

## NCERT/CBSE PHYSICS CLASS 11 textbook

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Answers to NCERT/CBSE PHYSICS Class 11(Class XI)textbook

CHAPTER FIVE Laws of Motion

### EXERCISES

(For simplicity in numerical calculations, take  $g = 10 \text{ m s}^{-2}$ )

5.21 A stone of mass 0.25 kg tied to the end of a string is whirled round in a circle of radius 1.5 m with a speed of 40 rev./min in a horizontal plane. What is the tension in the string ? What is the maximum speed with which the stone can be whirled around if the string can withstand a maximum tension of 200 N ?

**5.21**

**Solution:**

Mass of stone,  $m=0.25 \text{ kg}$

Radius of circle,  $r=1.5 \text{ m}$

Angular speed of stone,  $\omega=2\pi f=2\pi\left(\frac{40}{60}\right)=\frac{4\pi}{3} \text{ rad s}^{-1}$

Maximum tension in string,  $T_{\text{max}}=200\text{N}$

Let tension in string be  $T$ .

Let maximum speed of stone be  $v_{\text{max}}$ .

Now, centripetal force is provided by tension,  $T = mr\omega^2 = 0.25(1.5)\left(\frac{4\pi}{3}\right)^2 = 6.58\text{N}$

Also,  $v_{\text{max}} = \sqrt{\frac{rT_{\text{max}}}{m}} = \sqrt{\frac{1.5 \times 200}{0.25}} = 34.64 \text{ ms}^{-1}$

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