

SHARJAH INDIAN SCHOOL (B.W) Grade XI.  
Worksheet - Rotational Motion - Solution.

III. a.  $I_1 \omega_1 = I_2 \omega_2$

$$\frac{2}{5} MR_1^2 \frac{2\pi}{T_1} = \frac{2}{5} MR_2^2 \frac{2\pi}{T_2}$$

$$\frac{R_1^2}{T_1} = \frac{R_2^2}{T_2} \quad | \quad R_2 = \frac{R_1}{2} \text{ (given)}$$

$$\frac{R_1^2}{T_1} = \frac{R_1^2}{4T_2}$$

$$T_2 = \frac{T_1}{4} = \frac{24 \text{ hrs}}{4} = \underline{\underline{6 \text{ hr}}}$$

Percentage change in time period

$$= \frac{T_1 - T_2}{T_1} \times 100 \%$$

$$= \frac{(24 - 6)}{24} \times 100 \% = \frac{18}{24} \times 100 \%$$

% change in time period.  $= 0.75 \times 100 \% = \underline{\underline{75\%}}$

b. P.E stored in the spring = Rotational K.E.

$$\frac{1}{2} kx^2 = \frac{1}{2} I \omega^2$$

$$1500 \times (10 \times 10^{-3})^2 = 20 \times \omega^2$$

$$\omega^2 = \frac{1500 \times 10^{-4}}{20} = 75 \times 10^{-4}$$

$$\omega = \underline{\underline{\sqrt{75} \times 10^{-2} \text{ rad/s}}}$$