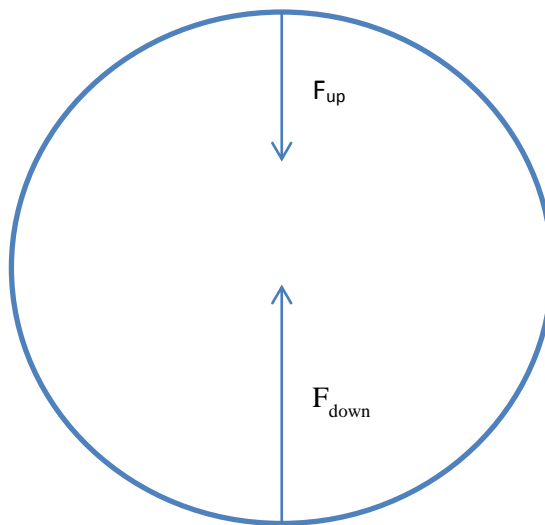# Answer on Question #40670, Physics, Mechanics

Question:

A STONE OF MASS 1KG TIED TO A LIGHT INEXTENSIBLE STRING OF LENGTH = 10/3m , WHIRLING IN A CIRCULAR PATH IN A VERTICAL PLANE. THE RATIO OF MAX. TENSION IN THE STRING TO THE MIN. TENSION IN THE STRING IS 4. THE SPEED OF THE STONE AT THE HIGHEST POINT OF THE CIRCLE IS :

1. 10 m/s

2. 5(2)^1/2 m/s

3. 10(3)^1/3 m/s

4. 20 m/s

Answer:

From Newton's second law of motion F_{up} and F_{down} equals:

$$F_{down} = mg + \frac{mv_d^2}{r}$$

$$F_{up} = \frac{mv_{up}^2}{r} - mg$$

where $\frac{v^2}{r}$ is centripetal acceleration, v is velocity.

The law of conservation of energy:

$$\frac{mv_d^2}{2} = \frac{mv_{up}^2}{2} + 2mgr$$

The ratio of tensions equals 4:

$$\frac{F_{down}}{F_{up}} = 4 = \frac{mg + \dfrac{mv_{up}^2}{r} + 4mg}{\dfrac{mv_{up}^2}{r} - mg}$$

Therefore:

$$\frac{3v_{up}^2}{r} = 9g$$

$$v_{up} = \sqrt{3gr} = \sqrt{3\frac{10}{3}\,10} = 10\frac{m}{s}$$

Answer: 1. $10\dfrac{m}{s}$