INTERNATIONAL INDIAN SCHOOL – DAMMAM

MODEL EXAMINATION - JANUARY 2014

CLASS XI **SUBJECT – PHYSICS** **MAX MARKS: 70**

TIME: 3 HOURS

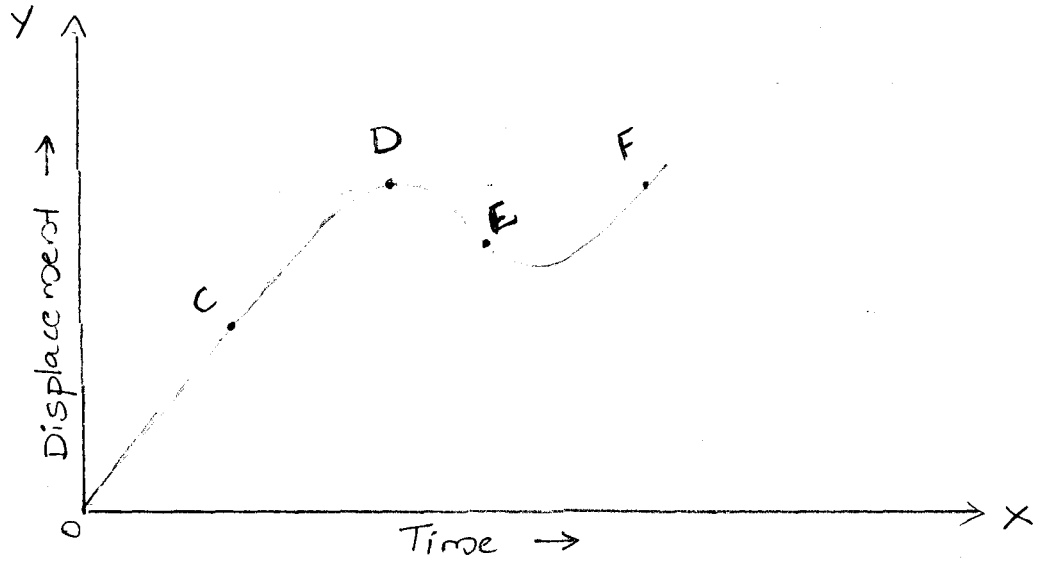
SET A

GENERAL INSTRUCTIONS

a) All questions are compulsory
b) There is no overall choice. However an internal choice has been provided in one question of two marks, one question of three marks, all three questions of five marks.
c) Question nos. 1 to 5 are very short answer type questions carrying one mark each.
d) Question nos. 6 to 10 are short answer type questions carrying 2 marks each.
e) Question nos. 11 to 22 are short answer type questions carrying 3 marks each.
f) Question no.23 is a value based question carrying 4 marks.
g) Question nos. 24 to 26 are long answer type questions carrying 5 marks each.
h) Use of calculator is not permitted. However you may use log table if necessary.

1. Why does a tennis ball bounce higher on hills than on plains?
2. What is the maximum percentage error in the measurement of kinetic energy if the percent errors in mass and velocity are 2% and 3% respectively?
3. A thief jumps from the upper storey of a house with a load on his back. What is the force of the load on his back when the thief is in air?
4. Why we cannot open or close a door by applying force at the hinges?

5. Which physical quantity is represented by the product of moment of inertia and the angular velocity?
6. The displacement – time graph of a moving particle is shown in the figure. Comment on the signs of the velocities at the points C, D,E,and F.



7. Define Simple Harmonic Motion.
8. State any four assumptions of kinetic theory of gases.
9. The maximum range of a projectile is $2/\sqrt{3}$ times its actual range. What is the angle of projection for the actual range?

OR

Two balls are thrown with the same initial velocity at angles 'α' and $(90^0-\alpha)$ with the horizontal. What will be the ratio of the maximum heights attained by them?

10. What are conservative and non conservative forces? Give examples.
11. A satellite orbits the earth at a height of 400km above the surface. How much energy must be expended to rocket the satellite out of earth's gravitational influence? Mass of the satellite is 200 kg, mass of the earth is 6×10^{24} kg, radius of the earth is 6.4×10^{6} m, G= 6.67×10^{-11} Nm^2kg^{-2}
12. What is angle of friction? Prove that the tangent of the angle of friction is equal to the coefficient of static friction.
13. Derive an expression for excess pressure inside a soap bubble?
14. A rigid bar of mass 15 kg is supported symmetrically by three wires each 2m long. Those at each end are of copper and the middle one is of iron.

Determine the ratio of their diameters if each is to have the same tension. Given: Young's modulus of elasticity for copper and iron are 110×10^{9} Nm^{-2} and 190×10^{9} Nm^{-2} respectively.

15. What is a refrigerator? Draw its block diagram. Write an expression for its coefficient of performance?

OR

What is a heat engine? Draw its block diagram. Write an expression for its efficiency.

16. State Kepler's laws of planetary motion.

17. Obtain by the method of dimensional analysis an expression for the surface tension of a liquid rising in a capillary tube. Assume that the surface tension depends on mass 'm' of the liquid, pressure 'p' of the liquid and radius 'r' of the capillary tube. The constant k= ½.

18. A projectile is fired at an angle 'θ' with the horizontal with velocity 'u'. Derive an expression for maximum height and time of flight.

19. State law of equipartition of energy. Use it to find the molar specific heat capacity at constant volume of a mono atomic and diatomic gas.

20. Derive an expression for centripetal acceleration of an object in uniform circular motion in a plane. What will be the directions of the velocity and acceleration at any instant?

21. (i) State First law of thermodynamics.

(ii) What thermodynamic variable is defined by First law of thermodynamics?

(iii) What happens to the internal energy of a gas during adiabatic compression?

22. State law of conservation of linear momentum. Prove the law from Newton's third law of motion.

23. Melwin found that the road to his school is very pathetic. Most of the time accidents occur on the road. He took this as an issue and discussed with his friends and teachers. They planned to reconstruct the road with the help of their society, by raising the outer edge of the road a little above the inner edge. With a great effort they were able to do it and thus accidents were reduced.

(a) What according to you, are the moral values displayed by Melwin and his friends to solve the above problem?

(b) A curve in a road has 60m radius. The angle of bank of the road is 47°. Find the maximum speed a car can have without skidding, if the coefficient of static friction between tyres and the road is 0.8

24. State and Prove Bernoulli's theorem. Give its two applications.

OR

(a)Define coefficient of viscosity. Write its S.I unit.

(b) Derive an expression for the terminal velocity attained by a spherical body falling through a viscous medium.

25. (a) Distinguish between elastic and inelastic collision.

(b)Deduce a relation for the velocity of the masses after collision, if their velocities in a straight line before collision is u_1 and u_2

OR

(a) An elastic spring of spring constant 'k' is stretched by an amount 'x'. Show that its potential energy is $\frac{1}{2} kx^2$

(b)The bob of a pendulum is released from a horizontal position. If the length of the pendulum is 2.5 m, what is the speed with which the bob arrives at the lowermost point, given that it dissipated 7% of initial energy against air resistance?

26. (a) State and explain the theorem of parallel axes of moment of inertia.

(b) Three bodies, a ring, a solid cylinder and a solid sphere roll down the same incline plane without slipping . They start from rest.The radii of the bodies are identical. Which of the bodies reaches the ground with maximum velocity?

OR

(a) State and explain the theorem of perpendicular axes of moment of inertia.

(b) Torques of equal magnitude is applied to a hollow cylinder and a solid sphere, both having the same mass and radius. The cylinder is free to rotate about its standard axis of symmetry, and the sphere is free to rotate about an axis passing through its centre. Which of the two will