

80. A 0.1 kg mass is suspended from a wire of negligible mass. The length of the wire is 1m and its cross-sectional area is $4.9 \times 10^{-7} \text{m}^2$. If the mass is pulled a little in the vertically downward direction and released, it performs simple harmonic motion of angular frequency 140 rad s^{-1} . If the Young's modulus of the material of the wire is $n \times 10^9 \text{ Nm}^{-2}$, the value of n is

ANSWER: 4

81. A binary star consists of two stars A (mass $2.2M_s$) and B (mass $11M_s$), where M_s is the mass of the sun. They are separated by distance d and are rotating about their centre of mass, which is stationary. The ratio of the total angular momentum of the binary star to the angular momentum of star B about the centre of mass is

ANSWER: 6

82. Gravitational acceleration on the surface of a planet is $\frac{\sqrt{6}}{11}g$, where g is the gravitational acceleration on the surface of the earth. The average mass density of the planet is $\frac{2}{3}$ times that of the earth. If the escape speed on the surface of the earth is taken to be 11 kms^{-1} , the escape speed on the surface of the planet in kms^{-1} will be

ANSWER: 3

83. A piece of ice (heat capacity = $2100 \text{ J kg}^{-1} \text{ }^\circ\text{C}^{-1}$ and latent heat = $3.36 \times 10^5 \text{ J kg}^{-1}$) of mass m grams is at -5°C at atmospheric pressure. It is given 420 J of heat so that the ice starts melting. Finally when the ice-water mixture is in equilibrium, it is found that 1 gm of ice has melted. Assuming there is no other heat exchange in the process, the value of m is

ANSWER: 8

84. A stationary source is emitting sound at a fixed frequency f_0 , which is reflected by two cars approaching the source. The difference between the frequencies of sound reflected from the cars is 1.2% of f_0 . What is the difference in the speeds of the cars (in km per hour) to the nearest integer? The cars are moving at constant speeds much smaller than the speed of sound which is 330 ms^{-1} .

ANSWER: 7
