



^iVLK MvZ

fygKv

hvi fi AvtQ, hv`vb`Lj Kti Ges ej c0qM Kiti c0ZnZ Kti ev Kivi tPov Kti ZvtK Avgiv enj
c`v_9 GB grnietk; weifbæAvKvi, Y I ifc Qmofq AvtQ c`v_9 grnietk; AmsL` e`ziqtQ hv`i
GKÎ Kiti cvl qv hvte mgM0c`v_9`eÁvbK avi Yv gtZ c`vt_9 th tKvb mxgve× Ask nj e`z thgb
eB, Kjg, tij Mvox GgbwK mh, c`w_ex, b9T BZ`w I GK GKwU e`z

hv` tKvb e`z AvKvi GZ tQvU nq th Zvi AvqZb tbB ej tj B Pti Zte ZvtK ej v nq KYv (Particle)/
KYvi mgw e`z Gi fi AvtQ AvqZb AvtQ| KYvi AvqZb tbB fi AvtQ| wKšzcKZct9 Ggb tKvb
e`z tbB hvi AvqZb`i b`| KYv Avmtj GKwU ZmEK avi Yv| KYvi Ae`vb tKvb we`z Z etj aiv nq/
wmmvtei bvbv iKg mveavi Rb` G iKg avi Yvi AeZvi Yv Kiv ntqtQ|

Avgv`i Avtk cvtk c0tgB bRi cto AmsL` e`z Dci | Gme e`z gta` wKQyPj gvb, wKQyPj gvb bq/
Pj gvb ej tz Avgiv GKUv wtkl avi YvtK enS, Zv nj e`w Zvi cwi cwikR Ab`vb` e`z Zzbrq`vb
cwi eZ0 Kti | G aitbi Pj gvb e`z K Avgiv enj MvZkxj e`z MvZi wecixZ Ae`v ev Pj gvbZvi
wecixZ Ae`v nj w`wZ| w`wZ I MvZ wbtq weAvtbi th mbvZb kvLv Zvi brg ej we`v| ej we`vi
Avtj vP` wclq w`wZ I MvZ| MvZi gta` weifbzv we`g vb| tKvb tKvb MvZkxj e`z abw`0 mgq ci ci
Avevi Nti Avtm| tKvb tKvb e`z Pjvi mgq KwctZ`vtK| Gfvte weifbæaitbi MvZi mti½ Avgiv
cwi wPZ| G Aa`vtq gj-Z`i wLZ MvZ wbtq Avtj vPbv Kiv nte| GKB mvt_ MvZ wclqK avi Yv AR#bi
Rb` c0m½K i wkgvj v, Gt`i gta` cv`R` ev Zzbr, MvZ wclqK KtqKwU MvYwZK mF c0Z0v, Gi
e`envi Kti mgm`v mgvavb, MvZ wclqK tj LwPÎ Askb I e`envi Ges coš-e`z MvZi cKwZ. I c0ve
wbtq we`wv Z Avtj vPbv Kiv nte| GKB mti½ c0h½ we`y c0h½ Kiv wvqv Ges Avtcw9JK tell m`uKw
avi Yv GB BDwbU mýuó Kiv nte|

cW-1

ej we`v, cñ½ we`y cñ½ KwWtgv

Dfík`

G cvW tkfI Avcub-

- 1 ej we`vi msÁv w`tZ cviteb Ges Gi Avtj vPbri cwi mi Dfík` Ki tZ cviteb,
- 1 e`z Muzi eYbVq cñ½ we`yK Ges Gi cQvRbxqZv e`vL`v Ki tZ cviteb,
- 1 cñ½ KwWtgv wK Zv eYbV I e`vL`v Ki tZ cviteb,
- 1 cñ½ KwWtgv tZ MuzKxj e`z Ae`vb I mi Y mbr`3 Ki tZ cviteb|

2.1 ej we`vi msÁv I cwi mi

ej we`v tFŠZ weÁvtbi cPxbZg kvLv| ej, w`wZ I Muzi m½ m`ú,3| ZvB hLbB e`z w`wZKxj Zv ev MuzKxj Zvi K_v Avtj vPbv nq ZLbB gj-Z Avtj vPbv nq ej we`vi | ej we`vi th Astk etj i w`wZKxj Zvi K_v Avtj vPbv Kiv nq Zv w`wZwe`v Avi th Astk etj i w`wZKxj e`z Muz mspvš-Avtj vPbv Kiv nq Zv Muzwe`v| e`z Dci cñ½ etj i dtj DrcbMuz thgb Muzwe`vi Avtj vP` w`wZKxj tZgub Muzi Kiv Y wePv Kti e`z w`wZKxj Muz Ges Muzi cFvte e`z Ae`vbMZ cwi eZB| Muzwe`vi Avtj vP` w`wZKxj|

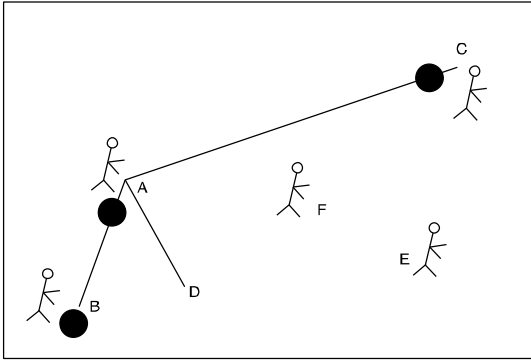
GB BDwbUi cieZPAbtQ` wj tZ Avgiv gj-Z i w`wZKxj gta`B Avtj vPbv mrgvex ivLe|

w`wZ : mgtqi cwi eZPbi m½_ cwi cwk`Ki m½ct` hLb tKvb e`z Ae`vb Acwi eWZ`_vK ZLb H e`zK w`wZKxj ev w`i e`z etj | e`z Gifc Ae`vb Acwi eWZ`_vKvK etj w`wZ|

Muz : mgtqi cwi eZPbi m½_ m½_ cwi cwk`Ki m½ct` hLb tKvb e`z Ae`vbi cwi eZB NtU ZLb ZvK MuzKxj e`z etj | Avi e`z Ae`vb cwi eZPbi Gifc NUbvK etj Muz|

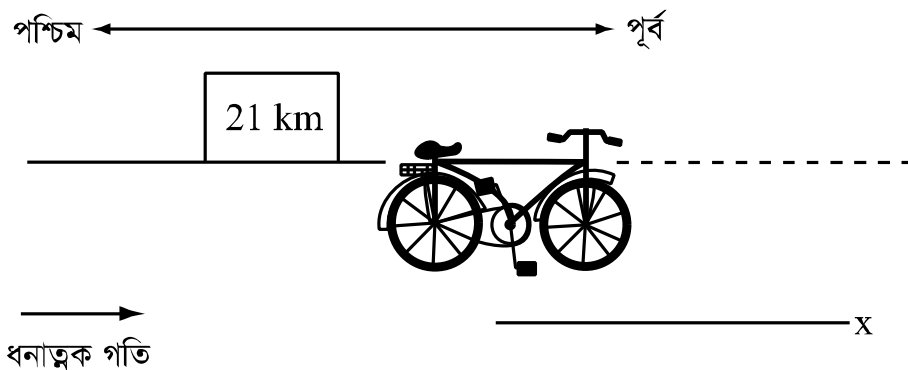
2.1.2 cñ½ we`y cñ½ KwWtgv

Avgiv hLbB tKvb e`z MuzKxj Zvi K_v ewj ev Kíbv Kwí Zqwb Zvi cwi cwk`k` Avgv`i gvbmcU tFtm I tV| hw` AvcbvK ckaKiv nq Avcub KZUKznU tQb? `FveZB Avcub ej teb tKv_v t`K? A_ w`vUv ev Pjv i i`i cñ½U w`v`0 Ki tZ nte| aiv hvK Avcub GKwU tLjvi gv tV dtej `tj i tLvjqvqo| cQvRb gZ gv tV t`Šov`Qb| ej wbtq A_ev ej Qrov wP`U t`Lky (wP`2.1)|



wP` 2.1

tKvb GK mgq Avcbvi Ae`vb A Zvici h_vu`tg cŁZ ugubtU Avcbvi Ae`vb t`Lv tMj B,C,D, E, F| Avcbvi KZUkymiY ntqtQ? G cŁkŁe DĒi LŁ mnR bq| Gt`qġtġ cŁkŁZġKB cŁkŁeKiZ nte, tKv_v t`tk? KLB? A t`tk 1 ugubU ci Avcbvi miY nte AB| ġKšZA t`tk 2 ugubU ci Avcbvi miY AC; 3 ugubU ci AD| Gfġte hLbB Avgiv miYi K_v eij ZLbB GKġU ġbwi`Œ `vb ev ġe`y mġtcġ Zv DġŁŁx KiZ nq| GKgmiK MġZi t`qġtġ th mij tiLv eivei ġeġP` e`ġ MġZkxj tmB tiLvi GKġU ġe`ġK gj- ġe`yGes GKġU ġ KġK abvZġ aġi ġbZ nq| Gi ci GB cŁġ½ tiLvi mġ½ ev mġtcġġ hveZxq ġmve cwiMYb KiZ nq| ġPġ 2.2 j`ġġ Ki`b| cġk GKġU gvBj djK t`Lv hvġ`Q| GiġġK Avgiv cŁġ½ ġe`yGes iv`ġġġK cŁġ½ tiLv aiġQ| iv`ġi Wġb (ceġġK) MġZ abvZġ ġKšzeġg (cġġg) ġġK tMġj MġZ FYvZġ aiv nq| tKvb mġBġKj Avġivnx ceġġK hvġ`Qb, Zvi MġZ aYvZġ|



ġPġ 2.2

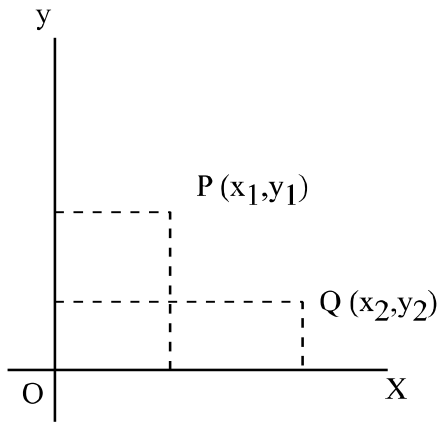
iv`ġġi ġġK GKġU Aġ (x Aġ) fiev hvq Ges aiv hvq ceġġK Gi Rb` abvZġ ġġK| Zv ntj tKvb mgq mġBġKj Avġivnxġ Ae`vb tf±i nte $r=x_i$, GLġb Avġivnxġ `vbvsk x nt`Q Zvi miYi tf±i Dcġsk ġ ceġġġK GKġK tf±i| ġecixZfġte fiev hvk, mġBġKj Avġivnx mġBġKj Pmġj ġq cġġg ġġK x `ġZj GġmġQ Zv ntj Avġivnxġ `vbvsk nte $-x$ Ges Ae`vb tf±i nte $r=x_i$,

gġfġte coš-GKġU e`ġ ġeġfġmġgtqi Ae`vb G aiġbi GKġU cŁġ½ KvVġgv Œviv ġbYġ Kiv hvq| th ġe`yġġK e`ġ tQto t` lqv nq ZġġK cŁġ½ ġe`yġeiv thġZ cġġi| e`ġth tiLv eivei cġo ZġġK aYvZġ Aġ aiv thġZ cġġi|

GLġb Avgiv cŁġ½ KvVġgvi K_v AvġjvPbv Kijvg| ġKšze`ġ MġZkxj Zvi ġeġPbvq GKġU tiLġġK cŁġ½ aiġj ev GKġU ġe`ġK gj- ġe`yġeġPbv Kġi me mġm`v mġvavb ev me mgq mġm`v mġvavb mġe bq|

ġġgmiK cŁġ½ KġVġgv

ġPġ 2.1 ġPġġU Avei ġeġPbv Ki`b| A ġe`ġġġK gj- ġe`yġeġPbv Kiv ntqtQ ZġZ e`ġ MġZ AB, AD, AC, tiLv eivei ġeġPbv Kiv hZ mnR, DC eivei ġeġPbv Kiv tZgġb KÓKi| Avei A ġe`y t`tk 5m `ġi GKġU gvġ ġe`yġbwi`Œ Kiv mġe ġK? n`v, G mġm`v mġvavġbi Rb` Avgiv R`ġġZ kġġ; ġġgmiK Ges ġġgmiK `vbvsk e`e`v Ges cŁġ½ KvVġgvi DġŁŁx Kie| mgZġj MġZ eYġvq ġġgmiK cŁġ½ KvVġgvB hġ_Œ ġKšziY`ġb A_ev NbgmiK Ae`vi MġZ eYġvq ġġgmiK cŁġ½ KvVġgv Acwi nvhġ



IP1 2.3

Avmby Avgiv 2.3 IP1i e- KYvUj MvZ chftj vPbv Kmi | aiv hvK GKU KYv mgZtj P ve`jZ Aew-Z | UKQymgq cti GuU Q ve`jZ `vbsv Z nj | KYvUj Ae-ib eSveri Rb` ci-úi j^`mj tiLvi c0qvRb| GRb` OX Ges OY tiLv Askb Kiv nj | Giv ci-úi j^fvte o ve`jZ t0` Kti0| IP1 o tK gj- ve`yOY Ges OY tiLv `vK h_vmtg `v A1 x- A1 I -y A1 ejv nq| GLvrb gj- ve`yGes gj- ve`jZ j^fvte ci-úi t0`x A10q vbtq mvo ntqt0 v0gvv K c0h/ Kvvtgv|

vbw 0 mgtq KYvU P ve`jZ x- t_tK Ges y- A1 t_tK vbw 0 `jtZ; Ae-ib Ki0| aiv hvK GB `i-Z; x1 I y2 Zv ntj P Gi Ae-ib ev `vbsK nte (x1 y2) | GKbFvte Q ve`jZ KYvUj ev Q ve`vdi `vbsK nte (x2 ,y2) | P,Q `v ve`y0gvv K c0h/ Kvvtgvi gta` `v Ae-ib ev `vbsK vbt`R Ki0|

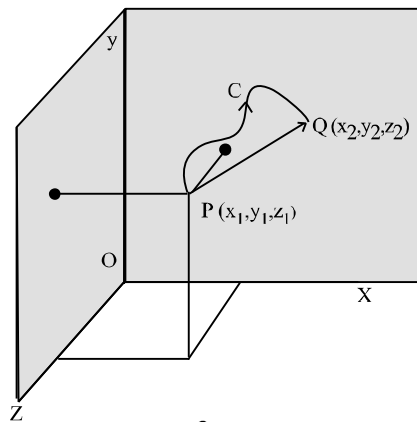
x- A1 eivei GKK tfti i Ges y A1 eivei GKK tfti j ntj P Ges Q Gi Ae-ib tfti nte h_vmtg,

$$OP = ix_1 + jy_1$$

$$OQ = ix_2 + jy_2$$

v0gvv K c0h/ Kvvtgv

aiv hvK Ntii gta` GKU e-zKYv Ggbfvte Aew-Z hv tKvb t`qvj ev tqtStZ bq, dvKv RvqMvq (evZvmi gta`) | aiv hvK KYvU P ve`jZ Aew-Z IP1 2.4 | KYvUj Ae-ib tevSvrbvi Rb` P ve`yt_tK Ntii `y` tK t`qvj `vU j^Ges tqtSi Dci GKU j^Uvbn nj | Zj `v t_tK P ve`j j^`jtZ nj h_vmtg (x,y,z) | Ntii tqtS Ges t`qvj vZbvU Zj vgvj Z nq|



IP1 2.4

aiv hvK t0` ve`v o GtK ejv nq gj- ve`y Zj `v i ci-úi j^OX, OY Ges OZ | OX tK x- A1, y- A1 Ges OZ tK z- A1 ejv nq| Gevte gvve`yGes vZbvU A1 mgbtq MvZ c0h/ Kvvtgvv tK v0gvv K Kvvtgv ejv nq| Ges GB KvvtgvZ P ve`j ev P ve`jZ KYvi `vbsK nt`O (x,y,z) | tfti MvZtZ x,y,z A1 eivei GKK tfti `v h_vmtg (i, j, k)

$$OP = ix + jy + kz$$

cieZxPZ Avvub v0gvv K tfti m^utK^ve`vvi Z Rvrbt| GB BDvbtU gj-Z GK gvvt K c0h/ KvvtgvZ MvZ veltq Avtj vPbv mvgvex `vKte| cieZPBDvbtU v0-gvvt K c0h/ KvvtgvZ MvZ veltq Avtj vPbv `vKte|

cúVwËi gj`vqb

múK DËi wúZ wúK wPý (v) w b |

1/ GK gwí K cñ½ KvVúgvúZ KquU A¶ _vúK?

K. GKúU

M. wZbúU

L. `wú

N. GKúU ev `wú

2. wí gwí K cñ½ KvVúgvú gj`wé`yKquU?

K. GKúU

M. wZbúU

L. `wú

N. AmsL`

cW-2

MwZ veIqK iwkgyj v

Dfík

G cvI tkfI Avcib-

- 1 miY, `wZ I tetMi msAv w`Z cvi`eb, e`eKj b ifc çKvk Ki`Z cvi`eb,
- 1 mgq-miY QK ev tj L t`K Mo `wZ Ges Zvr`wYK `wZ tei Ki`Z cvi`eb,
- 1 mgq-tetMi QK ev tj L t`K Mo ZiY Ges Zvr`wYK ZiY tei Ki`Z cvi`eb|

2.2.1 miY

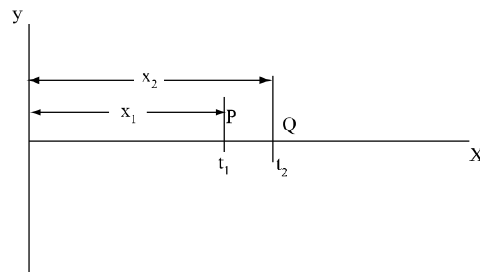
tKvb e`z Ae`vb cwi eZ` nj miY NtU| e`zKYv mij ev eµ th çt_B PjK bv tKb, tKvb GKwU wv` ð mgq mi`Yi Awfgly wv` ð nte| e`wI tkl Ae`vb Ges Aw` Ae`vb tK GKwU mij tiLv ðviv hÿ Ki`j H mij tiLv ðmi Yð miPZ Kti|

g`b Kiv hvK GKwU e`z- A` eivei Pj`Q (wP` 2.5)| Gi ç`wK Ae`vb P Ges t tm`KÙ çti Ae`vb Q| gj` ve`y, t`K P Gi `iZiOP = x₁, Gi `jZiOQ = x₂| mZivs Gt`t` miY -Gi gvb

$$PQ = (x_2 - x_1)$$

x- A` eivei GKK tf±i i aiv nj, miY PQ = (x₂ - x₁) i

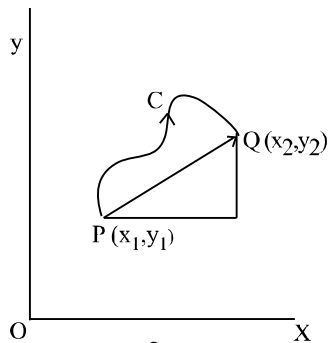
GLb g`b Kiv hvK w`gwi`K t`t` GKwU KYv xy Ztj MwZkj wP` 2.5| e`zKYvU ç`wK Ae`vb P ve`y `vbsK x₂, x₁| t mgq çti e`z KYvU Q ve`y `vbsK x₂, y₂, P t`K Q ve`y`z mi vmi A`ev x₂, y₂ eµçt` thfiteB KYvU `vbswi Z tnvK bv tKb Gt`t` miY PQ Gi gvb `vbsK R`wgiZi mrvth` cvl qv hvte|



wP` 2.5

$$PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$PQ, \text{ x A`ji m} \frac{1}{2} \theta \text{ tKvY AvbZ nj } \tan \theta = \frac{y_2 - y_1}{x_2 - x_1}$$



wP` 2.6

G Avtj vPbv t`K çZxggb n`Q mi`Yi gvb Ges w`K Df`qB ve``gvb, GuU GKwU tf±i| ZvB tKvb e`zKYvi tkl Ae`vb tf±i Ges Aw` Ae`vb tf±i i cv`B nj miY| MvYwZKfite,

$$miY \Delta \mathbf{r} = \mathbf{r}_f - \mathbf{r}_i$$

GLv`b r_f tkl Ae`vb tf±i Ges r_i Aw` Ae`vb tf±i| GKgwi`K `i`LK MwZi t`t` GKK tf±i i nj, Δr = (x_f - x_i) i tj Lv hvq|

mi`Yi GKK, `tN` GKK nj I Gi GKwU w`K `v`K| mi`Yi GK`Ki msL`v gvb wgvri (m)| Gi gv`v mgxKiY [L]

2.2.2 Muztelm

mg tqi mi t mi t Yi cwi e Z f bi nvi t K e - z Muz telm ev mst q t c telm e j v n q | A - f r telm = $\frac{mi Y}{mgq}$

mi t Yi GK u v b Ges GK u v b w i w K Av t Q | m z i v s t e t M i g v b Ges w b w i w K v K t e | a i v h v K t K v b K Y v x - A q l e i v e i P j t Q h v i m i t b i A w f g l y x - A t q l i w i t K | 2.5 w P T A b y v i t i e - z c o u g K A e - v b P G e s t t m t K U c i A e - v b Q n t j ,

$$\text{Mo telm, } \vec{v} = \frac{PQ}{t} = \frac{(x_2 - x_1)\mathbf{i}}{t} \dots \dots \dots (2.3)$$

g t b i v L t Z n t e $x_2 - x_1$ ` j Z i A v m t j K Y v i t t m t K U A w Z m u s - j Z i | D c t i i m g x K i Y (2.3) t t K e - z t t m t K U Mo telm c v l q v h v q | Mo e s v t b v i R b t K v b c Z x t K i D c i e v i w P y (-) e e n v i K i v n q | G L v t b v o v i v Mo v e s v t Q |

t K v Y K Y v t t m t K U x y Z i j t K v b m i j e v e m c t P (x₁, y₁) t t K Q (x₂, y₂) w e j Z A v m j (w P T 2.6) H m g t q i A e K v t k e - z K Y v i Mo telm n t e | G i A w f g l y n t e P t t K Q w e j y w i t K | t K v b G K U v m w b w i g n t Z M u z K i j K Y v i t e m w K f i t e w b Y q K i v m a e ? m g z i t e G c o k e D E i w i z t M t j A v g v t i K j b w e v (Calculus)-G i m i n v t h w b t Z n t e | e - z Y v i t K v b g y t Z P t e M t K e j v n q | Z v r q l w Y K t e m (Instantaneous Velocity) | A v m j A v g i v Z v r q l w Y K t e m w b Y q i D c i q e v L v K w i |

$$\vec{v} = \frac{PQ}{t} = \frac{(x_2 - x_1)\mathbf{i} + (y_2 - y_1)\mathbf{j}}{t} \dots \dots \dots (2.4)$$

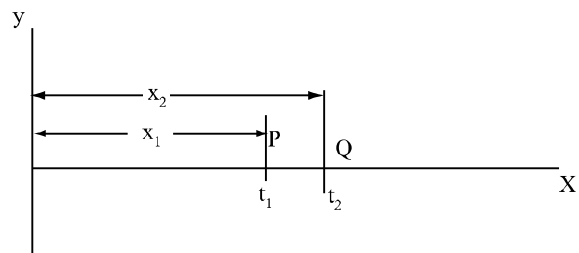
Zvr q l w Y K t e m

g t b K i v h v K G K u v e - z K Y v x - A q l e i v e i c w i e w Z M u z t e m w b t q A M t h i n t Q | a i v h v K M u z i i n e v i t₁ t m t K U c i e - z Y v i A e - v b P G e s t₂ t m t K U e - z A e - v b Q (w P T 2.7) | P w e j y v b v i s K x₁ G e s Q w e j y v b v i s K x₂ A Z G e t₁ t t K t₂ m g t q i e e a v t b x A q l e i v e i e - z Y v i M o t e m

$$\vec{v} = \frac{x_2 - x_1}{t_2 - t_1} \dots \dots \dots (2.5)$$

h i w t₂ G e s t₁ G i e e a v b K g t Z v t K Z v n t j P G e s Q G i g a K v i i z i l K g t Z v K t e G e s 2.5 m g x K i Y q l z z i A e K v t k e - z Y v i Mo M u z t e m w b t R K i t e |

t₂ G e s t₁ G i e e a v b h i w L o B b M b n q, Z L b Q w e j y P w e j y L o B w b K U e Z P n t e | G t q l t P Q A e K v t k i g v b A w Z q l z a e t j m g x K i Y (2.5) K v h Z G K u v w b w i g y t Z M u z t e m e v Z v r q l w Y K t e m c k v k K i t e |



w P T 2.7

m z i v s e j v h v q m g t q i e e a v b, (G L v t b t₂ G e s t₁) h L b c l q i b Z L b m i Y I m g t q i A b y v Z, G L v t b

$\frac{x_2 - x_1}{t_2 - t_1}$ G B A b y v Z i w w b w i g y t Z e - z Y v i Z v r q l w Y K t e m | K j b w e v (Calculus) G i f v l v q e - z

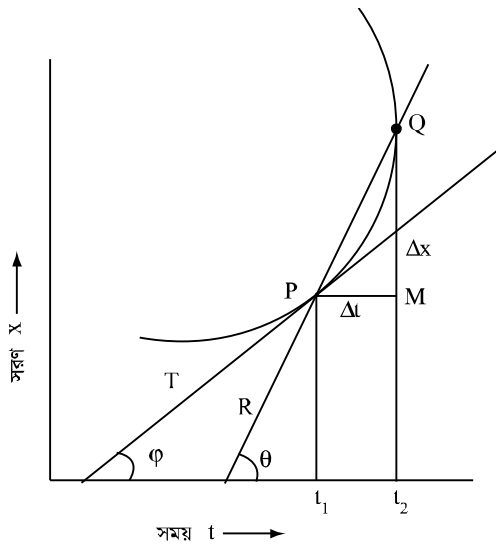
w b w i g y t Z P M u z t e m w b g i e t c c k v k K i v n q :

$$v = \lim_{\Delta t \rightarrow 0} \frac{\Delta x}{\Delta t} \mathbf{i} = \frac{dx}{dt} \mathbf{i} \dots \dots \dots (2.6)$$

mg tqi e' eavb Δt hLb i' tY'i KvQvKwQ nq ZLY GtK dt tj Lv nq Ges tm mg tqi mi YtK dx tj Lv nq/ w b tP mgxKiY 2.6 Gi R' w gwZK Zvrch e' vL' v Kiv nj :

uP t 2.8 -G MwZkj e' z mgq-miY tj LuP t AvKiv ntqtQ/ gtb Kw t2 mg tq gjy we' y' tK e' KYvi miY x1 Ges t2 mg tq e' KYvi miY x2 / GB B gyfZ Qj LuP t e' KYvi Ae' vb h_v μtg P Ges Q Øviv t' Lv b ntqtQ/ uP t t' tK j q' Ki' b, Δt mg tqi AeKv tK Mo MwZteM/

$$v = \frac{x_2 - x_1}{t_2 - t_1} = \frac{\Delta x}{\Delta t} \text{ PQ R' v Gi bWZ (Slope) = } \tan \theta$$



uP t 2.8

hLb Δt Gi gvb Kg tZ v' tK ZLb Q we' y' P we' y' w' tK GwM tq Avm tZ v' tK A' P PQ R' v tK u' k' Ki w' tK GwM tq Avm tZ v' tK / T mgwvSK Ae' vq (in the limit A' P hLb Δt → 0) R' v Ges PT u' k' R' ci' u' t' i Dci mgcwZZ nq/ msAvbyv t' t1 mg tq e' KYvi Zvr q' wYK teM/

$$v = \lim_{\Delta t \rightarrow 0} \frac{\Delta x}{\Delta t} = \frac{dx}{dt} = \tan \phi \dots \dots \dots (2.7)$$

Kv tRB t' Lv hv t' Q th, tKvb gyfZ Q GKwU e' KYvi Zvr q' wYK teM GB e' KYvi mgq-miY tj LuP t i Avbyv t' K we' t' z AswKZ u' k' Ki bWZ ev Xtj i mgvb/ tetMi gvZr' mgxKiY [teM] = [LT⁻¹]; GKK ms⁻¹ wgvvi cWZ tm tK tU/

2.2.3 `wZ

tKvb e' zGKK mg tq th c_ AwZ μg Kti ZvtK H e' z `wZ etj / tm c_ mij, eμ B-B ntZ cvti / Kv tRB Ø' wZØ ej tZ Avgiv MwZi w' K w b t' R Kw b v/ mg tq e' z th `tZ u' k' z AwZ μg Kti ZvB e' z `wZi cwi gvY/ w' K w b t' K c' qvRb nq bv etj `wZ GKwU t' j vi i w' k / `wZ Ges tetMi GKK GKB ms⁻¹ (wgvvi cWZ tm tK tU) `wZi gv t' v mgxKiY wbgie' f' c:

$$[\text{`wZ}] = [LT^{-1}]$$

tKvb e' z `wZ a' e ntj I Zvi teM cwi eZ Økuj ntZ cvti w' k' z t' Kvb e' z teM a' eK ntj Zvi `wZ I a' e nte/ Avmly e' v' cvi wU e' vL' v Kiv hvK/

aiv hvK GKwU e' z mg `wZ tZ GKwU e' f' c t_ Ny q' v b / Gi `wZ a' eK / teM w' k' a' eK? Avgiv Rvnb, teM t' f' ± i i w' k / Gi gvb I Awfgly Av t' Q e' f' v Kvi c t_ Nj tZ ntj cWZ gyfZ Q Gi MwZ c t_ i Awfgly e' j vq Kv tRB e' w' i `wZ a' eK ntj I teM cwi eZ Økuj / w' k' z t' Kvb e' z MwZ a' eK Ø G K_v i A_ q' j Zvi MwZ c t_ i Awfgly Ges MwZi gvb me' v Acwi eZ Øxq/ AZGe e' z teM a' e etj `wZ cwi eZ Øbi c' k' e I t' v b v /

2.2.4 ZjY

$$mg\tau qi\ m\tau\ _\ tet\ Mi\ cwi\ eZ\ bi\ nvi\ t\ K\ Zj\ Y\ etj\ | \ A_\ \tau\ Zj\ Y = \frac{tet\ Mi\ cwi\ eZ\ bi}{mgq}$$

tetMi cwi eZ bi GKiu t f±i i vnk iKŠzmgq GKiu t -j vi i vnk | mzi vs Zj Y GKiu t f±i i vnk | gtb Kw GKiu e -z cōi iK telM u, t tm tKŪ cti Gi telM = v

$$\therefore e^{-z} Muz tetMi cwi eZ bi = v - u$$

$$mzi vs\ ms\ Avbyviti\ e^{-z}\ Zj\ Y, \ a = \frac{v-u}{t} \dots \dots \dots (2.8)$$

GLv b D t Kiv cōqv Rb th cō ugK Muz u Ges tkl Muz v Gi Awfgy GK bvl n tZ cvti tm t t t t (v-u) ej tZ Avgiv tkl Muz tetM Ges cō ugK Muz tetMi t f±i i vnk | (Vector Difference) e s e | Zj Y FYvZK n t j Zv t K g ` b (Retardation) ej v n q | mg t q i m t _ h w e - z t e M n v m c v q Z t e e j v n q th e - z i g ` b n t ` Q | Z j t Y i G K K m s ^ - 1 (u g U v i c Ō Z t m t K t Ū) G i g w i K m g x K i Y n j : [Z j Y] = [L T ^ - 2]

Zv t t i v K Z j Y

Muz tetMi b v q e - z Y v i Z j Y i c Ō Z g y t Z e ` j v t Z c v t i | e - z D c i c h y e j m y g n t j e - z Z j Y m y g n q | G t K A v g i v e v j m g - Z j Y | e - z D c i c h y e j A m g n t j e - z t h Z j Y n q Z v A m g - Z j Y | G i f c 2.8 G e s m g x K i t Y t m g t q i A e K v t k m i P Z Z j Y t K e - z Y v i M o Z j Y e j v n q | n e w f b a m g t q e - ` K Y v i Z v r t t i v K Z j Y i v b Y e K i t Z n t j m g t q i m t _ e - z Y v i M u z t e t M i K x i f c c w i e Z P n t ` Q Z v R i b t Z n q | 2.9 b s i P t i G K i u M u z K x j e - z Y v i ō m g q - t e M ō t j L u P i A w z n t q t Q |

t1 Ges t2 mg t q e - z Y v i t e M h v m t g v1 Ges v2 | G B ` g y t Z e m g q - t e M t j L u P i e - z Y v i A e v b P G e s Q ō v i v m i P Z n t q t Q |

i P i v b y v i t i , (t 2 - t 1 e v Δ t) A e K v t k M o Z j Y

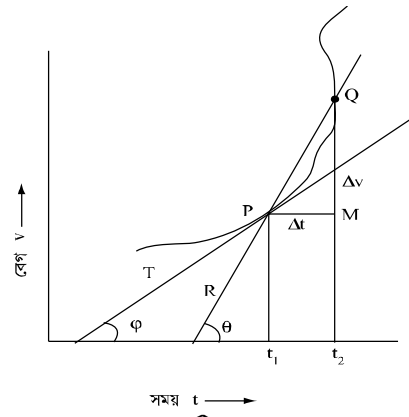
$$a = \frac{v_2 - v_1}{t_2 - t_1} = \frac{\Delta v}{\Delta t}$$

$$PQ\ R\ 'v\ Gi\ Xij = \tan\theta$$

hLb Δt Gi gvb Kg t Z v t K ZLb PQ R'v PT - ū k K i i t K A v M t Z v t K | hLb Δt → 0 ZLb PQ R'v PT - ū k R m g c w i Z Z n t e |

ms Avbyviti t1 mg t q e - z Z v r t t i v K Z j Y |

$$a = \lim_{\Delta t \rightarrow 0} \frac{\Delta v}{\Delta t} = \frac{dv}{dt} = PT - ū k K i Xij = \tan\phi$$



পট 2.9

mzi vs, tKiv gytZ GKiu e - z Y v i Z v r t t i v K Z j Y G B e - z Y v i m g q - t e M t j L u P i i A v b y v i t K n e ` z Z A w z - ū k K i X i t j i m g v b |

tKiv i v b i c Ō i i K t e t M D c t i i i t K Q t o t ` l q v e - z h Z B D c t i D t v Z Z B t e M K g t Z v t K A w f K t i P U v t b e - z M u z n v m t c t Z v t K G t t t i e - z t e t M i g ` b N t U , A _ \tau t K i v e - z Z j Y e - z t e t M i A w f g y L i n e c i x Z n t Z c v t i | e - z D c t i D V t Z D V t Z G K m g q t e M i Y n t q g y t Z P R b i n q | G i c i B e - z i v b t P c o t Z v t K e - z i D c t i I v v G e s i v b t P b g v D f q c h q q B G i D c i A w f K I R Z j Y (g) m g v b | m t e P P A e v t b e - z i M u z t e M k Y n q m Z , i K Š z G m g q l G i D c i Z j Y n e ` i g v b v t K , A _ \tau t K i v e - z M u z i k Y n t j I Z v i Z j Y v K v m e |

cW mvi vsk

miY : tKvb e^{-z} vⁱ tkl Ae^{-vb} t^{f±i} Ges Awⁱ Ae^{-vb} t^{f±i} i cv^r tK miY etj | vⁱ vⁱ vⁱ tK e⁻ⁱ Av^Z μ^{vš-} t^{Zj} n^t Q miY |

miY = Δr = r_f - r_i

teM : GKK mg^{tq} e^{-z} miY nj Zvi teM | t^{lžZg} mgq e^{-eavtb} e^{-z} mi^tYi nvi vⁱ vⁱ Zvr^t t^{lžZg} teM vⁱ vⁱ Kiv nq | M^v vⁱ vⁱ ZK f^v t^e,

teM v = $\lim_{\Delta t \rightarrow 0} \frac{\Delta s}{\Delta t} = \frac{ds}{dt}$

ZjY : mg^{tqi} m^t t^e t^{lžZg} mi c^v i e^Z t^{lžZg} bi nvi t^{lžZg} ZjY etj | t^{lžZg} mgq e^{-eavtb} e^{-z} t^{lžZg} mi c^v i e^Z t^{lžZg} bi nvi t^{lžZg} Zvr^t t^{lžZg} ZjY ej v nq | M^v vⁱ vⁱ ZK f^v t^e,

ZjY, a = $\lim_{\Delta t \rightarrow 0} \frac{\Delta v}{\Delta t} = \frac{dv}{dt}$

c^v vⁱ vⁱ gj⁻ vⁱ vⁱ 2.2

m^v vⁱ vⁱ D^e i vⁱ t^{lžZg} vⁱ vⁱ (v) vⁱ vⁱ vⁱ b |

1. GKvU mgZ^{tj} xy vⁱ vⁱ vⁱ K c^v t^{lžZg} K^v vⁱ vⁱ g^t a⁻ PQ vⁱ vⁱ vⁱ vⁱ vⁱ vⁱ h⁻ vⁱ vⁱ t^{lžZg} (2,2) | (4,6) GKvU e^{-z} miY PQ n^{tj}, PQ = KZ n^t e?

K. $\sqrt{(x_1-x_2)^2+(y_1-y_2)^2}$ L. $(2-4)^2+(2-6)^2$

M. $(x_2-x_1)^2+(y_2-y_1)^2$ N. $2\sqrt{5}$

2. Zvr^t t^{lžZg} mi mg^x Kⁱ Y t^{lžZg} vⁱ vⁱ vⁱ vⁱ (M^v vⁱ vⁱ ZK c^v t^{lžZg} vⁱ vⁱ h⁻ vⁱ vⁱ A⁻ vⁱ vⁱ K n^{tj} |

K. $v = \frac{\Delta x}{\Delta t}$ L. $v = \lim_{\Delta t \rightarrow 0} \frac{ds}{dt}$

M. $v = \lim_{\Delta t \rightarrow 0} \frac{\Delta s}{dt}$ N. $v = \lim_{\Delta t \rightarrow 0} \frac{\Delta x}{\Delta t} = \frac{dx}{dt}$

3. tKvb ev^k vⁱ vⁱ m^v vⁱ vⁱ vⁱ

K. tKvb e^{-z} vⁱ vⁱ a^e K n^{tj} Zvi teM c^v i e^Z t^{lžZg} k^v x^j n^t Z c^v tⁱ |

L. tKvb e^{-z} vⁱ vⁱ a^e K n^{tj} Zvi teM a^e K n^t Z c^v tⁱ vⁱ |

M. tKvb e^{-z} vⁱ vⁱ a^e K vⁱ n^{tj} | Zvi teM a^e K n^t Z c^v tⁱ |

N. tKvb e^{-z} vⁱ vⁱ a^e K vⁱ n^{tj} | teM c^v i e^Z t^{lžZg} k^v x^j n^t Z c^v tⁱ vⁱ |

4. e^{-z} M^v Z k^v n^{tj} | Zvi ZjY a^e vⁱ t^{lžZg} K Lb?

K. K Lb b^q |

L. hLb tKvb e^{-z} K Dci t^{lžZg} t^{lžZg} t^{lžZg} t^{lžZg} | qv nq |

M. hLb tKvb e^{-z} K Dc^t i vⁱ t^{lžZg} Q^t t^{lžZg} | qv nq |

N. hLb coš-e^{-z} f^v c^t t^{lžZg} Av^v vⁱ Z K^t i |

cW 3

MuZ velqK iukgvj vi ZjY Ges MuZi mgxKiY

Df`k`

G cV tk`l Avc1b-

- | `wZ I teM mi mv`k` I cv_R` Df`k` KiZ cvi`eb,
- | teM I ZjYi mv`k` I cv_R` Df`k` KiZ cvi`eb,
- | ZjY I g`tbi mv`k` I cv_R` Df`k` KiZ cvi`eb,
- | MuZi mgxKiY, wj c`Zcv`b KiZ cvi`eb|

2.3.1 MuZ velqK iukgvj vi ZjY

`wZ I teM:

K. mv`k` : `wZ I teM Df`qi GKK ms⁻¹ Ges Df`qi B gv`v mgxKiY GKB [LT⁻¹]

L. `emi`k` ev cv_R`

`wZ	teM
1. GKK mg`q th tK1b w` tK AwZµvš`- iZ`K `wZ etj	1. GKK mg`q w`w` 0 w` tK AwZµvš`- iZ`K teM etj
2. `wZ GK1U t`-j vi i vnk	2. teM GK1U t`f±i i vnk
3. `wZ me`v avZ`K	3. teM avZ`K ev FYvZ`K n`Z cvi`i
4. tKej gv`v gv`tbi cwi eZ`b `wZi cwi eZ` nq	4. gv`b A_ev w` K th tK1b GK1U A_ev Df`qi cwi eZ`b teM mi cwi eZ` nq
5. e`-z teM mi gv`b `wZ	5. w`w` 0 w` tK `wZB teM

teM I ZjY

K. mv`k` : teM I ZjY Df`qB t`f±i i vnk Ges Df`qB avZ`K ev FYvZ`K n`Z cvi`i |

L. `emi`k` ev cv_R`

teM	ZjY
1. mi`Yi cwi eZ`bi nvi`K teM etj	1. teM mi cwi eZ`bi nvi`K ZjY etj
2. teM mi GKK ms ⁻¹	2. ZjYi GKK ms ⁻²
3. teM mi gv`v [LT ⁻¹]	3. ZjYi gv`v [LT ⁻²]
4. MuZnxb e`-z teM kb` nq	4. e`-z MuZnxb ev teM kb` n`j I e`-z Dci ZjY Kvh`i n`Z cvi`i

ZjiY I g`b

K. miv`k` : Dfqb w` K i`mk, Df`qi GKK GKB, gv`v GKB Ges Df`qb teM cwi eZ`bi nvi |
 L. `emv`k` ev cv`R`

ZjiY	g`b
1. teM eix`i nvi`K ZjiY etj	1. teM n`tmi nvi`K g`b etj
2. ZjiY m`p`i Rb` e`z` Muzi Avf`g`L ej c`q`M Ki`Z nq	2. g`b m`p`i Rb` Muzi necix`Z w``K ej c`q`M Ki`Z nq
3. Zji`Yi c`f`v`te e`z` fi`teM I Muzkiv`3 μgk eix` cvq	3. g`b`i c`f`v`te e`z` fi`teM I Muzkiv`3 μgk nwm cvq

2.3.2 Muzi mgxKiY

Muzi w`l`q`K i`mk`g`v`v`_`tj`v` nj miY s, teM v, ZjiY a Giv c`Z`i`KB mgq (t) Gi A`tc`q`K | A`_`
 Muzkixj e`z` Av` Ae`vb (x₁) Ges tkl Ae`vb (x₂) Qivovl Priu` c`v`i`ng`Uvi w``v`g`b | GB
 c`v`i`ng`Uvi _`w`j` i` g`ta` m`p`w`` 0 m`u`K`e` `g`vb hv Priu` mgxKiY 0v`v` c`K`v`K` Kiv` nq | G`i` ej`v` nq Muzi
 mgxKiY | Muzi w`l`q`K i`mk`g`v`vi msAv` t`_`KB GB mgxKiY _`w`j` i` c`Z`c`v`b` Kiv` nq | Muzkixj KYvi teM
 mij` ti`Lv` eivei` nl` qvq` `i`Z`ej` t`Z` Avgiv` miY` e`v`S | mij` i`u`LK` Muzi` t`q`i`T` সঞ্চিষ্ট t`j`vi` i`mk` w`b`q`
 w`m`ve` Ki`tj` I m`w`K` dj`vdj` cvl`qv` hv`te | GRb` G`i`q`i`T` \vec{s} , \vec{v} , \vec{a} Gi g`vb` w`b`q` mgxKiY Dccv`b`
 Kiv` nj | miY, teM, ZjiY s, v, a Gi g`vb` h`_`v`μ`g` Ges mgq` t` n`tj` mgxKiY _`tj`v` w`b`g`e`c` |

- i) s = vt
- ii) v = u+at
- iii) s = ut + $\frac{1}{2}$ at²
- iv) v² = u² + 2as

gva`w`g`K (beg`-`kg) tk`Y`xi` c`v`_`e`Av`t`b` Av`c`w`b` GB mgxKiY _`w`j` c`Z`c`v`b` K`i`i`Q`b` | t`K`ej` Z`v` g`t`b`
 Kivi` Rb` GLv`t`b` AZ`š`-`m`st`q`i`c` Dc`v`cb` Kiv` nj | G` `i` (GKv`k`-`0`v`k` tk`Y`x`Z) Avgiv`
 K`i`j` K`j`v`t`mi` m`v`v`t`h` mgxKiY _`w`j` c`Z`0`v` Kivi` c`x`w`Z` R`i`b`e` |

mbvZb c`x`w`Z`Z` Muzi mgxKiY c`Z`0`v`

1. Avgiv` R`w`b, te`t`Mi` msAv` nj GKK mg`q` A`w`Z`μ`v`š`-`i`Z`j` e`z` z`w` t` mg`q` w`b`w`` 0` w``K` s` `i`Z`j`

$$A`w`Z`μ`g` K`i` Z`v`n`t`j` e`z` Mo` teM $\vec{s} = \frac{s}{t}$$$

ev, s = $\frac{\vec{s}}{v}$ t 2.9 (i)

e`z` w`l` h`w` mg`te`M` P`t`j` Z`v`n`t`j`

$$Z`v`r`q`w`Y`K` teM, v = Mo`teM $\vec{v}$$$

$$t`m`q`i`T` s = vt$$

2. gtb Kwi tKvb e⁻ z₁ Aw⁻ teM ubtq a mg ZjtY t mgq Ptj tkl teM_v cÜB nj | mZi vs t mgtq teM_i cwieZB⁰ v - u msÁv t₋tK Avgiv Rwb, Mo ZjY⁻ a = $\frac{v-u}{t}$

eV, v-u = $\frac{\rightarrow}{a} t$

eV, v = u + $\frac{\rightarrow}{a} t$ 2.9 (ii)

mgZjtY MwZkxj e⁻ z₁ t₋tK

Zvr⁰WYK ZjtY = MoZjtY

a = $\frac{\rightarrow}{a}$

∴ v = u + at

3. gtb Kwi u Aw⁻ teM ubtq a myg ZjtY Ptj t mgtq e⁻ z₁ kkl teM_v cÜB nj | GLv⁻t e⁻ z₁ Mo teM_v n⁻tj msÁvbynti Avgiv `W mgxKiY cvB | Zv nj |

Mo teM_v⁻ = $\frac{s}{t}$ eV, s = $\frac{-}{v} t$ (a)

Mo teM_v⁻ = $\frac{u+v}{2}$ (b)

mgxKiY (a) tZ_v⁻ Gi gvb emtj cvl qv hvq

s = $\frac{u+v}{2} .t$

= $\frac{u+u+at}{2} .t$ [mgxKiY 2.9 (ii) t₋tK]

= $ut + \frac{1}{2} at^2$ (iii)

4. 2.9 (ii) bs mgxKiY_v Df_q c⁰tK eM⁰K_i

v² = (u+at)²

= u² + 2uat² + a² t²

= u² + 2a(ut + $\frac{1}{2} t^2$)

= u² + 2as (iv) [mgxKiY 2.9 (iii) t₋tK ut + $\frac{1}{2} a t^2$ Gi gvb emtq]

Avmlj Gevi K⁰vj K_vvtmi (Calculus) m⁰vt⁰ mgxKiY_v cÜZÖv Kiv hvK |

K⁰vj K_vvtmi c⁰xvZ_tZ MwZi mgxKiY cÜZÖv

1. tKvb v⁰ g⁰vt⁰ Kvb e⁻ z₁ Yvi MwZteM_v Ges a ntj ,

a = $\frac{Lt}{\Delta t \rightarrow 0} \frac{\Delta v}{\Delta t} = \frac{dv}{dt}$

eV, $\frac{dv}{dt} = a$

eV, dv = adt (iii)

mgxKi YiUi Dfqc¶ mgvKj b (integration) K¶i cVb|

$$\int dv = \int a dt$$

$$e^{-\text{¶}} mgZj \text{¶Y MwZkxj e¶j a GKW a¶eK| \dots \dots \dots (c)$$

$$e\text{¶, } v = at + k \dots \dots \dots (d)$$

GLv¶b k mgvKj b a¶eK| e^{-\text{¶}} c0_wgK MwZteM u n¶j tj Lv hvq, hLb t=0, ZLb v = u Kv¶RB mgxKi Y (d) G t=0 Ges v = u em¶¶q cVb, k = u

mgxKi Y k Gi gv b em¶¶j cvl qv hvte,

$$v = u + at$$

2. Avgiv Rvb th e^{-\text{¶}} MwZteM $v = \lim_{\Delta t \rightarrow 0} \frac{\Delta s}{\Delta t} = \frac{ds}{dt}$

$$Kv¶RB ds = v dt$$

$$e\text{¶, } ds = (u + at) dt$$

$$= u dt + at \cdot dt$$

Dfqc¶¶K mgvKj b K¶i cVb

$$\int ds = \int u dt + \int at \cdot dt$$

$$s = u \int dt + a \int t \cdot dt$$

$$s = ut + \frac{1}{2} at^2 + C \dots \dots \dots (e)$$

GLv¶b c mgvKj b a¶eK| hLb t=0 ZLb s=0, mZi vs c=0 n¶e, Kv¶RB mgxKi Y (e) n¶e|

$$s = ut + \frac{1}{2} at^2$$

3. Avgiv Rvb th tKvb g¶Z e^{-\text{¶}} Zj Y $a = \frac{dv}{dt} = \frac{dv}{ds} \cdot \frac{ds}{dt} = \frac{ds}{dt} \cdot \frac{dv}{ds}$

$$e\text{¶, } a = v \frac{dv}{ds} \quad (v = \frac{ds}{dt})$$

$$e\text{¶, } v dv = a ds \dots \dots \dots (f)$$

Dfqc¶¶K mgvKj b K¶i ,

$$\int v dv = \int a ds$$

$$e\text{¶, } \frac{v^2}{2} = as + c_1 \dots \dots \dots (g)$$

$$hLb s = 0 \quad ZLb v = u \quad Kv¶RB \frac{u^2}{2} = c_1$$

mgxKi Y (g) G c_1 Gi gv b em¶¶j cvl qv hvq

$$\frac{v^2}{2} = as + \frac{u^2}{2}$$

$$e\text{¶, } v^2 = u^2 + 2as$$

mvivsk

mi Y = s, telM = v, Zji Y = a Ges mgq = t ați Mvzi mgrKi Y mĤ, wj nj

i) $s = vt$

ii) $v = u + at$

iii) $s = ut + \frac{1}{2}at^2$

iv) $v^2 = u^2 + 2as$

cvĤvĤi gj`vqb

mĤK DĤĤi i cvĤk ĤK ĤY (√) Ĥ b |

1. 5ms^{-1} Mo telM Mvzkxj e`zı ugubĤU KZ `iZiAvZμg Ki te |
 K. 300 m L. 0.3 km
 M. 0.3kms^{-1} N. 0.3kms^{-1}

2. GKıU Mvox Ĥ`i ve`v t_ĤK mg-ZjiĤY Pj v`i i" Kij | 3 tmĤKŪ ci MvoxıU 9ms^{-1} telM cĤB nj |
 MvoxıU Zji Y KZ?
 K. 3m/s^2 L. 3kms^{-2}
 M. 3km^{-2} N. 3km/s^2

3. GKıU e`zı`i ve`v t_ĤK 4ms^{-2} mg-ZjiĤY hvĤv`i i" Kij, 6s ci e`Ĥi telM KZ nte?
 K. 6m^{-1} L. 4ms^{-2}
 M. 24ms^{-2} N. 24ms^{-1}

cW 4

MvZ veIqK KvZcq tj LvPÎ Ges Zv` i e`envi

Df`ik`

G cvV tkfI Avciab

- | miY-mgq tj L t_`tK teM vbYq Ki`Z cvi`eb,
- | teM-mgq tj L t_`tK ZjiY vbYq Ki`Z cvi`eb,
- | mgteM I AmgtetMi tj L mbv³ Ki`Z cvi`eb,
- | mgZjiY I AmgZjiY tj L mbv³ Ki`Z cvi`eb|

2.4.1 miY-mgq tj L

miY (s) mg`qi Dci vbf`kxj n`j

Avgi v`ij mL s = s(t)

A_`f s, t Gi A`c`qK

$$mgZjiY MvZkxj e`z` Rb` s(t) = ut + \frac{1}{2} at^2$$

Ab`w` tK mgteM MvZkxj e`z` Rb` A`c`qKvU nte s(t) = vt mgq`K x A`q Ges `jZ`K y A`q vbtq tj LvPÎ Askb Ki`j GKvU tiLv cvl qv hvte| GvU eμ ev mij `yitbiB n`Z cvi`| aiv hvK GKvU e`z`v`v` tK mgteM MvZkxj, gtb Kvi e`v`ji teM; v e`v`ji c0`v`K Ae`vb s₀; t tm`KÛ ci Ae`vb s(t) A_`f AvZμvš` i`Zj s_t = s₀ + s

$$\therefore s = s(t) - s_0$$

mgxKi YvU t_`tK e`sv hvq|

1. s(t) evvg t tj L GKvU mij tiLv|

2. Avv` Ae`vb s₀ etj mij tiLvU y A`q`K s₀ GKK `i`ZjtQ` Kti| Avv` Ae`vb kb` s₀ n`j mij tiLvU gj`v`v`v` nte|

3. mij tiLvUi Xvj nte e`z` teM (v)

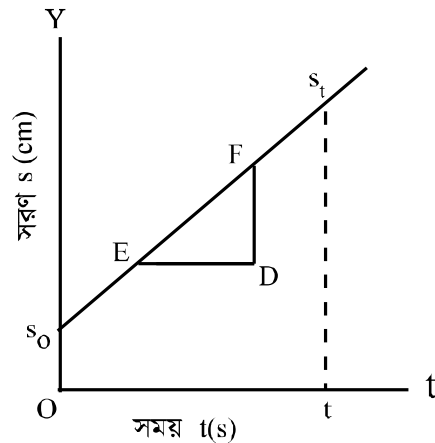
e`envi

G aitbi tj LvPÎ t_`tK teM v vbYq Kiv hvq| MvZkxj KYvi miY-mgq tj`Li Xvj B nte Zvi teM v tiLvUi Dci th tKvb `v` v`yE I F tbb| E I F v`y`v` t`q y- A`q`i mgvš`v`j `v` tiLv h_`v`tg EA I FB Askb Kvi | E v`y`v` t`q x-A`q`i mgvš`v`j ED Askb Kvi hv FB tK D v`v`z` tQ` Kti|

$$Zvntj miY-mgq mij tiLvUi Xvj nte \frac{FD}{ED}$$

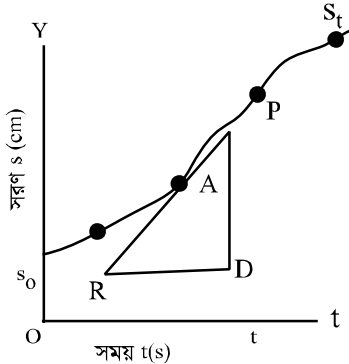
$$\therefore teM v = \frac{FD}{ED}$$

mgteM i t`q`i, Zv`q`v`K teM = MoteM



vPÎ : 2.10

∴ AsuKZ tj LuPĀ t_ġK ZvrġWYK teM = MoġeM = $\frac{FD}{ED}$
 Amg teMi tġġĀ mgq-miY tj LuU eµtiLv nte (wPĀ 2.11 t`Lġ)



wPĀ 2.11

e`envi

GġġĀ tj LuU eµtiLv| dtj tiLvi Xvj weifbæmgġq Avj v`v Avj v`v nte A_ġ weifbæmgġq teM Amg| Abġġ` 2.2.2 G ZvrġWYK teM wbyġi tġġĀ Avgiv AvġjvPbv Kġi wG tj L t_ġK th mgġq teM wbyġ KġZ nte wK tmB mgġq tjġLi Ae`ġbi Dci GKw ġkR AvġġZ nte| ġkR Ki Xvj B nte teM|

aiv hvK A we`ġZ e`ġi teM RvġZ Pvb| Zintġ tj LuU Dci A we`ġZ GKw ġkR AvġġZ ġkR Dci mġeavRbK ġġ we`yp I Q wbb| P I Q we`yga` w`ġq h_vµġg y I x Aġġi mgvšġj ġġ tiLv PD I QD Ges AvġġZ, Giv ci`úi D we`ġZ tQ` Kġi|

PQ ġi LuU Xvj = $\frac{PD}{QD}$ e`ġYvi ZvrġWYK teMi gvb wġ`R Kġi|

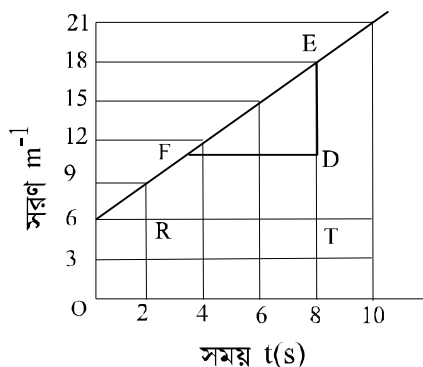
2.4.2 teM-mgq tj L

aiv hvK GKw e`ġYv wv`ġ w`ġK mg-ZġġY MwZkxj , Avw` teM = u, mg-ZġġY = a I t mgq cġi teM = v|

mġvbgvġi, $v = u + at$

mgxKi YwU t_ġK eSv hvq:

1. v ebgv t ġ L GKw mij tiLv nte
2. ti LuU y- AġġK u GKK ġġZġtQ` Kġe| hw` Avw` teM, kb` nq Zv nġj ti LuU gġ we`Mvgx nte|
3. ti LuU Xvj nte e`ġYvi ZġġYi gvb|



wPĀ 2.12

e`envi

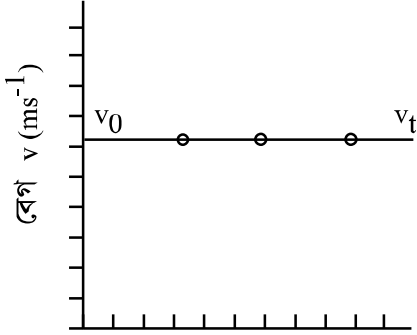
G aiġbi tj LuPĀ t_ġK ZġġY wbyġ Kiv hvq| teM-mgq tj LuU mij tiLv etġ eSġZ nte ZġġY mġg| GġġĀ tj LuU Xvj wbyġ KġġB ZġġY cvl qv hvte| tjġLi Dci th tKvb ġġ mġeavRbK we`ye I F t_ġK h_vµġg y Aġġi mgvšġj Ges x Aġġi mgvšġj ġġ tiLv tUġb Xvj wbyġ

Kiv hvte| wPĀ t_ġK, Xvj = $\frac{DE}{DF}$

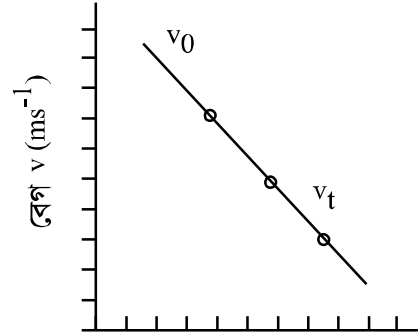
∴ KYwU teM $v = \frac{DE}{DF}$

ZġġY mġg bv nġj tj LuU GKw eµ tiLv nte|

tmf7f7 P7 2.11 Gi gZ th we`fz Zvr7WYK ZjiY wbyq KitZ nte tmB we`fz GKwU `ukR GfK `ukfKi Xij wbyq KitZ nte| teM-mgq tj LuU hw x At7ji mgvstvj nq Zvntj eStZ nte Gf7f7 e`z teMi tKvb cwieZB n7Q bv A_7r Gf7f7 ZjiY kY` (P7 2.13)| tj LuU hw μgk wbgwv nq (thgb P7 2.14) Zvntj eStZ nte Gf7f7 teM μgk nwm A_7r GwU FY ZjiY ev g`b cKvk KitQ|



সময় t (s)
P7 2.13



সময় t (s)
P7 2.14

cW mvisk

tj L t7tK teM wbyq : miY ebrg mgq tj tLi Xij tetMi Zvr7WYK gvb wbt`RK|

tj L t7tK ZjiY wbyq : teM-mgq tj tLi Xij Zvr7WYK ZjiYi gvb wbt`RK|

cwVvEi gj`vqb

mWk DEti i cwK wK wY ($\sqrt{\quad}$) w b|

1| miY-mgq ti Lvi Xij wKtmi gvb wbt`R Kti?

- (K) `wZ (L) teM
- (M) ZjiY (N) g`b

2| teM-mgq ti Lvi Xij wKtmi gvb wbt`R Kti?

- (K) `wZ (L) teM
- (M) ZjiY (N) miY

3| teM-mgq tj LuU m At7ji mgvstvj | Gi A_7K?

- (K) e`wji ZjiY abvZK (L) e`wji ZjiY FYvZK
- (M) e`wji ZjiY kb` (N) tj LuU 0viv ZjiYi gvb cvl qv m`e bq|

4| miY-mgq tj LuU GKwU eμ ti Lv| Gi A_7K?

- (K) e`wji teM myg (L) e`wji teM Amg
- (M) e`wji teM kY` (N) tj LuU 0viv tetMi gvb cvl qv hvq|

cW 5 coš-e`ž MvZ

Dfík`

G cvW tkfI Avciub

- 1) gŷ fivte coš-e`ž ej tZ wK ešvq Zv e`vL`v KitZ cvi`teb,
- 1) gŷ fivte coš-e`ž MvZi mĤ, tĵv eYbV KitZ cvi`teb,
- 1) gŷ fivte coš-e`ž MvZi mgxKiY, wĵ wĵ LtZ cvi`teb,
- 1) Lvov Dctii w`tk wbwŋB e`ž meŋaK D`PZv, tgvU DÇqbKvj Ges meŋaK D`PZv t`tk f; cĥô tcŠQrtZ AwZevnZ mgq wbyq KitZ cvi`teb|

2.5.1 coš-e`ž MvZ I coš-e`ž MvZi mĤvejx

tUvej t`tk GKwU Kjg Mvotq wbtP cto tMj | MvO t`tk GKwU dj gvwUz coj | DBy`vj vĵbi Qrt`
 `vno`q GK UKiv BU wbtP tdj tĵb| Gme coš-e`ž MvZi mĤ_ Avgiv mevB cwiwPZ| coš-e`ž
 MvZi eYbVq Avgiv evZvĵmi evav Dĥcŋv Kwĵ | hw` e`ž Dci evZvĵmi evav bMY` nq Zvntĵ e`z
 cĵivcvi` cĵ_exi AvKIŲ A_Ų AwfKtIŲ dtĵB cĵ_excĥô cWZZ nq| GtŋĵtĪ Avgiv e`wĵtk enĵ
 gŷ fivte coš-e`ž gŷ fivte coš-e`ž Dci th ZiY nq Zv AwfKIR ZiY| c`v_9eÁvĵbi Avtĵ vPbvq
 AwfKIR ZiY AZ`š-, i`ZcŲŲŲŲKv cvĵb Kti etĵ GtK Avjv`v cĶxK g Őviv mwPZ Kiv nq| hw` I
 f; cĥôi wewfbew`vĵb g-Gi gĵvbi mvgvb` cwiEZb nq Zely Avgiv wmwie wKvĵki mĵeavi Rb` g=
 9.8ms⁻² atĵ tbB|

w`i Ae`vb t`tk evavwbfivte cotĵ gŷ fivte coš-e`ž MvZ wZbvU wbgq tĵtb Ptĵ | Gt`i coš-e`ž
 mĵ bĵtg AwfwnZ Kiv ntqĵQ| mĤ, tĵv nĵ :

- GKB `vb t`tk fviX ev nĵ Kv th tKvb e`žK gŷ fivte cotZ t`qv ntĵ
- 1) e`žgn`wĵw`ŋ mgĵq GKB wĵw`ŋ `tZ; AwZµg Kti |
 - 2) wĵw`ŋ mgq ci cĶZ`K e`ž teM covi mgĵqi mgvbwvWZK
 - 3) wĵw`ŋ mgĵq e`ž AwZµvš-`tZ; e`ž covi mgĵqi eĵMŲ mgvbwvWZK|
 weÁvbx wDUB cixŋŋvgj-Kfivte meĶŲg mĤ, wĵ cĵvY Ktib| mĤ wZbvU MvYwZK mgxKiY t`tkI
 cĵvY Kiv hvq| cieZŲAbĵQĵ` G wĵtq Avtĵ vPbv Kiv nte|

2.5.2 coš-e`ž MvZi mgxKiY

gŷ fivte coš-e`ž MvZ GKgvĪK mg-ZiY MvZi GKwU cĶó.D`vniY| gŷ fivte coš-e`ž MvZi
 Awfgy_y-Aŋ aiv nq| GtŋĵtĪ Lvov Dctii w`tk GKK tf±i J aiv ntĵ gŷ fivte coš-e`ž ZiY nq,
 a = -gJ

GLvĵb FYvZK wPý e`envi Kiv ntqĵQ KviY ZiĵYi Awfgy wbtPi w`tk| thĵnZzgŷ fivte coš-e`ž
 MvZ GKwU mg-ZiY MvZ ZvB Avgiv Gi MvZ eYbVq 2.9(ii), 2.9(iii) Ges 2.9(iv) mgxKiY, wĵ e`envi
 Kie| GtŋĵtĪ ZiY a = g miY s = h e`envi Kiv nte| Zv ntĵ MvZi mgxKiY, wĵ i cwi ewZŲ ifc nte
 wbgĵfc:

- v=u+gt 2.10(i)
 - h=ut+ $\frac{1}{2}$ gt² 2.10(ii)
 - v²=u²+2gh 2.10(iii)
- GB mgxKiY, wĵ B coš-e`ž Rb` cĶhvR` MvZi mgxKiY|

coš-e-ž Muzi mgxKiY t_žK coš-e-ž mŕi cgvY

mgxKiY 2.10 (i) meŕePbv Kiv hvK | e-žYv hv w-ŕi Ae-ŕb t_žK cto Zvntj Avw` teM u=0 nq A_ŕ
v = 0 + gt

eV, v = gt

GLvŕb g a'e, AZGe v ∝ t hv, coš-e-ž wZxq mŕ cgvY Kŕi |

Gici mgxKiY 2.10 (ii) meŕePbv Kiv hvK | e-žYv hv w-ŕi Ae-ŕb t_žK cto Zvntj Avw` teM u=0
nq | A_ŕ

$$h = 0.t + \frac{1}{2}gt^2$$

$$h = \frac{1}{2}gt^2$$

GLvŕb $\frac{1}{2}g a'e$, AZGe $h \propto t^2$

Gi t_žK coš-e-ž wZxq mŕ cgvY nq |

e-žwv Lvon Dcŕi i w_žK wŕŕc Kŕi AwfKIR ZjY g l e-ž miY wecixZgŕ nq, tmŕŕŕ e-ŕbi
ZjY = -g (KviY AwfKIR Zjŕbi Awfgŕ meŕw wŕŕPi w_žK) | coš-e-ž Muzi mgxKiY, wj žZ g Gi
cwi eŕZg emŕŕq cvl qv hvŕe |

v = u - gt 2.11(i)

h = ut - $\frac{1}{2}gt^2$ 2.11(ii)

v² = u² - 2gh 2.11(iii)

GB mgxKiY, wj nj Lvon Dcŕi i w_žK wŕŕŕB e-ž Muzi mgxKiY |

2.5.3 Lvon Dcŕi i w_žK wŕŕŕB e-ž meŕaK Dŕb

aiv hvK GKw e-žK u ŕeŕM Lvon Dcŕi i w_žK wŕŕŕc Kiv nŕj v | e-ŕ hLb meŕaK D"PVq tcdŕŕŕe
ZLb Gi teM kb` nŕe | A_ŕ Avw` teM u, tkl teM = 0 l meŕaK D"PV H aiŕj 2.11 (iii) mgxKiY
t_žK cvl qv hvŕe,

$$0 = u^2 - 2gH$$

eV, $H = \frac{u^2}{2g}$ 2.12

meŕaK D"PVq DVvi mgq,

meŕaK D"PVq tcdŕŕŕi mgq t nŕj 2.11 (i) mgxKiY v = 0 emŕŕj cvl qv hvŕe

0 = u - gt

eV, $t = \frac{u}{g}$ 2.13

meñak D'PZv t_#K fvgtZ bvgvi mgq

gtb Kwi meñak D'PZv t_#K e`z fvgtZ bvgvi mgq t' | meñak D'PZvq e`z teM kb` | tKej gvĭ g Gi cFvte e`u H D'PZv t_#K fvgtZ cote | Gtĭĭĭ coš-e`z Mvzi mgxKiY 2.10(ii) t_#K cvl qv hvte |

$$H = 0. t' + \frac{1}{2} g(t')^2$$

$$\text{ev, } (t')^2 = \frac{2H}{g} = \frac{2}{g} \cdot H = \frac{2}{g} \cdot \frac{u^2}{2g} \quad (\text{mgxKiY 2.12})$$

$$\text{ev, } t' = \frac{u}{g} \dots \dots \dots 2.14$$

mgxKiY 2.13 Ges mgxKiY 2.14 t_#K `úóZ cĭxqgvb nq th GKĭU e`#K th tKvb teM Lvov Dcĭi i w`#K wbtĭc Kiĭj GĭU hZĭĭĭ mteP D'PZvq DVte (A_# hLb teM kY` nq) | Ges mteP D'PZv t_#K fvgtZ bvgvĭZ hZĭĭĭ mgq j vMte Zvi cwi gvY me`v mgvb | A_#

Dcĭi I Vvi mgq = wbtP bvgvi mgq |

$$AZGe tgvU Dĭqcb Kij T = Dĭvĭbi mgq + cZĭbi mgq \quad t + t'$$

$$\text{ev, } T = \frac{u}{g} + \frac{u}{g}$$

$$= \frac{2u}{g} \dots \dots \dots 2.15$$

2.5.4 coš-e`z Mvzi mgxKiĭYi e`enwiK cĭqM

coš-e`z Mvzi mgxKiY mgr cĭqM Kĭi Avgiv সংশ্লিষ্ট MvYvZK mgm`vi mgvavb KiĭZ cwi | wbtP G AbĭQĭ i D`vniĭYi mgm`v, wj mgvavb Kiv nĭ`Q |

D`vni Y 1 | $u = 9.8\text{ms}^{-1}$ teM GKĭU cv_iĭK Dcĭi i w`#K wbtĭc Kiv nj | GĭU KZ mgq cĭi fĭzĭo wĭĭi Avmte? ($g = 9.8\text{ms}^{-2}$)

D`vni Y 2 | GKĭU e`#K 196ms^{-1} teM Lvov Dcĭi i w`#K wbtĭc Kiv nj

- K. 20s ci e`wĭi teM KZ?
- L. meñak D'PZvq tcĭQĭZ KZ mgq j vMte?
- M. meñak KZ D'PZvq tcĭQĭte?
- N. Dcĭi DĭV Avevi fvgtZ wĭĭi AvmĭZ tgvU KZ mgq j vMte?

wbtR mgvavĭbi tPóv Ki`b | Zvi ci cĭĖ mgvavĭbi mĭ½ wĭwĭ tĭ wbb |

D`vni Y 1 |

$$GLvĭb AwZ\mu\check{S}`i-Z; h = 0, Avv` teM $u = 9.8\text{ms}^{-1}$, Zj Y $g = 9.8\text{ms}^{-1}$, mgq t wbyĭ KiĭZ nte |$$

$$\text{Avgiv Rvb, } h = ut - \frac{1}{2}gt^2$$

f`cĭo wĭĭi Avmĭj cv_iwĭi tkl Ae`vb I Avv` Ae`vb GKB A_# kb` |

$$A_#, 0 = 9.8t - \frac{1}{2} \cdot 9.8t^2,$$

$$\text{ev, } 0 = \frac{9.8t}{2}(2-t) = 0 \quad \text{KŠ} \frac{9.8t}{2} \neq 0, \text{ thĭnZ} \neq 0 \text{ AZGe } 2-t = 0$$

$$\text{ev } t = 2 \text{ Sec.}$$

D`vni Y 2

t` l qv AvtQ e`mli Aw`teM u = 196ms⁻¹ , Zji Y g = 9.8ms⁻²

K. GLvfb mgq t = 20sec.

tkl teM v = ?

Avgiv Rmb, v = u-gt

$$= (196-9.8 \times 20) \text{ ms}^{-1}$$

$$= (196-196) \text{ ms}^{-1}$$

$$\therefore v = 0 \text{ ms}^{-1}$$

L. meKaK D`PZvq DVvi mgq t ntj

Avgiv Rmb, t = $\frac{u}{g} = \frac{196}{9.8} \text{ s} = 20 \text{ sec.}$

M. meKaK D`PZv H ntj

Avgiv Rmb, H = $\frac{u^2}{2g} = \frac{196 \times 196}{2 \times 9.8} \text{ m} = 1960 \text{ m.}$

N. tgvU DÇqb Kvj T = $\frac{2u}{g} = \frac{2 \times 196 \text{ ms}^{-1}}{9.8 \text{ ms}^{-2}} = 40 \text{ Sec}$

mvi vsk

Lvor Dctii w`tk ubw`B e`z Rb` Zji Y -g;

ub`qcy teM u, t mgq AwZµvš-D`PZv h Ges teM v ntj

i. v = u-gt ii. h = ut - $\frac{1}{2}$ gt² iii. v² = u² -2gh

Dci t`tk Lvor ubtP coš-e`z Rb` Zji Y g avvK, ZLb mgxKi Y, wj nte-

i. v = u+gt ii. h = ut + $\frac{1}{2}$ gt² iii. v² = u² +2gh

cvVvEi gj`vqb 2.5

mWK DEti i cvk WK vPy (v) w b |

1/ ubw` teM Qto t` l qv e`z hLb mtePP D`PZvq tcaVq ZLb Zvi teM KZ nq?

K. g Gi mgvb

L. -g Gi mgvb

M. 0

N. tkl teMi mgvb

2/ AvfKIR Zji Y g a`e, t mgq GKwU e`z D`PZv bvtj h = $\frac{1}{2}$ gt² mgxKi YwU wK eSvq?

K. ubw` teM mgq e`z AwZµvš- i-Zi mgqti etMP mgvbsvZK

L. ubw` teM mgq e`z cB teM mgqti mgvbsvZK

M. ubw` teM mgq e`z AwZµvš- i-Zi mgqti mgvbsvZK

N. ubw` teM mgq e`z cB teM mgqti etMP mgvbsvZK

3/ GKwU e`z 9.8ms⁻¹ teM Lvor Dctii w`tk Qto t` l qv nj e`m 5 s. G mtePP D`PZvq DVj

Ges cvvq g Zjty ubtP cov`i` Kij | e`m Qto t` l qvi KZqY ci fvgZ vdti Avmte?

cW 6 AvtcrvK telM

Dt`ik`

G cvV tk`tl Avcib

- 1 AvtcrvK telM wK Zv ej tZ Ges D`vniYmn e`vL`v Ki tZ cvi`teb,
- 1 GKgvw`K c`h`% KvVtgv`Z th tKvb `B w` tK MuzKxj `v` e`-z` t`v`t` AvtcrvK telM wYq` Ki tZ cvi`teb,
- 1 GKB w` tK MuzKxj `v` e`-z` Ges ci`ui` necixZ w` tK MuzKxj `v` e`-z` AvtcrvK telM wYq` m`F` c`Z`ov` Ki tZ cvi`teb/

2.6.1 AvtcrvK tetMi A_©

Avgiv Rvnb mg`tqi mvt`c`v` e`-z`v`i` c`v`i`c`v`k`K`i` mvt`_ Ae`-vb` c`v`ie`Z`B` bv` Ki` t`j` e`-z`K` w`-v`Z` et`j` | gn`v`e`k`| Av`m` t`j` cig` w`-v`Z`k`x`j` et`j` t`K`v`b` e`-z`m`e` bq`| Ave`v`i` MuzKxj` Z`v`i` t`v`v`t` Av`g`i`v` et`j` w`O` c`v`i`c`v`k`K`i` mvt`c`v` Ae`-vb` c`v`ie`Z`v` Ki` t`j` e`-z`MuzKxj` | GB` c`v`i`c`v`k`K`i`K` Av`g`i`v` w`-v`Z`k`x`j` at`i` t`b`B`| Av`m` t`j` Z`v` m`e` bq`| Z`v`B` Av`g`i`v` GK`u`U` e`-z` mvt`c`v` Ab`-v`U` e`-z` Z`j` b`v`g`j`-K` w`-v`Z` I` Muz` v`e`t`e`P`b`v` K`v`i` | `v` MuzKxj` e`-z` GK`u`U`i` mvt`c`v` Ab`-v`U`i` t`e`M` t`K` AvtcrvK telM et`j` |

aiv hvK `v` Mv`ox` c`i`k`v`c`v`k` P`j` t`Q`| c`Q`g` Mv`ox`U` (A) Gi` Muz` N`b`U`v`q` 20km, w`Z`x`q` Mv`ox`U` (B) GKB` w` t`K` N`b`U`v`q` 50km t`e`M` P`j` t`Q`| A` Gi` Z`j` b`v`q` B` 30km/h` t`e`k` t`e`M` P`j` t`Q`| A`-v` A` Gi` mvt`c`v` e` Muz`t`e`M` N`b`U`v`q` 30 km| Mv`o` `v` h`v` ci`-ui` necixZ w` t`K` t`h`Z` Z`v`n` t`j` A` Gi` mvt`c`v` B` Gi` Muz`t`e`M` n` t`Z`v` N`b`U`v`q` 70km| `v` t`U`b` GKB` w` t`K` P`j` t`j` t`U`b`i` h`v`i`x`-i` g`t`b` n`q` `v` t`U`b`B` t`-t`g` Av`t`Q`| G` a`i`t`b`i` A` t`b`K` D`-v`n`i`Y` Av`g`i`v` w` t`Z` c`v`i` | Av`m` t`j` Av`g`i`v` AvtcrvK telM wYq`i` R`b`- w`K`Q`y`M`v`v`v`Z`K` c`x`v`Z` c`Z`o`v`i` t`P`o`v` K`v`i` |

2.6.2 AvtcrvK telM wYq`

aiv hvK A I B `v` MuzKxj e`-z` (vP` 2.17) | e`-z` v`i` t`e`M` h`-v`v`t`g` v`_A` I v`_B` | v`_A` = MN Ges v`_B` = OP | aiv hvK A Gi` mvt`c`v` B Gi` AvtcrvK telM wYq` Ki tZ n`te`| g`t`b` K`v`i` , D`f`q` e`-z` mvt`_ -v`_A` t`e`M` h`v` K`i`v` n`t`j`v`|

A e`-z` t`v`v`t` v`_A` = MN, B e`-z` t`v`v`t` v`_A` = OR

D`f`q` t`e`M`i` m` t`%` GKB` t`e`M` h`v` K`i` t`j` Z`v`-i` AvtcrvK tetMi c`v`ie`Z`B` n`te` b`v`|

OPSR m`v`g`š`v`i` K`u`U` Av`k`i`b`| OS` t`h`v`M` K`i`-b` OP+OR+OS (vP` 2.17) | Av`z`v`i`³ t`e`M`U` h`v` K`i`v`i` d`t`j` A` e`-z` v`i` w`-i` Ae`-vb` NM` K`v`i` Y` NM+MN` = 0 A`-v` A` e`-z` v`i` w`-i` Ae`-vb` Av`t`Q` w`K`š`z`B` e`-z` OS` t`e`M` c`O`B` n`t`q`t`Q`|

AZGe, A Gi` mvt`c`v` B Gi` AvtcrvK telM

V`_BA` = OS = v`_B` +(-v`_A`) = v`_B` -v`_A`

GKB`f`i`te` t`-L`v`b` h`v`q` , B Gi` mvt`c`v` A Gi` AvtcrvK telM

V`_BA` = v`_A` -v`_B` 2.17

GLvB v Gi cr` A¶i BA Øviv eSvb ntqfQ A mvtct¶ B Ges cr` A¶i AB Øviv eSvb ntqfQ B mvtct¶ A | A¶i ,wj tj Lvi mgq Aek` mZKñteb vAB bq v_{AB} gj- A¶i (Superscript)AB |

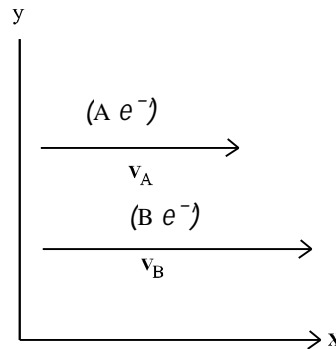
vetkl t¶¶

1. GKB wñK MwZkxj `w e⁻z

av hvK `w e⁻zA, B GKB wñK x A¶i eivei MwZkxj (w¶ 2.18) | Gt`i teM h_vµtg v_A Ges v_B | 2.17 mgxKiY t_¶K B Gi mvtct¶ A Gi Avtcw¶K teM, v_{AB} = v_A - v_B , A Gi mvtct¶ B Gi teM v_{AB} = v_B - v_A ; x A¶i AwfgtL Gi GKK tf±i i wetePbv Kitj tj Lv hvq |

$$v_{AB} = v_A i - v_B i$$

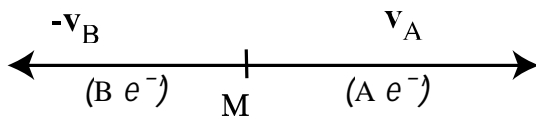
$$v_{AB} = v_B i - v_A i$$



w¶ 2.18

2. wecixZ wñK MwZkxj `w e⁻z

av hvK `w e⁻zA, B GKB A¶i eivei wecixZ wñK MwZkxj (w¶ 2.19) | Gt`i teM h_vµtg x A¶i eivei v_A Ges -v_B i | 2.17 mgxKiY t_¶K B Gi mvtct¶ A Gi Avtcw¶K teM, v_{AB} = v_A - v_B



w¶ 2.19

x A¶i AwfgtL GKK tf±i wetePbv Kitj ,

$$v_{AB} = v_A^{(i)} - v_B^{(-i)}$$

$$= (v_A i - v_B i)$$

$$\text{AZGe } v_{AB} = v_A + v_A$$

GKBfvte t` Lvb hvte, v_{BA} = v_B + v_A

mvi mst¶¶C

Avtcw¶K teM : `w MwZkxj e⁻z GKwLi mvtct¶ AbwLi teMtK Avtcw¶K teM etj |

A e⁻z mvtct¶ B e⁻z Avtcw¶K teM v_{BA} = v_B - v_A

B e⁻z mvtct¶ A e⁻z Avtcw¶K teM v_{AB} = v_A - v_B

Povš-gj`vqb

mWk DĚti i cĕk Wk Wý (√) w`b|

1/ P ěv`j`vbsk (x, -y,z) | x,y,z Aĕ eivei GKK tĕ±i Dcisk h_vµtg i, j, k | O gj` ěv`y
OP Gi Ae`vb tĕ±i KZ?

K. OP= ix+jy+kz

L. OP= ix+jy+kz

M. OP= ix-jy+kz

N. OP= ix-jy-kz

2/ tKvb cĕh½ KvVtgvı GkU gvĭ gj` ěv`y ntj H KvVtgvıU K'gvĭ K nĕZ cvĕi?

K. GK gvĭ K

L. W-gvĭ K

M. W gvĭ K

N. Dcĕi i me_wj

3/ mg Ztj t mgĕqi e`eavtb GKU e`Kv P ěv`y tK Q ěv`jZ tMj | P ěv`j`vbsk (0,y) Ges
Q ěv`j`vbsk (x,0) ntj v Gi gvĕ KZ nĕ?

K. $\sqrt{\frac{(y_2-y_1)^2+(x_2-x_1)^2}{t}}$

L. $\sqrt{\frac{(y_2-y_1)^2+(x_2-x_1)^2}{t}}$

M. $\sqrt{\frac{y^2+x^2}{t}}$

N. $\sqrt{\frac{x^2-y^2}{t}}$

4. tKvb i vĕk tRvovı GKK Avfbĕ

K. mi Y I teM

L. `i-Zj I `wZ

M. teM I Zj Y

N. `wZ I teM

5. wv` 0 teM Qĕo t` I qv e`zhLb mĕePP D`PZvq I tV ZLb Zvi teM KZ nq?

K. 9.8 ms⁻¹

L. -9.8 ms⁻¹

M. 0ms⁻¹

N. 1ms⁻¹

6. Zj tYi gvĭv tKvıU?

K. LT⁻¹

L. MLT⁻¹

M. MLT⁻²

N. LT⁻²

L. msĕB-DĚi cĕe

1. e`zĕ Kv KĕK etj?

2. w`wZ I MvZi msÁv w`b|

3. msÁv w`b : Ae`vb tĕ±i, mi Y, `wZ, teM, ZıvĕWYK teM, Zj Y, ZıvĕWYK Zj Y|

4. mi Y, teM I Zj tYi GKK I gvĭv mgxKi Y wj Lĕ|

5. mĕyg Zj tY MvZkxj e`zĕ Avv` teM, Zj Y, tkl teM I MvZ Kvĕj i gĕa` MvWvZK m`úKw wj Lĕ|

6. AvfKĕI P cĕvĕte gĕvĕte coš-e`zĕ mĕ_wj wj Lĕ|

7. AvfKĕI P cĕvĕte gĕvĕte coš-e`zĕ MvZi mgxKi YıU wj Lĕ|

8. W-gvĭ K cĕh½ KvVtgvı KqU Aĕ vĕK?

9. AvĕcĕĕK teM wK?

10. ěcixZ w`ĕK MvZkxj A I B e`zĕ wĕi gĕa` AvĕcĕĕK teMı MvWvZK msÁv w`b|

M. vek` DËi cËæ

1. GKgwî K, wögwî K I wî gwî K çñ½ Kivrtgvmgæ e`vL`v Ki`b|
2. Zvr¶wYK teM ej tZ wK e¶Sb wPÎ mn e`vL`v Ki`b|
3. Zvr¶wYK Zj Y ej tZ wK e¶Sb wPÎ mn e`vL`v Ki`b|
4. K`vj Kçv¶mi mrvv¶h` MvZi wbtæ³ mgxKiY, wj cËZövr Ki`b|
 - i. $v = u + gt$
 - ii. $h = ut + \frac{1}{2} gt^2$
 - iii. $v^2 = u^2 + 2gh$
5. mgq-mi Y tj L t_¶K Mo teM I Zvr¶wYK teM wby¶qi c×wZ e`vL`v Ki`b|
6. teM-mgq tj L t_¶K Zvr¶wYK Zj Y wby¶q c×wZ e`vL`v Ki`b|
7. coš-e`z m¶, wj eYövr Ki`b Ges G, t j vi MvYwZK çövr Y e`vL`v Ki`b|
8. u te¶M Lvov Dçti i w`¶K wbt¶¶B e`z t¶¶T wbtæ³ i wkmgæ wby¶q Ki`b|
 - i. me¶aK D`PZv
 - ii. me¶aK D`PZvq tçövi mgq
 - iii. D`lv I cZtbi mgq
 - iv. fvgtZ wdti Avmvi mgq
9. Avtçw¶¶K teM wby¶qi MvYwZK Dccv`w eYövr I e`vL`v Ki`b|

N. MvYwZK mçm`v

1. GKw Mvwo w`i Ae`v t_¶K $4m/s^2$ mgZj tY hvîv i`i` Kij |

K. 9s ci MvwoUj teM KZ nte?

L. D^3 mgtq MvwoUj Mo teM KZ nte

M. 4 tm¶KtÛ MvwoU KZ `iZ; AwZµg Ki te|
2. GKw tUb NvUvq 40km te¶M Pj tQ| tUbwU¶K 30 tm¶KtÛ _vgrtZ ntj KZ g`tb Pvj vtZ nte|
3. 20gm f¶i i GKw e`zK Dci t_¶K tQto t`lqv ntjv| 5 tm¶KtÛ ci e`wUj teM KZ nte? AwZµvš` iZ; KZ nte?
4. GKw e`zK $98ms^{-1}$ te¶M Lvov Dçti i w`¶K wbt¶¶c Kiv ntjv| 5 tm¶KtÛ ci Gi teM KZ nte?
5. DaY¶vix GKw tej y t_¶K GKw e`ztQto t`lqv ntjv| e`wUj tdjvi mgq tej ywU fvg t_¶K 176m Dçti wQj | e`wUj 20 tm¶KtÛ fvgtZ tçövq| e`wUj tdj t`lqvi mgq tej tbi teM KZ wQj ?
6. wv` ¶ teM mæúæ` wj Mvwo hLb ci `ú¶i i w`¶K AM¶ni nq ZLb Giv cËZ tm¶KtÛ 10m wKueZ¶ nq| hLb Mvwo `wGKB `vb t_¶K GKB w`¶K MvZkxj nq ZLb cËZ tm¶KtÛ Gt`i ga`eZ¶` iZ; 2m nq| Mvwo `wUj teM KZ?