DPP-4

(Vertical Circular Motion

Q.1 A 2 kg stone tied at the end of a string of 1 m length, is whirled along a vertical circle at a constant speed of 4 ms⁻¹. The tension in the string has a value of 52 N when the stone is
(1) At the top of the circle
(2) Half way down
(3) At the bottom of the circle
(4) None of the above

Q.2 A stone tied to a string is rotated in a vertical circle. The minimum speed with which the string has to be rotated
(1) Decreases with increasing mass of the stone
(2) Is independent of the mass of the stone
(3) Decreases with increasing in length of the string
(4) Is independent of the length of the string

Q.3 A stone tied to a string rotated with uniform speed in a vertical plane. If the mass of the stone is m, length of the string is r and the speed of the stone is v, the tension in the string when the stone is at its lowest point is (g = acceleration due to gravity)

(1) mg 　　(2) $\dfrac{mv^2}{r}$ 　(3) $\dfrac{mv^2}{r} - mg$ 　(4) $\dfrac{mv^2}{r} + mg$

Q.4 A bucket filled with water is tied to a rope of length 0.5 m and is rotated in a circular path in vertical plane. The least velocity it should have at the lowest point of circle so that water does not spill is, (g = 10 ms⁻²)

(1) $\sqrt{5}$ ms⁻¹ 　　　　　　(2) $\sqrt{10}$ ms⁻¹

(3) 5 ms⁻¹ 　　　　　　　　(4) $2\sqrt{5}$ ms⁻¹

Q.5 Aircraft Pilot has a weighing machine installed on the seat of the chair. The aircraft goes in a vertical circular loop with a constant speed. He finds that at the bottom of the loop he registers a weight of 7200 N. Weight of pilot is 80 kg. the radius of the loop is 250 m. Determine the speed of the aircraft.

(1) 150 m/s 　　　　　(2) $50\sqrt{10}$

(3) $100\sqrt{2}$ m/s 　　　(4) 100 m/s

Q.6 The minimum speed for a particle at the lowest point of a vertical circle of radius R, to describe the circle is v. If the radius of circle is reduced to one-fourth its value, the corresponding minimum speed will be

(1) $\dfrac{v}{4}$ 　　(2) $\dfrac{v}{2}$ 　　(3) $2v$ 　　(4) $4v$

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