No. of printed pages: 3

INDIAN SCHOOL SOHAR
SECOND TERM EXAMINATION- 2014
PHYSICS – THEORY

CLASS: XI **MARKS: 70**

DATE: 25/11/2014 **TIME: 3Hrs**

General Instructions

a. ***All questions are compulsory.***
b. ***There are 26 questions in total. Questions 1 to 5 carry one mark each, questions 6 to10 carry two marks each, questions11 to 22 carry three marks each, question 23 is a value based question carrying 4 marks and questions 24 to 26 carry five marks each.***
c. ***There is no overall choice. However, internal choice has been provided in one question of two marks, one question of three marks and all questions of five marks. You have to attempt only one of the given choices in such questions.***
d. ***Use of calculator is not permitted.***
e. ***You may use the following physical constants wherever necessary***

C= 3X 10^8 m/s ***h= 6.626 X10^{-34} Js*** ***e=1.6X 10^{-19} c***

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1. How is physics related to technology. (1)

2. Mention any two laws of conservation. (1)

3. Why a coolie does no work when he moves on road while carrying a box on his head? (1)

4. A train of 150 m length is going towards north direction at a speed of 10m/s. A parrot flies at a speed of 5m/s towards south direction parallel to railway track. What is the time taken by the parrot to cross the train. (1)

5. At which place on the earth, the centripetal force is maximum. (1)

6. The diameter of a sphere is 5.32 cm. Calculate its surface area to correct significant figures. (2)

7. A stone is dropped from the top of a tower of height 100m. The stone penetrates in the sand on the ground through a distance of 2m. Calculate the retardation of the stone. (2)

8. A grind stone has a moment of inertia of 6 kg m^2. A constant torque is applied and the grindstone is found to have a speed of 150 rpm in 10secs, after starting from rest. Calculate the torque. (2)

9. Obtain an expression for orbital velocity of a satellite.

OR

9. Derive an expression for acceleration due to gravity at a depth ‘d’ below the surface of the earth. (2)

10.Derive an expression for surface energy and hence define it with the help of an activity.(2)

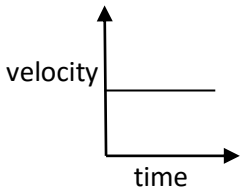
11. What is parallax. How can distance of a star be determined by parallax method. Explain. The distance of the Sun from the earth is 1.496×10^{11} m. If the angular diameter of the Sun is 2000", find the diameter of the Sun. (3)

12. State the parallelogram law of vectors. Prove the law of cosines. (3)

OR

12.(a) How does the velocity –time graph for uniform motion give a geometrical way of calculating the displacement covered during the given time 't'?

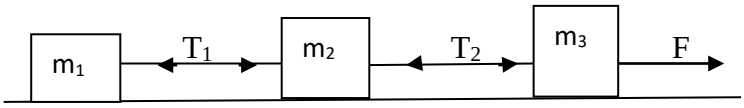
(b) Velocity time graph of a moving object is shown below. What is the acceleration of the object? Also draw displacement-time graph for the motion of the object. (3)



13. Explain the terms displacement vector graphically.
What is the angle between 2N force and 3N force so that their resultant is 4N? (3)

14. State Newton's second law of motion and mention its features. (3)

15. Three blocks are connected as shown in figure on a horizontal frictionless table and pulled to the right with a force F = 50 N. If m_1=5kg, m_2=10 kg and m_3 = 15kg, find the tensions T_1 and T_2. (3)



16.Define and explain the scalar product of vectors with the help of diagram and mention all its properties. (3)

17. State the force law for a spring. Derive an expression for the work done by the spring force in expanding and compressing the spring with the help of diagram. (3)

18. Define the term angular momentum and write its mathematical expression. (3)
A particle performs uniform circular motion with an angular momentum L. If the frequency of particle's motion is doubled and its K.E. is halved, what happens to its angular momentum.

19. State and explain the Kepler's laws of gravitation with the help of diagram. (3)

20. When can you say that a material is brittle or ductile. Support your answer with the help of stress and strain curve. (3)

21. Derive an expression for Young's modulus . A steel wire and a copper wire of equal cross-sectional area are joined end to end and the combination is subjected to a tension. Find the ratio of (a) the stress developed in the two wires, (b) the strains developed in the wires.

Given that Y of steel = $2.0 \times 10^{11} N/m^2$ and Y of copper = $1.1 \times 10^{11} N/m^2$. (3)

22. Define coefficient of viscosity and hence obtain an expression for terminal velocity. (3)

23. In a flood hit area, helicopter was dropping ration, medicines and other items for the victims. The helicopter was flying at a height of 98 m above the ground. Students of a nearby school were helping the authorities to evacuate the victims. They saw that a child was drowning. They rushed towards the child with life boat and saved the child.
(i) What is the time taken by the objects dropped from helicopter to reach the ground?
(ii) What values are shown by students? (4)

24.(a) Obtain an expression for escape velocity of a body.
The planet Saturn has a mass 95 times that of the earth, and its radius is 9.5 times the earth's radius. Calculate the escape speed of a body from Saturn's surface, if the escape speed from the earth's surface is 11.2 km/s.

OR

24. (a) Obtain an expression for acceleration due to gravity of the earth at its surface.
(b) The distance between earth and moon is 3.8×10^5 km and the mass of earth is 81times the mass of moon. Deduce the position of a point on the line joining the centres of earth and moon, where the gravitational field is zero. (5)

25. (a) State the theorem of perpendicular axes with the help of diagram.
(b) Derive an expression for moment of inertia of a disc about one of its diameters.
(c) A bullet of mass 10g and speed 500m/s is fired into a door and gets embedded exactly at the centre of the door. The door is 1.0 m wide and weighs 12kg. It is hinged at one end and rotates about a vertical axis practically without friction. Find the angular speed of the door just after the bullet embeds into it.

OR

25. (a) State the theorem of parallel axes with the help of diagram.
(b) Derive an expression for the moment of inertia of a rod of mass M, length L about an axis perpendicular to it through one end.
(c) Two particles of mass 2 kg and 1kg are moving along the same line with speeds 2m/s and 5m/s respectively. What is the speed of the centre of mass of the system if both the particles are moving (a) in same direction (b) in opposite direction? (5)

26.(a) Obtain the Bernoulli's equation with the help of diagram.
(b) Obtain an expression for guage pressure.

OR

26. (a) Obtain an expression for speed of efflux and hence state the Toricelli's law.
(b) Explain with the help of diagram how can the speed of efflux be measured with the help of Venturimeter. (5)