19. Time period of a simple pendulum is T inside a lift when the lift is stationary. If the lift moves upwards with an acceleration g/2, the time period of pendulum will be :

(1) $\sqrt{\frac{3}{2}}T$ (2) $\frac{T}{\sqrt{3}}$ (3) $\sqrt{\frac{2}{3}}T$ (4) $\sqrt{3}T$

JEE MAINS 2021

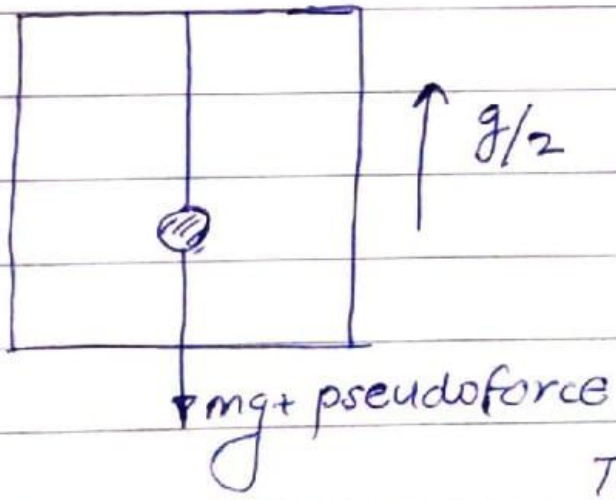
SOLUTION:

We $T = 2\pi\sqrt{\frac{l}{g_{eff}}}$

for a stationary lift $g_{eff} = g$

So, $T = 2\pi\sqrt{\frac{l}{g}}$

for lift moving upwards with an acceleration $g/2$, we have g_{eff} as -



now pseudoforce $= \frac{mg}{2}$

Total force $= mg + \frac{mg}{2}$

$= \frac{3mg}{2}$

So, $g_{eff} = \frac{3g}{2}$

So, $T' = 2\pi\sqrt{\frac{2l}{3g}}$, now $\frac{T'}{T} = \sqrt{\frac{2}{3}}$

So, $\boxed{T' = T\sqrt{\frac{2}{3}}}$