Brilliant Public School

Seepat Road Bahatarai, Bilaspur (C.G.)
Final Term Examination, 2017-18
Class – XI
Subject – Physics

Time: 3:00Hours   M.M. 70
Date: 19.02.2018   Monday

General instructions:

- All questions are compulsory.
- Q.No. 1 to Q.No. 5 carry one mark each.
- Q.No. 6 to Q.No. 10 carries two marks each.
- Q.No. 11 to Q.No. 22 carries three marks each.
- Q.No. 23 is a VBQ of four marks.
- Q.No. 24 to Q.No. 26 carries five marks each.
- Use of calculator is not allowed.

1. Action and reaction forces do not balance each other? Why?
2. What is the dot product of two perpendicular vectors?
3. Define moment of inertia of a body. Write the factors on which it depends.
4. Represent a harmonic wave in terms of its wavelength and time period.
5. How stationary waves are produced? Why they are called stationary?
6. The displacement of a particle with time is given as $\sqrt{x} = t + 9$. Show that the acceleration of the particle is constant.

7. State and prove work-energy theorem for a variable force.
8. (a) Establish the relation between torque and angular acceleration.

   (b) A torque of 108 dyne cm is applied to a fly wheel of mass 10 kg and radius of gyration 50 cm. What would be the resultant acceleration?

9. Define escape velocity. Obtain an expression for it of a body on the surface of the earth.

   Or

   At what height from the surface of the earth will the value of 'g' be reduced by 36% from the value at the surface? Radius of earth = 6400 km.

10. The absolute temperature of a given quantity of an ideal gas is doubled and its volume is decreased by half. How is the pressure affected?

11. A potential difference of V= 100 ± 2 volt, when applied across a resistance R which gives acurrent of 10 ± 0.5 ampere.Calculate the percentage error in R.

12. Three weights W_1, W_2 and W_3 hangs in equilibrium as shown in figure. Assume pulleys P_1 and P_2 are frictionless. If $W_3 = 400$ N, find the values of W_1 and W_2.
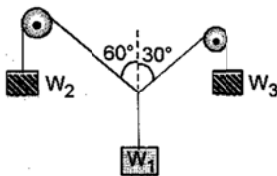
13. A train is moving with a velocity of 100 km h^{-1} in the North-East direction. If another train is moving with a velocity of 50 km h^{-1} in the North – West direction, then what is the relative velocity of the second train w.r.t. the first train?

14. Explain the term impulse. Give its SI unit. Prove that impulse is equal to the change in momentum.

15. Why does a cyclist bends inwards while negotiating a banked road? Explain with diagram.

16. Derive an expression for the potential energy of the stretched spring.

17. (a) Show that the vectors $\vec{A} = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\vec{B} = 2\hat{i} - \hat{j}$ are parallel.

    (b) A fly wheel rotating at 420 rpm slows downat a constant rate of 2 rad s^{-2}.Find out the time at which the fly wheel stops.

18. (a) Why does a satellite need no fuel to go around a planet in its fixed orbit?

    (b)Write the full form of geostationary satellite "APPLE".

    (c)Write two uses of geostationary satelites.

19. A composite wire of uniform diameter 3 mm consists of a copper wire of length 2.2 m and a steel wire of length 1.6 m stretches under a load by 0.7 mm. Calculate the load, where $Y_c = 1.1 \times 10^{11}$ Pa and $Y_s = 2.0 \times 10^{11}$Pa.

    Or

    Define the terms: stress and strain and also state their SI units. Draw the stress versus strain graph for a metallic wire, when stretched upto the breaking point.

20. State and prove Bernoulli's theorem.

21. State the following laws and write their expressions according to kinetic theory of gases: -

    a) Boyle's law
    b) Charles' law
    c) Gay lussac's law
    d) The law of Equipartition of energy.

    Or

    What do you mean by degree of freedom? Calculate the degree of freedom of a monoatomic and diatomic gas molecules.

22. A simple harmonic motion is represented by y (t) = 5 sin (20t+0.5).Calculate the amplitude, angular frequency, frequency and time period, if the displacement is in metres and time in seconds.

23. Naughty Ria after being completely wet in the rain, did not change her clothes after told by her mother Dr. Maya several times. Answer the following-

    (a) Comment on the advice of Dr. Maya to her daughter for changing the clothes.

    (b)Why wearing of wet clothes may prove harmful to us?

24. If the horizontal range of a projectile is and the maximum height attained by it is H, then prove that the velocity of projection is $u = \left[2g\left(H + \frac{R2}{16H}\right)\right]^{1/2}$ is the velocity of projection.

Or

(a) Find the angle of projection so that the body when projected has the horizontal range equal to the maximum height attained.

(b) A body is projected such that its KE at the top is $3/4^{th}$ of its initial KE. What will be the initial angle of projection of the projectile with the horizontal?

25. (a) Define two specific heats of a gas. And prove that for an ideal gas, $Cp = Cv + R$.
(b) Calculate the net work done by the gas from the given figure.
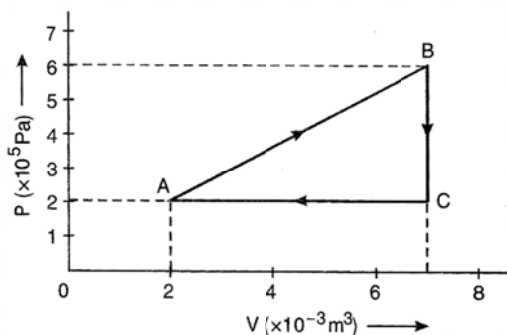
Or

(a) Derive the relation for work done during isothermal and adiabatic process.

(b) A Carnot engine takes 1000 kcal of heat from the reservoir at 627°C and exhausts heat to sink at 27°C. What is its efficiency and output? When its efficiency will be 100%?

26. (a) Derive Newton's formula for the velocity of sound in air .What correction did Laplace apply to it?

(b) Calculate the speed of sound in air STP. The mass of 1mole of air is 29 x 10^3 kg.

Or

What is Doppler's effect in sound? Derive the expression for apparent frequency, when (a) source is moving and listener is stationary (b)source is at rest and listener is moving.

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