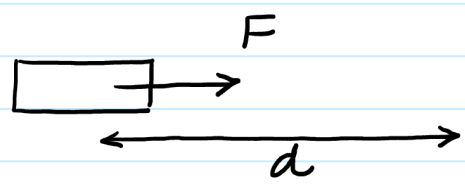
Work done

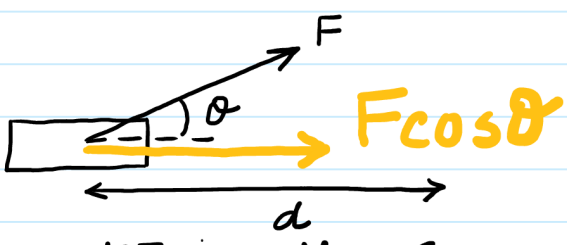
26 November 2020 09:21

Concept of Work done

defination :. product of force and the distance moved in the direction of the force

① 

$W = F \cdot d$

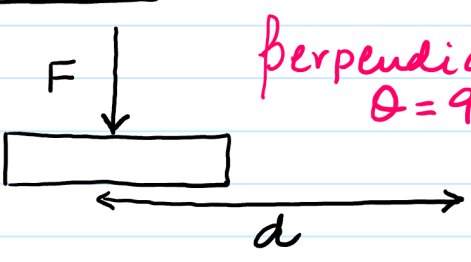
② 

$W = F \cdot d$ ✗

(b/c F & d are NOT in the same direction / plane)

$W = (F\cos\theta) \times (d)$ or

$$W = F \cdot d\cos\theta$$

③ 

perpendicular
$\theta = 90$

from ②

$W = F \cdot d \cos 90^\circ$ since $\cos 90^\circ = 0$

∴ we can conclude that if F & d are perpendicular than Workdoye is ZERO

$$W = 0$$

Exams (standard notation).

Work doye by the driving force/ forward force/ Engine.

$W = F_D \times d$ where F_D = driving force

Work doye against resistance/against friction/ by the opposing force

$W = F_F \times d$ where F_F = frictional force

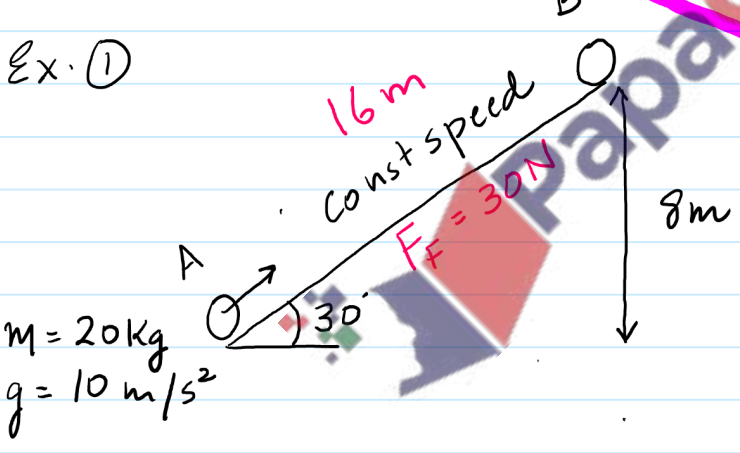
Q:. What happen to the Work doye on any object ?

In mechanics, work doye always gets converted into some form of Energy, which is why w.doye & Energy have the same units (J).

Work doye

- Kinetic Energy $\frac{1}{2}mv^2$
- G.P.E mgh
- Heat Energy/ W.doye against friction $F_F \cdot d$.

Ex. ①



done till here

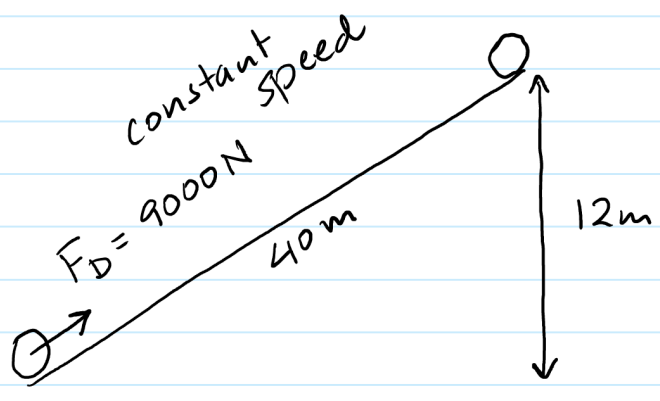
Calculate the W.doye in moving the object from A to B

W.done ??

- K.E: constant speed, $\Delta K.E = 0$
- G.P.E: $mgh = (20)(10)(8) = 1600J$
- W.friction: $F_f \times d = (30)(16) = 480J$

∴ W. done in moving the object $= 1600 + 480 = \underline{2080\,J}$ Ans.

Ex. 2.



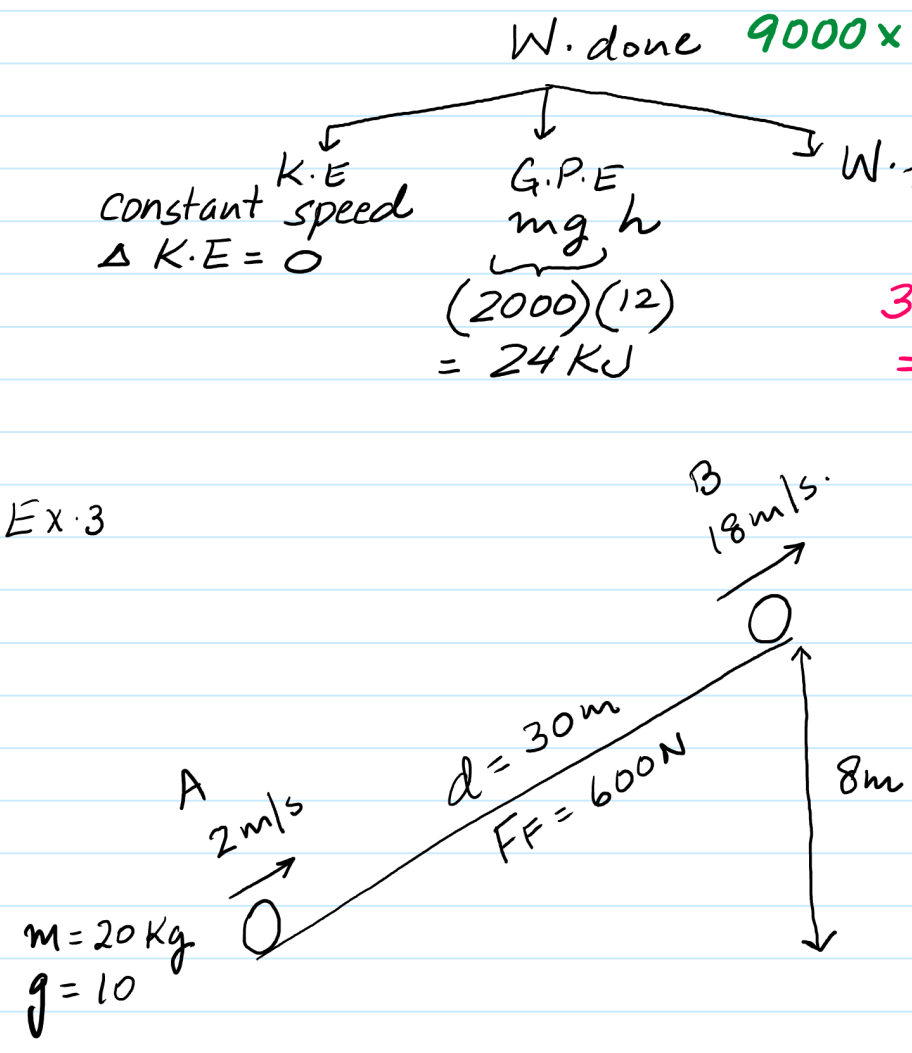
$W = 2000N$

Cal. the Energy dissapated as heat i.e (find W.done against friction.

W.done $9000 \times 40 = 360\,KJ$

- K.E: constant speed, $\Delta K.E = 0$
- G.P.E: $mgh = (2000)(12) = 24\,KJ$
- W.friction: FIND $360 - 24 = \underline{336\,KJ}$ Ans.

Ex. 3



Cal. W.done in moving the object from A to B

W.done ??

- K.E: $\Delta K.E = \frac{1}{2}(20)(18)^2 - \frac{1}{2}(20)(2)^2 = 3200\,J$
- P.E → $mgh = (20)(10)(8) = 1600J$
- W.friction: $F_F \times d$, $600 \times 30 = 18000\,J$

W.doye = 22800 J