



Roll No. _____ to be filled in by the candidate.

(NEW PATTERN)

Paper Code 6 4 7 3

Physics (Objective Type)

Sessions; 2012-2014, 2013-2015 & 2014-2016

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A, B, C & D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1.1. Which one is true for isothermal process?

- (A) $Q=0$ (B) $W=0$ (C) $Q=W$ (D) $\Delta U=0$

2. Average translational Kinetic energy of gas molecule is:

- (A) $\frac{1}{2}KT$ (B) KT (C) $\frac{2}{3}KT$ (D) $\frac{3}{2}KT$

3. One Peta is equal to:

- (A) 10^{18} (B) 10^{15} (C) 10^{12} (D) 10^9

4. The cross product, $\hat{k} \times \hat{j}$ is equal to:

- (A) $-\hat{i}$ (B) $-\hat{j}$ (C) $-\hat{k}$ (D) \hat{i}

5. The slope of velocity-time graph at any instant represents:

- (A) Instantaneous velocity (B) Force
(C) Instantaneous acceleration (D) Power

6. The horizontal range of a projectile is maximum, when it is projected at an angle of:

- (A) 0° (B) 30° (C) 45° (D) 60°

7. The ratio of dimensions of K.E and power is:

- (A) 1:1 (B) $[T]:1$ (C) $1:[T^{-1}]$ (D) $[M]:[T]$

8. π radian is equal to:

- (A) 0° (B) 90° (C) 57.3° (D) 180°

9. The minimum number of correctly positioned communication satellites to cover whole populated earth is:

- (A) 3 (B) 2 (C) 100 (D) 200

10. Speed of a hoop at the bottom of an inclined plane is:

- (A) \sqrt{gh} (B) $\sqrt{2gh}$ (C) $\sqrt{\frac{4}{3}gh}$ (D) $\sqrt{4gh}$

11. Which material has maximum viscosity:

- (A) Glycerin (B) Plasma (C) Methanol (D) Water

12. The expression for frequency of a mass m attached to a spring of spring constant K is:

- (A) $2\pi\sqrt{\frac{k}{m}}$ (B) $2\pi\sqrt{\frac{m}{k}}$ (C) $\frac{1}{2\pi}\sqrt{\frac{k}{m}}$ (D) $\frac{1}{2\pi}\sqrt{\frac{m}{k}}$

13. The distance between two consecutive nodes or antinodes is:

- (A) λ (B) $\frac{\lambda}{2}$ (C) $\frac{\lambda}{4}$ (D) $\frac{3\lambda}{4}$

14. If the organ pipe is closed at one end, the frequency of fundamental harmonic is:

- (A) $f_1 = \frac{v}{2l}$ (B) $f_1 = \frac{v}{4l}$ (C) $f_1 = \frac{4l}{v}$ (D) $f_1 = \frac{2l}{v}$

15. Increase in speed of sound for 1°C rise in temperature is:

- (A) 0.61ms^{-1} (B) 0.61cms^{-1} (C) 61ms^{-1} (D) 6.1ms^{-1}

16. The center of Newton's rings is dark due to:

- (A) Destructive interference (B) Diffraction
(C) constructive interference (D) Polarization

17. The magnifying power of a simple microscope is:

- (A) $1+\frac{d}{q}$ (B) $1-\frac{d}{f}$ (C) $1-\frac{d}{p}$ (D) $1+\frac{d}{f}$

Roll No. _____ (To be filled in by the candidate)

(NEW PATTERN)

Subject Code 6 0 4 7

Physics (Essay Type)**Sessions; 2012-2014, 2013-2015 & 2014-2016**

Time: 3:10 Hours

Marks: 83

Section - I**2- Write short answers of any eight parts from the following.**

2 x 8 = 16

- i. Write the dimensions of (i). Pressure. (ii). Density.
- ii. Why a motor cycle's safety helmet is padded?
- iii. If $\vec{A} + \vec{B} = \vec{0}$, what can you say about the components of the two vectors?
- iv. Can you add zero to a Null Vector?
- v. Explain the circumstances in which velocity 'V' and acceleration 'a' of a car are :
(i) Antiparallel. (ii). Perpendicular to each other.
- vi. Show that range of a projectile is maximum when projectile is thrown at the angle of 45° with horizontal.
- vii. An old saying is that "A chain is only as strong as its weakest link". What analogous statement can you make regarding experimental data used in computation?
- viii. Two vectors have unequal magnitudes. Can their sum be zero? Explain.
- ix. The period of simple pendulum is measured by a stop watch. What type of errors are possible in the time period?
- x. Motion with constant velocity is a special case of motion with constant acceleration. Is this statement true? Discuss.
- xi. Give the drawbacks to use the period of simple pendulum as a time standard.
- xii. Two row boats moving parallel in the same direction are pulled towards each other. Explain.

3- Write short answers of any eight parts from the following.

2 x 8 = 16

- i. Can we realize an ideal simple pendulum?
- ii. Define Node and Antinode.
- iii. Define power. Write its formula.
- iv. What are artificial satellites?
- v. Define moment of inertia & write its formula.
- vi. Name two characteristics of simple harmonic motion.
- vii. What is the difference between tangential velocity and angular velocity.
- viii. Does frequency depend upon amplitude for harmonic oscillator?
- ix. What sort of energy is in the following: (a) Compressed spring. (b) A moving car.
- x. What features do longitudinal waves have in common with transverse waves?
- xi. Is it possible for two identical waves traveling in the same direction along a string to give rise to a stationary wave?
- xii. A girl drops a cup from a certain height, which breaks into pieces. What energy changes are involved?

4- Write short answers of any six parts from the following.

2 x 6 = 12

- i. Specific heat of a gas at constant pressure is greater than specific heat at constant volume. Why?
- ii. How would you manage to get more orders of spectra using a diffraction grating?
- iii. Why does pressure of a gas in a car tyre increase when it is driven through some distance?
- iv. Why would it be advantageous to use blue light with a compound microscope?
- v. If a person was looking through a telescope at the full moon, how would the appearance of the moon be changed by covering half of the objective lens.
- vi. Can visible light produce interference fringes? Explain.
- vii. Prove that $\Delta y = \frac{\lambda L}{d}$
- viii. Does entropy of a system increase or decrease due to friction?
- ix. Prove that $W = P\Delta V$.

Section - II

NOTE: Answer any three questions from the following.

8x3=24

5. (a) Derive expressions for the magnitude and direction of the resultant of two vectors, added by rectangular component method. 05
(b) Find the angle of projection of a projectile for which its maximum height and horizontal range are equal. 03
6. (a) Define rotational K:E Also derive formula for rotational K:E of a disc and a hoop coming down an inclined plane. 05
(b) 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 5.0cm? 03
7. (a) Explain interference. Find the conditions for (i). constructive interference (ii). destructive interference. 05
(b) A simple pendulum is 25cm long. What will be its frequency of vibration at a place where $g=9.8 \text{ms}^{-2}$. 03
8. (a) Define simple microscope. Derive the expression for its magnifying power. 05
(b) Sodium light of wavelength 589nm is incident normally on a grating having 3000 lines per centimetre. What is the highest order of spectrum obtained with the grating? 03
9. (a) Derive Torricelli's theorem and Venturi relation by applying Bernoulli's equation. 05
(b) What is the average translational Kinetic energy of molecules in a gas at temperature 27°C ? 03

Section -III (Practical)

10.A Answer any four parts from the following.

2x4=08

- (i). What are the main parts of vernier calliper?
(ii). What is the law of parallelogram?
(iii). Why the amplitude of simple pendulum is kept small?
(iv). What is meant by elastic limit?
(v). What types of waves are set up on a vibrating string?
(vi). What is resonance?
(vii). What is critical angle?
(viii). What is magnifying glass?

- B. Write down the brief procedure to show experimentally that the time period of simple pendulum is independent of mass of bob. 03

OR

Write brief procedure to find the speed of sound using resonance tube apparatus by end correction method.

- C. Answer the following questions on the basis of graph drawn:(See graph on the back page at No. A.) 04
(i). What can you conclude from this graph? (ii). Find the value of 'g' from the graph.

OR

Answer the following questions on the basis of graph drawn:(See graph on the back page at No. B.)

- (i). Find the slope of the graph. (ii). Find the focal length from the graph.



Roll No. _____ to be filled in by the candidate.

(OLD PATTERN)
Session; 2011-2013

Paper Code	2	4	7	3
------------	---	---	---	---

Physics (Objective Type)

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given. Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

- The efficiency of diesel engine is:

(A) 45% to 50% (B) 15% to 20% (C) 35% to 40% (D) 25% to 30%
- The engine which is free from heat losses and friction is called:

(A) Carnot engine (B) Diesel engine (C) Steam engine (D) Petrol engine
- The unit of pressure in base units is:

(A) $\text{Kgm}^{-1}\text{Sec}^{-1}$ (B) KgmSec^2 (C) $\text{Kgm}^{-1}\text{Sec}^{-2}$ (D) KgmSec^{-2}
- The sum of three numbers 2.7543, 4.10 and 1.273 upto correct decimal place in significant figures is:

(A) 8.12 (B) 8.13 (C) 8.1273 (D) 8.127
- Which of the following is not a vector quantity?

(A) Density (B) Torque (C) Weight (D) Displacement
- Mathematically unit vector is given by:

(A) $\hat{A} = A\bar{A}$ (B) $\hat{A} = \frac{A}{A}$ (C) $\hat{A} = \frac{\bar{A}}{A}$ (D) $\hat{A} = \bar{A}.A$
- Change of momentum is equal to:

(A) Force (B) Power (C) Energy (D) Impulse
- The work done on a body of mass 2kg through a height of 2m against gravity is:

(A) 19.6J (B) 39.4J (C) -39.2J (D) -39.4J
- Dimensions of angular momentum are:

(A) [MLT] (B) [ML²] (C) [MLT⁻²] (D) [ML²T⁻¹]
- A Geo-stationary satellite completes its one revolution around the earth in:

(A) 84 minutes (B) 24 hours (C) 1 month (D) 1 year
- If cross-sectional area of pipe decreases, the speed of fluid:

(A) decreases (B) increases (C) remains constant (D) varies
- The product of time period and frequency is equal to:

(A) 1 (B) 2 (C) 3 (D) zero
- The wave length of a wave travelling with speed V and frequency F is:

(A) $\lambda = \frac{f}{v}$ (B) $\lambda = \frac{v}{f}$ (C) $\lambda = fv$ (D) $\lambda = \frac{v}{f^2}$
- When the amplitude of the wave becomes two times its energy, becomes:

(A) two times (B) same (C) half (D) four times
- Bragg's equation can be written as:

(A) $2d = \lambda \sin \theta$ (B) $n\lambda = d \sin \theta$ (C) $2d \sin \theta = n\lambda$ (D) $\lambda = \frac{d \sin \theta}{2n}$
- The property optical rotation of a substance can be used to determine:

(A) Density (B) Viscosity
(C) Concentration in solution (D) Elasticity
- The magnifying power of astronomical telescope is:

(A) $\frac{f_e}{f_o}$ (B) $1 + \frac{f_e}{f_o}$ (C) $\frac{f_o}{f_e}$ (D) $1 - \frac{f_o}{f_e}$

Roll No. _____ (To be filled in by the candidate)

(OLD PATTERN)

Subject Code 2 4 7

Session;2011-2013

Physics (Essay Type)

Time: 2:40 Hours

Marks: 68

Section - I**2- Write short answers of any eight parts from the following.**

2 x 8 =16

- What sort of energy is in the following? (i). Water in high dam (ii). Compressed spring.
- Give drawbacks to use the period of pendulum as a time standard.
- Find the change in momentum for an object subjected to a given force for a given time and state law of motion in terms of momentum.
- In which case is more work done? when a 50kg bag of books is lifted through 50cm, or when a 50kg crate is pushed through '2m' across the floor with a force of 50N?
- How would the two vectors of same magnitude have to be oriented, if they were to be combined to give a resultant equal to a vector of same magnitude.
- Name three different conditions that would make $\vec{A}_1 \times \vec{A}_2 = 0$
- What is meant by range of projectile? Also write its formula.
- Can velocity of an object reverse direction when acceleration is constant? If so, give an example.
- What is meant by conservative field? Also give an example.
- Write two conditions of equilibrium.
- Write dimensions of (i). Pressure. (ii). Density.
- Differentiate between random and systematic error.

3- Write short answers of any eight parts from the following.

2 x 8 =16

- Define radian and show that $S=r\theta$?
- Define beats and give its application?
- Explain the working of carburetor using Bernoulli's principle?
- Define progressive wave and give its two types?
- Calculate the velocity of sound at 10°C?
- Define terminal velocity and write its formula.
- Does frequency depend on amplitude for harmonic oscillator? Show that in S.H.M \vec{a} is zero when \vec{v} is greatest.
- What is the total distance travel by an object in SH.M in time period (T) if the amplitude is A.?
- Two row boats moving parallel in same direction are pulled towards each other. Why?
- Why an object orbiting the earth is said to be freely falling body?
- State the direction of following vectors in simple situations, angular momentum and angular velocity?

4- Write short answers of any six parts from the following.

2 x 6 =12

- Under what conditions two or more sources of light behaves as coherent sources?
- How would you manage to get more orders of spectra using a diffraction grating?
- Write down the two parts of Huggen's principle.
- How the power is lost in optical fibre through dispersion? Explain.
- Describe with the help of ray diagram, how biconvex lenses can be arranged to form a compound microscope?
- An object is placed at the distance of 20cm from a biconvex lens of focal length 10cm. Where the image will form?
- Why does the pressure of gas in a car tyre increase when it is driven through some distance?
- Does entropy of the system increase or decrease due to friction? Give two postulates of kinetic theory of gases?

Section - II**NOTE: Answer any three questions from the following.**

8x3=24

- (a) State and explain vector product and give its any five characteristics. 5
(b) Find the angle of projection of a projectile for which its maximum height and horizontal range are equal. 3
- (a) What is difference between real and apparent weight? Discuss different cases for apparent weight with respect to motion. 5
(b) A 1000 Kg automobile at the top of an inclined plane of height 10m and 100m long is released and rolls down the hill. What is its speed at the bottom of the incline if the average retarding force due to friction is 480N? 3
- (a) Define terminal velocity. Derive a relation for terminal velocity of a sphere moving through a viscous medium using Stoke's law. 5
(b) The turbine in a steam power plant takes steam from a boiler at 427°C and exhausts into low temperature reservoir at 77°C. What is the maximum possible efficiency? 3
- (a) What is simple pendulum? Derive a relation for the time period of simple pendulum, Also show that its motion is SHM. 5
(b) Find the temperature at which the velocity of sound in air two times its velocity at 10°C. 3
- (a) Describe the construction and working of Michelson's interferometer. How it is used to find unknown wave length? 5
(b) A simple astronomical telescope in normal adjustment has an objective of focal length 100cm and eye piece of focal length 5cm. Calculate the angular magnification. 3



Roll No. _____ to be filled in by the candidate

Paper Code	2	4	7	1
------------	---	---	---	---

Physics (Objective Type)

Session;2015-2017

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given. Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

- 1.1. One pico is equal to
 (A) 10^{12} (B) 10^{-12} (C) 10^{-6} (D) 10^6
2. Dot product of a vector with itself is:
 (A) Zero (B) $2A$ (C) A^2 (D) A
3. Unit of acceleration is:
 (A) mS^{-1} (B) mS (C) mS^{-2} (D) m^2S
4. The overcome gravity, fuel consumed by rocket is:
 (A) $40000kgS^{-1}$ (B) $30000kgS^{-1}$ (C) $20000kgS^{-1}$ (D) $10000kgS^{-1}$
5. 1 kilowatt hour is a unit of:
 (A) Energy (B) Power (C) Pressure (D) Force
6. The mass of earth is equal to:
 (A) $6 \times 10^{24}kg$ (B) $5 \times 10^{24}kg$ (C) $6 \times 10^{20}kg$ (D) $5 \times 10^{20}kg$
7. The height of the geostationary satellite above the equator is:
 (A) 35000Km (B) 36000Km (C) 34000Km (D) 33000Km
8. Dimension of angular velocity is:
 (A) $[LT^{-1}]$ (B) $[LT]$ (C) $[L^2 T]$ (D) $[T^{-1}]$
9. The law of conservation of mass gives:
 (A) Bernoulli's equation (B) Venturi relation (C) Torricelli's theorem (D) Equation of continuity
10. Frequency and time period are related as:
 (A) $fT^{-1}=1$ (B) $fT=1$ (C) $f^{-1}T=1$ (D) $fT^2=1$
11. Stars moving towards the earth show:
 (A) Red shift (B) Blue shift (C) Yellow shift (D) Green shift
12. Speed of sound in copper is:
 (A) $38000mS^{-1}$ (B) $3600mS^{-1}$ (C) $3500mS^{-1}$ (D) $3400mS^{-1}$
13. Velocity of sound is independent of:
 (A) Temperature (B) Density (C) Pressure (D) Medium
14. Fring spacing is equal to:
 (A) $\frac{\lambda D}{L}$ (B) $\frac{\lambda L}{d}$ (C) $\frac{L}{\lambda D}$ (D) $\frac{dL}{\lambda}$
15. In multimode step index fibre, the diameter of core is:
 (A) $5 \mu m$ (B) $50 \mu m$ (C) $100 \mu m$ (D) $150 \mu m$
16. Efficiency of steam locomotive is:
 (A) 10% (B) 9% (C) 8% (D) 7%
17. Cloud formation in atmosphere is an example of:
 (A) Isothermal process (B) Adiabatic process (C) Isobaric process (D) Isochoric process

Roll No. _____ (To be filled in by the candidate)

Subject Code 2 4 7

Physics (Essay Type)

Session; 2015-2017

Time: 2:40 Hours

Marks: 68

2x22=44

2 x 8 =16

Section - I**2- Write short answers of any eight parts from the following.**

- Write the demension of pressure and density.
- Define random and systematic error.
- The period of simple pendulum is measured by stop watch. What type of errors are possible in the time period?
- Define and explain significant figures.
- Is it possible to add a vector quantity to a scalar quantity? Explain.
- Name three different conditions that could make $\vec{A}_1 \times \vec{A}_2 = 0$
- What do you understand by positive and negative torques?
- Can velocity of an object reverse the direction, when acceleration is constant, if so, give an example.
- Define impulse and show that how is it related to linear momentum?
- Why is the first law of motion also called law of inertia?
- What is ballistic missile? Define its trajectory.
- Explain the difference between laminar flow and turbulent flow.

2 x 8 =16

3- Write short answers of any eight parts from the following.

- An object has 1 joule P.E., What does it mean? Explain briefly.
- Define angular displacement and its unit.
- What are beats draw the diagram to show beats.
- Give two applications of Doppler's effect.
- A disc and a hoop start moving down from the top of an inclined plane at the same time, which one will be moving faster on reaching at bottom?
- What is the difference between free and forced oscillations? Give examples.
- Why does a diver changes his body position before and after diving in the pool?
- Write down the common features of longitudinal and transverse waves.
- In which case more work is done when a 50kg bag is lifted up by 50cm. and when a 50kg crate is pushed through 2m by 50N force.
- Does the acceleration of a simple harmonic oscillator remain constant during oscillation? Discuss briefly.
- A person holds a bag of groceries while standing still, a car is stationary with its engine runing at stand point, how the two situations are similar.
- Describe some phenomenon in which resonance plays an important role.

2 x 6 =12

4- Write short answers of any six parts from the following.

- Can visble light produce interference fringes? Explain.
- Define thin flim. Write its two examples.
- How would you manage to get more orders of spectra using diffraction grating?
- Why would it be advantageous to use blue light with a compound microscope?
- If a person was looking through a telescope at the full moon. How would the appearance of the moon be changed by covering half of the objective lens?
- Define entropy and give its units.
- Why does the pressure of a gas in a car Tyre increase when it is driven through some distance?
- Does entropy of a system increase or decrease due to friction? Explain.
- Is it possible to construct a heat engine that will not expel heat into the atmosphere? Explain.

Section - II

8x3=24

NOTE: Answer any three questions from the following.

- (a) State and explain two conditions of equilibrium. **05**
(b) A truck weighing 2500kg and moving with a velocity of 21mS^{-1} collides with stationary car weighing 1000kg. **03**
The truck and the car move together after the impact. Calculate their common velocity.
- (a) Define absoulte potential energy. Derive expression for it. **05**
(b) What should be the orbiting speed to launch a satellite in a circular orbit 900Km above the surface of the earth? **03**
(Take mass of the earth as $6.0 \times 10^{24}\text{Kg}$ and its radius as 6400Km).
- (a) What is terminal velocity? Show that terminal velocity is directly proportional to the square of the radius of **05**
spherical body falling in a viscous medium.
(b) Find the average speed of oxygen molecules in air at S.T.P. **03**
- (a) What is simple microscope? Calculate its magnification. **05**
(b) Sodem light (=589nm) is incident normally on a grating having 3000 lines/ cm. What is highest order of the **03**
spectrum obtained with this grating?
- (a) Explain Young's double slit experiment for interference phenomenon. Derive equations for maxima, minima and **05**
linear distance on the screen between adjacent bright fringes.
(b) A glass light pipe in air will totally internally reflect a light ray, if its angle of incidence is at least 39° . What is **03**
the minimum angle for total internal reflection if pipe is in water? (Refractive index of water =1.33)



Roll No. _____ to be filled in by the candidate.

Paper Code 6 4 7 1

Physics (Objective Type) **Sessions; 2012-2014, 2013-2015 & 2014-2016**

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A, B, C & D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or pen ink on the answer sheet provided.

- 1.1. The approximate age of earth is:
 - (A) 1.4×10^{16} S
 - (B) 2.8×10^{16} S
 - (C) 1.4×10^{17} S
 - (D) 2.8×10^{17} S
2. If two vectors of equal magnitude and perpendicular to each other are added then their resultant make angle with x-axis is:
 - (A) 0°
 - (B) 90°
 - (C) 45°
 - (D) 60°
3. From velocity -time graph we can calculate:
 - (A) Displacement
 - (B) Force
 - (C) Acceleration and distance
 - (D) Speed
4. The force due to water flow is:
 - (A) $F = mv$
 - (B) $F = \frac{mv}{t}$
 - (C) $F = \frac{ma}{t}$
 - (D) $F = \frac{mt}{V}$
5. 10Kwh is equal to:
 - (A) 10^4 watt
 - (B) 36×10^6 joule
 - (C) 36×10^6 watt
 - (D) 3.6×10^6 joule
6. The unit of angular momentum is:
 - (A) N-S
 - (B) J-S
 - (C) m.S
 - (D) Kgms^{-1}
7. The pull of earth on a mass of 20kg at the centre of earth is:
 - (A) 392N
 - (B) 196N
 - (C) 9.8N
 - (D) zero
8. When a wheel turns through an angle of 180° it lays out a tangential distance S is equal to:
 - (A) $2\pi r$
 - (B) πr
 - (C) $2r$
 - (D) πr^2
9. The unit of ρgh is same as that of:
 - (A) Pressure
 - (B) Energy
 - (C) Power
 - (D) Force
10. The correct relation between frequency and time period is:
 - (A) $\frac{f}{T} = 1$
 - (B) $\frac{T}{f} = 1$
 - (C) $f \times T = 2$
 - (D) $f \times T = 1$
11. The correct relation is:
 - (A) $V = \lambda T$
 - (B) $\lambda = \frac{V}{T}$
 - (C) $v = \frac{\lambda}{f}$
 - (D) $v = f\lambda$
12. The distance between Node and antinode of a stationary wave is:
 - (A) $\frac{\lambda}{2}$
 - (B) $\frac{\lambda}{4}$
 - (C) λ
 - (D) 2λ
13. If a star is moving away from earth then it shows:
 - (A) Blue shift
 - (B) Black shift
 - (C) Red shift
 - (D) White shift
14. The central point of Newton's Ring is:
 - (A) Bright
 - (B) Dark
 - (C) Blue
 - (D) Red
15. The magnification of a convex lens of focal length 10cm is:
 - (A) 2.5
 - (B) 3.5
 - (C) 4.5
 - (D) 5
16. Absolute zero temperature means:
 - (A) 0°C
 - (B) 0°F
 - (C) 0K
 - (D) 273K
17. The value of Boltzman constant K is:
 - (A) $1.38 \times 10^{23} \text{JK}^{-1}$
 - (B) $1.38 \times 10^{-23} \text{JK}^{-1}$
 - (C) $1.38 \times 10^{26} \text{JK}^{-1}$
 - (D) $1.38 \times 10^{-26} \text{JK}^{-1}$

Roll No. _____ (To be filled in by the candidate)

(NEW PATTERN)

Subject Code 6 0 4 7

Physics (Essay Type)**Sessions; 2012-2014, 2013-2015 & 2014-2016**

Time: 3:10 Hours

Marks: 83

Section - I**2- Write short answers of any eight parts from the following.**

2 x 8 = 16

- i. Explain, how the swing is produced in fast moving cricket ball? ii. Write the demensions of (i). Pressure. (ii). Density.
- iii. If one of the rectangular components of a vector is not zero, can its magnitude be zero? Explain.
- iv. Why do we find it useful to have two units for the amount of substance, the kilogram and the mole?
- v. Suppose that sides of a closed polygon represent vectors arranged head to tail. What is the sum of these vectors?
- vi. A measurement taken by Vernier Caliper with least count as 0.01cm is 0.45cm, find absolute, fractional and percentage uncertainties.
- vii. Explain the circumstances in which velocity \vec{v} and acceleration \vec{a} of a car are: (i). Parallel. (b). Anti-Parallel.
- viii. A 1500kg car has its velocity reduced from 20mS⁻¹ to 15mS⁻¹ in 3.0s. How large was the retarding force?
- ix. At what point or points in its path does a projectile have its minimum speed, its maximum speed?
- x. The period of simple pendulum is measured by a stop watch. What type of errors are possible in the time period?
- xi. Define Impulse and show that it is related to linear momentum.
- xii. Is it possible to add a vector quantity to a scalar quantity? Explain.

3- Write short answers of any eight parts from the following.

2 x 8 = 16

- i. What are damped oscillations? ii. Can we realize an ideal simple pendulum?
- iii. Explain the terms Node and Antinode. iv. How the phenomena of resonance is produced?
- v. Why does sound travel faster in solids than in gases? vi. What is rotational K.E of disc?
- vii. A boy uses a catapult to throw a stone which accidentally smashes a green house window, List the possible energy changes.
- viii. In which case more work is done? When a bag of 50kg books is lifted through 50cm or when a 50kg crate is pushed through 2m across the floor with a force of 50N.
- ix. In the relation to S.H.M, explain the equation $y = A \sin(\omega t + \phi)$.
- x. What are non-conventional energy sources? Describe briefly.
- xi. When the mud flies off the tyre of a moving bicycle, in what direction does it fly? Explain.
- xii. Define angular momentum and its mathematical form.

4- Write short answers of any six parts from the following.

2 x 6 = 12

- i. Why does the pressure of a gas in a car tyre increase when it is driven through some distance?
- ii. Does entropy of a system increase or decrease due to friction? Explain.
- iii. How would you manage to get more orders of spectra using a diffraction grating?
- iv. What happens to the temperature of the room, when an air conditioner is left running on a table in the middle of the room? Explain.
- v. Define total internal reflection and continuous refraction.
- vi. How interference in thin film produces? vii. Can visible light produce interference fringes? Explain.
- viii. Differentiate between microscope and telescope. ix. Write four postulates of Kinetic theory of gases.

Section - II

NOTE: Answer any three questions from the following.

8x3=24

5. (a) Write scalar product of two vectors and describe its four characteristics. 05
(b) A ball is thrown horizontally from a height of 10m with velocity of 21 mS^{-1} . 03
How far off it hit the ground and with what velocity?
6. (a) Define Escape velocity. Prove that $V_{esc} = \sqrt{2gR}$. 05
(b) A gramophone record turn table accelerates from rest to an angular velocity of 45 rev min^{-1} in 1.60Sec. 03
What is average angular acceleration?
7. (a) What is a simple pendulum? Show that time period of simple pendulum is 05
directly proportional to square root of its length.
(b) A stationary wave is established in a string which is 120cm long and fixed at both ends. 03
The string vibrates in four loops, at a frequency of 120Hz. Determine its wavelength.
8. (a) Discuss Youngs's double slit experiment for interference of light. 05
(b) A telescope is made of an objective of focal length 20cm and an eye piece of 5.0cm 03
both convex lenses. Find the angular magnification.
9. (a) Describe Carnot engine and show that its efficiency only depends on the temperature of hot and cold reservoirs. 05
(b) How large must a heating duct if air moving 3.0 mS^{-1} along it can replenish the air in a room of 300 m^3 volume 03
every 15min? Assume the air's density remain constant.

Section -III (Practical)

10.A Answer any four parts from the following.

2x4=08

- (i). What is meant by least count of a screw gauge?
(ii). What do you mean by vector sum or resultant?
(iii). What is meant by static equilibrium?
(iv). Define centre of gravity.
(v). What type of waves are produced in the air column enclosed in the tube?
(vi). Why do we use water in resonance tube experiment?
(vii). What are the conditions for total internal reflection?
(viii). What is end correction?
- B. Write down the brief procedure to determine the focal length of a convex lense by displacement method. 03

OR

Write down the brief procedure to find the speed of sound by two resonance position method.

- C. Answer the following questions on the basis of graph drawn:(See graph on the back page at No. A.) 04
(i). Measure the slope of the graph. (ii). What do you infer from graph.

OR

Answer the following questions on the basis of graph drawn:(See graph on the back page at No. B.)

- (i). What do you conclude from the graph? (ii). Find the slope of a graph.



Roll No. _____ to be filled in by the candidate.

Paper Code 6 4 7 1

Physics (Objective Type)Sessions; 2013-2015 & 2014-2016
Group-I

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A, B, C & D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or pen ink on the answer sheet provided.

- 1.1. The base quantity (SI) among the following is:

(A) Force	(B) Torque	(C) Velocity	(D) Mass
-----------	------------	--------------	----------
2. The vector \vec{A} and \vec{B} act at right angle to each other, then the scalar product is:

(A) 0	(B) AB	(C) A^2B^2	(D) $AB\sin\theta$
-------	--------	--------------	--------------------
3. Which is non-renewable energy source?

(A) Hydroelectric	(B) Uranium	(C) Tides	(D) Sunlight
-------------------	-------------	-----------	--------------
4. 1 pascal is equal to:

(A) 133.3 torr	(B) 7.5×10^{-3} torr	(C) 5.7×10^{-3} torr	(D) 7.5×10^3 torr
----------------	-------------------------------	-------------------------------	----------------------------
5. The force responsible for the vibratory motion of a simple pendulum is:

(A) $mg\cos\theta$	(B) $mg\sin\theta$	(C) mg	(D) $mg\cot\theta$
--------------------	--------------------	--------	--------------------
6. The Bragg's equation is:

(A) $d\sin\theta = m\lambda$	(B) $d\cos\theta = m\lambda$	(C) $2d\sin\theta = m\lambda$	(D) $\Delta Y = L\lambda/d$
------------------------------	------------------------------	-------------------------------	-----------------------------
7. The velocity of light was determined accurately by:

(A) Young	(B) Laplace	(C) Newton	(D) Michelson
-----------	-------------	------------	---------------
8. Impulse has dimensions of :

(A) $[MLT^{-1}]$	(B) $[MLT^{-2}]$	(C) $[ML^{-1}T^{-1}]$	(D) $[MLT]$
------------------	------------------	-----------------------	-------------
9. A body is moving with constant velocity of 10m/s, its acceleration is:

(A) $10m/s^2$	(B) Zero	(C) $5m/s^2$	(D) $20m/s^2$
---------------	----------	--------------	---------------
10. The difference between c_p and c_v is:

(A) Boltzman constant	(B) Spring constant	(C) Molar gas constant	(D) Temperature
-----------------------	---------------------	------------------------	-----------------
11. The process in which no entropy change takes place is:

(A) Isothermal	(B) Isochoric	(C) Isobaric	(D) Adiabatic
----------------	---------------	--------------	---------------
12. The distance between two consecutive crests or troughs is:

(A) λ	(B) $\frac{\lambda}{2}$	(C) $\frac{\lambda}{4}$	(D) 2λ
---------------	-------------------------	-------------------------	----------------
13. For monoatomic gas, the value of gamma $\eta = (c_p/c_v)$ is:

(A) 1.40	(B) 1.67	(C) 1.29	(D) 2.67
----------	----------	----------	----------
14. Speed of sound does not depend upon:

(A) Density	(B) Temperature	(C) Medium	(D) Pressure
-------------	-----------------	------------	--------------
15. The period of a circular motion is:

(A) $T=rv$	(B) $T = 2\pi/W$	(C) $T=VW$	(D) $T = 2\pi W$
------------	------------------	------------	------------------
16. The alternate SI unit of angular momentum is given by:

(A) JS^{-2}	(B) NS	(C) JS	(D) JS^{-1}
---------------	--------	--------	---------------
17. Two radians are equal to:

(A) 114.6°	(B) 57.3°	(C) 90°	(D) 45°
-------------------	------------------	----------------	----------------

Roll No. _____ (To be filled in by the candidate)

**Sessions; 2013-2015 & 2014-2016
Group-I**

Physics (Essay Type)

Time: 3:10 Hours

Marks: 83

Section - I

2- Write short answers of any eight parts from the following.

2 x 8 = 16

- i. Define significant figures?
- ii. Differentiate between random error and systematic error.
- iii. How many nanoseconds are in 1 year?
- iv. Explain briefly the first condition of equilibrium.
- v. Derive a relation for the height of a projectile.
- vi. Why the fog droplets appear to be suspended in air?
- vii. Does a dimensional analysis give any information on constant of proportionality that may appear in the algebraic expression? Explain.
- viii. Two vectors have unequal magnitudes. Can their sum be zero? Explain.
- ix. Can a body rotate about its centre of gravity under the action of its weight?
- x. At what point or points in its path, does a projectile has its minimum speed, its maximum speed.
- xi. An object is thrown vertically upwards. Discuss the sign of acceleration due to gravity relative to velocity, while the object is in air?
- xii. Differentiate between uniform velocity and instantaneous velocity?

3- Write short answers of any eight parts from the following.

2 x 8 = 16

- i. Define damping with an example.
- ii. Does the frequency depend on amplitude for harmonic oscillator?
- iii. How can waste product be used to get energy?
- iv. How are beats useful in tuning musical instrument?
- v. What sort of energy is in the following. (i). A moving car. (ii). Compressed spring.
- vi. An object has 1J of potential energy. Explain what does it mean?
- vii. 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?
- viii. Write two differences between Newton's view and Einstein's view of gravitation.
- ix. What happens to the period of a simple pendulum if its length is doubled? What happens if the suspended mass is doubled?
- x. Find the temperature at which the velocity of sound in air is two times its velocity at 10°C.
- xi. A wave is produced along a stretched string but some of its particles permanently show zero displacement. What type of wave is it?
- xii. Describe what should be the minimum velocity, for a satellite to orbit close to the Earth around it?

4- Write short answers of any six parts from the following.

2 x 6 = 12

- i. Is it possible to construct heat engine that will not expel heat into the atmosphere?
- ii. Why does the pressure of a gas in a car tyre increase when it is driven through some distance?
- iii. How would you manage to get more orders of spectra using a diffraction grating?
- iv. How the power is lost in optical fibre through dispersion? Explain.
- v. Can a mechanical energy be converted completely into heat energy? Give an example.
- vi. What is molar specific heat of a gas?
- vii. Give some uses of x-rays diffraction by crystals?
- viii. Write two uses of a spectrometer.
- ix. What is meant by reversible process? Give an example.

Section - II

NOTE: Answer any three questions from the following.

8x3=24

5. (a) Define Projectile. Give its examples. Derive expressions for its maximum height, time of flight and range. 05
(b) The magnitude of dot and cross products of two vectors are $6\sqrt{3}$ and 6 respectively. 03
Find the angle between the vectors.
6. (a) Define absolute gravitational P.E and derive its expression. 05
(b) What is the least speed at which an aeroplane can execute a vertical loop of 1.0Km radius so that there will be no tendency for the pilot to fall down at the highest point. 03
7. (a) State and prove "Bernoulli's Equation". 05
(b) A carnot engine whose low temperature reservoir is at 7°C has an efficiency of 50%. It is desired to increase the efficiency to 70%. By how many degrees the temperature of the source be increased? 03
8. (a) Explain the effect of variation of pressure, density and temperature on the speed of sound in air. 05
(b) A simple pendulum is 50.0cm long. What will be its frequency of vibration at a place where $g=9.8\text{mS}^{-2}$? 03
9. (a) Explain the construction and working of compound microscope and derive the relation for its angular magnification with the help of ray diagram. 05
(b) Sodium light of wavelength 589nm is incident normally on a grating having 3000 lines per centimeter. 03
What is the highest order of the spectrum obtained with this grating?

Section-III (Practical)

10.A Answer any four parts from the following.

2x4=08

- (i). Which is more precise, vernier calliper or micrometer? Why? (ii). Name two methods of vectors addition..
(iii). If length is doubled what happens to the time period of a simple pendulum?
(iv). What is sonometer? (v). What is resonance?
(vi). When image distance 'q' is positive and when it is negative? (vii). State Snell's Law.
(viii). Why height of water column is measured by lower menscus?

- B. Write procedure to verify that time period of a simple pendulum is independent of the amplitude. 03

OR

Write procedure to determine the wavelength of sound in air using standing waves and to calculate the speed of sound by end correction method.

- C. Answer the following questions on the basis of graph drawn:(See graph on the back page at No. A.) 04
(i). What do you infer from graph A. (ii). Determine the slope of graph A.

OR

Answer the following questions on the basis of graph drawn:(See graph on the back page at No. B.)

- (i). What do you infer from graph B. (ii). Determine the slope of graph B at $P=22.5\text{cm}$.



Roll No. _____ to be filled in by the candidate.

Paper Code 6 4 7 2

Sessions; 2013-2015 & 2014-2016
Group-II

Physics (Objective Type)

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A, B, C & D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1.1. 0.0023 should be written in scientific notation as:

- (A) 0.023×10^{-1} (B) 0.23×10^{-2} (C) 23×10^{-4} (D) 2.3×10^{-3}

2. Direction of torque is given by:

- (A) Left hand rule (B) Screw method (C) Right hand rule (D) Dimension analysis

3. A body is thrown vertically upwards with initial velocity of 9.8 m s^{-1} , it will attain the height of:

- (A) 9.8m (B) 4.9m (C) 5.1m (D) 19.6m

4. Projectile motion is:

- (A) Two dimensional (B) Three dimensional (C) One dimensional (D) Free of dimensional

5. Which one is a conservative force?

- (A) Frictional force (B) Normal force (C) Air resistance (D) Electric force

6. Number of radian in one degree is:

- (A) 57 (B) 57.3 (C) 0.01745 (D) 40

7. A ball tied to the end of a string swings in a vertical circle, the tension in string is zero when.

- (A) $\frac{v^2}{r} = g$ (B) $v^2 = g$ (C) $v^2 = \frac{g}{r}$ (D) $vr = g$

8. When disc starts moving down on an inclined plane of height h , its velocity at bottom is:

- (A) $\sqrt{\frac{4gh}{3}}$ (B) \sqrt{gh} (C) $\sqrt{\frac{gh}{3}}$ (D) $\frac{2}{3}gh$

9. The time period of a simple pendulum depends on:

- (A) Length of the pendulum (B) Acceleration due to gravity
(C) Mass of bob (D) Both length and acceleration

10. The expression $v = f\lambda$ is valid for:

- (A) Linear motion (B) Angular motion (C) Translational motion (D) Wave motion

11. Which of the following are longitudinal waves.

- (A) Light waves (B) Stationary waves in string (C) x-rays (D) Sound waves

12. The velocity of sound in vacuum is:

- (A) 332 m s^{-1} (B) 1136 m s^{-1} (C) 646 m s^{-1} (D) Zero

13. The product of cross sectional area of the pipe and fluid speed at any point is:

- (A) Zero (B) Called flow rate (C) Variable (D) Called volume of fluid

14. Fringe spacing in Young's double slit experiment decrease with:

- (A) Increase of wavelength (B) Decrease of slits separation
(C) Decrease of wavelength (D) Increase of distance between slits and screen

15. In Michelson's experiment, the equation used to find speed of light is:

- (A) $c = 16fd$ (B) $c = \frac{16f}{d}$ (C) $c = \frac{1}{16fd}$ (D) $c = \frac{16d}{f}$

16. The relation between Boltzman constant K , molar gas constant R and avogadro numbers N_A .

- (A) $K = RN_A$ (B) $K = \frac{R}{N_A}$ (C) $K = \frac{N_A}{R}$ (D) $\frac{1}{R} = KN_A$

17. If an ideal gas is isothermally expanded its internal energy will be:

- (A) increased (B) decreased (C) same (D) none of these

Roll No. _____ (To be filled in by the candidate)

Sessions; 2013-2015 & 2014-2016
Group-II

Physics (Essay Type)

Time: 3:10 Hours

Marks: 83

Section - I

2- Write short answers of any eight parts from the following.

2 x 8 = 16

- i. What are base unit?
- ii. Can a body be in equilibrium under a single force?
- iii. What is scientific notation?
- iv. What is difference between uniform and variable velocity?
- v. Define the term unit vector and position vector.
- vi. If $\vec{A} + \vec{B} = 0$, what can you say about the components of the two vectors?
- vii. Define linear momentum and its formula.
- viii. Define impulse and write its mathematical formula.
- ix. State Newton's first law of motion.
- x. Explain the difference between Laminar flow and turbulent flow.
- xi. Name several repetitive phenomena in nature which could be served as reasonable time standard.
- xii. An old saying is that a chain is only strong as its weakest link what analogous statement can you make regarding experiment data used in a computation?

3- Write short answers of any eight parts from the following.

2 x 8 = 16

- i. Define rotational Kinetic energy.
- ii. An object has 1J of potential energy. Explain what does it means?
- iii. State law of conservation of energy.
- iv. Why does sound travel faster in solids than in gases?
- v. When mud flies off the tyre of a moving bicycle, in what direction does it fly? Explain briefly.
- vi. When a rocket re-enters the atmosphere, its nose cone becomes very hot. Where does this heat energy come from?
- vii. If a mass spring system is hung vertically and set into oscillations, why does the motion eventually stop?
- viii. Explain the relation between total energy, potential energy and Kinetic energy for a body oscillating with S.H.M.
- ix. Show that in S.H.M, the acceleration is zero when the velocity is greatest and the velocity is zero when acceleration is greatest?
- x. Is it possible for two identical waves travelling in the same direction along a string to give rise to a stationary waves.
- xi. Explain how many minimum number of geo-stationary satellite are required for global coverage of T.V transmission?
- xii. Differentiate between progressive wave and periodic waves.

4- Write short answers of any six parts from the following.

2 x 6 = 12

- i. In the young's experiment, one of the slits covered with blue filter and other with red filter, What would be pattern of light intensity on the screen?
- ii. Explain whether the Young's experiment is an experiment for studying interference or diffraction effect of light.
- iii. Define Plane wavefront.
- iv. One can buy a cheap microscope for use by the children. The image seen in such a microscope have coloured edges, why is this so?
- v. Is it possible to construct a heat engine that will not expel heat into the atmosphere?
- vi. Why does the pressure of a gas in a car tyre increase when it is driven through some distance?
- vii. Give an example of natural process that involves an increase in entropy.
- viii. Write down two postulates of Kinetic theory of gases.
- ix. Draw ray diagram of Biconvex lens.

Section - II

NOTE: Answer any three questions from the following.

8x3=24

5. (a) What is vector product? Give one example write three characteristics of vector product. 05
(b) A ball is thrown with a speed of 30mS^{-1} in the direction of 30° above the horizon. 03
Determine: (i). Height to which it rises. (ii). Time of flight.
6. (a) What is the difference between real and apparent weight? Discuss different cases of apparent weight with respect to motion. 05
(b) How large a force is required to accelerate an electron($m=9.1\times 10^{-31}\text{Kg}$) from rest its a speed of $2\times 10^7\text{mS}^{-1}$ through a distance of 5cm? 03
7. (a) Define molar specific heat of a gas at constant pressure and constant volume and prove that their difference is equal to the universal gas constant. 05
(b) A tiny water droplet of radius 0.01cm falls through air. Calculate its terminal velocity. Given that for air $\eta = 19\times 10^{-6}\text{kgm}^{-1}\text{s}^{-1}$ and density of water $\ell = 1000\text{kgm}^{-3}$. 03
8. (a) State Doppler effect and describe it when a listner moves towards and away from a stationary source. 05
(b) A simple pendulum is 50.0cm long. What will be its frequency of vibration at a place where $g=9.8\text{mS}^{-1}$? 03
9. (a) Describe the construction and working of a compound microscope. 05
(b) In a double slit experiment, the second order maximum occurs at $\theta = 0.25^\circ$. The wavelength is 650nm. 03
Determine the slits separation.

Section -III (Practical)

10.A Answer any four parts from the following.

2x4=08

- (i). What is the use of the upper jaws and the sliding strip?
(ii). What is meant by the least count of screw gauge?
(iii). What do you mean by rectangular components of a vector?
(iv). Why should the amplitude of a simple pendulum be small? (vi). Define node and antinode?
(v). Differentiate between longitudinal and transverse waves?
(vii). What is parallax? (viii). Define critical angle?
- B. Write down the procedure to verify that time period of a simple pendulum is independent of the amplitude of simple pendulum. 03

OR.

Write down the procedure to find out the refractive index of glass prism by critical angle method.

- C. Answer the following questions on the basis of graph drawn:(See graph on the back page at No. A.) 04
(i). Find the slope of graph A. (ii).What do you infer from graph A.

OR

Answer the following questions on the basis of graph drawn:(See graph on the back page at No. B.)

- (i). Find the focal length of the lens from the graph B. (ii). What do you conclude from the graph B.



9

Roll No. _____ to be filled in by the candidate.

Paper Code	2	4	7	3
------------	---	---	---	---

Physics (Objective Type)

Sessions; 2015-2017 & 2016-2018
Group-I

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given. Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

- 1.1. The ratio of $\frac{c_p}{c_v} = \gamma$ for diatomic gas like air is:
(A) 1.40 (B) 1.30 (C) 1.29 (D) 1.67
2. The number of spark plug needed in diesel engine is:
(A) 4 (B) 3 (C) 2 (D) 0
3. The dimension of density are:
(A) $[ML^{-2}]$ (B) $[M^2L^{-2}]$ (C) $[ML^{-3}]$ (D) None of these
4. If $\vec{A} \times \vec{B} = 0$, then angle between the vectors is:
(A) 90° (B) 180° (C) 0° (D) None of these
5. The value of escape velocity is:
(A) 1.1Km/s (B) 11Km/s (C) 1.1Km/h (D) 1.1cm/s
6. If a body of mass 5kg is raised vertically through a distance of 1m, then work done is:
(A) 49J (B) 4.9J (C) 490J (D) 0.49J
7. The acceleration along x-axis direction in case of projectile is:
(A) Zero (B) Equal to gravity (C) Maximum (D) Constant
8. The SI unit of angular momentum is:
(A) Kgm^2S^{-1} (B) Kgm^2S^{-2} (C) Kg^2mS^{-1} (D) $KgmS^{-1}$
9. Moment of inertia of rod is:
(A) $I = \frac{1}{12}mL^2$ (B) $I = \frac{2}{3}mL^2$ (C) $I = \frac{1}{12}m^2L$ (D) None of these
10. Height of geo-stationary orbit of the satellite above the earth is:
(A) 300Km (B) 250Km (C) 400Km (D) None of these
11. Bunsen burner works on the principle of:
(A) Venturi effect (B) Terricilli's effect (C) Bernoulli's effect (D) None of these
12. Shock absorber in automobiles is a practical form of:
(A) SHM (B) Damped oscillations (C) Forced oscillations (D) None of these
13. Distance between two consecutive nodes is:
(A) $\frac{\lambda}{2}$ (B) $\frac{\lambda}{4}$ (C) λ (D) 2λ
14. The speed of sound is greater in solids than in gases due to their high.
(A) Temperature (B) Pressure (C) Density (D) Elasticity
15. Beats cannot be heard if the difference of frequencies is more than.
(A) 10Hz (B) 9Hz (C) 6Hz (D) 4Hz
16. Michelson interferometer can be used to find the:
(A) Wavelength of light (B) Wavelength of sound (C) Velocity of sound (D) Velocity of light
17. The final image obtained by astronomical telescope is:
(A) Erect (B) Virtual (C) Magnified (D) All of these

10

Roll No. _____ (To be filled in by the candidate)

Sessions; 2015-2017 & 2016-2018
Group-I

Physics (Essay Type)

Time: 2:40 Hours

Marks: 68

2x22=44

2 x 8 =16

Section - I

2- Write short answers of any eight parts from the following.

- i. Define radian and steradian.
- ii. What is physical significance of dimension of physical quantity.
- iii. How many seconds are there in one year?
- iv. Define torque. Write its unit.
- v. Define impulse and write its formula.
- vi. Define: (a).Elastic collision. (b).Inelastic collision.
- vii. Name several repetitive phenomenon occurring in nature which could serve as reasonable time standards.
- viii. Can a vector have a component greater than the vector's magnitude. Explain.
- ix. Why can a body not rotate about its centre of gravity under the action of its weight?
- x. Motion with constant velocity is a special case of motion with constant acceleration. is this statement true? Discuss.
- xi. At what point or points in its path, does a projectile have its minimum speed, its maximum speed?
- xii. How the swing is produced in a fast moving cricket ball? Explain.

3- Write short answers of any eight parts from the following.

2 x 8 =16

- i. How can we obtain energy from Biomass?
- ii. Define heat and explain it with an example.
- iii. Prove that power is the dot product of force and velocity.
- iv. What is difference between free and forced oscillation?
- v. What is meant by moment of inertia? Explain briefly.
- vi. How many minimum number of geostationary satellites are required for global coverage of T.V transmission. Describe briefly.
- vii. Describe two phenomenon in which resonance plays an important role.
- viii. If a mass spring is hung vertically and set into oscillations why does the motion eventually stop?
- ix. What is the effect of temperature on the speed of sound?
- x. In which case is more work done? When a 50kg bag of books is lifted through 50cm or when a 50kg crate is pushed through 2m across the floor with a force of 50N.
- xi. Why Einstein views of gravitation are preferred than Newton's views of gravitation? Explain briefly.
- xii. What features do longitudinal waves have in common with transverse waves?

4- Write short answers of any six parts from the following.

2 x 6 =12

- i. How would you manage to get more orders of spectra using diffraction grating?
- ii. Explain whether the Young's experiment is an experiment for studying interference or diffraction effect of light.
- iii. Why the polaroid sunglasses are better than ordinary sunglasses?
- iv. Explain the difference between angular magnification and resolving power of an optical instrument.
- v. How the light signal is transmitted through the optical fibre?
- vi. State first law of thermodynamics and also write its mathematical form.
- vii. Is it possible to convert internal energy into mechanical energy? Explain with an example.
- viii. Can mechanical energy be converted completely into heat energy? If so give an example.
- ix. Specific heat of a gas at constant pressure is greater than specific heat at constant volume. Why?

Section - II

NOTE: Answer any three questions from the following.

8x3=24

- 5. (a) What are rectangular components? Describe the method of vector addition by rectangular components. 05
- (b) A ball is thrown horizontally from a height of 10m with a velocity of 21mS^{-1} . How far off will it hit the ground and with what velocity. 03
- 6. (a) Show that work done in gravitational field is independent of path followed. 05
- (b) A 1000kg car travelling with a speed of 144Kmh^{-1} rounds a curve of radius 100m. Find the necessary centripetal force. 03
- 7. (a) What is carnot engine? Give its four processes and derive the relation for its efficiency. 05
- (b) The pipe near the lower end of a large tank develops a small leak and a stream of water shoots from it. The top of water in the tank is 15m above the point of leak. With what speed does the water rush from the hole? 03
- 8. (a) What is Doppler's effect? Explain it for two cases. 05
- (i). When source moves towards a stationary observer.
- (ii). When observer moves towards a stationary source.
- (b) An 8kg body executes SHM with an amplitude 30cm. The restoring force is 60N. Find the time period of oscillation. 03
- 9. (a) What is compound microscope? Explain its working and derive formula for its magnifying power. 05
- (b) Blue light of wavelength 480nm illuminates a diffraction grating the second order image is formed at an angle of 30° from the central image. How many lines in a centimeter of the grating have been ruled? 03



(11)

Roll No. _____ to be filled in by the candidate.

Paper Code	2	4	7	2
------------	---	---	---	---

Physics (Objective Type)

Sessions; 2015-2017 & 2016-2018
Group-II

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given. Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1.1. Zero error of the instrument is a type of:

- (A) Systematic error (B) Classified error (C) Personal error (D) Random error

2. If $r=5\text{m}$ and $F=4\text{N}$ are along same direction, then torque is:

- (A) 20 N.m (B) 5 N.m (C) 10 Nm (D) Zero

3. The distance covered by a body in time 't' starting from rest is:

- (A) at^2 (B) v^2t (C) $a^2 \frac{t}{2}$ (D) $\frac{at^2}{2}$

4. If velocity-time graph is parallel to time axis, then acceleration of moving body will be:

- (A) Maximum (B) Positive (C) Zero (D) Negative

5. Which one of the following force can not do any work on the particle on which it acts:

- (A) Frictional force (B) Gravitational force (C) Electrostatic force (D) Centripetal force

6. The dimensions of power are:

- (A) MLT^{-1} (B) ML^2T^{-2} (C) ML^2T^{-1} (D) ML^2T^{-3}

7. When a body moves in a circle, the angle between linear velocity 'V' and angular velocity 'W' is always.

- (A) 90° (B) 45° (C) 0° (D) 180°

8. S.I unit of moment of inertia is:

- (A) Kgm^{-1} (B) Kg.m^2 (C) Kgm^{-2} (D) Kg.m

9. The diver spins faster when moment of inertia becomes:

- (A) smaller (B) greater (C) constant (D) Zero

10. The pressure will be low when speed of fluid is:

- (A) low (B) zero (C) constant (D) high

11. The force responsible for the vibratory motion of simple pendulum is:

- (A) $mg \cos \theta$ (B) $mg \sin \theta$ (C) $mg \sec \theta$ (D) $mg \tan \theta$

12. The velocity of sound in vacuum is:

- (A) Zero m/sec (B) 280mS^{-1} (C) 332mS^{-1} (D) 300mS^{-1}

13. When sound waves enter in different medium, the quantity that remains unchanged is:

- (A) Intensity (B) Speed (C) Frequency (D) Wavelength

14. Longitudinal waves do not exhibit(show):

- (A) Reflection (B) Polarization (C) Diffraction (D) Refraction

15. The light emitted from LED (Light emitting diode) has wavelength:

- (A) $1.3\mu\text{m}$ (B) $1.2\mu\text{m}$ (C) $1.4\mu\text{m}$ (D) $1.5\mu\text{m}$

16. Entropy is measure of:

- (A) Internal energy of system (B) Order of system (C) Disorder of system (D) Potential energy of system

17. S.I unit of pressure of gas is:

- (A) Nm^{-2} (B) N.m (C) $\frac{\text{N}^2}{\text{m}}$ (D) $\text{N}^2.\text{m}$

Roll No. _____ (To be filled in by the candidate)

Physics (Essay Type)**Sessions; 2015-2017 & 2016-2018
Group-II**

Time: 2:40 Hours

Marks: 68

2x22=44

2 x 8 =16

Section - I**2- Write short answers of any eight parts from the following.**

- Differentiate between elastic and inelastic collisions.
- Check the correctness of relation $F=ma$.
- How many years are in one second?
- Explain what do you understand by the term viscosity?
- Write down the steps for addition of vectors by rectangular component method.
- Is it possible to add a vector quantity to a scalar quantity? Explain.
- Name the three different conditions that could make $\vec{A}_1 \times \vec{A}_2 = 0$.
- Name several repetitive phenomenon occurring in nature which could serve as reasonable time standards.
- What is the difference between uniform and variable velocity?
- Explain the circumstances in which the velocity 'v' and acceleration 'a' of a car are:
 - Perpendicular to one another.
 - a is zero but 'v' is not zero.
- Derive the relation for time to reach maximum height for a projectile.
- Why do we find it useful to have two units for the amount of substance, the kilogram and the mole?

3- Write short answers of any eight parts from the following.

2 x 8 =16

- Differentiate between positive and negative work.
- How are beats useful in tuning a musical instrument?
- Define resonance with one example.
- Define angular velocity give its units and demensions.
- A disc is rolling down on an inclined. Find a relation for the speed of disc at its bottom.
- How many no of geostationary satellites are required for global coverage of T.V transmission? Explain briefly.
- What is the difference between displacement and amplitude?
- A girl drops a cup from a certain height which breaks into pieces. List out all energy changes.
- Does frequency of simple harmonic oscillator depend on amplitude? Explain briefly.
- What is the effect of pressure and density on the speed of sound?
- As a result of distant explosion an observer senses a ground tremor first and then hears the explosion, explain the time difference.
- When a rocket re-enters in atomsphere, its nose cone becomes very hot where does this energy come from?

4- Write short answers of any six parts from the following.

2 x 6 =12

- An oil flim spreading over a wet footpath shows colours. Explain how does it happen?
- How would you distinguish between un-polarized and plane polarized lights?
- How would you manage to get more orders of spectra using diffraction grating.
- Define total internal reflection and critical angle.
- One can buy a cheap microscope for use by the children. The image seen in such microscope have coloured edges. Why is this so?
- What is heat engine? Define efficiency.
- Why is the average velocity of the molecules in a gas zero but the average of the square of velocities is not zero?
- Does entropy of a system increase or decrease due to friction? Explain.
- Is it possible to construct a heat engine that will not expel heat in to the atmospher? Explain.

Section - II**NOTE: Answer any three questions from the following.**

8x3=24

- (a) Define scalar product of two vectors and also describe its characteristics. 05
(b) A 1500kg car has its velocity reduced from 20mS^{-1} to 15mS^{-1} in 3 second. How large was the average retarding force? 03
- (a) What are artificial satellites? Find the expression for velocity and period to put a satellite into the orbit. 05
(b) A child starts from rest at the top of a slide of height 4m. 03
(i). What is his speed at the bottom if the slide is frictionless?
(ii). if he reaches the bottom with a speed of 6m/s, what percentage of his total energy at the top of the slide is lost as a result of friction?
- (a) State Doppler's effect and discuss the case when the observer moves towards the stationary source. Also write at least one application. 05
(b) A simple pendulum is 50cm long. What will be its frequency of vibration at a place where $g=9.8\text{mS}^{-2}$. 03
- (a) Discuss the motion of horizontal mass spring system and also derive formula for time period, displacement and velocity. 05
(b) A church organ consists of pipes, each open at one end, of different lengths. The minimum length is 30mm and the longest is 4m. Calculate the frequency range of the fundamental notes. (speed of sound= 340mS^{-1}). 03
- (a) Define diffraction of light. Explain diffraction of x-rays by crystal and derive Bragg's equation. 05
(b) A glass light pipe in air will totally internally reflect a light ray, if its angle of incidence is at least 39° . What is the minimum angle for total internal reflection if pipe is in water. (Refractive index of water= 1.33). 03



Roll No. _____ to be filled in by the candidate.

Paper Code 2 4 7 5

Sessions; 2015-2017, 2016-2018 & 2017-2019

Physics (Objective Type)

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A, B, C & D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or pen ink on the answer sheet provided.

- 1.1. Which one of the following cannot be polarized:
(A) Radio waves (B) light waves (C) X-rays (D) Sound waves
2. The first person who attempted to measure the speed of light was:
(A) Michelson (B) Huygen (C) Galileo (D) Newton
3. In thermodynamics process, the equation $w = -\Delta U$ represents.
(A) Isothermal expansion (B) Isothermal compression (C) Adiabatic expansion (D) Adiabatic compression
4. The potential energy to the molecules of an ideal gas is considered to be:
(A) 100J (B) 212J (C) 273J (D) Zero J
5. In colour printing the whole range of colours can be obtained by mixing.
(A) three colours (B) four colours (C) five colours (D) seven colours
6. Minimum number of unequal forces whose vector sum can be zero are:
(A) 5 (B) 4 (C) 3 (D) 2
7. Change in momentum is equivalent to:
(A) Force (B) Energy (C) Impulse (D) Weight
8. Before the launch of a rocket the mass of the fuel of the rocket approximately consists of:
(A) 20% of rocket mass (B) 40% of rocket mass (C) 60% of rocket mass (D) 80% of rocket mass
9. Identify the non-conservative force among the following:
(A) Air resistance (B) Gravitational force (C) Elastic spring force (D) Electric force
10. If a body is moving in the counter clockwise direction then the direction of angular velocity will be:
(A) Towards the centre (B) Away from the centre
(C) Along the linear velocity (D) Perpendicular to both radius and linear velocity
11. The moment of inertia of 10kg hoop about the axis of rotation perpendicular to its plane having radius 5m is:
(A) 50 Kgm² (B) 100 Kgm² (C) 150 Kgm² (D) 250 Kgm²
12. The apparent weight of a pilot diving down with an acceleration 9.8mS⁻² will become:
(A) Half (B) Zero (C) Double (D) Increases to four times
13. The S.I units of flow rate of fluid is:
(A) mS⁻¹ (B) m²S⁻² (C) m³S⁻¹ (D) m³S⁻²
14. When three-fourth of the cycle of a vibrating body completed then the phase of vibration is:
(A) $\frac{\pi}{4}$ radian (B) $\frac{\pi}{2}$ radian (C) $\frac{3\pi}{2}$ radian (D) π radian
15. Waves produced in organ pipes are:
(A) transverse stationary waves (B) longitudinal stationary waves
(C) Electromagnetic waves (D) Matter waves
16. If the period of wavemotion is 0.01Sec and wave speed is 100mS⁻¹ then frequency of wave is:
(A) 0.5 Hz (B) 1 Hz (C) 10 Hz (D) 100 Hz
17. A bat finding its correct location by sending.
(A) Matter waves (B) Ultrasonic waves (C) Infrasonic waves (D) Electromagnetic waves

Roll No. _____ (To be filled in by the candidate)

Sessions; 2015-2017, 2016-2018 & 2017-2019

Physics (Essay Type)

Time: 2:40 Hours

Marks: 68

2x22=44

2 x 8 =16

Section - I**2- Write short answers of any eight parts from the following.**

- i. Under what conditions zeros are not significant?
- ii. Give the drawbacks to use period of a pendulum as time standard.
- iii. Distinguish between precision and accuracy.
- iv. Define radian and steradian. Are they basic units of S.I?
- v. Can a body rotate about its centre of gravity under the action of its weight?
- vi. What is the unit vector in the direction of vector, $\vec{A} = 4\hat{i} + 3\hat{j}$.
- vii. You are standing on the edge. What should you do to avoid falling?
- viii. Can the velocity of an object reverse direction when acceleration is constant? If so give an example.
- ix. Explain the circumstances in which (a) \vec{v} is zero but \vec{a} is not zero (b) \vec{a} is zero but \vec{v} is not zero.
- x. Which will be more effective in knocking down a bear and why? (a). A rubber bullet. (b). a lead bullet of same momentum.
- xi. When a massive body collides elastically with light stationary body, what will be their final velocities?
- xii. Why should chimney be tall for its better working?

3- Write short answers of any eight parts from the following.

2 x 8 =16

- i. A boy uses a catapult to throw a stone which accidentally smashes a green house window, list possible energy changes.
- ii. Explain briefly how the energy is obtained from the fermentation of biomass.
- iii. Differentiate between renewable and non-renewable energy sources with examples.
- iv. What is critical velocity for a satellite which is orbiting at nearest height to earth? Derive this value.
- v. Why does a diver change his body position before and after diving in the pool?
- vi. A hoop and disc start moving down on an inclined plane at the same time, which one will be moving faster on reaching the ground?
- vii. What is a phase angle?
- viii. Define SHM and angular frequency.
- ix. Write any two applications of Dopplers effect.
- x. How are beats useful in tuning a musical instrument?
- xi. Describe some common phenomenon in which resonance plays an important role
- xii. What happens when a jet plane like a concorde flies faster than speed of sound

4- Write short answers of any six parts from the following.

2 x 6 =12

- i. Can visible light produce interference fringes? Explain.
- ii. Define wave fronts also write its types.
- iii. The center of Newton's ring is dark. Why?
- iv. Why would it be advantageous to use blue light with a compound microscope?
- v. Define critical angle and total internal reflection.
- vi. Is it possible to construct a heat engine that will not expel heat into the atmosphere?
- vii. Can the mechanical energy be converted completely into heat energy? if so give an example.
- viii. Define molar specific heat of a gas at constant volume and molar specific heat at constant pressure.
- ix. Does the entropy of system increase or decrease due to friction?

Section - II**NOTE: Answer any three questions from the following.**

8x3=24

5. (a) Describe elastic collision in one dimension. Show that relative velocity before collision = Relative velocity after collision. 05
(b) A load of 10N is suspended from a clothes line. This distorts the line so that it makes an angle of 15° with the horizontal at each end. Find the tension in the clothes line. 03
6. (a) What is meant by rotational Kinetic energy? Find rotational Kinetic energy for a disc and hoop. 05
(b) 100m^3 of water is pumped from a reservoir into a tank 10m higher than the reservoir in 20 minutes. If density of water is 1000kgm^{-3} , find the power delivered by the pump. 03
7. (a) Define and explain Molar specific heat of a gas at constant pressure and at constant volume and also derive relation between them. 05
(b) A tiny water droplet of radius 0.01cm descends through air from a height. Calculate its terminal velocity. 03
Given that for air $\eta = 19 \times 10^{-6} \text{kgm}^{-1}\text{s}^{-1}$ and density of water $\rho = 1000\text{kgm}^{-3}$.
8. (a) What is simple pendulum? Show that its motion is SHM. Derive a formula for its time period. 05
(b) A train is approaching a station at 90Kmh^{-1} sounding a whistle of frequency 1000 Hz. What will be the apparent frequency of the whistle heard by a listener sitting on the platform. Speed of sound $v = 340\text{ms}^{-1}$. 03
9. (a) What is astronomical telescope? Using ray diagram, calculate magnification power of astronomical telescope. 05
(b) X-ray of wavelength 0.150nm are observed to undergo a first order reflection at a Bragg angle of 13.3° from the quartz crystal. What is the interplaner spacing of the reflecting planes in the crystal? 03



Roll No. _____ to be filled in by the candidate.

Paper Code 6 4 7 5

Session; 2014-2016

Physics (Objective Type)

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given. Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

- 1.1. Newton rings are formed as a result of:
(A) Dispersion (B) Interference (C) Diffraction (D) Polarization
2. The final image formed by simple microscope is:
(A) Virtual and inverted (B) Real and erect (C) Virtual and erect (D) Real and inverted
3. The efficiency of petrol engine is about:
(A) 20-25% (B) 30-35% (C) 25-30% (D) 35-40%
4. The process which is carried out at constant temperature is called:
(A) Adiabatic (B) Isothermal (C) Isochoric (D) Isobaric
5. The SI unit of solid angle is:
(A) Steradian (B) Degree (C) Revolution (D) Radian
6. The resultant of two forces 6N and 8N acting at right angle to each other is:
(A) 4N (B) 6N (C) 8N (D) 10N
7. Motion of rocket is in accordance with law of:
(A) Linear momentum (B) Energy (C) Mass (D) Angular momentum
8. Slope of velocity time graph represents:
(A) Average acceleration (B) Average velocity (C) Average speed (D) Instantaneous acceleration
9. Kilowatt hour is the unit of:
(A) Power (B) Work (C) Force (D) Momentum
10. The expression for the orbital speed of a satellite is:
(A) $\sqrt{\frac{Gr}{M}}$ (B) $\sqrt{\frac{M}{Gr}}$ (C) $\sqrt{\frac{r}{GM}}$ (D) $\sqrt{\frac{GM}{r}}$
11. The period of revolution of a geostationary satellite is equal to:
(A) 1 hour (B) 84 minute (C) 1 day (D) 1 month
12. 1 radian=
(A) 57.3° (B) 54.3° (C) 53.7° (D) 56.3°
13. The lower reading of blood pressure is called:
(A) systolic pressure (B) Diastolic pressure (C) Normal pressure (D) Non-normal pressure
14. In simple harmonic motion the acceleration of a body is directly proportional to:
(A) Applied force (B) Amplitude (C) Restoring force (D) Displacement
15. If 20 waves pass through a medium in 1sec with a speed of 20mS⁻¹ then the wavelength is:
(A) 20m (B) 40m (C) 400m (D) 1m
16. Radar system is an application of:
(A) Interference (B) Beats (C) Stationary waves (D) Doppler effect
17. The beats are used to find:
(A) Intensity (B) wavelength (C) Frequency (D) Speed

Roll No. _____ (To be filled in by the candidate)

Session; 2014-2016

Physics (Essay Type)

Time: 3:10 Hours

Marks: 83

Section - I**2- Write short answers of any eight parts from the following.**

2 x 8 = 16

- i. Show that the famous "Einstein Equation" $E=mc^2$ is dimensionally consistent.
- ii. Add the following masses given in kg upto appropriate precision, 2.189, 0.089, 11.8, 5.32.
- iii. Name two repetitive phenomenon occurring in nature which could serve as reasonable time standards.
- iv. What is meant by precision and accuracy?
- v. State the static equilibrium and dynamic equilibrium.
- vi. Does a moving object have impulse? Explain.
- vii. Is it possible to add a vector quantity to a scalar quantity? Explain.
- viii. Can a body rotate about its centre of gravity under the action of its weight? Explain.
- ix. At what point or points in its path does a projectile have its maximum speed and why?
- x. How a motor cycle's safety helmet is padded to prevent serious injury?
- xi. Explain the difference between elastic and inelastic collisions?
- xii. Explain how the swing is produced in a fast moving cricket ball?

3- Write short answers of any eight parts from the following.

2 x 8 = 16

- i. A girl drops a cup from a certain height, which breaks into pieces. What energy changes are involved?
- ii. Calculate the work done in Kilo joules in lifting a mass of 10kg (at a steady velocity) through a vertical height of 10m.
- iii. Explain how many minimum number of geo-stationary satellites are required for global coverage of T.V transmission?
- iv. What features do longitudinal waves have in common with transverse waves?
- v. Prove that $1\text{Kwh}=3.6\text{MJ}$.
- vi. Show that orbital angular momentum $L_0=mvr$.
- vii. Define critical velocity. Write its value.
- viii. Can we realize an ideal simple pendulum? Explain briefly.
- ix. Define damped oscillation.
- x. Does frequency depend on amplitude for harmonic oscillator? Explain.
- xi. State principle of superposition.
- xii. Why does sound travel faster in solids than in gases?

4- Write short answers of any six parts from the following.

2 x 6 = 12

- i. How would you manage to get more orders of spectra using a diffraction grating?
- ii. What is Bragg equation for x-rays diffraction (XRD)? What is application of XRD in Biology?
- iii. Define diffraction. When is the diffraction of light prominent?
- iv. What is single mode step index fiber and multimode step index fiber? Why single mode fiber is preferred in telecommunication.
- v. Differentiate between magnifying power and resolving power of optical instruments.
- vi. Is it possible to construct a heat engine that will not expel heat into the atmosphere? Explain.
- vii. Does entropy of a system increase or decrease due to friction? Explain.
- viii. Define heat engine. Why is working substance needed in heat engine?
- ix. Specific heat of a gas at constant pressure is greater than specific heat at constant volume. Why?

Section - II

NOTE: Answer any three questions from the following.

8x3=24

5. (a) State and prove law of conservation of linear momentum. 05
(b) Find the angle between the two vectors: $\vec{A} = 5i + j$ and $\vec{B} = 2i + 4j$ 03
6. (a) Discuss the inter conversion of potential energy and kinetic energy when frictional force is not considered. 05
(b) What should be the orbiting speed to launch a satellite in a circular orbit 900Km above the surface of earth. 03
(take mass of earth as 6.0×10^{24} kg and its radius as 6400Km)
7. (a) State first law of thermodynamics. Discuss isothermal and adiabatic processes. 05
(b) Water flows through a hose, where internal diameter is 1cm 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} ? 03
8. (a) What are defects in Newton's formula for the speed of sound in air. How was this formula corrected by Laplace? 05
(b) A spring, whose spring constant is 80.0 N m^{-1} vertically supports a mass of 1.0kg in the rest position. Find the distance by which the mass must be pulled down, so that on being released, it may pass the mean position with a velocity of 1.0 m s^{-1} . 03
9. (a) Describe the Young's double slit experiment for demonstration of interference of light. Also derive an equation for fringe spacing. 05
(b) An astronomical telescope having magnification power of 5 consist of two thin lenses 24cm apart. Find the focal length of the lenses. 03

Section -III (Practical)

10.A Answer any four parts from the following.

2x4=08

- (i). What is zero correction (ii). What is the use of screw gauge.
(iii). What is the unit of force? Define it. (iv). Why is the free fall method so called?
(v). What is the relation between frequency and time period? (vi). Define node and antinode.
(vii). What is critical angle? (viii). What is magnification.

- B. Write down the brief procedure of the experiment to find the unknown weight of a body by the method of vector addition of forces. 03

OR

Write down the brief procedure of the experiment to determine the wavelength of sound in air using stationary waves and to calculate the speed of sound.

- C. Answer the following questions on the basis of graph drawn:(See graph on the back page at No. A.) 04

- (i).What does the graph indicate. (ii). Find the slope of graph.

OR

Answer the following questions on the basis of graph drawn:(See graph on the back page at No. B.)

- (i).Find the slope. (ii). What do you infer from graph?



Roll No. _____ to be filled in by the candidate.

(For all sessions)

Paper Code 6 4 7 1

Physics (Objective Type)

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given. Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

- 1.1. Mass is highly concentrated form of:
(A) Inertia (B) Energy (C) Plasma (D) Charge
2. Dimensions of $\sqrt{\frac{g}{l}}$ is same as:
(A) Angular frequency (B) Force (C) Torque (D) Time period
3. Force of 10N makes an angle of 30° with y-axis, its x-component will be:
(A) 5N (B) 8.66 (C) $\frac{10}{\sqrt{2}}N$ (D) $10\sqrt{2}N$
4. In which quadrant vector $-2\hat{i}-3\hat{j}$ lies.
(A) 1st (B) 2nd (C) 4th (D) 3rd
5. Distance travelled by free falling object in first second is:
(A) 4.9m (B) 9.8m (C) 19.6m (D) 10m
6. Choice of zero potential energy level is:
(A) Surface of the Earth (B) at infinity
(C) Just above the surface of the Earth (D) arbitrary
7. 2° is equal to:
(A) 0.035 rad (B) 0.30 rad (C) 0.35 rad (D) 0.0035 rad
8. Centripetal force is directed along:
(A) Tangent to circle (B) radius (C) axis of rotation (D) x-axis
9. Terminal velocity of a particle in the fluid depends on:
(A) Nature of fluid (B) Acceleration of particle (C) Force on particle (D) angular velocity of particle
10. Radar system is an application of:
(A) Electric effect (B) Doppler's effect (C) Magnetic effect (D) Chemical effect
11. $\sqrt{\frac{l}{g}}$ and $\sqrt{\frac{m}{k}}$ has same:
(A) numerical value (B) units (C) damping (D) time period
12. On loading the prong of tuning fork with wax, the frequency of sound:
(A) increases (B) decreases (C) remains same (D) periodic increase and decrease
13. Fringe spacing increases if we use:
(A) lowest order (B) highest order (C) red light (D) blue light
14. Soap film shows colours due to:
(A) Interference (B) Diffraction (C) Polarization (D) Reflection
15. Magnifying power of the lens is 6 then its focal length will be:
(A) 4 (B) 6 (C) 5 (D) 4.5
16. The SI unit of product of pressure and volume is:
(A) Watt (B) Joule (C) Pascal (D) N.m
17. Carnot engine cycle consists of:
(A) Four steps (B) Three steps (C) Single step (D) Two steps

Roll No. _____ (To be filled in by the candidate)

(For all sessions)

Physics (Essay Type)

Time: 2:40 Hours

Marks: 68

Section - I**2- Write short answers of any eight parts from the following.**

2 x 8 = 16

- Find unit vectors in the direction of vector $\vec{A}, \vec{A} = 8\hat{i} + 4\hat{j}$.
- What do you mean by scientific notations? Give one example.
- Time period of a simple pendulum is measured by stop watch. What type of errors are possible in the time period?
- Differentiate between base units and derived units with examples.
- Calculate the number of seconds in one year.
- Write briefly about Ballistic Missile.
- Define viscosity and give its units.
- Explain the circumstance in which \vec{V} and \vec{a} are (i). in parallel. (ii). are perpendicular.
- Vector \vec{A} lies in xy plane. For what orientations will both of its rectangular components be negative and for what orientations, its rectangular components be positive.
- Describe Newton's second law of motion in terms of momentum.
- Explain briefly how the swing is produced in a fast moving cricket ball with figure.
- Define positive and negative acceleration along with their directions.

3- Write short answers of any eight parts from the following.

2 x 8 = 16

- Calculate the work done in Killo joules in lifting a mass of 10kg through vertical height of 10m.
- A boy uses a catapult to throw a stone which accidentally smashes a green house window. Discuss the possible energy changes.
- Convert 1.4kw into joule/sec.
- Prove that $1\text{rad} = 57.3^\circ$.
- Show that for a body attached with a spring $\vec{a} = \frac{-k}{m} \vec{x}$.
- Can we realize an ideal simple pendulum?
- Why does sound travel faster in solids than in gasses?
- What are the uses of beats?
- What is meant by moment of inertia? Explain its role in angular motion.
- How artificial gravity is produced in a satellite orbiting around the Earth.
- What happens to the period of a simple pendulum if its length is doubled?
- Differentiate between mechanical waves and electromagnetic waves.

4- Write short answers of any six parts from the following.

2 x 6 = 12

- Under what conditions two or more sources of light behave as coherent sources?
- How would you manage to get more orders of spectra using a diffraction grating?
- Can visible light produce interference fringes? Explain.
- How the light signal is transmitted through the optical fibre?
- Why would it be advantageous to use blue light with a compound microscope?
- Specific heat of a gas at constant pressure is greater than specific heat at constant volume. Why?
- Is it possible to construct a heat engine that will not expel heat into the atmosphere?
- Can the mechanical energy be converted completely into heat energy? if so give an example.
- Define isothermal process and adiabatic process.

Section - II**NOTE: Answer any three questions from the following.**

8x3=24

- (a) How can a vector be resolved into its rectangular components? How a vector is determined if its rectangular components are given? 05
(b) A ball is thrown with a speed of 30mS^{-1} in a direction 60° with horizontal. Calculate the range of the ball. 03
- (a) Define absolute potential energy. Derive an expression for the absolute potential energy on the surface of the Earth, considering $r=R$ (Radius of the Earth). 05
(b) A body of moment of Inertia $I=080\text{Kg}\text{m}^2$ about a fixed axis, rotates with a constant angular velocity of 100radS^{-1} . Calculate its angular momentum L and the torque to sustain this motion. 03
- (a) What is "Carnot Engine"? Derive formula for its efficiency. 05
(b) How large must a heating duct be if air moving 3.0mS^{-1} along it can replenish the air in a room of 300m^3 volume every 15min? Assume air's density remains constant. 03
- (a) Derive Newton's formula for velocity of sound in air and describe the correction made by Laplace. 05
(b) A simple pendulum is 50cm long. What will be its frequency of vibration at a place where $g=9.8\text{mS}^{-2}$? 03
- (a) Explain Young's double slits experiment. Derive the relation for position of m th bright and dark fringes from the center of the screen. 05
(b) A telescope is made of an objective of focal length 20cm and an eye piece of 5.0cm, both convex lenses. Find the angular magnification. 03



Roll No. _____ to be filled in by the candidate.

(Session;2014-2016)

Paper Code 2 4 6 1

Physics (Objective Type)

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given. Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1.1. Mass is highly concentrated form of:

- (A) Inertia (B) Energy (C) Plasma (D) Charge

2. Dimensions of $\sqrt{\frac{E}{I}}$ is same as:

- (A) Angular frequency (B) Force (C) Torque (D) Time period

3. Force of 10N makes an angle of 30° with y-axis, its x-component will be:

- (A) 5N (B) 8.66 (C) $\frac{10}{\sqrt{2}}N$ (D) $10\sqrt{2}N$

4. In which quadrant vector $-2\hat{i}-3\hat{j}$ lies.

- (A) 1st (B) 2nd (C) 4th (D) 3rd

5. Distance travelled by free falling object in first second is:

- (A) 4.9m (B) 9.8m (C) 19.6m (D) 10m

6. Choice of zero potential energy level is:

- (A) Surface of the Earth (B) at infinity
(C) Just above the surface of the Earth (D) arbitrary

7. 2° is equal to:

- (A) 0.035 rad (B) 0.30 rad (C) 0.35 rad (D) 0.0035 rad

8. Centripetal force is directed along:

- (A) Tangent to circle (B) radius (C) axis of rotation (D) x-axis

9. Terminal velocity of a particle in the fluid depends on:

- (A) Nature of fluid (B) Acceleration of particle (C) Force on particle (D) angular velocity of particle

10. Radar system is an application of:

- (A) Electric effect (B) Doppler's effect (C) Magnetic effect (D) Chemical effect

11. $\sqrt{\frac{\ell}{g}}$ and $\sqrt{\frac{m}{k}}$ has same:

- (A) numerical value (B) units (C) damping (D) time period

12. On loading the prong of tuning fork with wax, the frequency of sound:

- (A) increases (B) decreases (C) remains same (D) periodic increase and decrease

13. Fringe spacing increases if we use:

- (A) lowest order (B) highest order (C) red light (D) blue light

14. Soap film shows colours due to:

- (A) Interference (B) Diffraction (C) Polarization (D) Reflection

15. Magnifying power of the lens is 6 then its focal length will be:

- (A) 4 (B) 6 (C) 5 (D) 4.5

16. The SI unit of product of pressure and volume is:

- (A) Watt (B) Joule (C) Pascal (D) N.m

17. Carnot engine cycle consists of:

- (A) Four steps (B) Three steps (C) Single step (D) Two steps

Roll No. _____ (To be filled in by the candidate)

(Session;2014-2016)

Physics (Essay Type)

Time: 3:10 Hours

Marks: 83

Section - I**2- Write short answers of any eight parts from the following.**

2 x 8 =16

- Find unit vectors in the direction of vector \vec{A} , $\vec{A} = 8\hat{i} + 4\hat{j}$.
- What do you mean by scientific notations? Give one example.
- Time period of a simple pendulum is measured by stop watch. What type of errors are possible in the time period?
- Differentiate between base units and derived units with examples.
- Calculate the number of seconds in one year.
- Write briefly about Ballistic Missile.
- Define viscosity and give its units.
- Explain the circumstance in which \vec{v} and \vec{a} are : (i). in parallel. (ii). are perpendicular.
- Vector \vec{A} lies in xy plane. For what orientations will both of its rectangular components be negative and for what orientations, its rectangular components be positive.
- Describe Newton's second law of motion in terms of momentum.
- Explain briefly how the swing is produced in a fast moving cricket ball with figure.
- Define positive and negative acceleration along with their directions.

3- Write short answers of any eight parts from the following.

2 x 8 =16

- Calculate the work done in Killo joules in lifting a mass of 10kg through vertical height of 10m.
- A boy uses a catapult to throw a stone which accidentally smashes a green house window. Discuss the possible energy changes.
- Convert 1.4kw into joule/sec.
- Prove that $1\text{rad} = 57.3^\circ$.
- Show that for a body attached with a spring $\vec{a} = -\frac{k}{m}\vec{x}$.
- Can we realize an ideal simple pendulum?
- Why does sound travel faster in solids than in gasses?
- What are the uses of beats?
- What is meant by moment of inertia? Explain its role in angular motion.
- How artificial gravity is produced in a satellite orbiting around the Earth.
- What happens to the period of a simple pendulum if its length is doubled?
- Differentiate between mechanical waves and electromagnetic waves.

4- Write short answers of any six parts from the following.

2 x 6 =12

- Under what conditions two or more sources of light behave as coherent sources?
- How would you manage to get more orders of spectra using a diffraction grating?
- Can visible light produce interference fringes? Explain.
- How the light signal is transmitted through the optical fibre?
- Why would it be advantageous to use blue light with a compound microscope?
- Specific heat of a gas at constant pressure is greater than specific heat at constant volume. Why?
- Is it possible to construct a heat engine that will not expel heat into the atmosphere?
- Can the mechanical energy be converted completely into heat energy? if so give an example.
- Define isothermal process and adiabatic process.

Section - II

NOTE: Answer any three questions from the following.

8x3=24

5. (a) How can a vector be resolved into its rectangular components? How a vector is determined if its rectangular components are given? 05
- (b) A ball is thrown with a speed of 30mS^{-1} in a direction 60° with horizontal. Calculate the range of the ball. 03
6. (a) Define absolute potential energy. Derive an expression for the absolute potential energy on the surface of the Earth, considering $r=R$ (Radius of the Earth). 05
- (b) A body of moment of Inertia $I=080\text{Kgm}^2$ about a fixed axis, rotates with a constant angular velocity of 100radS^{-1} . Calculate its angular momentum L and the torque to sustain this motion. 03
7. (a) What is "Carnot Engine"? Derive formula for its efficiency. 05
- (b) How large must a heating duct be if air moving 3.0mS^{-1} along it can replenish the air in a room of 300m^3 volume every 15min? Assume air's density remains constant. 03
8. (a) Derive Newton's formula for velocity of sound in air and describe the correction made by Laplace. 05
- (b) A simple pendulum is 50cm long. What will be its frequency of vibration at a place where $g=9.8\text{mS}^{-2}$? 03
9. (a) Explain Young's double slits experiment. Derive the relation for position of m th bright and dark fringes from the center of the screen. 05
- (b) A telescope is made of an objective of focal length 20cm and an eye piece of 5.0cm, both convex lenses. Find the angular magnification. 03

Section -III (Practical)

10.A Answer any four parts from the following.

2x4=08

- (i). What is vernier constant? (ii). What is meant by pitch of screw?
- (iii). What is the first condition of equilibrium? (v). What is second's pendulum?
- (iv). Define Hook's law. (vi). What is end correction?
- (vii). What is meant by critical angle? (viii). What is parallax?

B. Write down the brief procedure to determine the volume of a solid cylinder using verier calliper.

03

OR

Write down the brief procedure to determine velocity of sound by resonanace tube using one resonance position.

C. Answer the following questions on the basis of graph drawn:(See graph on the back page at No. A.)

04

- (i). What does this graph indicate? (ii). Find slope of the graph.

OR

Answer the following questions on the basis of graph drawn:(See graph on the back page at No. B.)

- (i). Find slope of the graph. (ii). Find value of "v" for $t=0.85\text{sec}$.

928-011-A-

P.T.O

Roll No. _____ to be filled in by the candidate.

(For all sessions)

Paper Code 6 4 7 7

Physics (Objective Type)

Time: 20 Minutes

Marks: 17

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A, B, C & D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1.1. Which one of the following is correct?

(A) $m = E/C^2$

(B) $m = C^2/E$

(C) $m = C^2E$

(D) $m = CE$

2. Which of the following is perpendicular to $4\hat{i} - 3\hat{j}$:

(A) $4\hat{i} + 3\hat{j}$

(B) $6\hat{i}$

(C) $7\hat{k} + \hat{i}$

(D) $3\hat{i} + 4\hat{j}$

3. Torque is rotational analogous of:

(A) Momentum

(B) Force

(C) Weight

(D) Axis of rotation

4. A ball is dropped from a height of 4.2 meters. To what height it will rise if there is no loss after rebounding?

(A) 4.2 m

(B) 8.4 m

(C) 12.6 m

(D) 2.4 m

5. Total time for which the projectile remains in air is called:

(A) Time of projectile

(B) Time period

(C) Time of flight

(D) Time constant

6. Dimensions of angular acceleration are:

(A) $[T^{-1}]$

(B) $[T^{-2}]$

(C) $[T^{-3}]$

(D) $[LT^{-2}]$

7. When a body moves in a circular path its linear velocity:

(A) remains constant

(B) becomes zero

(C) changes

(D) increases

8. If 20 waves pass through medium in one second with speed of 20 ms^{-1} , the wavelength is:

(A) 20 m

(B) 2 m

(C) 400 m

(D) 1 m

9. Distance between two consecutive nodes is:

(A) λ (B) 2λ

(C) $\frac{\lambda}{2}$

(D) $\frac{\lambda}{4}$

10. For mono atomic gas $C_v = \frac{3R}{2}$ therefore γ for this gas is:

(A) $\frac{3}{5}$

(B) $\frac{5}{3}$

(C) $\frac{4}{15}$

(D) $\frac{15}{4}$

11. Average velocity of molecules in gas is:

(A) zero

(B) positive

(C) negative

(D) infinity

12. Gravity performs zero work when body moves:

(A) Vertically

(B) Horizontally

(C) at 60° with vertical(D) at 60° with horizontal

13. The SI unit of rate of flow of fluid is:

(A) m/s

(B) m^3/s (C) m/s^2

(D) Kg m/s

14. Energy of particle executing SHM of amplitude X_0 is proportional to:

(A) X_0^2

(B) X_0^{-2}

(C) X_0

(D) $\frac{X_0^2}{2}$

15. Formula for Fringe spacing is:

(A) $\frac{\lambda d}{L}$

(B) $\frac{\lambda L}{d}$

(C) $\frac{Ld}{\lambda}$

(D) $\frac{m\lambda L}{d}$

16. Length of astronomical telescope for normal adjustment is:

(A) $f_o + f_e$

(B) $f_o - f_e$

(C) $\frac{1}{f_o} - \frac{1}{f_e}$

(D) $\frac{1}{f_o} + \frac{1}{f_e}$

17. Least count of meter rod is:

(A) 0.01 cm

(B) 0.001 cm

(C) 0.1 cm

(D) 1 cm

Roll No. _____ (To be filled in by the candidate)

(For all sessions)

Physics (Essay Type)

Time: 2:40 Hours

Section - I

Marks: 68

2- Write short answers of any eight parts from the following.

2 x 8 = 16

- Write the dimensions of (a) Pressure (b) Density
- Define the terms (a) Unit vector (b) Position vector
- Calculate the maximum height of the projectile.
- Why fog droplets appear to be suspended in air?
- What are the dimensions and units of coefficient of viscosity " η " in the formula $F = 6\pi\eta rv$.
- How the uncertainty in the average value of many measurements is assessed?

vii. Which of the given equation is correct? $f = v\lambda$ or $f = \frac{v}{\lambda}$.

viii. Show that the sum and difference of two perpendicular vectors of equal lengths are also perpendicular and of the same length.

ix. State and illustrate the "Right Hand Rule" of vector product.

x. Find the angle of projection of a projectile for which its maximum height and horizontal range are equal.

xi. At what point or points in its path does a projectile have its minimum speed, its maximum speed?

xii. Define isolated system. What is the importance of an isolated system in the conservation of linear momentum?

3- Write short answers of any eight parts from the following.

2 x 8 = 16

- Prove that $P = \vec{F} \cdot \vec{V}$.
- Derive the relation of work energy principle.
- Define Beats and Stationary waves.
- Prove that $v = r\omega$.
- When a rocket re-enters the atmosphere, its nose cone becomes very hot. Where does this heat energy come from?
- Define angular momentum and write its different mathematical forms.
- When mud flies off the tyre of a moving bicycle in what direction does it fly? Explain.
- A block weighing 4.0 Kg extends a spring by 0.16m from its unstretched position. The block is removed and 0.50 Kg body is hung from the same spring. If the spring is now stretched and then released what is its period of vibration?
- Define simple pendulum and find the frequency of second pendulum.
- Does the acceleration of a simple harmonic oscillator remain constant during its motion? Is the acceleration ever zero? Explain.
- What is the effect of pressure and density on speed of sound.
- Why does sound travel faster in warm air than in cold air? Explain.

4- Write short answers of any six parts from the following.

2 x 6 = 12

- Write down the main parts of spectrometer and two uses of spectrometer.
- Specific heat of a gas at constant pressure is greater than specific heat at constant volume. Why?
- Derive Charle's Law from Kinetic theory of gases.
- Is it possible to construct heat engine that will not expel heat into the atmosphere?
- How can we increase the internal energy? Explain.
- What do you mean by the term wavefront and ray of light?
- What is diffracting grating? Write its equation.
- In the Young experiment, one of the slits is covered with blue filter and other with red filter. What would be the pattern of light intensity on the screen?
- What do you understand by linear magnification and angular magnification?

Section - II

24

NOTE: Answer any three questions from the following.

- (a) Define scalar product. Write down four characteristics of vector product. 05
(b) Find the angle of projection of a projectile for which its maximum height and horizontal range are equal. 03
- (a) What is gravitational field? Show that in gravitational field work done is independent of path followed. 05
(b) A church organ consists of pipes, each open at one end, of different lengths. The minimum length is 30mm and the longest is 4 m. Calculate the frequency range of the fundamental notes. (Speed of sound = 340ms⁻¹). 03
- (a) Define and explain the centripetal force and derive the relation for it. 05
(b) What gauge pressure is required in the city mains for a stream from a fire hose connected to the city mains to reach a vertical height of 15.0m? 03
- (a) Discuss energy conservation in SHM. 05
(b) Find the average speed of oxygen molecule in the air at STP. 03
- (a) Write down the construction and working of a Michelson's interferometer. Give its equation. 05
(b) A compound microscope has lenses of focal length 1.0 cm and 3.0cm. An object is placed 1.2cm from the object lens. If a virtual image is formed 25cm from the eye, calculate the magnification of the instrument. 03