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SAMPLE PAPER -III (2014-2015)

STD- XI

PHYSICS

SET-B

Time : 3 hours **Maximum Marks : 70**

General Instruction :

(i) All questions are compulsory.
(ii) There are **30** questions in total. Questions **1** to **8** are very short answer type questions and carry **one** mark each.
(iii) Questions **9** to **18** carry **two** marks each, questions **19** to **27** carry **three** marks each and questions **28** to **30** carry **five** marks each.
(iv) One of the questions carrying three marks weightage is value based question
(v) There is not overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three question of five marks each weightage. You have to attempt only one of the choices in such questions.
(vi) Use of calculators is **not** permitted. However, you may use log tables if necessary.
(v) Please write down the serial number of question before attempting it.
(vi) You may use the following values of physical constant wherever necessary.
Boltzmann's constant K = 1.38×10^{-23} JK^{-1}
Avogadro's number NA = 6.022×10^{23}/mol
Radius of Earth R = 6400 km.

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1. Give two examples of dimension less variables. 1

2. What does the slope of velocity-time graph represent? 1

3. What is the angular velocity of the hour hand of a clock? 1

4. What is the principle of working of a rocket? 1

5. On a rainy day skidding takes place along a curved path. Why? 1

6. What is the source of the kinetic energy of the falling rain drop? 1

7. Two balls of different masses are thrown vertically upward with same initial velocity. Maximum heights attained by them are h_1 and $h_2$hrespectively what is $\frac{h_1}{h_2}$? 1

8. State second law of thermodynamics. 1

9. If x = at + bt^2, where x is in metre and t in hour, what will be the unit of'a' and 'b'? 2

10. A block of mass M is pulled along a horizontal frictionless surface by a rope of mass m by applying a force P at the free end of the rope. Find the force exerted by the rope on the block. 2

OR

A car moving with a speed of 50 kmh^{-1}can be stopped by brakes after at least 6 m. What will be the minimum stopping distance, if the same car is moving at speed of 100kmh^{-1} ?

11. A particle of mass m is moving in an horizontal circle of radius 'r', under a centripetal force equal to (k/r^2), where k is a constant. What is its potential energy? 2

12. Show that in the absence of any external force, the velocity of the centre of mass remains constant ? 2

13 Calculate the energy required to move a body of mass m from an orbit of radius 2R to 3R.? 2

14. Using dimensional method , to obtain, Stoke's law expression for viscous force F = 6π η a ν 2
.

15. What is an isothermal process? Also give essential conditions for an isothermal process to take place. 2

16. Calculate the fall in temperature of helium initially at 15°C, when it is suddenly expanded to 8 times its volume. Given γ = 5/3. 2

17. State Hooke's law. Deduce expression for young's modulus of material of a wire of length 'l', radius of cross section 'r' loaded with a body of mass M producing an extension Δl in it.? 2

18. A particle is in linear simple harmonic motion between two points A and B, 10 cm apart, Take the direction from A to B as positive direction and give the signs of velocity and acceleration on the particle when it is
(i) At the end B
(ii) At 3 cm away from A going towards B 2

19. Draw displacement-time, velocity-time and acceleration-time graphs for a Particle executing simple harmonic motion. 3

OR

Two particles of mass m_1 and m_2 having velocities U_1 and U_2 respectively make a head on collision. Derive the relation for their final velocities. Discuss the following special cases. (i) m_1 >> m_2 and U_2 = 0 (ii) m_1 << m_2 and U_2 = 0

20. A force acting on a body along Y axis the direction of motion of the body. If this force produces a potential energy U = A X^4 when A = 1.2 Jm^{-1}. What is the force acting on the body when the body is at x = 0.8m 3

21. A uniform circular disc of radius R is rolling on a horizontal surface. Determine the tangential velocity (i) at the upper most point (ii) at the centre of mass and (iii) at the point of contact.. 3

22.**A sports teacher was training the children for march-past. On their way they come across a bridge .Then the physical education teacher stopped the children marching on the bridge.**

(a) Comment upon the values of sports teacher.

b) Also explain what is meant by Resonance. **3**

23. Define the term gravitational potential. Give its S.I. unit. Also derive expression for the gravitational potential energy at a point in the gravitational field of the earth 3

24. (i) Define Absolute Zero.
(ii) Deduce the dimensional formula for R, using ideal gas equation PV = nRT
(iii) Find degree of freedom of a monoatomic gas. 3

25. Two masses 8 kg and 12 kg are connected at the two ends of a light Inextensible string that goes over a frictionless pulley. Find the acceleration of the masses, and the tension in the string when the masses are released. [g = 9.8 ms^{-2}] 3

26. The position of a particle is given by r= (3 t i+2 t^2j+4 k) m
Where t is in seconds, r is in meters and the coefficients have the proper units.
(a) Find the velocity v and acceleration a.
(b) What is the magnitude of velocity of the particle at t = 2 s? 3

27. Two vectors A and B are inclined to each other at an angle θ. Using triangle law of vector addition, find the magnitude and direction of their resultant. 3

28. Obtain an expression for minimum velocity of projection of a body at the lowest point for Looping a vertical loop. 5

OR

Derive expression for the orbital velocity of a satellite and its time period. What is a geostatinary satellite. Obtain the expression for the height of the geostationary satellite.

29. (i) Explain the terms specific heat and heat capacity.
(ii) State Newton's law of cooling. Derive mathematical expression for it. 5

OR

State and prove Bernoulli ‘s theorem. Give its limitation. Name any two application of the principle.

30. . Discuss the Newton's formula for velocity of sound in air. What correction was applied to it by Laplace and why? 5

OR

Show that total mechanical energy *E* of a particle executing simple harmonic motion is constant and equal to $\frac{1}{2}KA^2$, where $K = m\omega^2$, m = mass and ω is angular velocity and A is the maximum amplitude. Also draw the graph of potential energy, kinetic energy and total energy of the particle.

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