INTERNATIONAL INDIAN SCHOOL,DAMMAM

MODEL EXAMINATION JAN 2015

Sub : Physics – Theory

Time 3 hours | Class XI | Max Mark 70

General Instructions: SET - A

1.All questions are compulsory. Use of calculators is not permitted.

2.There are 26 questions in total. Question 1 to 5 carries one mark each. Questions 6 to 10 carry two mark each, questions 11 to 22 carry three mark each, question 23 carry four mark(value based question),24 to 26 carry five marks each.

3.There is no overall choice. However an internal choice has been given in all questions of five marks,one question of two mark and one question of three mark.You have to attempt only one of the given choices in those questions.

SET A

1.Two springs have force constant k_1 and k_2. Such that $k_1 > k_2$. Which one of them requires greater force to produce the same extension?

2.The absolute temperature of the gas is increased three times.What will be the increase in rms velocity of the gas molecule?

3. If $x= at^2 +bt +c$ where x is displacement as function of time, then give the dimension of a and b.

4.Is it possible to open the cap of a pen with one finger.Why?

5.A heavy wire is suspended from a roof but no weight is attached to its lower end.Is it under stress?Justify your answer.

6.A wire stretches by a certain amount under a load.If the load and radius are both increased to four times,find the stretch caused in the wire.

7.Prove the Mayer's relation

8.Which of the two will increase the pressure more: an adiabatic or an isothermal process in reducing the volume to 50% of its initial value?

9.Define escape velocity and show that escape velocity of a planet is $\sqrt{2gR}$ where g is the acceleration due to gravity and R is the radius of the planet.

10.State and prove the Kepler's law of periods.

OR

Prove that the acceleration due to gravity varies with height $g'=g(1-2h/R)$.

11.A body is projected vertically upwards from the surface of the earth so as to reach a height equal to the radius of the earth.Neglecting the resistance due to air,calculate the initial speed which should be imparted to the body.(M_E=5.98 X 10^{24} kg, R_E = 6400kg, G= 6.67 x 10^{-11} m^2kg^{-2})

12.Prove that the rate of angular momentum of a particle is equal to the torque acting on it.

13.A disc of mass 5kg and radius 50cm rolls on the ground at the rate of 10m/s.Calculate the Kinetic Energy of the disc.

14.Define coefficient of friction.Derive an expression for minimum angle of an inclined plane for which a block kept on it will just start sliding.

15.Two masses 8kg and 12kg are connected at the two ends of an inextensible string that passes over a frictionless pulley.Find the acceleration of the masses and tension in the string when the masses are released.

16.State one basic point of difference between elastic and inelastic collisions.Show that velocity of separation of the two bodies is equal to their velocity of approach for elastic collision in one dimension.

OR

A nucleus is at rest in the laboratory frame of reference. Show that if it disintegrates into two smaller nuclei,the products must move in the opposite directions.

17.The coefficient of viscosity (η) of a gas depends on the mass(m),the effective diameter(d) and the mean speed(v) of the gas molecules.Use dimensional analysis to find a relation between them.

18. State and prove the parallelogram law of vectors.

19. A body dropped from a height 'h' with initial velocity zero,strikes the ground with a velocity 3m/s.Another body of same mass is dropped from the same height 'h' with an initial velocity of 4m/s.Find the final velocity of the second mass with which it strikes the ground.

20.State the law of equipartition of energy and prove that for a diatomic gas,the ratio of the two specific heats at room temperature is 7/5.

21.Explain Stoke's law.A metallic ball of radius r and density ρ is falling through a liquid of density η.Derive the relation for terminal velocity.

22.Distinguish between an isothermal process and adiabatic process with examples.

23.Having found his mother suffering from fever,Ram took her to the doctor for treatment.While checking the status, the doctor used a thermometer to know the temperature of the body.He kept the thermometer in the mouth of the patient and noted the reading as 102°F.He gave the necessary medicines. After coming home,Ram asked his mother ,who is a science teacher,why mercury is used in a thermometer when there are so many liquids.Then his mother explained the reason.

(a) Comment upon the values of the mother.

(b) A newly designed thermometer has its lower fixed point and upper fixed point marked at 5° and 95° respectively.Compute the temperature on this scale corresponding to 50°C.

24.A projectile is fired with a certain velocity 'u' making an angle 'θ' with the horizontal.Find the maximum height attained ,total time of flight and the horizontal range.Show that its trajectory is parabolic.

Find the range of the ball,which when projected with a velocity of 29.4 m/s just passes over a pole 4.9m high.

OR

From the velocity time graph of a uniformly accelerated motion,deduce the equations of motion between

(i) Velocity and time
(ii) Displacement and time
(iii) Displacement and velocity.

A body starts from rest and acquires a velocity of 12m/s in 5 s.Calculate the acceleration and displacement.

25. Derive an expression for the excess of pressure inside a liquid drop.

Find the work done to break a drop of liquid of radius R to 8 tiny drops of radius 'r'. (assume the surface tension to be T).

OR

Derive an expression for the capillary rise of a liquid through a tube of small area of cross section.

Water rises in a capillary tube to a height of 2cm.In another capillary tube whose radius is one third of it,how much will the water rise?If the first capillary tube is inclined at an angle 60° with the vertical,then what will be the position of water in the tube.

26. Derive the relation for the optimum velocity of negotiating a curve by a body in a banked road.

A curved road of diameter 1.8km is banked so that no friction is required at a speed of 30m/s.What is the banking angle?

OR

Consider a mass 'm' attached to a string of length 'l' performing vertical circle.Find an expression for

(i) Velocity at any point.
(ii) Tension at any point.
(iii) Velocity at the lowermost point for a vertical circle.