

**NAGALAND  
Class XI  
Physics  
Sample Paper-1**

**Time allowed: 3 hours**

**Maximum Marks: 70**

**General Instructions:**

- i. Approximately 15 minutes is allotted to read the question paper and revise the answers.
- ii. The question paper consists of 30 questions. All questions are compulsory.
- iii. Marks are indicated against each question.
- iv. Internal choice has been provided in some questions.

**N.B: Check that all pages of the question paper is complete as indicated on the top left side.**

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1. The number of antinodes in the standing wave shown in the diagram below is[1Mark]
  - (i) 6
  - (ii) 7
  - (iii) 14
  - (iv) 10
2. The amplitude of a simple harmonic oscillator is doubled; then period of oscillator would [1Mark]
  - (i) double
  - (ii) remain same
  - (iii) four times
  - (iv) becomes half
3. A coordinate system that enables us to describe the position of a body in space at any instant of time is called [1Mark]
  - (i) origin
  - (ii) reference point
  - (iii) intersection point
  - (iv) reference frame
4. Refrigerator transfers heat from the cold cooling coils to warm surroundings. Which law of thermodynamics favours this process? [1Mark]
  - (i) Zeroth Law of Thermodynamics
  - (ii) First Law of Thermodynamics
  - (iii) Second Law of Thermodynamics
  - (iv) Third Law of Thermodynamics

5. A decrease in temperature in a liquid would change it to which of the following?[1Mark]
  - (i) Solid
  - (ii) Liquid
  - (iii) Gas
  - (iv) Plasma
6. Find the dimension of  $a$  in the following equation:  
 $F = a/x + v$   
 Where,  $F$  = force applied,  $x$  = distance covered,  $a$  and  $v$  are constants. [1Mark]
7. Can a body undergo change in speed or direction due to internal forces? [1Mark]
8. An impulse is applied to a moving object with a force at an angle of  $20^\circ$  w.r.t velocity vector. What is the angle between the impulse vector and change in momentum vector? [1Mark]
9. In a tug of war, one team is slowly giving way to the other. What work is being done and by whom? [1Mark]
10. Will Bernoulli's principle be applicable in case of a parachute falling through atmosphere? [1Mark]
11. The nearest star to our solar system is 4.29 light year away. How much is this distance in terms of parsecs? [2Mark]
12. A bomb is released from a horizontally flying bomber when it is vertically above the target. Will it hit the target? [2Mark]
13. Define speed. How is it different from velocity?

**Or**

[2Mark]

Distinguish between damped and forced oscillations. What do you mean by resonant oscillations?

14. A 120 g mass has a velocity of  $\vec{v} = (2\hat{i} + 5\hat{j})$  m/s at a certain instant  $t$ . What is its K.E.? [2Mark]
15. A wheel rotates with a constant angular acceleration of  $3.6 \text{ rad/s}^2$ . If the angular velocity of the wheel rotate is  $4.0 \text{ rad/s}^2$  at  $t_0=0$ , what angle does the wheel rotate in 1s? What will be its angular velocity at  $t = 1\text{s}$ ?

**Or**

[2Mark]

If a planet existed whose mass and radius were both half that of the earth, what would be the value of the acceleration due to gravity on its surface as compared to what it is on the earth's surface?

**16.** What do you mean by an open organ pipe?

**Or**

[2Mark]

What will be the period of oscillation of a simple pendulum of length 100 cm in a spaceship in a geostationary orbit?

**17.** State with reasons, whether the following algebraic operations with scalars and vectors are meaningful: [3Mark]

- (a) adding any two scalars,
- (b) adding a scalar to a vector of same dimension,
- (c) multiplying any vector by any scalar,
- (d) multiplying any two scalars,
- (e) adding any two vectors, and
- (f) adding a component of a vector to the same vector

**18.** Two masses  $m_1$  and  $m_2$  are connected at the ends of a light inextensible string that passes over frictionless pulley. Find the acceleration, tension in the string and thrust on the pulley when the masses are released. [3Mark]

**19.** Does the expression  $K.E = \frac{1}{2} mv^2$  hold for a variable force? Prove it. [3Mark]

**Or**

State a few statements for second law of thermodynamics.

**20.** Assume that the thermal conductivity of copper is four times that of brass. Two rods of copper and brass, of the same length and cross section are joined end to end. The free end of the copper rod is kept at  $0^\circ\text{C}$  and the free end of the brass rod at  $100^\circ\text{C}$ . Calculate the temperature at junction of the two rods at equilibrium. Ignore radiation losses

**Or**

[3Mark]

Show that for small oscillations the motion of a simple pendulum is simple harmonic. Derive an expression for its time period. Does it depend on the mass of the bob?

**21.** Calculate the work done in blowing a soap bubble of radius 10 cm, surface tension being  $0.06 \text{ Nm}^{-1}$ . What additional work will be done in further blowing it so that its radius is doubled? [3Mark]

- 22.** A body oscillates simple harmonically according to equation  $y = 5 \cos \left( 3\pi t + \frac{\pi}{3} \right)$  cm. What is displacement, velocity and acceleration at  $t = 3s$ .

**Or**

[3Mark]

Derive an expression for the time-period and frequency of oscillation of a cylindrical wooden block floating over water when it is slightly depressed, and released from the state of equilibrium.

- 23.** What are thermal radiations? Give some of its basic characteristics.

**Or**

[3Mark]

Assume that the thermal conductivity of copper is four times that of brass. Two rods of copper and brass, of the same length and cross section are joined end to end. The free end of the copper rod is kept at  $0^\circ\text{C}$  and the free end of the brass rod at  $100^\circ\text{C}$ . Calculate the temperature at the junction of the two rods at equilibrium. Ignore radiation losses.

- 24.** A sphere of radius 10 cm is subjected to a pressure of 100 atm. Its volume decreases by 0.2 cc. Find its Bulk modulus. [3Mark]

- 25.** [3Mark]

- (a) Savita was surprised to see oil spreading on to the surface of water and asked her mother to explain why oil spreads on to the surface of water. Her mother explained her daughter the reason behind it. By going through the explanation she thought of learning more about the other scientific phenomenon also. What qualities do you find in Savita?
- (b) Oil spreads over the surface of water whereas water does not spread over the surface of oil. Why?

- 26.** If angular momentum is conserved in a system whose moment of inertia is decreased, will its rotational kinetic energy be also conserved? Explain. [3Mark]

- 27.** A man can swim with speed of 4 km/hr in still water. How long does he take to cross the river 1 km wide if the river flows steadily at 3 km/hr and he makes his stroke normal to the river current? How far down the river does he go when he reaches the other bank? [3Mark]

- 28.** Explain why:

- (i) A body with large reflectivity is a power emitter.
- (ii) A brass tumbler feels much colder than a wooden tray on a chilly day.
- (iii) An optical pyrometer (for measuring high temperatures) calibrated for an ideal black body radiation gives too low a value for the temperature of a red hot piece in the open, but gives a correct value for the temperature when the same piece is in the furnace.

(iv) The earth without its atmosphere would be inhospitably cold.  
Heating systems based on circulation of steam are more efficient in warming a building than those based on circulation of hot water

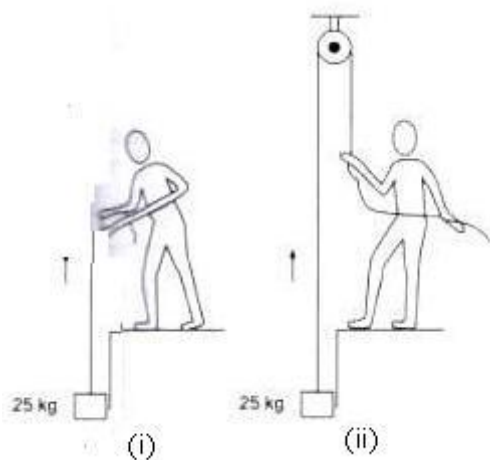
**Or**

[5Mark]

Two identical springs each of force constant  $K$  are connected in (a) series (b) parallel, so that they support a mass  $m$ . Find the ratio of the time periods of the mass in the two systems

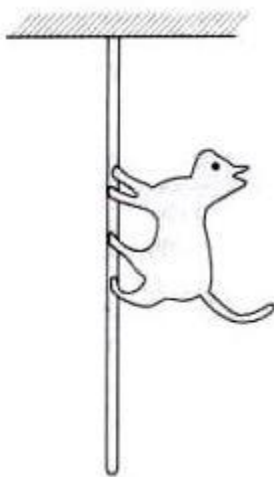
**29.**

(i)



A block of mass 25 kg is raised by a 50 kg man in two different ways as shown in figure. What is the action on the floor by the man in the two cases? If the floor yields a normal force of 700 N, which mode should the man prefer?

(ii)



An animal of mass 40 kg climbs on a rope which can stand a maximum tension of 600 N. In which of the following cases will the rope break. The animal

(a) climbs up with an acceleration of  $6 \text{ ms}^{-2}$

- (b) climbs down with an acceleration of  $4 \text{ ms}^{-2}$
- (c) climbs up with a uniform speed of  $5 \text{ ms}^{-1}$
- (d) falls down the rope nearly under gravity?

Take  $g = 10 \text{ ms}^{-2}$  and ignore the mass of the rope.

**Or**

What do you understand by 'laminar flow' and 'streamlined flow'? Water is flowing with a speed of  $2 \text{ m/s}$  in a horizontal pipe with cross sectional area  $2 \times 10^{-2} \text{ m}^2$  at pressure  $4 \times 10^4 \text{ Pa}$ . What will be the pressure at a smaller cross section where the area decreases to  $0.01 \text{ m}^2$ ? [5Mark]

- 30.** Having seen a big stone falling from the top of a tower Ravi pulled his friend Kiran away. The stone hit Ravi slightly and he got hurt. But he was saved from a major accident.
- i. What can you say about values of Ravi?
  - ii. From the top of a tower  $100 \text{ m}$  in height, a ball is dropped and at the same time another ball is projected vertically upwards from the ground with a velocity of  $25 \text{ m/s}$ . Find when and where the two balls meet. Take  $g = 9.8 \text{ m/sec}^2$ .

**Or**

State Hooke's law. Draw a stress-strain curve for a metal and mark the proportional limit, elastic limit and fraction point.

Define each of the terms: proportional limit, elastic limit and fraction point.

[5Mark]