

OPG WORLD SCHOOL
CLASS XI
ANNUAL EXAMINATION (2021-22)
Subject: Physics

MM:70

Time: 3 Hours

General Instructions:

1. This question paper contains 34 questions in four sections.
2. Section A consists of 13 questions.
3. Section B consists of 12 questions.
4. Section C consists of 6 questions.
5. Section D consists of 3 questions.
6. All questions are compulsory. However, internal choice has been provided.

Section A

1. The angular velocity depends upon the rate of change of the?
(a) Angular acceleration (b) Angular Distance.
(c) Angular Displacement. (d) torque
2. The total flight requires a time that is?
(a) four times the time necessary to reach the maximum height.
(b) thrice the time necessary to reach the maximum height
(c) equal to the time necessary to reach the maximum height.
(d) twice the time necessary to reach the maximum height
3. A body of mass 20 kg is initially at a height of 3 m above the ground. It is lifted to a height of 2 m from that position. Its increase in potential energy is
(a) 100 J (b) 392 J
(c) 60 J (d) -100 J
4. When the linear momentum of a particle is increased by 1% its kinetic energy increases by x%. When the kinetic energy of the particle is increased by 300%, its linear momentum increases by y%. The ratio of y to x is
(a) 300 (b) 150
(c) 100 (d) 50
5. Two wires A and B are of the same length. The diameters are in the ratio 1 : 2 and the Youngs modulus are in ratio 2:1. if they are pulled by the same force, then their elongations will be in ratio
(a) 4 : 1 (b) 1 : 4
(c) 1 : 2 (d) 2 : 1
6. When the angle of contact between a solid and a liquid is 90° , then
(a) Cohesive force > Adhesive force (b) Cohesive force < Adhesive force
(c) Cohesive force = Adhesive force (d) Cohesive force >> Adhesive force
7. The temperature of a piece of metal is raised from 27°C to 51.2°C . the rate at which metal radiates energy increases nearly
(a) 1.36 times (b) 2.36 times
(c) 3.36 times (d) 4.36 times
8. Emissivity of perfectly black body is
(a) 1 (b) 2
(c) 5 (d) 0
9. At a given volume and temperature, the pressure of a gas
(a) varies inversely as its mass (b) varies inversely as the square of its mass
(c) varies linearly as its mass (d) is independent of its mass
10. Which of the following parameters dose not characterize the thermodynamic state of matter?
(a) work (b) volume
(c) pressure (d) Temperature
11. In damped oscillation the directions of the restoring force and the resistive force
(a) are the same (b) are opposite
(c) may be same or opposite (d) have no relation with each other
12. When a particle performing uniform circular motion of radius 10 cm undergoes the SHM, what will be its amplitude?
(a) 10 cm (b) 5 cm
(c) 2.5 cm (d) 20 cm

13. Loudness of a note of sound is
 (a) Directly proportional to amplitude of the wave
 (c) Directly proportional to velocity of the wave

- (b) Directly proportional to square of amplitude of wave
 (d) Directly proportional to square of velocity of the wave

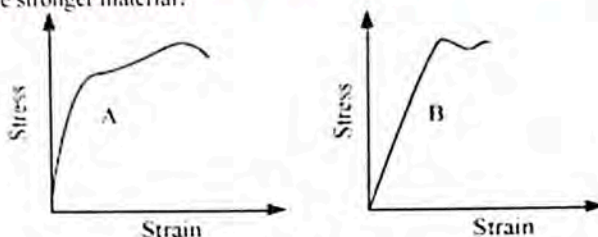
Section B

14. What is the angle between two forces of 2N and 3N having resultant as 4N?
 15. Which is greater: the angular velocity of the hour hand of a watch or angular velocity of the earth around its own axis?
 16. Two masses one n times as heavy as the other have the same K.E. What is the ratio of their momenta?
 17. A bullet of mass 20 g moving with a velocity of 500 ms^{-1} strikes a tree and goes out from the other end with a velocity of 400 ms^{-1} . Calculate the work done in passing through the tree.
 18. A steel wire of length 4.7 m and cross-sectional area $3.0 \times 10^{-5} \text{ m}^2$ stretches by the same amount as a copper wire of length 3.5 m and cross-sectional area of $4.0 \times 10^{-5} \text{ m}^2$ under a given load. What is the ratio of the Young's modulus of steel to that of copper?

OR

Which is more elastic rubber or steel? Explain.

19. The stress-strain graphs for materials A and B are shown in the figure. The graphs are drawn to the same scale.
 (a) Which of the materials has the greater Young's modulus?
 (b) Which of the two is the stronger material?



20. A hydraulic automobile lift is designed to lift cars with a maximum mass of 3000 kg. The area of cross-section of the piston carrying the load is 425 cm^2 . What maximum pressure would the smaller piston have to bear?
 21. On a hot day, a car is left in sunlight with all the windows closed. After some time, it is found that the inside of the car is considerably warmer than the air outside. Explain why?
 22. Differentiate between isothermal and adiabatic process?
 23. The bob of a vibrating simple pendulum is made of ice. How will the period of swing change when the ice starts melting?

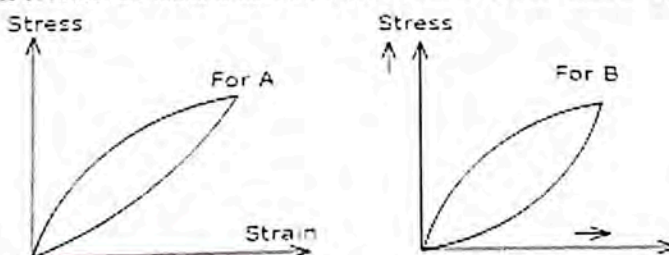
OR

A particle executing S.H.M has a maximum displacement of 4 cm and its acceleration at a distance of 1 cm from its mean position is 3 cm/s^2 . What will be its velocity when it is at a distance of 2 cm from its mean position?

24. If two sound waves have a phase difference of 60° , then find out the path difference between the two waves?
 25. A hospital uses an ultrasonic scanner to locate tumours in a tissue. What is the wavelength of sound in the tissue in which the speed of sound is 1.7 km/h ? The operating frequency of the scanner is 4.2 MHz .

Section C

26. Two different types of rubber are found to have the stress – strain curves as shown in the figure stress



- i) In what ways do these curves suffer from the stress- strain curve of a metal wire?
 ii) Which of the two rubbers A and B would you prefer to be installed in the working of a heavy machinery
 iii) Which of these two rubbers would you choose for a car tyre?

27. Stoke's law deals with spherical bodies moving through a viscous fluid. Give its statement and derive it dimensionally.

28. A geyser heats water flowing at the rate of 3.0 litres per minute from 27°C to 77°C . If the geyser operates on a gas burner, what is the rate of consumption of the fuel if its heat of combustion is $4.0 \times 10^4 \text{ J/g}$?
29. In changing the state of a gas adiabatically from an equilibrium state A to another equilibrium state B, an amount of work equal to 22.3 J is done on the system. If the gas is taken from state A to B via a process in which the net heat absorbed by the system is 9.35 cal, how much is the net work done by the system in the latter case? (Take $1 \text{ cal} = 4.19 \text{ J}$)

OR

Draw a P-V diagram for isothermal and adiabatic expansion?

30. At what distance from the mean position, is the kinetic energy in a simple harmonic oscillator equal to potential energy?
31. A transverse harmonic wave on a string is described by $y(x, t) = 3.0 \sin(36t + 0.018x + \pi/4)$ where x and y are in cm and t in s. The positive direction of x is from left to right. (a) Is this a travelling wave or a stationary wave? If it is travelling, what are the speed and direction of its propagation? (b) What are its amplitude and frequency? (c) What is the initial phase at the origin?

Section D

32. What is Bernoulli's theorem? Show that the sum of pressure, potential and kinetic energy in the streamline flow is constant.

In a horizontal pipeline of uniform area of cross – section, the pressure falls by 5N/m^2 between two points separated by a distance of 1km. What is the change in kinetic energy per kg of oil flowing at these points? Given the Density of oil $= 800\text{kg/m}^3$

OR

Define terminal velocity and derive an expression for it.

- a) To keep a piece of paper horizontal, you should blow over, not under, it.
- b) When we try to close a water tap with our fingers, fast jets of water gush through the openings between our fingers.

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31. (a) What is calorimeter?
(b) Name the material of which it is made of. Give two reasons for using the material stated by you.
(c) Out of the three metals A, B and C of specific heat $900 \text{ J kg}^{-1} \text{ }^{\circ}\text{C}^{-1}$, $380 \text{ J kg}^{-1} \text{ }^{\circ}\text{C}^{-1}$ and $460 \text{ J kg}^{-1} \text{ }^{\circ}\text{C}^{-1}$ respectively, which will you prefer for calorimeter? Given reason.
(d) How is the loss of heat due to radiation minimised in a calorimeter?

OR

Explain why:

- (a) a body with large reflectivity is a poor emitter
 - (b) a brass tumbler feels much colder than a wooden tray on a chilly day
 - (c) the earth without its atmosphere would be inhospitably cold
 - (d) heating systems based on circulation of steam are more efficient in warming a building than those based on circulation of hot water
32. What is simple pendulum? Find an expression for the time period and frequency of a simple pendulum.
A body describes simple harmonic motion with amplitude of 5 cm and a period of 0.2 s. Find the acceleration and velocity of the body when the displacement is (a) 5 cm, (b) 3 cm, (c) 0 cm.

OR

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 the positive direction and give the signs of velocity, acceleration and force on the particle when it is

- a) At the end A,
- b) At the end B,
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