AMRITA VIDYALAYAM
ANNUAL EXAMINATION 2017 -'18

Class : XI   **Marks : 70**
Time   : 3 hrs

PHYSICS (042)

GENERAL INSTRUCTIONS:
1. All questions are compulsory.
2. There are 26 questions in total. Questions 1 to 5 carry 1 mark each, questions 6 to 10
*   carry 2 marks each, questions 11 to 22 carry 3 marks each and questions 24 to 26 carry*
*   5 marks each.*
3. Question 23 is a value based question carrying 4 marks.
4. There is no overall choice. However, an internal choice has been provided in 1
*   question of 2 marks, 1 question of 3 marks and all 3 questions of 5 marks each. Only*
*   one of the choices in such questions has to be attempted.*
5. Use of calculators is not permitted.

---

1. Can the relative velocity of two bodies be greater than the absolute velocity of either?
2. If two identical springs of steel and copper are pulled by applying equal forces, then in which case more work has to be done?
3. Why is water used as a coolant?
4. In a given process on an ideal gas, $dw = 0$ and $dQ < 0$. What happens to the temperature of the gas?
5. What would be the effect on the rms velocity of gas molecules if the temperature of gas is increased by a factor of 4?
6. If the displacement of a body is zero, is the distance covered by it is necessarily zero?
7. The angle between vectors A and B are 60^0, what is the ratio of $A.B$ and $A \times B$?
8. Does the escape speed of a body from the earth depends on
    a) mass of the body?   b) direction of projection?

    <div align="center">OR</div>

    Assuming the earth to be a sphere of uniform mass density, how much would a body weigh half way down to the center of the earth if it weighed 250 N on the surface?
9. What is a seconds pendulum? How much is its length on the surface of moon?
10. The displacement of a particle having S.H.M is $X = 10 \sin (10pt + p/4)$ m. Find
    a) Amplitude.   b) Time Period.   c) Frequency.   d) Maximum velocity.
11. A body starting from rest accelerates uniformly along a straight line at the rate of $10\,ms^{-2}$ for 5 seconds. It moves for 2 seconds with uniform velocity of $50\,ms^{-1}$. Then it retards uniformly and comes to rest in 3 sec. Draw velocity-time graph of the body and find the total distance travelled by the body.
12. Find the magnitude of the resultant of two vectors A and B in terms of their magnitudes and angle θ between them. What happens when $\theta = 0^0$ and $\theta = 90^0$.
13. What is a projectile? A projectile can have the same range R for two angles of projection. If t_1 and t_2 be the time of flight in the two cases, then prove that $t_1 t_2 = 2R/g$.
14. Define the term orbital speed. Establish a relation for the orbital speed of a satellite very close to the surface of earth. Find the ratio of this orbital speed to the escape speed.
15. Draw stress-strain graph for a loaded steel wire. Mark and explain the terms.
    a) Permanent Set   b) Elastic limit   c) Fracture point
16. a) State Pascal's law of transmission of fluid pressure.

b) A hydraulic automobile lift is designed to lift cars with a maximum mass of 3,000 kg. The area of cross section of the piston carrying load is 425 cm^2.
What maximum pressure would the smaller piston have to bear?

17. Explain the three modes of heat transfer with example.

18. Obtain an expression for work done in an isothermal process.

19. Explain the working of a heat engine. Why is efficiency of a heat engine less than unity?

20. On the basis of Kinetic theory, derive an expression for pressure exerted by an ideal gas.

OR

A flask contains argon and chlorine in the ratio 2:1 by mass. The temperature of the mixture is 27^{0}C. Obtain the ratio of
a) average kinetic energy per molecule, and
b) root mean square speed V$_{rms}$ of the molecules of the two gases.
Atomic mass of argon = 39.9 u; Molecular mass of chlorine = 70.9 u.

21. What is meant by Simple Harmonic Motion (S.H.M)?
a) At what point is the energy entirely kinetic and potential in S.H.M?
b) What is the total distance travelled by a body executing S.H.M in a time equal to its time period, if its amplitude is A?

22. a) How will the time period of a simple pendulum change if its length is doubled?
b) The acceleration due to gravity on the surface of the moon is 1.7 ms^{-2}. What is the time period of a simple pendulum on the moon if its time period on the earth is 3.5 sec? Given g = 9.8 ms^{-2}.

23. Three athletes A, B and C throw their javelins from the same positions with the same initial speeds making angles 30^0, 40^0 and 60^0 respectively with the horizontal.
a) Out of the three athletes, which one can throw the javelin to the maximum distance? What values has he displayed?
b) Give the condition for maximum horizontal range of a projectile.

24. Derive the three equations of motion by calculus method. Express under which condition they can be used.

OR

a) With the help of a simple case of an object moving with constant velocity show that the area under velocity-time graph represents the displacement over a given time interval.
b) The length covered by a body is found to be directly proportional to the square of time. What is the nature of acceleration?
c) A car moving with a speed of 126 km / hr is brought to a stop within a distance of 200 m. Calculate the retardation of the car and the time required to stop it.

25. State and prove Kepler's law of Planetary motion. Deduce Newton's law of gravitation from Kepler's law.

OR

What is escape velocity? Obtain an expression for the escape velocity on earth. Why there is no atmosphere on moon? Explain.

26. State Bernoulli's theorem with help of a suitable diagram. Give any two examples of Bernoulli's theorem in daily life.

OR

a) How do insects run on the surface of water?
b) Derive an expression for excess pressure inside a soap bubble.
c) Define the term surface energy. Write down its dimensional formula and unit.