

PHYSICS (NEW COURSE)

GROUP FIRST

ACADEMIC SESSION : 2015 - 17 TO 2017 - 19

TIME: 20 MINUTES

MARKS: 17

**OBJECTIVE**

NOTE: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question.

**QUESTION NO. 1**

1. Which of the following is a derived quantity?  
(A) Mass (B) Velocity (C) Length (D) Time
2. Error in the measurement of radius of sphere is 1%. The error in the calculated value of its volume is  
(A) 7% (B) 5% (C) 3% (D) 1%
3. Magnitude of resultant vector of 6N and 8N which are perpendicular to each other is  
(A) 14 N (B) 10 N (C) 20 N (D) 2N
4. If magnitudes of scalar product and vector products are same then the angle between the two vectors is  
(A) 30° (B) 45° (C) 60° (D) 180°
5. Distance covered by a freely falling body in 2 seconds will be  
(A) 9.8 m (B) 19.2 m (C) 19.4 m (D) 19.6 m
6. Kilowatt hour is the unit of  
(A) Work (B) Force (C) Power (D) Momentum
7. The weight of an object in an elevator moving down with an acceleration of  $9.8 \text{ m/s}^2$  will become  
(A) Half (B) Double (C) Unchanged (D) Zero
8. Artificial gravity can be created in the spaceship by  
(A) Revolving around the earth (B) Spinning around its own axis  
(C) Increasing its velocity (D) Decreasing its velocity
9. The systolic pressure of normal healthy person is  
(A) 110 torr (B) 115 torr (C) 120 torr (D) 130 torr
10. When the amplitude of oscillation is doubled then its energy becomes  
(A) Double (B) Four times (C) One half (D) Six times
11. The distance between two consecutive troughs is called  
(A) Displacement (B) Amplitude (C) Wavelength (D) Wave-front
12. In the stretched string, if speed of the wave is doubled, the tension will be.  
(A) 2 (B) 4 (C) 8 (D) 6
13. When light enters glass, it suffers a change in  
(A) Frequency (B) Wavelength (C) Velocity (D) Both velocity and wavelength
14. In a Michelson interferometer by moving the mirror through a distance of  $\lambda/4$ . The path difference changes by  
(A)  $\lambda/2$  (B)  $\lambda$  (C)  $\lambda/4$  (D)  $2\lambda$
15. For normal adjustment, what is the length of astronomical telescope if focal lengths of objective and eye piece are 100 cm and 20 cm respectively  
(A) 100 cm (B) 20 cm (C) 5 cm (D) 120 cm
16. If the temperature of sink is absolute zero then the efficiency of heat engine should be  
(A) 100% (B) 50% (C) Zero (D) Infinite
17. The difference between two molar heat capacities is equal to  
(A) Temperature (B) Pressure (C) Volume (D) Universal gas constant

SECTION-I

PAK-41-11-18

**QUESTION NO. 2 Write short answers any Eight (8) questions of the following**

16

- (1) How many seconds are there in one year?
- (2) Time period is measured by a stopwatch. What types of errors are possible in time period?
- (3) Give drawbacks to use period of pendulum as a time standard ?
- (4) Define the units of angle; the radian and the steradian.
- (5) Can the magnitude of a vector have negative value? Explain.
- (6) Under what condition would a vector have components that are equal in magnitude?
- (7) Define null vector and component of a vector.
- (8) Show that range of a projectile is maximum at angle of 45°.
- (9) Discuss the condition when acceleration  $\vec{a}$  of a car is zero but velocity  $\vec{V}$  is not zero.
- (10) Motion with constant velocity is a special case of motion with constant acceleration. Is this statement true? Discuss
- (11) Why fog droplet appears to be suspended in air?
- (12) Give two applications of the Bernoulli's equation?

**QUESTION NO. 3 Write short answers any Eight (8) questions of the following**

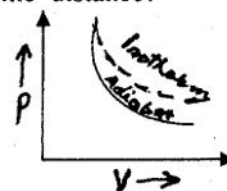
16

- (1) A boy uses a catapult to throw a stone, which accidentally smashes a green house window. List the possible energy changes.
- (2) What are renewable and non-renewable energy sources .Give one example of each
- (3) What is solar constant? Give its value.
- (4) Why does a diver change his body position before and after the diving in the pool? Briefly explain with figure.
- (5) State right hand rule how would you apply it to find the direction of angular velocity.
- (6) What are banked tracks? Explain briefly
- (7) Does the frequency of simple pendulum depends on amplitude or length of simple pendulum? Explain briefly
- (8) If a mass spring, system is hung vertically and set into oscillations. Why does the motion eventually stops.
- (9) Differentiate between damped and un-damped oscillations.
- (10) Write down two applications of Doppler's effect.
- (11) What is the difference between transverse and longitudinal waves ? Draw their diagrams also.
- (12) Why does sound travel faster in solids than in gasses?

**QUESTION NO. 4 Write short answers any Six (6) questions of the following**

12

- (1) The centre of Newton's rings is dark although the thickness of air film is effectively zero at the centre .Explain
- (2) Why x-rays cannot be diffracted by ordinary glass grating?
- (3) An oil film spreading over a wet footpath shows colours. Explain, how does it happen?
- (4) An astronomical telescope of long focal length and large aperture is considered to be a good telescope. Why ?
- (5) How the light signal is transmitted through the optical fiber?
- (6) Is it possible to convert internal energy into mechanical energy? Explain with an example .
- (7) Why does the pressure of a gas in a car tyre increases when it is driven through some distance?
- (8) How can the efficiency of real heat engine be increased?
- (9) Solid line represents adiabatic and dotted line isothermal process. In which process more work is done?

SECTION-II**Note: Attempt any Three questions from this section****8 x 3 = 24**

- 5.(a) • Define cross product of two vectors. Also, write down four characteristics of cross product. 5
- (b) • A 100 g golf ball is moving to the right with a velocity of 20 ms<sup>-1</sup>, it makes a head on collision with 8kg steel ball initial at rest. Compute velocities of balls after collision. 3
- 6.(a) • Define the absolute potential energy. Derive its mathematical expression 5
- (b) • What should be the orbiting speed to launch a satellite in circular orbit 900 Km above the surface of earth? (Take mass of the earth as 6 × 10<sup>24</sup> Kg and its radius as 6400 Km) 3
- 7.(a) • Define terminal velocity. Show that the terminal velocity is directly proportional to the square of the radius. 5
- (b) • Find the average speed of oxygen molecule in the air at STP. 3
- 8.(a) • Prove that the total energy of the vibrating mass-spring system remains constant. 5
- (b) • A pipe has length of one meter. Determine the frequencies of the fundamental and the first two harmonics If the pipe is open at both ends. (Speed of sound in air = 340 ms<sup>-1</sup>) 3
- 9.(a) • What is telescope? Discuss its construction and magnification with ray diagram. 5
- (b) • A second order spectrum is formed at an angle of 38.0°. When light falls normally on a diffraction grating having 5400 lines per centimeter. Determine wavelength of the light used. 3

PHYSICS (NEW COURSE)

GROUP SECOND

ACADEMIC SESSION : 2015 – 17 TO 2017 - 19

DQK-G2-11-18

TIME: 20 MINUTES

MARKS: 17

**OBJECTIVE**

NOTE: You have four choices for each objective type question as A , B , C and D . The choice which you think is correct , fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question.

**QUESTION NO. 1**

- 1 Significant figure in 0.0045 are  
(A) 1 (B) 3 (C) 4 (D) 2
- 2 If  $V = 5.2 \pm 0.1$  volt. The percentage uncertainty of  $V^3$  will be  
(A) 2% (B) 4% (C) 6% (D) 1%
- 3 10 N and 20 N are acting on a body of mass 2 Kg , the minimum acceleration will be  
(A)  $10 \text{ ms}^{-2}$  (B)  $20 \text{ ms}^{-2}$  (C)  $60 \text{ ms}^{-2}$  (D)  $5 \text{ ms}^{-2}$
- 4  $(\hat{i} \times \hat{j}) \times \hat{k} + (\hat{j} \times \hat{i}) \times \hat{i}$  will be  
(A)  $-\hat{j}$  (B)  $\hat{j}$  (C)  $\hat{i}$  (D)  $\vec{0}$
- 5 When projectile reaches the highest point of trajectory, the vertical component of velocity becomes  
(A) Small (B) Maximum (C) Zero (D)  $V_i \cos \theta$
- 6 Which one is an example of non-renewable energy source ?  
(A) Oil (B) Wind (C) Sun light (D) Biomass
- 7 When a particle is moving in a circular path; its projection along diameter executes  
(A) Linear motion (B) Circular motion (C) Simple harmonic motion (D) Perpetual motion
- 8 Moment of inertia of solid sphere is  
(A)  $m r^2$  (B)  $\frac{2}{5} m r^2$  (C)  $\frac{1}{12} m r^2$  (D)  $\frac{1}{2} m r^2$
- 9 If the radius of droplet becomes half then its terminal velocity in the fluid will be  
(A) Half (B) Double (C) One fourth (D) One third
- 10 Stars moving towards Earth shows  
(A) Red shift (B) Blue shift (C) Compton's shift (D) Yellow shift
- 11 Tuning a radio is an example of resonance  
(A) Mechanical (B) Electrical (C) Magnetic (D) Physical
- 12 The basic principle of beats is  
(A) Interference (B) Diffraction (C) Polarization (D) Super position Principle
- 13 In case of point source , the shape of wave-front is  
(A) Plane (B) Spherical (C) Cylindrical (D) Circular
- 14 In interferometer ,shifting of one bright fringe to next by displacing the mirror  
(A)  $\lambda/4$  (B)  $\lambda/2$  (C)  $\lambda$  (D)  $\lambda/8$
- 15 The diameter of the core of a single mode step index fiber is  
(A)  $100 \mu m$  (B)  $50 \mu m$  (C)  $50 \mu m$  to  $100 \mu m$  (D)  $5 \mu m$
- 16 Efficiency of a heat engine working between temperature  $27^\circ \text{C}$  and  $327^\circ \text{C}$  will be  
(A) 50 % (B) 90 % (C) 40 % (D) 61 %
- 17 A cycle of petrol engine undergoes  
(A) Two processes (B) Three processes (C) Four processes (D) Single step

## SECTION-I

**QUESTION NO. 2 Write short answers any Eight (8) questions of the following**

16

- (1) Show that the famous Einstein's Equation " $E = mc^2$ " is dimensionally correct.
- (2) Does dimensional analysis give any information on constant of proportionality that may appear in an algebraic expression. Give one example?
- (3) What is meant by the term precision? Explain briefly with one example.
- (4) Differentiate between base quantities and derived quantities.
- (5) Define position vector and equal vectors.
- (6) Can a body rotate about the centre of gravity under the action of its weight? Explain.
- (7) Name two conditions that would make  $\vec{A}_1 \cdot \vec{A}_2 = 0$
- (8) State Newton's third law of motion. Explain briefly with one example.
- (9) At what point or points in the path of a projectile it has maximum and minimum speed
- (10) Define impulse and show that how it is related to linear momentum.
- (11) Explain difference between Laminar flow and turbulent flow
- (12) Why a fog droplet appears to be suspended in air.

**QUESTION NO. 3 Write short answers any Eight (8) questions of the following**

16

- (1) A girl drops a cup from a certain height, which breaks into pieces. What energy changes are involved?
- (2) What is geo-thermal energy?
- (3) An object has 1 J of potential energy. What does it mean. Explain.
- (4) On what factors does moment of inertia depend?
- (5) Why does a diver change his body position before and after diving in pool?
- (6) Show that  $L_0 = mvr$
- (7) Does frequency depend on the amplitude of harmonic oscillator?
- (8) If a mass spring system is hung vertically and set into oscillations, why does the motion eventually stop?
- (9) Define resonance. Give its two examples in which resonance plays an important role.
- (10) Differentiate between transverse and longitudinal waves. Give one example of each
- (11) Explain the term nodes and antinodes.
- (12) Explain why sound travel faster in warm air than in cold air?

**QUESTION NO. 4 Write short answers any Six (6) questions of the following**

12

- (1) Explain whether the young's experiment is an experiment for studying interference or diffraction effects of light?
- (2) How would you distinguish between un-polarized and plane polarized lights?
- (3) Write down the conditions for detectable interference.
- (4) What are the two conditions for total internal reflection to take place?
- (5) If, a person was looking through a telescope at full moon, how would the appearance of the full moon be changed by covering half of the objective lens?
- (6) Why does the pressure of a gas in a car tyre increases when it is driven through some distance?
- (7) A thermos flask containing milk, as a system is shaken rapidly. Does the temperature of milk rise?
- (8) Specific heat of a gas at constant pressure is greater than specific heat at constant volume. Why?
- (9) Define entropy. Give its mathematical form and SI unit.

## SECTION-II

**Note: Attempt any Three questions from this section**

8 x 3 = 24

- 5. (a) State and explain Newton's second law of motion. And also derive this law in terms of momentum. 5  
 (b) A load is suspended by two cords as shown in figure, Determine the maximum load that can be suspended at 'P', if maximum breaking tension of the cord used is 50 N 3
- 6. (a) What is conservative field? Show that earth gravitational field is a conservative field 5  
 (b) A gramophone record turntable accelerate from rest to an angular velocity of 45.0 rev min<sup>-1</sup> in 1.60 s. What is the average angular acceleration? 3
- 7. (a) Define pressure of the gas. Derive its formula in terms of kinetic theory of gases. 5  
 (b) A certain globular protein particles has a density of 1246 kg m<sup>-3</sup>. It falls through pure water ( $\eta = 8.0 \times 10^{-4} \text{ Nm}^{-2}\text{s}$ ) with a terminal speed of 3.0 cm h<sup>-1</sup>. Find the radius of the particle 3
- 8. (a) What are stationary waves? Describe the stationary waves produced in a stretched string and prove that their frequencies are quantized. 5  
 (b) A 8.0 kg body executes SHM with amplitude 30 cm. The restoring force is 60 N when the displacement is 30 cm. Find the time period. 3
- 9. (a) What is compound microscope? Draw rays diagram and derive expression for the magnification of compound microscope. 5  
 (b) A light is incident normally on a grating, which has 2500 lines per centimeter. Compute the wavelength of spectral line for which the deviation in second order is 15° 3

