

# JP INTERNATIONAL SCHOOL

Affiliated to CBSE

Session 2015-16

FIRST SEMESTER EXAM

CLASS XI ----PHYSICS

DATE: - 14-09-15

Max. Marks :70

Time: Three Hours

## GENERAL INSTRUCTIONS:

1. All questions are compulsory.
2. Questions 1 to 5 carry 1 mark each.
3. Questions 6 to 10 carry 2 marks each.
4. Questions 11 to 22 carry 3 marks each.
5. Question 23 carry 4 marks.
6. Questions 24 to 26 carry 5 marks each.

Q1) Who gave the formula  $E = mc^2$ ?

Q2) What does slope and area under velocity time graph represent?

Q3) Sand is thrown on tracks covered with snow. Why?

Q4) If earth contracts to half of its radius, what would be length of the day.

Q5) What are the values of 'g' and 'G' at the centre of the earth.?

Q6) The displacement of a particle varies with time as  $x = 4t^2 + 15t + 25$ . Find velocity and acceleration of the particle at  $t=0$ .

Q7) Find the angle between the vectors.  $A = \hat{i} + 2\hat{j} - \hat{k}$   $B = -\hat{i} + \hat{j} + 2\hat{k}$

Q8) Define Impulse. Show that the impulse of a force is equal to the change in momentum produced by the force.

OR

A particle moves along the X-axis from  $x = 0$  to  $x = 5$  m under the influence of a force given by  $F = 7 - 2x + 3x^2$ . Find the work done in the process.

Q9) Two bodies of masses 1 Kg and 2 Kg are located at (1,2) and (-1,3) respectively. Calculate the co-ordinates of the centre of mass.

Q10) How are 'g' and 'G' are related to each other?. Derive an expression for it.

Q11) A gas bubble from an explosion under the water, oscillates with a period T proportional to  $p^a d^b E^c$  where 'p' is the static pressure, 'd' is the density of water and E is the total energy of the explosion. Find the values of a, b, c.

Q12) The length and breadth of a rectangle are  $(5.7 \pm 0.1)$  cm and  $(3.4 \pm 0.2)$  cm. Calculate area of the rectangle with error limits.

Q13) Draw the following graphs representing the motion of an object under free fall.

$$\begin{array}{r} 257 \\ \times 34 \\ \hline 1028 \\ 778 \\ \hline 1938 \end{array}$$

$$19.38 \pm 0.02$$

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- i) Variation of position with respect to time. ii) variation of velocity with respect to time. iii) Variation of acceleration with respect to time.

Q14) State triangle law of vector addition. Using this law find the magnitude and direction of their resultant

Q15) On a certain day, rain was falling vertically with a speed of 35 m/s. A wind started blowing after some time with a speed of 12 m/s in east to west direction. In which direction should a boy waiting at a bus stop hold the umbrella. ?

Q16) A man of mass 'm' is standing on the floor of a lift. Find his apparent weight when the lift is

i) moving down with acceleration 'a'.ii) moving up with acceleration 'a'.

iii) falling freely.iv) moving with uniform velocity 'v'

OR.

Two masses 'm1' and 'm2' connected at the two ends of string which passes over a pulley. Calculate acceleration of the masses and the tension in the string. ( $m_1 > m_2$ )

Q17) Define instantaneous power. Express it as the scalar product of force and velocity vectors.

How much mass is converted into energy per day in Tarapur nuclear power plant operated at  $10^7$  KW ?

Q18) Show that total energy of the stretched spring remains conserved when it is released. Find the expression for the maximum speed.

Q19) Prove that the angular momentum of a particle is equal to twice the product of its mass and areal velocity.

Q20) Derive an expression for the moment of inertia of thin uniform circular ring about an axis passing through the centre and perpendicular to the plane of the ring.

Hence determine the moment of inertia of a thin ring about a tangent in its plane.

Q21) What is escape velocity ? Prove that escape velocity from the surface of the earth 11.2 Km/s.

Q22) State and explain the Kepler's laws of planetary motion.

Q23) One day Arvind went to Super Bazar to purchase some groceries. There he saw an old lady struggling with her shopping. He immediately showed lift. The old lady showed hesitation. Then Arvind helped her how to operate lift. The lady was very happy.

i) What are the values showed by the Arvind ?.

ii) An elevator which can carry maximum of 1800 Kg is moving up with constant speed of 2 m/s. The opposing force is 4000 N. Determine the maximum power delivered by the motor to the elevator in horse power

Q24) In an experiment, refractive index of glass was observed to be 1.45, 1.56, 1.54, 1.44, 1.54 and 1.53. Calculate i) mean value of refractive ii) Mean absolute error iii) Fractional error iv) Percentage error. Express the results in terms of absolute error and percentage error.

OR

Derive an equation for the distance covered by a uniformly accelerated body in  $n$ th second of its motion. A body travels half its total path in the last second of its fall from rest, calculate the of its fall.

Q25) A projectile is fired with a velocity 'u' making an angle  $\theta$ . Show that its trajectory is a parabola. Derive expressions for i) time of maximum height ii) time of flight iii) maximum height iv) horizontal range.

OR

What do mean by banking of a curved road? Determine the angle of banking so as to minimise the wear and tear of the tyres of a car negotiating a banked curve.

Q26) Prove that in an elastic one-dimensional collision between two bodies, the relative velocity of approach before collision is equal to the relative velocity of separation after collision. Hence derive expressions for the velocities of the bodies in terms of their initial velocities before collision.

Discuss special cases i) When two bodies of equal masses collide. ii) When a body collides against a stationary body of equal mass.

OR

Discuss the variation of 'g' with depth and altitude. Prove that distance we have to cover into earth below its surface is two times the distance we have to cover above the surface to get the same change in the value of 'g'.