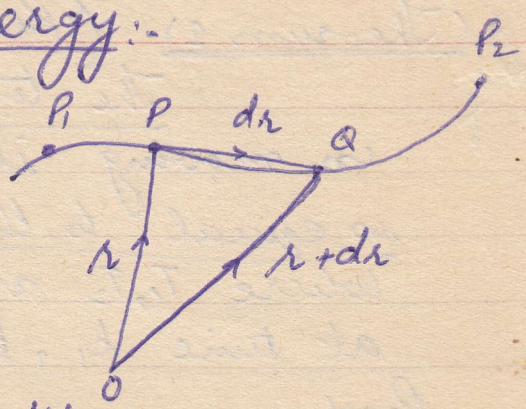
Work, Power and Energy:-



If a force F, acting on a particle whose position vector at time t is $\vec{r}$, produces a displacement $d\vec{r}$, in time dt, then work done W

$$dW = F.d\vec{r} \quad \rightarrow (1)$$

Hence the amount of work done by F in moving the particle from P_1 to P_2 along the path of the particle, is

$$W = \int_{P_1}^{P_2} F.d\vec{r} = \int_{r_1}^{r_2} F.d\vec{r} \quad \rightarrow (2)$$

where r_1, r_2 are position vectors of P_1, P_2 resp.

The quantity $P = \frac{dw}{dt}$ is called power applied to the particle. Thus the power ~~$P = \frac{dw}{dt}$~~ is the rate of working on the particle and

$$P = \frac{dw}{dt} = F.\frac{d\vec{r}}{dt} \Rightarrow F.v$$

$\because dw = F.d\vec{r}$

$\because \frac{d\vec{r}}{dt} = v$

where v is the velocity of the particle at time t

If m is the mass of the particle, then the quantity $T = \frac{1}{2}mv^2$ is called the kinetic energy of the particle whose speed is v at time t. We now establish a relationship between the work done and the kinetic energy of the particle.