 1 Tick the correct answer.

- Name the quantity which is a vector
a) power b) charge c) mass ☒ d) weight
- An example of scalar quantity is
☒ a) speed b) displacement c) torque d) momentum
- The resultant of two forces 5N and 12N making an angle 90° with each other is
a) 7 N b) 9 N c) 12 N d) 13 N *None of these*
- The cross product of two vectors is negative when the angle between them is
a) 90° b) 180° ☒ c) 270° d) 360°
- The dot product of vector \vec{A} with itself ($\vec{A} \cdot \vec{A}$) is equal to
a) 0 b) 2A c) 1 ☒ d) A^2

--(5)

Q. No. 2. Fill in the Blanks.

- The unit vector in the direction of $\vec{A} = 2\hat{i} - \hat{j} + 2\hat{k}$ is $\frac{2}{3}\hat{i} - \frac{1}{3}\hat{j} + \frac{2}{3}\hat{k}$
- $(\hat{i} \times \hat{j}) \cdot \hat{k}$ is equal to $= \hat{k} \cdot \hat{k} = 1$
- Two equal and opposite forces acting on a body form a couple
- A body is said to be in state of complete equilibrium if its linear & angular acc. is zero
- If a body is rotating with uniform angular velocity. Its angular acceleration is equal to $\alpha = \frac{\Delta \omega}{\Delta t}$

--(5)

Q. No. 3. Explain briefly the following statements.

- If $\vec{A} + \vec{B} = 0$ what can you say about the components of the two vectors. *must be equal & opposite*
- Name three different conditions that would make $\vec{A}_1 \times \vec{A}_2 = 0$ *A_1 null; or $A_2 = 0$ or A_2 is null; or $A_1 \times 0 = 0$ or A_1 & A_2 parallel or antiparallel*
- Can a body be rotated about center of gravity under the action of its weight? *No. Because moment arm will be zero & τ will be zero*

--(6)

Q. No. 4. a) Define resultant vector. (1)

- Describe the Method of addition of Vectors by rectangular components. (5)
- Two forces of magnitude 50 N and 100 N act on a body in directions making angles 30° and 60° respectively with x-axis. Find the resultant force and direction. (3)

$$F = \sqrt{(50 \cos 30^\circ + 100 \cos 60^\circ)^2 + (50 \sin 30^\circ + 100 \sin 60^\circ)^2} \quad \& \quad \tan \theta = F_y / F_x \quad \text{--(9)}$$

Q. No. 5. a) Define Right Hand Rule. (1)

- Describe the characteristics of Vector Product. (5)
- The magnitudes of dot and cross product of two vectors are $6\sqrt{3}$ and 6 respectively. Find the angle between the vectors. (3)

--(9)

$$\tan \theta = \frac{AB \sin \theta}{AB \cos \theta} = \frac{6}{6\sqrt{3}} \Rightarrow \theta = \tan^{-1} \frac{6}{6\sqrt{3}} = \dots \quad [5+5+6+9 = 25]$$

FORMAN CHRISTIAN COLLEGE, LAHORE

Assignment 4

Chapter 3

First Year

Name: _____

Roll No. _____

Section: _____

Q. No. 1 a) Tick the Correct Answer.

- When the velocity-time Graph is parallel to the time-axis, the acceleration of the moving body is
a) positive (b) negative ☒ (c) zero (d) maximum
- Distance covered by freely falling bodies in 2 seconds is
(a) 4.9 m (b) 9.8 m ☒ (c) 19.6 m (d) 39.2 m
- The force with which the Earth attracts a body towards its center is called its,
(a) mass ☒ (b) weight (c) Gravitation (d) Gravity
- The force of 50 N acts on a body for 10 seconds. What will be the change in momentum.
(a) 250 N-sec ☒ (b) 500 N-sec (c) 750 N-sec (d) 1000 N-sec
- The horizontal range of a projectile is maximum when it is projected at an angle of
(a) 0° ☒ (b) 45° (c) 60° (d) 90°

b) Fill in the Blanks

- When the value of average and instantaneous velocities are equal, the body is said to be moving with Uniform velocity
- The property of a body due to which it opposes the state of rest or uniform motion is called Inertia
- The collision in which the momentum and KE both are conserved before and after collision is called an elastic collision
- The maximum vertical height attained by a projectile is given by the formula $h = \frac{v_i^2 \sin^2 \theta}{2g}$
- An un-powered and unguided Missile is called a ballistic missile

Q. No. 2. Give brief Answer of the following statements.

- Motion with constant velocity is a special case of motion with constant acceleration. Is this a statement true? Discuss. Yes; $a = \frac{v_f - v_i}{t} = \frac{0}{t} = 0$
- Prove that the rate of change of momentum is equal to force applied. $F = ma = \frac{m v_f - m v_i}{t}$
- At what point or points in its path does a projectile have its maximum and minimum speed. max. Speed at start & end. Min. Speed at highest point

Q. No. 3.

- Define S.I. unit of force. Newton (N) = Force required to accelerate 1 kg of mass at 1 m/s^2
- Discuss the Elastic collision in one dimension. Prove that the magnitude of relative velocity of approach is equal to magnitude of relative velocity of separation.
- A foot ball is thrown upward with an angle 30° with respect to the horizontal. To throw a 40 m pass, what must be the initial speed of the ball?

$$R = \frac{v_i^2 \sin 2\theta}{g} \Rightarrow v_i = \dots = 21 \text{ m s}^{-1}$$

$$v_1 - v_2 = -(v_1' - v_2')$$

FORMAN CHRISTIAN COLLEGE, LAHORE

Physics Test

Chapter 4

First Year

Total Marks: 25

Name: _____

Roll No. _____

Section: _____

Q. No. 1. a) Encircle the Correct Answer.

- The Dimensions of Power are,
(a) $ML^2 T^2$ (b) $ML^{-1} T^{-1}$ (c) $ML^2 T^{-3}$ (d) $ML^2 T^{-2}$
- A field in which the work done in moving an object along a closed path is equal to zero is called,
(a) Electric field (b) Magnetic field (c) Conservative field (d) Nuclear field
- The intensity of the solar energy reaching the Earth's surface is,
(a) $0.5 \text{ K watt m}^{-2}$ (b) 1 K watt m^{-2} (c) 2 K watt m^{-2} (d) $1.5 \text{ K watt m}^{-2}$ (3)

b) Fill in the Blanks

- Work done along the closed path is equal to Zero
- Solar cells are thin wafers made from Silicon
- An example of non-conservative field is rough surface / air friction (3)

Q. No. 2. Give brief Answers of the following statements.

- When the work done is maximum or minimum. $\vec{\theta} = 0^\circ$ $\vec{\theta} = 90^\circ$
- Power is the dot product of force and velocity. $P = \frac{W}{t} = \frac{F \cdot d}{t} = \vec{F} \cdot \vec{v}$
- When the rocket enters the atmosphere the nose cone becomes very hot.
Where does this energy come from? Due to air friction (6)

Q. No. 3.

- Is the gravitational force between the Earth and the Sun the same at all times of the year? Explain. No.
- What is an Absolute Potential Energy. Determine its value on the surface of the Earth. $U_g = -\frac{G M m}{R}$
- A car of mass 800 kg traveling at 54 kmh^{-1} is brought to rest in 60 m . Find the average retarding force on the car. What has happened to original kinetic energy.

$$v_f^2 - v_i^2 = 2as; F = ma; 1500 \text{ N}$$

$$2+8+3 = (13)$$

FORMAN CHRISTIAN COLLEGE, LAHORE

Physics Test

Chapter 4

First Year

Total Marks: 25

Name: _____

Roll No. _____

Section: _____

Q. No. 1. a) Encircle the Correct Answer.

- The work done will be negative, if the angle between force \vec{F} and displacement \vec{d} is
a) 0° (b) 60° (c) 90° (d) 180°
- Solar cells are made up of the material called,
(a) carbon (b) iron (c) silicon (d) calcium
- One kilowatt hour is equal to
(a) 1.6 MJ (b) 2.6 MJ (c) 3.6 MJ (d) 5.6 MJ (3)

b) Fill in the Blanks

- The product of force and displacement is called work.
- The SI unit of power is Watt.
- The intensity of solar energy absorbed by Earth during a clear day is about 1 kW m^{-2} . (3)

Q. No. 2. Give brief Answers of the following statements.

- In which W. done is independent of path followed or*
What is a conservative field? *Work done is zero for closed path.*
- What type of energy is stored in water dam? *Gravitational PE*
- A boy uses a catapult to throw a stone which accidentally smashes a green house window. List the possible energy changes. (6)
 $PE \rightarrow KE \rightarrow \text{Sound} + \text{heat energy} + \text{W. done in breaking window}$

Q. No. 3.

- What is the law of conservation of Energy.
- i) Define escape velocity. Derive relation for escape velocity and calculate its value on the earth surface. *$v_{esc} = \sqrt{2gR} = 11 \text{ km s}^{-1}$*
ii) Also prove that work done on the body is equal to the change in its K.E. *Loss of PE = gain in KE*
- How large a force is required to accelerate an electron ($m = 9.1 \times 10^{-31} \text{ kg}$) from rest to a speed of $2.0 \times 10^7 \text{ ms}^{-1}$ through a distance of 5.0 cm?
 $v_f^2 - v_i^2 = 2aS$; $F = ma$; $3.6 \times 10^{-15} \text{ N}$ (13)

FORMAN CHRISTIAN COLLEGE, LAHORE
(A Chartered University)

Physics Test

Chapter 5

First Year

Total Marks: 25

Name: _____

Roll No. _____

Section: _____

Q. No. 1. Encircle the Correct Answer.

- i) The angle subtended at the center of the circle by an arc equal to its radius is equal to,
(a) one degree (b) one Radian (c) one rotation (d) one revolution
- ii) When a body moves in a circle the angle between v and ω is always,
(a) 0° (b) 45° (c) 90° (d) 180°
- iii) If a car moves with a uniform speed of 2 ms^{-1} in a circle of radius 0.4 m. Its angular velocity is,
(a) 1 rad s^{-1} (b) 2.5 rad s^{-1} (c) 4.5 rad s^{-1} (d) 5 rad s^{-1}
- iv) If a stone is whirled in a vertical circle at the end of a string when the stone is at the highest position, the tension in the string is,
(a) zero (b) max (c) minimum (d) less than the weight of the stone
- v) S.I. unit of Angular Momentum is,
(a) kg m s (b) $\text{kg m}^2 \text{ s}^{-1}$ (c) $\text{kg m}^2 \text{ s}^{-2}$ (d) $\text{kg m}^{-1} \text{ s}^{-1}$
- vi) A man in an elevator is descending with an acceleration will conclude that his weight has
(a) decreased (b) increased (c) remains constant (d) reduces to zero
- vii) Minimum number of communication satellites required to cover the whole Earth is,
(a) 1 (b) 2 (c) 3 (d) 4
- viii) The value of g is maximum,
(a) at the equator (b) at the poles (c) at the center of the Earth
(d) between the poles and the equator
- ix) The angular speed for the daily rotation of the Earth in rad s^{-1} is,
(a) π (b) 2π (c) 4π (d) $7.3 \times 10^{-5} \text{ rad s}^{-1}$
- vi) The linear velocity of a hoop rolling down an inclined plane is,
(a) $\sqrt{2gh}$ (b) \sqrt{gh} (c) $\sqrt{\frac{1}{2}gh}$ (d) $\sqrt{\frac{4}{3}gh}$ (10)

Q. No. 2. Give brief Answers of the following statements.

- i) Describe what should be the minimum velocity for a satellite to orbit close to the earth around it.
 $v_{\min} = \sqrt{gR} = 7.9 \text{ km s}^{-1}$
- ii) Explain what is meant by centripetal force and why it must be furnished to an object. If the object is to follow a circular path. $F_c = mv^2/r$
- iii) When mud flies off the tyre of a moving bicycle, in what direction does it fly off? Explain. (6)
tangent to the wheel

Q. No. 3.

- a) Define Moment of Inertia. Give its S.I. units. $I = \sum_{i=1}^n m_i r_i^2 ; \text{kg m}^2$
- b) What is an Artificial Gravity? How is it created in a space ship? Prove the frequency of the satellite when it is rotated around its own axis is given by, $f = \frac{1}{2\pi} \sqrt{\frac{g}{R}}$
 $a = \omega^2 r; a_c = R(\frac{2\pi}{T})^2 = R(\frac{2\pi}{1/f})^2 \Rightarrow f = \dots$
- c) What is the least speed at which an aero plane can execute a vertical loop of 1.0 km radius so that there will be no tendency for the pilot to fall down at the highest point.
 $a_c = g = \frac{v^2}{R} \Rightarrow v = \dots$ 1+5+3 = (9)

FORMAN CHRISTIAN COLLEGE, LAHORE

(A Chartered University)

Physics Test

Chapter 6

First Year

Total Marks: 25

Name: _____

Roll No. _____

Section: _____

Q. No. 1. Encircle the Correct Answer.

- The dimensions of coefficient of viscosity are,
(a) MLT (b) $ML^{-1}T^{-1}$ (c) ML^2T^{-2} (d) $ML^{-2}T^{-2}$
- If each particle of fluid passing through a point follows the same path, then the flow is called,
(a) irregular flow (b) stream line flow (c) turbulent flow (d) regular flow
- The pressure will be low where the speed of the fluid is,
(a) zero (b) high (c) low (d) constant
- A two meter high tank is full of water, a hole appears at the middle. What is the speed of the efflux?
(a) $3.42 ms^{-1}$ (b) $4.42 ms^{-1}$ (c) $5.42 ms^{-1}$ (d) $6.42 ms^{-1}$
- The drag force increases as the speed of the object,
(a) increases (b) decreases (c) remains constant (d) none of these (5)

Q. No. 2. Give brief Answers of the following statements.

- Explain the difference between laminar flow and turbulent flow.
Smooth flow; Disorderly & changing flow pattern
- Why the fog droplet appear to be suspended in air?
Due to drag force
- Explain how the swing is produced in a fast moving cricket ball.
High speed low pressure
- Two boats moving parallel in the same direction are pulled towards each other. Explain.
Relative speed of water & air is high so pressure will be low.
- Explain the working of a carburetor of a motor car using by Bernoulli's Equation.
*High velocity of air drawn out produces low pressure (10)
so petrol mixture drawn inside.*

Q. No. 3.

- Define Equation of continuity. $A_1v_1 = A_2v_2$
- State and prove Bernoulli's Equation. $p + \frac{1}{2}\rho v^2 + \rho gh = \text{Constant}$
- Certain globular protein has a density $1246 kg m^{-3}$ through a pure water, $\eta = 8 \times 10^{-4} N m^{-2}s$ with terminal velocity of $3.0 cm hour^{-1}$. Find the radius of the particle.
$$v_t = \frac{2gR^2\eta}{9\eta} \Rightarrow R = \sqrt{\frac{v_t \times 9\eta}{2g}} = \sqrt{\frac{3 \times 10^{-2} \times 9 \times 8 \times 10^{-4}}{2 \times 9.8 \times 1246}} = 1.6 \times 10^{-6} m$$

$$1+1+5+3 = (10)$$

FORMAN CHRISTIAN COLLEGE, LAHORE
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Physics Test

Chapter 6

First Year

Total Marks: 25

Name: _____

Roll No. _____

Section: _____

Q. No. 1. Encircle the Correct Answer.

- i) The SI unit of viscosity is,
☒ (a) $\text{kg m}^{-1} \text{s}^{-1}$ (b) $\text{kg m}^{-1} \text{s}^{-2}$ (c) kg m s^{-1} (d) $\text{kg m}^{-2} \text{s}^{-1}$
- ii) The smooth or steady streamline flow is known as,
 (a) turbulent flow (b) simple flow ☒ (c) laminar flow (d) regular flow
- iii) The pressure will be low where the speed of the fluid is,
 (a) zero (b) constant (c) 'low' ☒ (d) high
- iv) A two meter high tank is full of water, a hole appears at the middle. What is the speed of the efflux?
 (a) 6.42 ms^{-1} ☒ (b) 4.42 ms^{-1} (c) 5.42 ms^{-1} (d) 3.42 ms^{-1}
- v) The drag force increases as the speed of the object,
 (a) decreases ☒ (b) increases (c) remains constant (d) none of these (5)

Q. No. 2. Give brief Answers of the following statements.

- i) Explain what do you understand by the term viscosity?
property of fluids by which they resist their flow due to internal friction.
- ii) Why the fog droplet appear to be suspended in air?
Due to drag force.
- iii) Explain how the swing is produced in a fast moving cricket ball.
High speed low pressure
- iv) Two boats moving parallel in the same direction are pulled towards each other. Explain.
Relative speed of water & air is high so pressure will be low.
- v) Explain the working of a carburetor of a motor car using by Bernoulli's Equation.
High velocity of air drawn out produces low pressure (10) so petrol mixture drawn inside.

Q. No. 3.

- A device used to measure speed of liquid flow; $P_1 - P_2 = \frac{1}{2} \rho v_2^2$*
- a) What is venturi meter? Apply Bernoulli's equation on it.
 - b) State and prove Equation of Continuity. $A_1 v_1 = A_2 v_2$
 - c) Water flows through a hose, whose internal diameter is 1 cm at a speed of 1 m s^{-1} .
 What should be the diameter of the nozzle if the water is to emerge at 21 m s^{-1} ?
 $A_1 v_1 = A_2 v_2 \Rightarrow \pi r_1^2 v_1 = \pi r_2^2 v_2$ 2+5+3 = (10)
 $\left(\frac{D_1}{2}\right)^2 v_1 = \left(\frac{D_2}{2}\right)^2 v_2 \Rightarrow D_2 = \dots = 0.2 \text{ cm}$

FORMAN CHRISTIAN COLLEGE, LAHORE
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Physics Assignment

Chapter 7

First Year

Total Marks: 25

Name: _____

Roll No. _____

Section: _____

Q. No. 1 Encircle the Correct Answer.

- i) In S.H.M. the acceleration of the body is directly proportional to,
a) applied force (b) amplitude (c) displacement (d) restoring force
- ii) The frequency of the second's pendulum is,
(a) 0.5 hertz (b) 1 hertz (c) 1.5 hertz (d) 2 hertz
- iii) Total energy of the mass attached at one end of a spring executing S.H.M. at any displacement x is given by,
(a) $\frac{1}{2}kx$ (b) $\frac{1}{2}kx_0$ (c) $\frac{1}{2}kx_0^2$ (d) kx
- iv) Angular frequency is given by the expression
(a) $\omega = \frac{v}{r}$ (b) $\omega = \frac{2\pi}{T}$ (c) $\omega = \sqrt{\frac{k}{m}}$ (d) all of them
- v) When the damping is small, the amplitude of vibration at resonance will be,
(a) small (b) large (c) remains constant (d) none of the above
- vi) In microwave oven, heating is produced by the phenomenon of,
(a) free oscillation (b) forced oscillation (c) damped oscillation (d) resonance
- vii) The time period of the mass attached to the end of a spring is $T = \frac{2\pi\sqrt{m/k}}$
- viii) Frequency of vibratory motion $f = \frac{1}{T}$ of the time period.
- ix) The sharpness of resonance curve of a resonating system depends upon the frictional loss of air resistance (9)

Q. No. 2. Give brief Answer of the following statements.

- i) Can we realize an ideal simple pendulum? No. Due to friction & weight of string
- ii) Explain the relation between total energy, potential energy and kinetic energy for a body oscillating with SHM. $(PE)_{max} = (KE)_{max} = E_{total}$ $(PE+KE) = \frac{1}{2}kx_0^2$
- iii) Describe some common phenomenon in which resonance plays an important role. (6)

Q. No. 3.

- i) Define S.H.M. Give three examples. ad-x; Simple pendulum, mass-spring system
- ii) What is a simple pendulum? Prove that its motion is S.H.M. Derive an expression for its time period. Projection of circular motion
 $F = ma = -mg\theta \Rightarrow a = -\frac{g}{l}\theta$; $T = 2\pi\sqrt{l/g}$
- c) A simple pendulum is 1 meter long. What will be the frequency of vibration at a place where the value of $g = 9.8 \text{ m s}^{-2}$.
 $f = \frac{1}{T} = \frac{1}{2\pi\sqrt{l/g}} = \dots\dots\dots$ or $1+1+1+4+3 = (10)$

Q. No. 4.

- a) Define time period, frequency, displacement and amplitude.
- b) Discuss the motion of projection of point P moving along the circular path with constant speed. Show that its motion is S.H.M. Derive an expression for
i) Instantaneous displacement $x = x_0 \sin \omega t$
ii) Instantaneous velocity $v = \omega \sqrt{x_0^2 - x^2}$
iii) acceleration in terms of ω $a = -x_0 \omega^2 \sin \theta$ $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + 5 + 3 = (10)$
 $a = -\omega^2 x$

FORMAN CHRISTIAN COLLEGE, LAHORE

(A Chartered University)

Physics Assignment

Chapter 8

First Year

Total Marks: 25

Name: _____

Roll No. _____

Section: _____

Q. No. 1. Encircle the Correct Answer.

- The waves produced on the surface of water are
(a) electromagnetic waves (b) longitudinal waves (c) stationary waves (d) transverse waves
- If 25 waves pass through a medium in one second with a speed of 50 ms^{-1} , then λ is,
(a) 1 m (b) 2 m (c) 3 m (d) 4 m $[v = f\lambda \text{ or } \lambda = \frac{v}{f} = \frac{50}{25} = 2]$
- The velocity of sound in vacuum is,
(a) 300 ms^{-1} (b) 332 ms^{-1} (c) zero (d) 324 ms^{-1}
- When the temperature is increased by 1°C . The velocity of sound is increased by,
(a) 0.61 ms^{-1} (b) 0.61 cm s^{-1} (c) 2 ms^{-1} (d) 2.6 ms^{-1}
- The distance between two consecutive node and antinode is,
(a) λ (b) 2λ (c) $\lambda/2$ (d) $\lambda/4$ (5)

b) Fill in the Blanks

- Two waves of equal frequency traveling in opposite direction give rise to Stationary Waves
- Stars moving away from the Earth show a red shift
- When a particle of the medium is simultaneously acted upon by two or more waves, then the resultant displacement of the particles is the algebraic sum of their individual displacement is called Superposition
- Find the temperature at which the velocity of sound in air is two times its velocity of sound at 10°C $v_{10} = 332 + 0.61 \times 10 = 338.1 \text{ ms}^{-1}$ (5)
 $v_t = 2 \times v_{10} = 2 \times 338.1 = 332 + 0.61 t \Rightarrow t = 564.26$
- A string of length l maintains stationary waves of wavelength λ_n is given by $\lambda_n = \frac{2}{n} l$

Q. No. 2. Give brief Answers of the following statements.

- How beats are useful in tuning the musical instruments? A new instrument is tuned.
- Why does sound travel faster in solids than in gases? E is greater in solids.
- How should a sound source move with respect to an observer so that its frequency of sound does not change. Relative Speed should be zero. (6)

Q. No. 3.

- Define Doppler's effect. Change in f due to relative motion of Source & Observer.
- Describe Newton's Formula for the velocity of sound and explain how was it corrected by Laplace. $v = \sqrt{E/\rho}$; Laplace $[PV^\gamma = \text{const}] \Rightarrow v = \sqrt{\gamma P/\rho}$
- An organ pipe has a length of 50 cm. Find the frequency of its fundamental note and the next harmonic, when it is,
i) open at both ends, ii) close at one end,
The speed of sound is 350 m s^{-1} 1+2½ + 2½+3 = (9)
 - $l = \frac{\lambda}{2} \text{ or } \lambda = 2l \Rightarrow f_1 = \frac{v}{2l} = \dots \text{ and } f_2 = 2f_1 = \dots$
 - $l = \frac{\lambda}{4} \text{ or } \lambda = 4l \Rightarrow f_1 = \frac{v}{4l} = \dots \text{ and } f_2 = 3f_1 = \dots$

FORMAN CHRISTIAN COLLEGE, LAHORE

(A Chartered University)

Physics Assignment

Chapter 9

First Year

Total Marks: 30

Name: _____

Roll No. _____

Section: _____

Q. No. 1. Encircle the Correct Answer.

- Electromagnetic wave theory was proposed by,
(a) Hertz (b) Huygen (c) Newton (d) Maxwell
- Which one of the properties of light does not change with the nature of the medium,
(a) velocity (b) wavelength (c) amplitude (d) frequency
- According to Einstein light travels from one place to another place in the form of,
(a) waves (b) particles (c) photons (d) radiation
- Longitudinal waves do not exhibit,
(a) reflection (b) refraction (c) diffraction (d) polarization
- The distance between two bright fringes is called,
(a) wavelength (b) fringe spacing (c) wavelet (d) amplitude
- Michelson Interferometer can be used to find the,
(a) velocity of light (b) wavelength of light (c) order of the spectrum (d) none of these
- The path difference for constructive interference should be,
(a) $d = \lambda / 2$ (b) $d = 3/2 \lambda$ (c) $d = 5/2 \lambda$ (d) $d = m \lambda$
- One Angstrom is equal to,
(a) 10^{-8} cm (b) 10^{-6} cm (c) 10^{-10} nm (d) 10^{-8} nm
- Which of the following can not be polarized,
(a) radio waves (b) ultraviolet rays (c) x-rays (d) sound waves
- If 5000/cm are ruled on the diffraction grating, then the slit spacing will be,
(a) 5×10^{-3} A° (b) 5×10^{-4} A° (c) 2×10^{-4} A° (d) 2×10^{-4} A° (10)

$$d = \frac{1}{N} = \frac{1}{5000} = 2 \times 10^{-4} = 2 \times 10^{-4} \times 10^{-8}$$

b) Fill in the Blanks

- Huygen's Principle is used to locate the new wavefront
- The central point of the Newton's ring is dark
- The blue sky is due to scattering
- Polarization of light show that light is transverse electromagnetic waves (4)

Q. No. 2. Give brief Answers of the following statements.

- Can visible light produce interference of light? Yes. It has phase coherence.
- How would you manage to get more orders of spectra using diffraction grating? Increase d.
- Why the Polaroid sun glasses are better than ordinary sun glasses? Reduces glare
- How would you distinguish between unpolarized and plane polarized light? With a Polaroid (8)

Q. No. 3.

- What is polarization? Confining of vibrations in one plane
- Describe Young's Double Slit experiment to demonstrate the interference of light.
Derive an expression for Fringe Spacing. $\Delta y = \frac{\lambda}{d}$
- In Double Slit experiment, the second order maximum occur at $\theta = 0.25^\circ$. The wavelength is 650 nm. Determine the slit separation. $1 + 5 + 2 = (8)$
 $d \sin \theta = m \lambda$ or $d = \frac{m \lambda}{\sin \theta} = \dots$

FORMAN CHRISTIAN COLLEGE, LAHORE

(A Chartered University)

Physics Assignment

Chapter 10

First Year

Total Marks: 35

Name: _____

Roll No. _____ Section: _____

Q. No. 1. Encircle the Correct Answer.

- Image formed is twice of object size for convex lens with $f = 10$ cm. Object position is,
(a) 10 cm (b) 15 cm (c) 20 cm (d) 25 cm $M = \frac{q}{p} \Rightarrow 2 = \frac{q}{p} \Rightarrow q = 2p$
 $\frac{1}{f} = \frac{1}{p} + \frac{1}{q} \Rightarrow \frac{1}{10} = \frac{1}{p} + \frac{1}{2p} \Rightarrow \frac{1}{10} = \frac{3}{2p} \Rightarrow p = 15$
- Michelson used the equation to determine the speed of light,
(a) $c = 4$ fd (b) $c = 8$ fd (c) $c = 12$ fd (d) $c = 16$ fd
- The least distance of distinct vision for the normal human eye is,
(a) 10 cm (b) 15 cm (c) 20 cm (d) 25 cm
- The final image produced by the compound microscope is,
(a) real & inverted (b) real & erect (c) virtual & erect (d) virtual & inverted
- For an Astronomical Telescope, $f_o = 4$ m & $f_e = 25$ mm. The magnifying power is,
(a) 60 (b) 100 (c) 160 (d) 200 $M = \frac{f_o}{f_e} = \frac{4}{25 \times 10^{-3}} = 160$
- The speed of light in vacuum is,
(a) $3 \times 10^8 \text{ ms}^{-1}$ (b) $3 \times 10^9 \text{ ms}^{-1}$ (c) $3 \times 10^{10} \text{ ms}^{-1}$ (d) $3 \times 10^{12} \text{ ms}^{-1}$
- Multimode step index fibre is useful for,
(a) long distance (b) short distance (c) neither long nor short (d) none of these
- Light entering glass will not suffer a change in,
(a) frequency (b) wavelength (c) distance (d) velocity
- The diameter of a single mode step index is,
(a) $2.5 \mu\text{m}$ (b) $5 \mu\text{m}$ (c) $10 \mu\text{m}$ (d) $15 \mu\text{m}$
- The angular magnification of an optical instrument is given by the formula,
(a) θ_o / θ_i (b) θ_i / θ_o (c) $\theta_i / 2\theta_o$ (d) $2\theta_o / \theta_i$ (10)

b) Fill in the Blanks

- When object lies within focus and optical center of a convex lens. It acts as a magnifying glass or simple microscope
- Magnifying power of a simple microscope is given by formula $M = 1 + \frac{d}{f}$
- Object's maximum details can be seen by a microscope with light of short wavelength
- For normal adjustment, the length of the astronomical telescope is $f_o + f_e$
- An image formed by a concave lens is always virtual
- At some angle of incidence when the angle of refraction becomes 90° , called critical angle
- Layer of lower refractive index over central core of high refractive index is cladding
- The light emitted from (LED) has a wavelength $1.3 \mu\text{m}$ [$M = 1 + \frac{25}{20} = 2.25$]
- The magnifying power of a convex lens of focal length 20 cm is 2.25
- Spherical and chromatic aberration is found in cheap microscope / lenses

Q. No. 2. Give brief Answers of the following statements.

- What do you understand by linear magnification and angular magnification? $M = \frac{q}{p} = \frac{\theta_i}{\theta_o}$
- How the light signal is transmitted through optical fibre? Total internal reflection
- How the power is lost in optical fibre through dispersion. Explain. Due to scattering & absorption & continuous refraction

Q. No. 3. To see distant objects; $f_e < f_o$

- Distinguish between a telescope and a microscope to produce large magnification. $f_o < f_e$
- Describe the construction of a compound microscope. Draw a neat diagram. $M = \frac{q}{p} (1 + \frac{d}{f_e})$
- Derive an expression for the magnifying power of a compound microscope.
- An astronomical telescope having a magnifying power of 5 consists of two thin lenses 24 cm apart. Find the focal length of the lenses. $2 + 4 + 3 = (9)$

$$M = \frac{f_o}{f_e} \Rightarrow f_o = M f_e = 5 f_e$$

$$L = f_o + f_e = 5 f_e + f_e \Rightarrow f_e = \frac{L}{6} = \frac{24}{6} = 4 \text{ cm}$$

$$f_o = 5 f_e = 20 \text{ cm}$$

FORMAN CHRISTIAN COLLEGE, LAHORE
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Physics Assignment

Chapter 11

First Year

Total Marks: 25

Name: _____

Roll No. _____ Section: _____

Q. No. 1. Encircle the Correct Answer.

- i) At constant pressure, the graph between volume and absolute temperature is ,
(a) hyperbola (b) straight line (c) parabola (d) ellipse
- ii) For a gas obeying the Boyle's law. If the pressure is doubled, the volume becomes,
(a) double (b) one half (c) four times (d) remains constant
- iii) The KE of the molecule of an ideal gas at absolute zero will be,
(a) below zero (b) infinite (c) zero (d) above zero
- iv) The expression for pressure exerted by an ideal gas is given as ,
(a) $P = \frac{1}{3} N_0 < \frac{1}{2} m v^2 >$ (b) $P = \frac{2}{3} N_0 < \frac{1}{2} m v^2 >$ (c) $P = \frac{2}{3} N_A < \frac{1}{2} m v^2 >$
(d) $P = \frac{1}{2} N_0 < \frac{1}{2} m v^2 >$
- v) The temperature scale which is independent of the nature of substance used in the thermometer is called ,
(a) Centigrade scale (b) Fahrenheit scale (c) Kelvin scale
(d) Thermodynamic scale

(5)

b) Fill in the Blanks

- i) The total sum of all the energies of all molecules in an object is known as Internal energy
- ii) The ideal gas law is given in the form of Boyle's Law/ Charles's Law
- iii) The value of the universal gas constant R in S.I. units is $8.314 \text{ J mole}^{-1} \text{ K}^{-1}$
- iv) The efficiency of the Carnot engine depends on temp. of hot & cold reservoirs.
- v) When the temperature of the source and sink of a heat engine become equal, the entropy will be maximum

(5)

Q. No. 2. Give brief Answers of the following statements.

- i) Why is the average velocity of the molecules in a gas is zero, but the average of the squares of the velocities is not zero? Av. of each component vel. is zero. But square of ve vel. cannot be zero.
- ii) Specific heat of a gas at constant pressure is greater than the specific heat at constant volume. Why? $C_p > C_v$. In C_p part of heat is used in doing work.
- iii) Give an example of a process in which no heat is transferred to or from the system but the temperature of the system changes. Adiabatic expansion. $2+2=6$

Q. No. 3.

- a) Define C_p and C_v .: C_p to raise 1°K at const. P. & C_v to raise 1°K at const. V.
- b) Prove that $C_p - C_v = R$: $n C_p \Delta T = n C_v \Delta T + \Delta W (= n R \Delta T) \Rightarrow C_p - C_v = R$
- c) Estimate the average speed of Nitrogen molecules in air under standard conditions of temperature and pressure.

1 + 5 + 3 = (9)

$$T = \frac{2}{3k} < \frac{1}{2} m v^2 > \text{ or } < v^2 > = \frac{3kT}{m} \quad \left\{ \begin{array}{l} T = 273 \text{ K} \\ k = 1.38 \times 10^{-23} \\ m = \frac{28 \times 10^{-3}}{6.022 \times 10^{23}} \end{array} \right.$$

$$\text{or } \sqrt{< v^2 >} = \sqrt{\frac{3kT}{m}} = \text{-----}$$