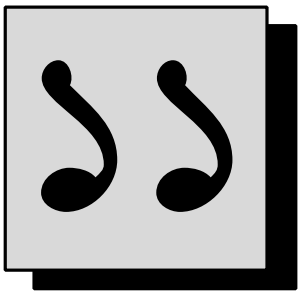


Zvc I M¨vm

fwgKv

mvavi YZ Zvc c‡qv‡M c`v_ cmwiZ nq Ges Zvc Acmvi‡Y c`v_ m¼ªZ nq| wKšzZvc c‡qv‡M c`v‡_i wZb Ae¯vi cmviY GKB iKg nq bv| GKB Zvcgv‡Îv ewµx‡Z KwVb I Zij c`v‡_i Zzjbvq M¨vmxq c`v‡_i cmviY A‡bK †ewk nq| KwVb c`v‡_i wb‡`ó AvKvi I AvqZb Av‡Q| ZvB Zvc c‡qvM Ki‡j KwVb c`v‡_i ^`N¨ cmviY, †¶Î cmviY I AvqZb cmviY N‡U| Zij I M¨vmxq c`v‡_i wb‡`ó AvKvi †bB| ZvB Zij I M¨v‡mi ïaygvÎ AvqZb cmviY N‡U| M¨v‡mi cmviY cv‡Îi cmvi‡Yi Zzjbvq A‡bK †ewk e‡j M¨v‡mi †¶‡Î cv‡Îi cmviY D‡c¶v Kiv hvq| wKšzZij c`v‡_i †¶‡Î cv‡Îi cmviY we‡ePbv Ki‡Z nq|

Avevi KwVb I Zij c`v‡_i cmvi‡Yi †¶‡Î Pv‡ci D‡ëv‡hvM¨ fwgKv †bB| wKšzM¨v‡mi †¶‡Î Pv‡ci ZviZ‡g¨ Zvcgv‡Îv I AvqZ‡bi cwieZb N‡U| M¨v‡mi wb‡`ó AvKvi †bB| wb‡`ó AvqZbI †bB| hLb †h cv‡Î ivLv nq ZLb †m cv‡Îi AvKvi I AvqZb jvf K‡i| wKšzewfb cv‡Î GKB cwigvY M¨v‡mi Pvc wewfb nq| ZvB M¨v‡mi AvPiY Av‡jvPbv Ki‡Z n‡j Zvcgv‡Îv, Pvc I AvqZb G wZbwU iwkB D‡ëv‡ Ki‡Z nq|

G BDwb‡U Avgiv M¨v‡mi mfv, Av`k M¨vm mgxKiY, M¨v‡mi MwZZË, Mo‡eM, MoeM‡eM, gj- Mo eM‡eM, AvYweK †eM e›Ub, MwZZË Abyw‡i M¨v‡mi Pvc, Mogy³ c_, ev®úPvc I Av`ZwgwZ m¤ú‡K Av‡jvPbv Ki‡ev|

cvV - 1
M¨v‡mi m~Î, e‡qj I Pvj©‡mi m~‡Îi mgš^bZ iƒc: Av`k© M¨vm mgxKiY|

D‡Ïk¨
G cvV †k‡l Avcwb -

- M¨v‡mi m~θ¸‡jv eY©bv Ki‡Z cvi‡eb,
- Av`k© M¨vm mgxKiY cÖZcv`b Ki‡Z cvi‡eb,
- mveRbxb M¨vm a"e‡Ki gvb wbY©q Ki‡Z cvi‡eb|

11.1.1 M¨v‡mi m~Î (Gas Laws)

M¨v‡mi Ae¯'v cKvk Kivi Rb¨ AvqZb, ZvcgvÎv I Pvc GB wZbwU iwki gvb D‡jøL Ki‡Z nq| GB wZbwU iwki †h †Kvb GKwU w¯'i _vK‡j Ab¨ `ywU iwki g‡a¨ m¤úK© wbawiZ nq| m¤úK©¸wj wbw`ó m~Î †g‡b P‡j| GB m~θwj‡K M¨v‡mi m~Î e‡j| wb‡¤œ m~θwj eY©bv Kiv n‡jv|

*(K) ZvcgvÎv w¯'i _vK‡j, wbw`ó f‡ii M¨v‡mi AvqZb I Pv‡ci m¤úK© **e‡q‡ji m~Î** bv‡g cwiwPZ|*

*(L) Pvc w¯'i _vK‡j wbw`ó f‡ii M¨v‡mi AvqZb I ZvcgvÎvi g‡a¨ m¤úK© **Pvj©‡mi m~Î** bv‡g cwiwPZ|*

*(M) AvqZb w¯'i _vK‡j wbw`ó f‡ii M¨v‡mi Pvc I ZvcgvÎvi g‡a¨ m¤úK© **Pv‡ci m~Î** bv‡g cwiwPZ| G m~θwU‡K †M-**jy¨mv‡Ki m~ÎI** ejv nq|*

(K) e‡q‡ji m~Î (Boyle's law) t *Bs‡iR weÁvbx ievU© e‡qj 1662 wLóv‡ã G m~ÎwU Avwe®‹vi K‡ib| Zvui bvgvbymv‡i G m~‡K e‡q‡ji m~Î ejv nq|*

m~Î *t w¯'i ZvcgvÎvq wbw`ó f‡ii M¨v‡mi AvqZb chy³ Pv‡ci e¨¯'vbycvwZK|*
hw` w¯'i ZvcgvÎvq wbw`ó f‡ii M¨v‡mi Pvc I AvqZb h_vµ‡g P *I* V *nq, Zvn‡j -*

$V \propto \frac{1}{P}$ ---------------- (1)

ev, $PV = k$ *(a"eK)* --------------------------- *(2)*

GLv‡b k *GKwU mgvbycvwZK a"eK hvi gvb M¨v‡mi fi I ZvcgvÎvi Dci wbf©i K‡i| hw`* $P_1, P_2$ *I* $P_3$ *Pv‡c wbw`ó f‡ii M¨v‡mi AvqZb h_vµ‡g* V_1, V_2 *I* V_3 *nq Zvn‡j -*

$P_1 V_1 = P_2 V_2 = P_3 V_3 =$ *a"eK (*K) ----------------------------*(3)*

(L) Pvj©m Gi m~Î (Charles' law) t *divmx weÁvbx Pvj©m 1787 wL÷v‡ã G m~ÎwU Avwe®‹vi K‡ib| Zvui bvgvbymv‡i G m~‡K Pvj©m Gi m~Î ejv nq|*

m~Î *t w¯'i Pv‡c †Kvb wbw`ó f‡ii M¨v‡mi AvqZb cÖwZ wWMÖx †mjwmqvm ZvcgvÎv e„w× ev n«v‡mi Rb¨* 0^0c *ZvcgvÎvi AvqZ‡bi* $\frac{1}{273}$ *Ask e„w× ev nªvm nq|*

g‡b Kwi, w¯'i Pv‡c wbw`ó f‡ii †Kvb M¨v‡mi AvqZb o°c *ZvcgvÎvq* V_o, θ_1°c *ZvcgvÎvq* V_1, θ_2°c *ZvcgvÎvq* V_2

∴ Pvjm Gi m‚Îvbymv‡i,

$$V_1 = V_0\left(1+\frac{\theta_1}{273}\right)$$

ev, $$V_1 = V_0\left(\frac{273+\theta_1}{273}\right)$$

ev, $$V_1 = V_0\frac{T_1}{273} \quad \text{---} (4)$$

GLv‡b T_1 = cig †¯‹‡j Zvcgv‡Îv = $(\theta_1{}^0 c + 273)$

Abyiƒcfv‡e,

Pvc AcwiewZZ †i‡L D³ M¨v‡mi Zvcgv‡Îv $\theta_2{}^0 C$ n‡j Gi AvqZb

$$V_2 = V_0\left(1+\frac{1}{273}\theta_2\right)$$

$$= V_0\left(\frac{273+\theta_2}{273}\right) = V_0\frac{T_2}{273} \quad \text{-------------------------------------}(5)$$

mgxKiY (4) †K (5) Øviv fvM K‡i cvIqv hvq,

$$\frac{V_1}{V_2} = \frac{T_1}{T_2}$$

ev, $$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

∴ $\frac{V}{T}$ = a"eK|

∴ $V \propto T$

A_vr Pvjm Gi m‚‡K wb¤œwjwLZfv‡e wee„Z Kiv hvq,

w¯'i Pv‡c wbw`©ó f‡ii M¨v‡mi AvqZb Gi cig Zvcgv‡Îi mgvbycvwZK|

†cÖkvi m‚Î t AvqZb w¯'i _vK‡j cÖwZ wWMÖx †mjwmqvm Zvcgv‡Îv e„w× ev nªv‡mi Rb¨ †Kvb wbw`©ó cwigvY M¨v‡mi Pvc 0^0 c Zvcgv‡Îvi Pv‡ci $\frac{1}{273}$ Ask h_vµ‡g e„w× ev nªvm cvq|

g‡b Kwi, w¯'i AvqZ‡b 0^0 c Zvcgv‡Îvq †Kvb wbw`©ó cwigvY M¨v‡mi Pvc = P_0 Ges $\theta_1{}^0$ c Zvcgv‡Îvq H M¨‡mi Pvc = P_1

Zvn‡j Pv‡ci m‚Îvbymv‡i,

$$P_1 = P_0\left(1+\frac{\theta_1}{273}\right)$$

$$= P_0\left(\frac{273+\theta_1}{273}\right)$$

ev, $P_1 = P_0 \frac{T_1}{273}$ [$\because T_1 = \theta_1 + 273$]

ev, $\frac{P_1}{T_1} = \frac{P_0}{273}$ -- (6)

Abyiƒcfv‡e AvqZb AcwiewZZ †i‡L D³ M¨v‡mi Zvcgvòv $\theta_2^{\,0}$ c n‡j Gi Pvc

$P_2 = P_0\left(1+\frac{1}{273}\theta_2\right) = P_0\left(\frac{273+\theta_2}{273}\right)$

ev, $P_2 = P_0 \frac{T_2}{273}$ [$\because T_2 = 273 + \theta_2$]

ev, $\frac{P_2}{T_2} = \frac{P_0}{273}$ -- (7)

mgxKiY (6) I (7) †_‡K †jLv hvq,

$\frac{P_1}{T_1} = \frac{P_2}{T_2}$

ev, $\frac{P}{T}$ = a"eK

$\therefore P \propto T$

AZGe, †iM&bvi Pv‡ci m~‡Î‡K wb¤œwjwLZ fv‡e wee„Z Kiv hvq:

AvqZb w¯’i _vK‡j †Kvb wbw`ó f‡ii M¨v‡mi Pvc Gi cig Zvcgvòvi mgvbycvwZK|

11.1.2 e‡qj I Pvj©‡mi m~‡Îi mgwbZ iƒc t Av`k© M¨vm mgxKiY

g‡b Kwi, †Kvb wbw`ó f‡ii M¨v‡mi AvqZb, Pvc I cig Zvcgvòv h_vµ‡g V, P I T |

e‡qj Gi m~Îvbymv‡i, $V \propto \frac{1}{P}$, (hLb T w¯’i _v‡K)

Pvj©m Gi m~Îvbymv‡i, $V \propto T$,(hLb P w¯’i _v‡K)

AZGe,

$V \propto \frac{T}{P}$, hLb me KqwU ivwk cwiewZZ nq|

ev, $V = K\frac{T}{P}$

ev, $\frac{PV}{T} = K$ --- (8)

ev, $PV = KT$ --- (9)

GLv‡b K GKwU a"e msL¨v hvi gvb M¨v‡mi fi I GK‡Ki Dci wbfikxj|

M¨v‡mi fi GK Mvg AYyev 1 mole n‡j G a"eK‡K R A¶i Øviv cKvk Kiv nq| G‡K M¨vm a"eK (gas constant) ejv nq|

†m‡¶‡Î mgxKiY(8)-†K †jLv hvq,

$\frac{PV}{T} = R$

ev, PV = RT ---------- (10)

GLv‡b V=1 mole M¨v‡mi AvqZb| wbw`ó Pvc I Zvcgv‡Îvq †h †Kvb M¨v‡mi 1 mole GKB AvqZb `Lj K‡i| ci¤¶v K‡i †`Lv †M‡Q †h, ¯'vfweK Zvcgv‡Îv I Pv‡c 1 mole M¨vm $22.4 \times 10^{-3}$ $m^3$ AvqZb `Lj K‡i|

1 mole M¨v‡mi †¶‡Î $\frac{PV}{T}$ Gi gvb mKj M¨v‡mi †¶‡Î mgvb nq| ZvB, $R = \frac{PV}{T}$ ‡K mveRbxb ev wekRbxb M¨vm a"eK (Universal gas constant) ejv nq|

hw` m f‡ii †Kvb M¨v‡mi AvqZb V Ges H M¨v‡mi AvYweK fi M nq, Zvn‡j 1 mole M¨v‡mi AvqZb n‡e $\frac{M}{m}V$

AZGe †m†¶‡Î

$P.\frac{M}{m} V = RT$

ev, $PV = \frac{m}{M} RT$

ev, PV = nRT ---------- (11)

[GLv‡b $n = \frac{\text{Mvdmi fi (m)}}{\text{AvYweK fi (M)}}$ = †gvj msL¨v

G mgxKiY e‡qj I Pvj‡mi m¤¢ii mgwbZ i¡c Ges G‡K Av`k M¨vm mgxKiY ejv nq|

11.1.3 t ¯'vfweK Zvcgv‡Îv I Pv‡c M¨vm a"eK, R Gi gvb wbYq

¯'vfweK Pvc, $P = 101325\ Nm^{-2}$

¯'vfweK Zvcgv‡Îv, T = 273.15 K

¯'vfweK Zvcgv‡Îv I Pv‡c 1 mole M¨v‡mi AvqZb = 22.4×10^{-3} m^3

∴ ¯'vfweK Zvcgv‡Îv I Pv‡c, V = 22.4×10^{-3} m^3 $mole^{-1}$

1 mole M¨v‡mi Rb¨ Av`k M¨vm mgxKiY, PV = RT

ev, $R = \frac{PV}{T}$

$$\therefore R = \frac{101325 \times 22.4 \times 10^{-3}}{273.15}$$

$$= 8.314\ J\ mol^{-1}\ k^{-1}$$

D`vniY

1| w¯i Zvcgvîvq 10^5 N m^{-2} Pv‡c wbw`ó f‡ii wKQyM¨v‡mi AvqZb 0.04 m^3

(K) 2×10^5 N m^{-2} Pv‡c M¨v‡mi AvqZb KZ n‡e (L) KZ Pv‡c M¨vmwUi AvqZb 0.08 m^3 n‡e ?

(K) ai‡Y hvwK, wb‡Yq AvqZb V_2

e‡qj Gi m¤ú~vbywµ‡i,

PV = a“eK,

A_vr $P_1 V_1 = P_2 V_2$ ---------- (1)

GLv‡b, P_1 = cv_wgK Pvc = 10^5 N m^{-2}

V_1 = cv_wgK AvqZb = 0.04 m^3

P_2 = Pyovš Pvc = 2×10^5 N m^{-2}

V_2 = Peovš AvqZb = ?

1 bs mgxKiY †_‡K †jLv hvq,

$$V_2 = \frac{P_1 V_1}{P_2}$$

$$= \frac{10^5 \times .04}{2 \times 10^5} = .02 \text{ m}^3$$

$$= 2\times 10^{-2} \text{ m}^3$$

(L) ai‡Y hvwK, wb‡Yq Pvc = P_2

e‡qj Gi m¤ú~vbywµ‡i, PV = a“eK|

A_vr $P_1 V_1 = P_2 V_2$

$\therefore 10^5 \times 0.04 = P_2 \times 0.08$

$$\therefore P_2 = \frac{10^5 \times 0.04}{0.08} = \frac{10^5}{2} = \frac{100000}{2} = 50000 = 5 \times 10^4 \text{ N m}^{-2}$$

Dt (K) 2×10^{-2} m^3

(L) 5×10^4 N m^{-2}

2| wQwc Awdvi GKwU †evZ‡j ¯vfweK Pv‡c 27^0 c Zvcgvîvq wKQyM¨vm Av‡Q| †evZ‡j i Zvcgvîv 57^0 c -G DbxZ Ki‡j M¨v‡mi Pvc KZ n‡e?

Avgiv Rwb, $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$

GLv‡b, $V_1 = V_2$ = †evZ‡j i AvqZb

P_1 = cv_wgK Pvc = 1.01325×10^5 N m^{-2}

T_1 = cv_wgK Zvcgvîv = (27 + 273)K = 300K

T_2 = Pgvš Zvcgv Îv = (57 + 273)K = 330K

P_2 wb‡Yq Pvc = ?

$\therefore \frac{P_1}{T_1} = \frac{P_2}{T_2}$

ev, $P_2 = \frac{P_1 T_2}{T_1}$

$= \frac{1.01325 \times 10^5 \times 330}{300}$ Nm^{-2}

$= 1.11457 \times 10^5$ $N\ m^{-2}$

Dt 1.11457×10^5 $N\ m^{-2}$

3| w¯i Pv‡c, 5×10^5 m^3 AvqZb wewkó K‡¶i Zvcgv Îv 27^0 c G DbxZ n‡j v| Gi AvqZ‡bi KZ Ask evZvm †ei n‡q hv‡e?

Avgiv Rwb,

$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$

GLv‡b, $P_1 = P_2$

$\therefore \frac{V_1}{T_1} = \frac{V_2}{T_2}$ ---------- (1)

GLv‡b,

V_1 = cv_wgK AvqZb = 5×10^5 m^3

T_1 = cv_wgK Zvcgv Îv = (27 + 273) = 300

T_2 = Pgvš Zvcgv Îv = (37 + 273) = 310

V_2 = Pgvš AvqZb = ?

1 bs mgxKiY †_‡K †jLv hvq,

$V_2 = \frac{V_1 \times T_2}{T_1} = \frac{5 \times 10^5 \times 310}{300} = 5.17 \times 10^5$ m^3

$\therefore V_2 - V_1 = 5.17 \times 10^5 - 5 \times 10^5$

$= 0.17 \times 10^5$

$\therefore \frac{V_2 - V_1}{V_1} = \frac{0.17 \times 10^5}{5 \times 10^5} = \frac{0.17}{5} = \frac{34}{1000}$

Dt $\frac{34}{1000}$ Ask|

mvims‡¶c

e‡qj Gi m~Î t w¯—i ZvcgvÎvq wbw`ó f‡ii M¨v‡mi AvqZb Gi Pv‡ci e¨¯—vbycvwZK|

$V \propto \frac{1}{P}$

Pvj©m Gi m~Î t w¯—i Pv‡c wbw`ó f‡ii M¨v‡mi AvqZb Gi cig ZvcgvÎvi mgvbycvwZK|

$V \propto T$

†ivbvi Pv‡ci m~Î t w¯—i AvqZ‡b wbw`ó f‡ii M¨v‡mi Pvc Gi cig ZvcgvÎvi mgvbycvwZK|

$P \propto T$

Av`k M¨vm mgxKiY t $PV = RT$

mveRbxb M¨vm a"eK R Gi gvb t $8.314 J mol^{-1} k^{-1}$

cv‡VvËi g~j¨vqb

K. ^be©¨w³K ck t mwVK DË‡ii cv‡k wUK wPý (√) w`b|

1| †Kvb M¨v‡mi AvqZb V, ZvcgvÎv T Ges Pvc P| Gi ZvcgvÎv AcwiewZZ _vK‡j $V \propto \frac{1}{P}$ mgxKiYwU †Kvb m~Î †_‡K cvIqv hvq?

(K) Pvj©‡mi m~Î (L) †iv‡bvi Pv‡ci m~Î
(M) e‡q‡ji m~Î (N) wbDU‡bi m~Î|

2| †Kvb M¨v‡mi AvqZb V, ZvcgvÎv T Ges Pvc P| Gi Pvc AcwiewZZ _vK‡j $V \propto T$ mgxKiYwU †Kvb m~Î †_‡K cvIqv hvq ?

(K) e‡q‡ji m~Î (L) Pvj©‡mi m~Î
(M) Wvë‡bi m~Î (N) mgbq m~Î

3| †Kvb M¨v‡mi AvqZb V, ZvcgvÎv T Ges Pvc P| Gi AvqZb w¯—i _vK‡j $P \propto T$ mgxKiYwU †Kvb m~Î †_‡K cvIqv hvq?

(K) A¨v‡fvM¨v‡Wvi m~Î (L) †iv‡bvi Pv‡ci m~Î
(M) e‡q‡ji m~Î (N) Pvj©‡mi m~Î

4| mveRbxb M¨vm a"eK, R Gi gvb †KvbwU ?

(K) $8.234 J mole^{-1} K^{-1}$ (L) $8.341 J mole^{-1} K^{-1}$
(M) $8.314 J mole^{-1} K^{-1}$ (N) $8.413 J mole^{-1} K^{-1}$

L. msw¶ß ck

1| e‡qj Gi m~ÎwU eYbv Ki"b|
2| Pvj©m Gi m~ÎwU eYbv Ki"b|
3| †ivbvi Pv‡ci m~ÎwU eYbv Ki"b|
4| Av`k M¨vm mgxKiYwU wjLyb|
5| mveRbxb M¨vm a"e‡Ki gvb wjLyb|

cvV 2
M¨v‡mi MwZZË, Mo‡eM, Mo eM‡eM, g~j Mo eM‡eM, AvYweK †eM e›Ub|

D‡Ïk¨
G cvV †k‡l Avcwb
- M¨v‡mi MwZZ‡Ëi †gšwjK ¯^xKvh¸wj eYbv Ki‡Z cvi‡eb,
- Mo ‡eM, Mo eM ‡eM I g~j Mo eM‡eM e¨vL¨v Ki‡Z cvi‡eb,
- AvYweK †eM e›Ub m¤‡Ü ej‡Z cvi‡eb|

welq e¯‘
11.2.1 M¨v‡mi MwZZ‡Ëi †gšwjK ¯^xKvh
M¨v‡mi MwZZË KZ¸wj †gšwjK ¯^xKv‡hi Dci cwZwôZ| 1857 wL÷v‡ã Kwmqvm c_g GB ¯^xKvh¸wj eYbv K‡ib | ¯^xKvh¸wj wb‡P D‡ল্লখ Kiv n‡jv|

(1) c‡Z¨K M¨vm AmsL¨ ¶z`ª ¶z`ª AYy mgb‡q MwVZ| †Kvb GKwU M¨v‡mi mKj AYyGKB iKg; wewfbœ M¨v‡mi AYywewfbœ| AYy‡jv GK ev GKwaK cigvYywb‡q MwVZ|

(2) M¨vm AYy¸wj n‡"Q fiwe›`yev fiKYv (Point mass)| G‡`i AvqZb M¨vm cv‡Îi AvqZ‡bi Zzjbvq AZ¨š bMb¨| AYy¸wji AvKvi G‡`i ga¨Kvi `yi‡Zi Zzjbvq bMb¨|

(3) M¨v‡mi AYy¸wj m¤ú~Y© ¯^vaxb, Z¯^vcK `p †MvjK Ges G†`i g‡a¨ †Kvb AvKlY ev weKlY ej †bB|

(4) AYy¸wj wew¶ßfv‡e QyvQywU Ki‡Q| G‡`i †e‡Mi gvb wewfbœ|

(5) AYy¸wj ci¯ú‡ii mv‡_ Ges cv‡Îi †`qv‡ji mv‡\_ av°v Lvq| msN‡li ga¨eZx mg‡q AYy¸wj mg‡e‡M mij‡iLvq P‡j| msNlKvj LyeB mvgvb¨| `yU msN‡li ga¨eZx mg‡q GKwU AYy†h `~iZ AwZµg K‡i Zv‡K gy³ c_ e‡j|

(6) †h‡nZzAYy¸wj m¤ú~Y© ¯^vaxb Z¯^vcK †MvjK Giv wbDU‡bi MwZm~Î †g‡b P‡j| ZvB msN‡li c‡e I c‡i G‡`i fi‡eM I MwZkw³ msiw¶Z \_v‡K| cv‡Îi †`qv‡ji mv‡_ AYy¸wji av°vi `i"bB Pv‡ci m„ó nq|

†h me M¨vm Dc‡iv³ ¯^xKvh¸wj †g‡b P‡j †m me M¨vm‡K Av`k M¨vm ejv nq| wKšzme‡¶‡Î ev¯e M¨v‡mi AvPiY Dc‡iv³ wbqgvbyhvqx nq bv|

11.2.2 t Mo‡eM I g~j Mo eM‡eM (Mean Velocity, and Root Mean Square Velocity)
aiv hvK, wbw`ó AvqZ‡bi GKwU Ave× cv‡Î GKwU M¨vm ivLv Av‡Q; M¨vm AYyi msL¨v N Ges †Kvb gyn~‡Z AYy¸wji †eM h_vµ‡g $C_1, C_2, \ldots\ldots\ldots, C_N$ *, Zvn‡j M¨vm AYy¸wji*

*Mo‡eM (*Mean Velocity*)* $= \bar{C} = \dfrac{C_1+C_2+\ldots\ldots+C_N}{N}$

MoeM‡eM *t †Kvb M¨v‡mi me AYyi †e‡Mi e‡Mi Mo‡K Mo eM‡eM (*Mean Square Velocity*) ejv nq|*

AZGe, Mo eM‡eM = $\bar{c}^2 = \dfrac{C_1^2+C_2^2+\ldots\ldots+C_N^2}{N}$

g~j Mo eM †eM (Root Mean Square Velocity) *ev ms‡¶‡c* R.M.S. *†eM t Mo eM‡e‡Mi eMg~‡K g~j Mo eM‡eM ev* R.M.S. *†eM e‡j|*

G‡K hw` C Øviv cKvk Kiv nq Zvn‡j

gj- Mo eM‡eM, $C = \sqrt{\bar{c}^2} = \sqrt{\frac{C_1^2+C_2^2+.....+C_N^2}{N}}$

gj- Mo eM‡eM I Mo‡eM Gi gvb mgvb bq| wb‡P GKwU †QvU wnmv‡ei mvnv‡h¨ Zv †`Lv‡bv n‡jv|

aiv hvK, wZbwU AYy †eM $h_v\mu‡g$ 5 ms $^{-1}$, 10 ms $^{-1}$ I 15 ms $^{-1}$

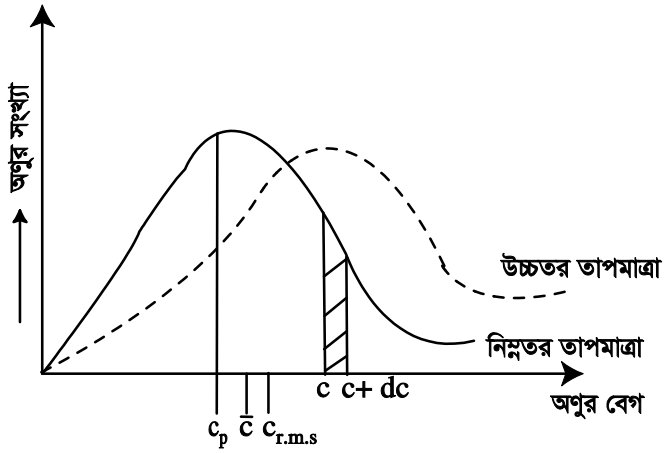
AZGe, G‡`i Mo‡eM = $\frac{5+10+15}{3}$ = 10 ms $^{-1}$

AYy gj- Mo eM‡eM = $\sqrt{\frac{5^2+10^2+15^2}{3}}$ = 10.8 ms^{-1}

M¨v‡mi MwZZ‡Ë Mo‡e‡Mi e¨envi †bB| ïaygvÎ gj- Mo eM‡eM (R.M.S. †eM) e¨eüZ nq|

11.2.3 t AvYweK †eM e›Ub

M¨v‡mi AYywj wewfb †e‡M wewfb w`‡K MwZkxj _v‡K| d‡j ci¯úi mv‡_ I cv‡Îi †`qv‡ji Mv‡q msNl NU‡Q | ¯vfweK Pv‡c I K¶ZvcgvÎvq cwZ Nb wgUvi M¨v‡m M¨vm AYywji g‡a¨ msNl msL¨v cwZ †m‡K‡Û cvq 10^9; msN‡li Kvi‡Y AYy †e‡Mi gvb I w`K cwieZb nq| †Rgm KvK g¨v·I‡qj M¨vm AYy we¶ß MwZ we‡ePbv K‡i AmsL¨ M¨vm AYy g‡a¨ m¤ve¨ †eM e›U‡bi MwYwZK m~Î c`vb K‡ib| cieZxKv‡j Rvgvb c`v_we` A‡Uv óvb g¨v·I‡q‡ji GB †eM e›Ub m~Î cix¶vi mvnv‡h¨ cgvY K‡ib| Zvi cix¶vjä djvdj g¨v·I‡q‡j wnmv‡ei mv‡_ PgrKvi fv‡e wg‡j hvq|



wPÎ 11.1

g¨v·I‡q‡ji †eM e›Ub m~Îvbyqvwqx Aw¼Z †jLwPÎ 11.1 bs wP‡Îi g‡Zv| AYy †eM e›Ub AYy fi I Zvcgv Îvi Dci wbfi K‡i| †Kvb wb`ó Zvcgv Îvq AYy fi hZ Kg n‡e AwaK †eM m¤úb AYy msL¨v ZZ †ekx n‡e| GKB Zvcgv Îvq wewfb M¨v‡mi AYy MwZkw³ mgvb| AZGe nvév AYywji gj-Mo eM‡eM fvix AYywji gj- Mo eM‡eM A‡c¶v †ewk n‡e|

†h †e‡M AYymsL¨v me‡P‡q †ewk †m †eM‡K ejv nq mewaK m¤ve¨ †eM (Most Probable Velocity) G‡K C_p Øviv cKvk Kiv nq| GB †e‡Mi ‡P‡q AwaKZi †e‡Mi AYy msL¨v k‡b¨i w`‡K Kg‡Z _v‡K| Mo‡eM mewaK m¤ve¨ †eM A‡c¶v wKQyJ ewk| Avevi gj- Mo eM‡eM Mo‡eM t_‡K †ewk nq|

†eM C I C+ d C-Gi ga¨eZx gvb wewkó AYywji msL¨v GB `yB we›`yZ j¤Ø‡qi g‡a¨ †jLwPÎ wb¤¯ Gjv‡Kvi †¶Îd‡ji mgvb| (11bs wP‡Î Qvqve¨Z AÂj Øviv t`Lv‡bv n‡q‡Q)|

mvims‡¶c

M¨v‡mi MwZZË KZ¸wj †gŠwjK ¯xKv‡hi Dci cwZwôZ|

MwZZ‡Ë M¨vm AYyi gj Mo eM‡eM (R.M.S. ‡eM) M¨vm AYy MwZ‡e‡Mi Mo wn‡m‡e e¨eüZ nq|

gj Mo eM‡eM t Mo eM‡e‡Mi eMgj‡K gj Mo eM‡eM ejv nq| A_vr gj Mo eM‡eM,

$$C = \sqrt{\frac{C_1^2 + C_2^2 + \dots\dots\dots\dots + C_N^2}{N}}$$

wecy msL¨K M¨vm AYy we¶ß MwZ we‡ePbv K‡i g¨v·I‡qj †h e›Ub m~Î c`vb K‡ib m~ÎwU‡K g¨v·I‡q‡j i †eM e›Ub m~Î ejv nq|

cv‡VvË‡i gj¨vqb

K. ^be¨w³K ck t mwVK DË‡ii cv‡k wUK wPý (√) w`b|

1| †Kvb M¨v‡mi 3 wU AYy †eM h_vµ‡g- 10, 15, 20 ms^{-1} | G‡`i †e‡Mi Mo †eM †KvbwU

(K) 15.5 ms^{-1} (L) 15 ms^{-1}

(M) 16 ms^{-1} N) 10 ms^{-1}

2| †Kvb M¨v‡mi cvPwU AYy †eM h_vµ‡g 5ms^{-1} , 6ms^{-1} , 7ms^{-1} , 8ms^{-1} , 9 ms^{-1} G‡`i gj MoeM‡eM †KvbwU?

(K) 7 ms^{-1} (L) 8ms^{-1}

(M) 7.14 ms^{-1} (N) 7.5 ms^{-1}

L. msw¶ß ck

1| †eM Gi msÁv wjLyb|

2| gj Mo eM‡eM Gi msÁv wjLyb|

iPbvgjK ck

1| M¨v‡mi MwZZ‡Ëi †gŠwjK ¯xKvh¸wj wjLyb|

2| AvYweK †eM m~wU eYbv Ki“b|

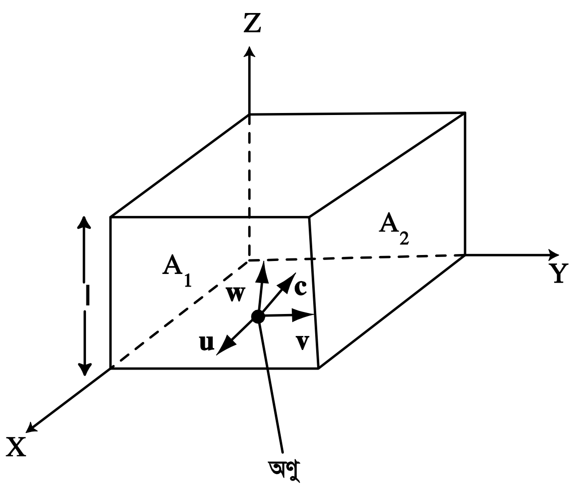
cvV- 3
MwZZË Abyœvb‡i M¨v‡mi Pvc, Zvcgvlv I AYyi gš— Mo eM©e‡Mi g‡a¨ m¤úK

D‡Ïk¨
G cvV †k‡l Avcwb -

- M¨v‡mi MwZZ‡Ëi mvnv‡h¨ †Kvb wbw`ó cwigvY M¨v‡mi Pvc I M¨vm AYyi gš— Mo eM©e‡Mi g‡a¨ m¤úK cwZcv`b Ki‡Z cvi‡eb|
- Zvcgvlv I AYyi gš— Mo eM©e‡Mi g‡a¨ m¤úK cwZôv Ki‡Z cvi‡eb|

wel qe¯‘
11.3.1 t MwZZË Abyœvb‡i M¨v‡mi Pvc

aiv hvK, GKwU NbKvKwZ.i cv‡Îi g‡a¨ †Kvb M¨vm ivLv n‡q‡Q Ges cv‡Îi †`qvj m¤úY©fv‡e w¯wZ¯vcK I Gi cwZwU cv‡ki ˆ`N¨ l, cv‡Îi `ÿ †`qvj X A‡¶i mv‡_ j¤fv‡e, `ÿ †`qvj Y A‡¶i mv‡_ I `ÿ ‡`qvj Z A‡¶i mv‡_ j¤fv‡e Aew¯Z|



wPÎ 11.2

aiv hvK, X A‡¶i mv‡_ j¤fv‡e Aew¯Z `yÕ ‡`qvj A_1 I A_2| cv‡Îi g‡a¨ C_1 ‡eM wewkó GKwU AYyaiv n‡jv X, Y I Z A¶ eivei †e‡Mi †gvU Dcvsk h_vµ‡g u_1, v_1 w_1 |

g‡b Kiv hvK, AYywU A_1 †`qv‡j av°v †Lj| AYyi fi m n‡j AYywU $mu_1$ fi‡eM av°v L‡e Ges msNl¸wj w¯wZ¯vcK e‡j GKB fi‡eM wecixZ w`‡K wd‡i hv‡e| d‡j Gi fi‡eM n‡e - mu_1

AZGe, AYywUi fi‡e‡Mi cwieZb = $-mu_1 - (mu_1) = -2mu_1$ | A_1 ‡`qv‡j av°v †L‡q AYywU $\frac{l}{u_1}$ mg‡q $A_2$ †`qv‡j †cŠQv‡e| A_2 †`qv‡j av°v †L‡q cybivq $A_1$ †`qv‡j wd‡i Avm‡e| hw` Ab¨ †Kvb AYyi mv‡_ msN‡l wjß bv nq Zvn‡j A_1 †_‡K Avevi A_1 G wd‡i Avm‡Z AYywUi mgq jvM‡e $\frac{2l}{u_1}$ |

Zvn‡j cwZ †m‡K‡Û A_1 †`qv‡j msNl msL¨v $\frac{u_1}{2l}$ | †h‡nZzGKwU msN‡l AYywUi fi‡e‡Mi cwieZb = $-2mu_1$.

$\frac{u_1}{2l}$ msN‡l A_vr 1 †m‡KÛ H AYywUi fi‡e‡Mi cwieZb = $-2mu_1 \times \frac{u_1}{2l} = -\frac{m^2u_1}{l}$

wKšZwbDU‡bi wØZxq MwZ m~Î Abyhvqx‡i GK †m‡K‡Û fi‡e‡Mi cwieZb chÿ e‡ji mgvb| A_vr D³ AYywUi Dci †`qvj KZK.chÿ ej = $\frac{-mu_1{}^2}{l}$ | wbDU‡bi ZZxq m~Î Abyhvqx‡i H AYyi GKB cwigvY ej †`qv‡ji Dci wecixZ w`‡K c‡qvM K‡i| AZGe, AYywU Øviv $A_1$ †`qv‡j chÿ ej + $\frac{mu_1{}^2}{l}$

∴ F_x n‡j M¨v‡mi me AYyKZK. A_1 Z‡j chÿ ej,

$$F_x = \frac{m}{l}(u_1{}^2 + u_2{}^2 + ... + u^2{}_N)$$

GLv‡b u_1 , u_2 BZ¨w` 1, 2 BZ¨w` AYyi †e‡Mi X Dcvsk|

Avgiv Rwb, Pvc = GKK †¶Î‡dj Dci chÿ ej = $\frac{ej}{†¶Îdj}$

∴ l^2 †¶Îdj wewkó A_1 †`qv‡j Pvc,

$$P_x = \frac{F_x}{l^2} = \frac{m}{l^2 \times l}(u_1{}^2 + u_2{}^2 + ... + u_N{}^2)$$

ev, $P_x = \frac{Nm\bar{u}2}{l^3}$ .... (1)

GLv‡b, $\overline{u^2}$ = AYyi Mo eM‡eM

$$= \frac{u_1{}^2 + u_2{}^2 + ... + u^2N}{N}$$

ev, $N\overline{u^2} = u_1{}^2 + u_2{}^2 + ... + u^2 N$

wc_v‡Mviv‡mi m‡Îi mvnv‡h¨ †`Lv‡bv hvq †h, †h †Kvb AYyi Rb¨ $c^2 = u^2 + v^2 + w^2$

∴ Mo eM‡e‡Mi Rb¨ $\overline{c^2} = \overline{u^2} + \overline{v^2} + \overline{\omega^2}$

†h‡nZz N GKwU eo msL¨v Ges AYy¸wj PZw`‡K BZ¯ZZ Nyi‡Q †eovq, Avgiv ej‡Z cwi †h,

$\overline{u^2} = \overline{v^2} = \overline{\omega^2}$ A_vr $\overline{c^2} = 3\overline{u^2}$

Ges $P_x = P_y = P_z = P$ (aiv hvK)

$$\overline{c^2} = 3\overline{u^2}$$

$\therefore \; \bar{v^2} = \frac{\bar{c^2}}{3}$

$\therefore$ *1 bs mgxKiY‡K †jLv hvq*

$$P = \frac{Nm\bar{c^2}}{3l^3}$$

wKšÍ l^3 = *cv‡Îi AvqZb =* M^3 *M¨v‡mi AvqZb =* V

$$\therefore \; P = \frac{Nm\bar{c^2}}{3v}$$

ev, $PV = \frac{1}{3} Nm\bar{c^2}$ ---------- *(2)*

hw` cv‡Îi AvqZb GKK ($1m^3$*) aiv nq, Zvn‡j †jLv hvq,*

$P = \frac{1}{3} Nm\bar{c^2}$ ---------- *(3)*

mgxKiY (2) †_‡K †jLv hvq

$$P = \frac{1}{3}\frac{Nm}{v}\bar{c^2}$$

ev, $P = \frac{1}{3}\rho\bar{c^2}$ ---------- *(4) [GLv‡b* Nm *= †gvU fi,* $\frac{Nm}{V} = \rho$ *= NbZ]*

ev, $\bar{c^2} = \frac{3P}{\rho}$ ---------- *(5)*

$\bar{c^2}$ *Gi eMgfy‡K ms‡¶‡c* $C_{r.m.s}$ *ev ïaycÖviv cKvk Kiv hvq|*

$$\sqrt{\bar{c^2}} = C = \sqrt{\frac{3p}{\rho}}$$ ---------- *(6)*

GwUB AYyg gfy Mo eM‡e‡Mi mv‡_ Pv‡ci m¤úK|

11.3.2 t ZvcgvÎv I AYyg¡- Mo eM‡e‡Mi g‡a¨ m¤úK

M¨v‡mi Pvc I AYyg¡- Mo eM‡e‡Mi g‡a¨ m¤úwKZ mgxKiYwU

$$P = \frac{1}{3}\rho \bar{c^2}$$

Dfq cv‡k V Øviv ¸Y K‡i cvB

$$PV = \frac{1}{3} V\rho \bar{c^2}$$

ev, $PV = \frac{1}{3} Nm \bar{c^2}$ $(\because \rho r = \frac{Nm}{V})$

hw` M¨v‡mi g‡a¨ n msL¨K †gvj _v‡K Ges AvYweK f i M nq Zvn‡j

$$PV = \frac{1}{3} nM \bar{c^2} \quad (\because n = \frac{Nm}{M})$$

Avevi $PV = nRT$

$$\therefore nRT = \frac{1}{3} nM \bar{c^2}$$

ev, $\frac{1}{3} M \bar{c^2}) = RT$

ev, $\bar{c^2} = \frac{3RT}{M}$ ---------- (7)

ev, $C_{r.m.s} = C = \sqrt{\frac{3RT}{M}}$

†h‡nZz M I R a“eK

$C \propto \sqrt{T}$ ---------- (8)

ev, $\bar{c^2} \propto T$ ---------- (9)

A_vr M¨vm AYy Mo eM‡eM M¨v‡mi cig ZvcgvÎvi mgvbycwZK| ZvcgvÎv e„× †c‡j AYyjwi Mo eM‡eM e„× cvq|

7 bs mgxKiY †_‡K wjL‡Z cwi,

$\frac{1}{2} MC^2 = \frac{3}{2} RT$

$\frac{1}{2} MC^2$ n‡”Q T cig ZvcgvÎvq cwZ †gvj M¨v‡mi MwZkw³ G‡K E Øviv cKvk Kiv nq|

A_vr T cig ZvcgvÎvq cwZ †gvj M¨v‡mi MwZkw³ $E = \frac{3}{2} RT$

cwZ †gvj M¨v‡m AYy msL¨v‡K Av¨v‡fvMv‡Wvi msL¨v (N_A) e‡j| $N_A = 6.02 \times 10^{23}$

AZGe, M¨v‡mi cwZ AYy Mo MwZ kw³

$\frac{E}{N_A} = \frac{3}{2}\frac{R}{N_A}T = \frac{3}{2}kT$ [GLv‡b $k = \frac{R}{N_A}$]

k †K †evëRg¨v‡bi a“eK ejv nq| Gi gvb = 1.38×10^{-23} J K^{-1}

AZGe, M¨vm AYy Mo MwZkw³ Gi cig Zvcgv‡Îvi mgvbycwZK| MwZZË Abyôv‡i Zvcgv‡Îv M¨vm AYy Mo MwZkw³ wb‡`k K‡i|

D`vniY

1| ¯vfweK Zvcgv‡Îv I Pv‡c †Kvb M¨v‡mi NbZ 0.09 kg m^{-3} n‡j H M¨v‡mi AYyjvi gvÎ Mo eM‡eM wbYq Ki“b|

Avgiv Rwb, M¨v‡mi AYyjvi gvÎ Mo eM‡eM $C = \sqrt{\frac{3P}{\rho}}$

GLv‡b P = ¯vfweK Pvc = 1.01325×10^5 Nm^{-2}

ρ = M¨v‡mi NbZ = 0.09 kg m^{-3}

∴ gvÎ Mo eM‡eM, $C = \sqrt{\frac{3 \times 1.01325 \times 10^5}{0.09}}$

$= 18.37 \times 10^2$ ms^{-1}

Dt 18.37×10^2 ms^{-1}

2| 0^0 c Zvcgv‡Îvq Aw·‡R‡bi gvÎ Mo eM‡eM wbYq Ki“b|

Avgiv Rwb, gvÎ Mo eM‡eM, $C = \sqrt{\frac{3RT}{M}}$

GLv‡b, R = 8.31 J $mole^{-1}$ k^{-1}

T = 273 k

M = 32 g = 32×10^{-3} kg

∴ gvÎ Mo eM‡eM, $C = \sqrt{\frac{3 \times 8.31 \times 273}{32 \times 10^{-3}}}$

$= \sqrt{212684}$ ms^{-1}

$= 461$ ms^{-1}

Dt 461 ms^{-1}

3| 30^0 c Zvcgv‡Îvq 2 gm bvB‡Uv‡R‡bi †gvU MwZkw³ wbYq Ki“b|

Avgiv Rwb, cwZ †gvj M¨v‡mi MwZkw³ = $\frac{3}{2}$ RT

∴ n msL¨K †gv‡ji MwZkw³ = $\frac{3}{2}$ nRT

$= \frac{3}{2}\frac{m}{M}$ RT [∵ $n = \frac{m}{M}$]

$= \frac{3 \times 2}{2 \times 28} \times 8.31 \times 303$ [∵ T = (273+30)k = 303k]

= 269.78 J

Dt 269.78 J

mvi ms‡¶c

MwZZË Abyôvi M¨v‡mi Pvc, $P = \frac{1}{2}\rho \bar{c^2}$

GLv‡b, ρ = M¨v‡mi NbZ

$\bar{c^2}$ = AYyi Mo eM‡eM

$C = \sqrt{\frac{3RT}{M}}$

GLv‡b M I R a“eK

$\therefore C \propto \sqrt{T}$

A_vr M¨vm AYyi g‡a¨ Mo eM‡eM cig Zvcgvîvi eMg‡ji mgvbycvwZK|

M¨v‡mi cwZ AYyi Mo MwZkw³ = $\frac{3}{2}$ KT

cv‡VwËi g‡a¨¨vqb

1| M¨v‡mi Pv‡ci mv‡_ M¨vm AYyi Mo eM‡e‡Mi m¤úK© wb‡Pi †KvbwU ?

(K) $P = \frac{2}{3}\ Rc^{\bar{2}}$ (U) $P = \frac{1}{3}\ nc^{\bar{2}}$

(M) $P = \frac{1}{3}\ \rho c^{\bar{2}}$ (M) $P = \frac{3c^{\bar{2}}R}{K}$

2| wb‡Pi †KvbwU M¨v‡mi Zvcgvîv I M¨vm AYyi g‡a¨ Mo eM‡e‡Mi mv‡_ m¤úK©?

(K) $C = \frac{3RT}{M}$ (L) $C = \sqrt{\frac{3RT}{M}}$

(M) $C = \frac{3}{2}\ RT$ (N) $C = \frac{1}{2}\ KT$

3| M¨v‡mi cwZ AYyi Mo MwZkw³ KZ?

(K) $\frac{1}{2}$ kT (L) $\frac{3}{2}$ RT

(M) $\frac{1}{2}$ RT (N) $\frac{3}{2}$ kT

4| Zvcgvîv e¨w³× †c‡j AYyw³i Mo eM‡e‡Mi †¶‡Î †KvbwU N‡U?

(K) nvm cvq (L) e¨w³× cvq

(M) Acwiewa _v‡K (N) mvgvb¨ nvm cvq

cvV 4
Mo gy³ c_, f¨vbÛvi Iqvjm mgxKiY, evDbxq MwZ

D‡Ïk¨

G cvV †k‡l Avcwb -

- M¨v‡mi Mogy³ c_ m¤ú‡K aviYv w`‡Z cvi‡eb,
- M¨v‡mi f¨vbWvi Iqvjm mgxKiY wjL‡Z cvi‡eb,
- evDbxq MwZ eYbv Ki‡Z cvi‡eb|

11.4.1 Mo gy³ c_ (Mean Free Path)

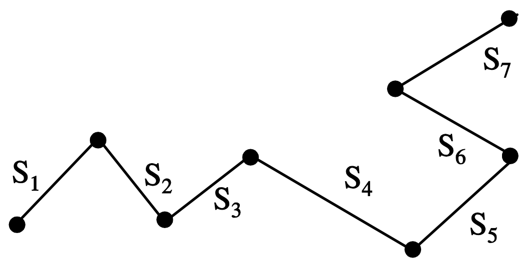
MwZZË Abyhvqx M¨v‡mi AYy¸wj memgq ci¯ú‡ii mv‡_ Ges cv‡Îi †`qv‡ji mv‡\_ av°v Lvq| cici `yevi msN‡l©i g‡a¨ AYy¸wj mij‡iLv eivei P‡j| cici `yevi msN‡l©i ga¨eZx `~iZ‡K ôgy³ c_' e‡j| †Kvb AYyi gy³ c_¸wj mgvb nq bv| ZvB Mo gy³ c_ wbYq Ki‡Z nq| gy³ c‡_i `~iZ¸wji Mo wb‡j †h gvb cvIqv hvq Zv‡KB Mo gy³ c_ e‡j|

Mogy³ c‡_i msÁv t †Kvb AYyi cici `yevi msN‡l©i ga¨eZx `~iZ¸wji Mo wb‡j `~i‡Zi †h gvb cvIqv hvq Zv‡KB Mo gy³ c\_ e‡j| hw` †Kvb Abyn msL¨K msN‡l©i gva¨‡g †gvU S `~iZ AwZµg K‡i Zvn‡j,

Mogy³ c_, $\lambda = \frac{S}{n}$

ev, $\lambda = \frac{S_1 + S_2 + S_3 + \ldots\ldots\ldots\ldots\ldots\ldots + S_n}{n}$

GLv‡b wewfbœ msN‡l©i g‡a¨ AwZµvš— `~iZ‡K $S_1$, $S_2$, $S_3$, --- BZ¨vw` aiv nq|



wPÎ 11.3

11.4.2 t f¨vbWvi Iqvjm mgxKiY

wewfbœ weÁvbx cix¶v K‡i †`‡L‡Qb †h, cKZ.M¨vm me mgq Av`k M¨vm mgxKiY PV=RT †g‡b P‡j bv| ZvQvov e‡qj Zvi cix¶vq j¶¨ K‡i‡Qb †h, ïaygvÎ D”PZvcgvÎvq I wb¤œPv‡c ev¯—e M¨vm Zvi m~Î †g‡b P‡j|

MwZZ‡Ëi ¯^xKvh¸wj‡Z a‡i †bqv n‡q‡Q †h, M¨v‡mi AYy¸wji AvqZb bMb¨ Ges msNl© e¨ZxZ M¨vm AYy¸wji g‡a¨ †Kvb AvKl©Y ej wµqv K‡i bv| f¨vbWvi Iqvjm G `yÕwU ¯^xKvh ms‡kvab K‡i ev¯—e M¨v‡mi †¶‡Î GKwU mgxKiY cwZôv K‡ib|

cKZc‡¶ M¨vm AYy¸wj ci¯úi‡K AvKl©Y K‡i| cv‡Îi Af¨š—‡i †h AYy¸wj Ae¯'vb K‡i Zviv mgfv‡e PZzw`©‡K AvKwl©Z nq e‡j jwä ej kyb¨ nq| wKš'z †h AYy¸‡jv †`qv‡ji KvQvKvwQ _v‡K, †`qv‡ji w`‡K mgfv‡e AvKl©Y Kivi AYy¸‡jvB e‡j Zviv †`qv‡ji wecixZ w`‡Ki AYy¸‡jvi AvKwl©Z n‡e| A_vr cKZ. Pvc `yc Pvc A‡c¶v †ewk n‡e| cvß Pvc P Ges AvKl©YRwbZ e‡ji `i"b Pvc nvm P_1 n‡j, cKZ.Pvc n‡e $P+P_1$

f¨vbWvi Iqvj‡mi g‡Z G AwZwi³ Pvc M¨v‡mi Nb‡Zi e‡Mi mgvbycvwZK ev M¨v‡mi AvqZ‡bi e‡Mi e¨¯—vbycvwZK|

$$\therefore P_1 \propto \rho^2 \propto \frac{1}{V^2}$$

ev, $P_1 = \frac{a}{V^2}$, GLv‡b a a“eK|

cKZ.Pv‡ci gvb = $(P + \frac{a}{V^2})$ GLv‡b a = a“eK|

M¨v‡mi MwZZ‡Ë a‡i †bqv nq †h, M¨v‡mi AYy¸wji AvqZb AZ¨š bMb¨| wKšzwb¤ ZvcgvÎvq I D”PPv‡c M¨v‡mi AvqZb D‡c¶bxq bq| d‡j M¨v‡mi KvhKi AvqZb, M¨vm cv‡Îi AvqZb V A‡c¶v wKQyKg n‡e| AvqZb nvm‡K b Øviv cKvk Ki‡j M¨vm AYy¸i Pjv‡divi Rb¨ cKZ.AvqZb nq (V-b)|

AZGe, 1 mole M¨v‡mi Rb¨ ev¯—e M¨v‡mi mgxKiY $(P + \frac{a}{V^2})(v - b) = RT$

GwUB f¨vb Wvi Iqvjm mgxKiY|

11.4.3 t evDbxq MwZ t kw³kvjx AYyexÿ¶Y h‡šši mvnv‡h¨ †Kvb Zi‡j ¶z`ª KYvi Zvcxq MwZ †`L‡Z cvIqv hvq| 1827 wLÖó‡ã Bs‡iR weÁvbx ievU evDb AYyexÿ¶Y h‡šši mvnv‡h¨ Dw™‡`i Af¨šixY MVb cix¶vi mgq GwU c_g j¶¨ K‡ib| ZvB Zvi bvgvbymv‡i GB MwZ‡K **evDbxq MwZ** ejv nq|

wewfb weÁvbxi cix¶vjä djvd‡j evDbxq MwZi wb¤wjwLZ ˆewkó¨¸wj cwijw¶Z nq|

(1) ZvcgvÎv e„w× †c‡j KYv¸wji MwZ e„w× cvq|

(2) KYv¸wj hZ †QvU nq Zv‡`i MwZ ZZ †ekx nq|

(3) Zi‡ji mv›`Zv (Viscosity) hZ Kg nq KYv¸wji MwZ ZZ e„w× cvq|

(4) evDbxq MwZ AwbqwgZ, Awew”Qb, G‡jv‡g‡jv I wewP¶ß|

(5) cv‡Îi bovPovi Dci KYv¸wji MwZ wbfikxj bq|

mvi ms‡¶c

Mogy³ c‡_i msÁv t †Kvb AYy cici `yBwU msN‡li ga¨eZx `~iZ¸wji Mo wb‡j `~i‡Zi †h gvb cvIqv hvq Zv‡KB Mogy³ c_ e‡j|

f¨vbWvi Iqvjm mgxKiY t $(P + \frac{a}{V^2})(v - b) = RT$

cv‡VvËi gj¨vqb

K| ^be¨w³K ck t mwVK DË‡ii cv‡k wUK wPý (√) w`b|

1| ev¯—e M¨vm KLb e‡qj Gi mv‡_ †g‡b P‡j?
(K) Lye wb¤ Zvcgv‡Îvq I D”PPv‡c
(L) D”P Zvcgv‡Îvq I D”PPv‡c
(M) wb¤Pvc I D”P Zvcgv‡Îvq
(N) wb¤Pvc I wb¤Zvcgv‡Îvq|

2| evDbxq MwZi ^ewkó¨ wb‡Pi †KvbwU ?
(K) cv‡Îi bovPovi Dci KYv¸wji MwZ wbfikxj |
(L) KYv¸wj hZ eo nq Zv‡`i MwZ ZZ †ewk nq|
(M) Zvcgv‡Îv ewµ× †c‡j KYv¸wji MwZ ewµ× cvq|
(N) Zi‡ji mv›`Zv hZ †ewk nq KYv¸wji MwZ ZZ ewµ× cvq|

msw¶ß ck

(1) Mo gy³ c‡_i msÁv wjLyb|
(2) evDbxq MwZi ^ewkó¨¸wj wjLyb|

cvV 5
ev®úPvc t m¤ú„³ I Am¤ú„³ ev®ú, Am¤ú„³ I m¤ú„³ ev‡®úi cv_K¨, evqygÛ‡j Rjxq ev®ú, Av`ZvwgwZ, wkwki I wkwkiv¼|

D‡Ïk¨

G cvV †_‡K Avcwb -

- ev®úPvc wK Zv ej‡Z cvi‡eb,
- ms¤ú„³ I Ams¤ú„³ ev®úPv‡ci g‡a¨ cv_K¨ wjL‡Z cvi‡eb,
- wkwkiv‡¼i msÁv ej‡Z cvi‡eb|

11.5.1 t ev®úPvc t m¤ú„³ Am¤ú„³ ev®ú

Vapour pressure : Staurated and Unsaturated Vapour :

†Kvb Zij c`v_‡K GKwU Ave× cv‡Î †i‡L w`‡j ev®úvqb cwµqvq µgk ev®úxfZ nq| ev®ú AYyxwj ci¯ú‡ii mv‡_ Ges cv‡Îi †`qv‡ji mv‡_ av°v Lvq| G‡Z †`qv‡j Pvc c‡o| G Pvc‡K **ev®úPvc** e‡j|

wbw`ó Zvcgv‡Îvq GKwU Ave× ¯v‡bi ev®ú avivY Kivi ¶gZv wbw`ó Ges Gi GKwU m‡ev"P mxgv Av‡Q| hLb †Kvb Ave× ¯vb GKwU wbw`ó Zvcgv‡Îvq Avi AwZwi³ ev®ú avivY Ki‡Z cv‡i bv, ZLb H ¯vb‡K ev®ú Øviv ms¤ú„³ ejv nq| ms¤ú„³ ev®ú Øviv mó Pvc‡K **m¤ú„³ ev®úPvc (Saturated Vapour pressure)** e‡j|

†Kvb wbw`ó Zvcgv‡Îvq †Kvb Ave× ¯v‡b mewaK †h cwigvY ev®ú _vK‡Z cv‡i, Zv A‡c¶v Kg ev¯ú _vK‡j H ev®úPvc‡K Am¤ú„³ ev®ú e‡j Ges Gi Øviv mó Pvc‡K **Am¤ú„³ ev®ú Pvc (Unsaturated Vapour)** e‡j|

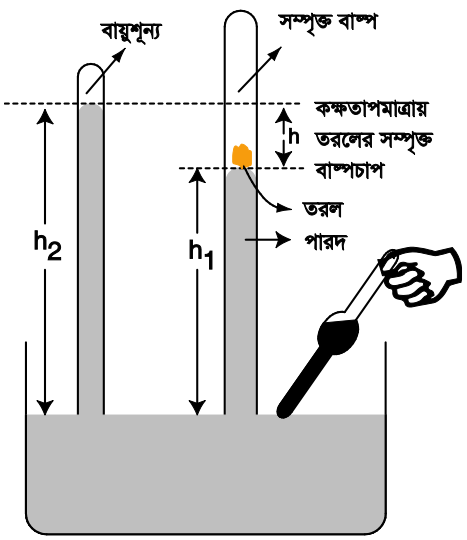
GKwU cix¶vi mvnv‡h¨ ms¤ú„³ I Ams¤ú„³ ev®úPv‡ci mgvúó avivYv †`Iqv †h‡Z cv‡i|

cix¶wU wb¤i|c

cix¶v t cvq GK wgUvi j¤v I wZb wgwjwgUvi e¨v‡mi `yØ KvPbj †bIqv nq| bj `yØ‡K we‡× cvi` Øviv c¥K‡i Aci GKwU cvi`c¥K cv‡Îi Dci Dcø K‡i ivLv nq| cix¶vMv‡i evqygÛjxq Pvc Abyhv‡i cvi` ¯¤ b‡ji Dci w`‡K DV‡e Ges Dfq b‡ji cvi` ¯‡¤i D"PZv mgvb n‡e| cvi` ¯‡¤i Dc‡i dukv ¯vb‡K Uwi‡mjxi kb¨¯vb e‡j| GKwU evukv wc‡c‡Ui mvnv‡h¨ †Kvb GKwU b‡j hw` †duwv †duwv cwb c‡ek Kiv‡bv nq, cwb cvi` A‡c¶v nvév e‡j cvi‡`i Dc‡i D‡V Av‡m Ges U‡i‡mjxi kb¨¯v‡b `"Z ev®úwqZ nq| G ev®úPv‡c cvi` ¯¤ wb‡P †b‡g hvq| Gfv‡e wc‡c‡Ui mvnv‡h¨ Aí Aí K‡i cwb b‡j c‡ek Ki‡Z _vK‡j cvi` ¯¤ ax‡i ax‡i wb‡P bvg‡Z _v‡K| Ggb GKwU mgq Av‡m hLb b‡j cwb c‡ek Kiv‡Z _vK‡j Avi ev®úwqZ bv n‡q cvi‡`i Dci Rgv nq| ZLb cvi` ¯¤ Avi wb‡P bv‡g bv|

G Ae¯vq U‡i‡mjxi kb¨¯vb ev®ú Øviv ms¤ú„³ n‡q ‡M‡Q| G cix¶v t_‡K †evSv hvq †h, c‡Z¨K Ave× ¯v‡bi ev¯ú avivY Kivi mewaK GKUv ¶gZv Av‡Q hLb mewaK ev‡®ú ¯vbwU c¥K n‡q hvq, ZLb Gi Pvc m‡ev"P nq|

H ev®ú‡K m¤ú„³ ev®ú ejv nq Ges Pvc‡K m¤ú„³ ev®ú Pvc e‡j| m¤ú„³ Ae¯vq †cŠQwi ce- chš b‡ji g‡a¨ †h ev®ú _v‡K, Zv‡K Am¤ú„³ ev®ú e‡j| ‡Kvb Ave× ¯v‡b Zi‡ji ms¯ú‡k ev®ú _vK‡j †m ev®ú Aek¨B m¤ú„³| Zvn‡j ejv hvq, †Kvb c`v‡_i ev®ú Zi‡ji Dcw¯wZ‡Z †h Pvc c‡qvM K‡i Zv‡K m¤ú„³ ev®ú Pvc (s.v.p.) e‡j| ev‡®úi ms¯ú‡k wbR¯ Zi‡ji Dcw¯wZ wb‡`k K‡i Ave× ¯v‡b mewaK cwigvY ev®ú i‡q‡Q Ges AwZwi³ ev®ú NYxfZ n‡q Zi‡j cwiYZ n‡q‡Q| G cix¶vq bj `ywU cvi` ¯‡¤i cv_K¨ †_‡K m¤ú„³ ev®ú Pvc wbYq Kiv hvq| hw` m¤ú„³ Ae¯vq cvi` ¯‡¤i D"PZv h_1 I Ab¨wUi D"PZv h_2 nq, Zvn‡j m¤ú„³ ev®ú Pvc, $h = h_2 - h_1$,



wPÎ Ñ 11.4

cix¶vi mvnv‡h¨ †`Lv‡bv hvq †h, Am¤ú„³ ev®ú †gvUvgywU fv‡e e‡qj I Pvj‡mi mÂ†g‡b P‡j|

11.5.2 t wkwki I wkwki¼ (Dew and Dew point)

Zvcgv‡Îv evo‡j †Kvb ¯v‡bi Rjxq ev®ú avivY ¶gZv †e‡o hvq I Zvcgv‡Îv Kg‡j †m ¯v‡bi Rjxq ev®ú avivY ¶gZv K‡g hvq| evqygÛj Rjxq ev®ú Øviv m¤ú„³n‡j H evqygÛj Avi Rjxq ev®ú avivY Ki‡Z cv‡i bv| mvavivYZ ‡Kvb ¯v‡bi evqygÛ‡j †h cwigvY Rjxq ev®ú _v‡K, Zvi Øviv †m evqygÛj m¤ú„³ nq bv|

wKšzevqyax‡i ax‡i kxZj n‡Z _vK‡j, †Kvb GK Zvcgv‡Îvq evqyD³ Rjxq ev®ú ØvivB m¤ú„³ n‡q hvq Ges Avi Rjxq ev®ú avivY Ki‡Z cv‡i bv| ZLb Rjxq ev®ú NYxfZ n‡q wkwk‡i cwiYZ nq| †h Zvcgv‡Îvq evqyRjxq ev®ú Øviv m¤ú„³ nq, †m Zvcgv‡Îv‡K H ¯v‡bi wkwki¼ e‡j| †Kvb ¯v‡b evqyÝ Zvcgv‡Îv nvm w¯i Pv‡c N‡U _v‡K| ZvB †Kvb ¯v‡bi evqyiZ cv_wgK Ae¯vq Rjxq ev‡®úi †h Pvc, †mwU H ¯v‡bi wkwki¼ m¤ú„³ ev®ú Pv‡ci mgvb|

kirKv‡j †fvi‡ejv Nv‡mi WMvq ev Mv‡Qi cvZvq wkwki we›`y‡`Lv hvq| G mgq w`‡bi †ejvq †ek Mig I iv‡Z kxZ _v‡K| w`‡bi †ejv evqygÛ‡ji Zvcgv‡Îv †ewk e‡j Rjxq ev®ú avivY ¶gZv †ewk _v‡K| iv‡Zi †ejv Zvcgv‡Îv hLb K‡g hvq, ZLb wb¤ Zvcgv‡Îvq evZv‡m Rjxq ev‡®úi cwigvY, avivY ¶gZvi †P‡q †ewk n‡q c‡o| d‡j evZvm Rjxq ev‡®ú m¤ú„³ nq Ges AwZwi³ Rjxq ev®ú NYxfZ n‡q wkwk‡i cwiYZ nq| avZe c`v_ ZvovZwo VvÛv nq e‡j wU‡bi Pv‡j eo eo wkwki we›`yRg‡Z †`Lv hvq| †h Zvcgv‡Îvq evqygÛ‡ji †Kvb wbw`ó AvqZ‡bi evqyGi g‡a¨ Aew¯Z Rjxq ev®ú Øviv m¤ú„³ nq, †m Zvcgv‡Îv‡K wkwki¼ e‡j|

†Kvb ¯v‡bi Zvcgv‡Îv 26^oC Ges wkwki¼ 26^oC ej‡Z eySv hvq, H ¯v‡bi evqy 20^oC Zvcgv‡Îvq Rjxq ev‡®ú Am¤ú„³ wKšz 20^o C Zvcgv‡Îvq GKB cwigvY Rjxq ev¯ú Øviv H ¯v‡bi evqym¤ú„³ nq| Avevi 26^oC Zvcgv‡Îvq H ¯v‡b Dcw¯Z Rjxq ev‡®úi Pvc, 20^oC Zvcgv‡Îvq m¤ú„³ Rjxq ev‡®úi Pv‡ci mgvb|

11.5.3 m¤ú„³ I Am¤ú„³ ev‡®úi cv_K¨

(Difference between Saturated and unsaturated vapours)

m¤ú„³ ev®ú	Am¤ú„³ ev®ú
(1) wbw`ó Zvcgvîvq †Kvb Avevi ¯v‡b hw` mewnaK cwigvY ev®ú _v‡K, Zvn‡j D³ ev®ú‡K m¤ú„³ ev®ú e‡j	(1) wbw`ó Zvcgvîvq †Kvb ¯v‡b mewnaK †h cwigvY ev®ú _vK†Z cv‡i Zvi †P‡q Kg ev®ú _vK‡j D³ ev®ú‡K Am¤ú„³ ev®ú e‡j	
(2) m¤ú„³ ev®ú ïaygvÎ Avevi ¯v‡b ˆZix Kiv hvq	(2) †Lvjv Ges Avevi Dfq ¯v‡bB Am¤ú„³ ev®ú ˆZix Kiv hvq	
(3) m¤ú„³ ev®ú ¯xq Zi‡ji mv‡_ mvg¨vewZ¯vq Ae¯vb K‡i	(3) Am¤ú„³ ev‡®úi ms¯ú‡k D³ c`v‡_i †Kvb Zij _v‡K bv	
(4) m¤ú„³ ev®ú Pvjm I e‡qj Gi mvÎ †g‡b P‡j bv	(4) Am¤ú„³ ev®ú Pvjm I e‡qj Gi mvÎ †g‡b P‡j	
(5) Zvcgvîv ewi× Ki‡j wbw`ó cwigvY m¤ú„³ ev®ú Am¤ú„³ ev‡®ú cwiYZ nq	(5) Zvcgvîv Kwg‡q wbw`ó cwigvY Am¤ú„³ ev®ú‡K m¤ú„³ ev‡®ú cwiYZ Kiv hvq	

mvims‡¶c

m¤ú„³ ev®ú Pvc t wbw`ó Zvcgvîvq †Kvb Avevi ¯v‡b hw` mewnaK cwigvY ev®ú _v‡K Zvn‡j D³ ev®ú‡K m¤ú„³ ev®ú e‡j | m¤ú„³ ev®ú Øviv mó Pvc‡K m¤ú„³ ev®úPvc (Saturated Vapour Pressure) e‡j |

Am¤ú„³ ev®ú Pvc t wbw`ó Zvcgvîvq †Kvb Avevi ¯v‡bi ev®ú m‡ev”P †h Pvc w`‡Z cv‡i, ev‡®úi Pvc Zvi †P‡q Kg n‡j Zv‡K Am¤ú„³ ev®ú Pvc e‡j |

wkwkiv¼ t †h Zvcgvîvq evqygÛ‡j i †Kvb wbw`ó AvqZ‡bi evqygGi g‡a¨ Aew¯Z Rjxq ev®ú Øviv m¤ú„³ nq, †m Zvcgvîv‡K wkwkiv¼ e‡j |

cv‡VvËi gj¨vqb

K. ‰be¨w³K ck t mwVK DË‡ii cv‡k wUK wPý (√) w`b|

1| m¤ú„³ ev®ú Pvc-
K) Pvjm Gi mf¨ †g‡b P‡j
L) e‡qj Gi mf¨ †g‡b P‡j
M) e‡qj I Pvjm Gi mf¨ †g‡b P‡j bv
N) e‡qj I Pvjm Gi mf¨ †g‡b P‡j |

2| wkwkiv¼ ej‡Z wK eSvq ?
K) Rjxq ev‡®úi Zvcgvîv
L) evqy¯Z Rjxq ev‡®úi cwigvY
M) Am¤ú„³ Rjxq ev‡®úi Zvcgvîv
N) †h Zvcgvîvq evqy¯Z Rjxq ev®ú m¤ú„³nq

3| Am¤ú„³ ev®ú Pvc
K) Pvjm I e‡qj Gi mf¨ †g‡b P‡j |
L) Pvjm Gi mf¨ †g‡b P‡j wKsze‡qj Gi mf¨ †g‡b P‡j bv|
M) e‡qj Gi mf¨ †g‡b P‡j wKszPvjm Gi mf¨ †g‡b P‡j bv|
N) Pvjm I e‡qj Gi mf¨ †g‡b P‡j bv|

L. msw¶ß ck

1| m¤ú„³ ev®ú Pv‡ci msÁv wjLyb|
2| wkwkiv‡¼i msÁv wjLyb|
3| †Kvb ¯v‡bi Zvcgvîv 25^{0} c Ges wkwkiv¼ 18^{0} c ej‡Z wK eSvq?

cvV 6

evqyi Av`Ö©Zv, wm³ I ïî¦ evjen¨vB‡MwgUvi, Av`Ö©ZwgwZ msµvšÍ K‡qKwU ck, evqygÛ‡j Rjxq ev‡®úi mv‡_ RwoZ K‡qKwU cvKwZK NUbv|

D‡Ïk¨

G cvV †k‡l Avcwb -

- cig Av`Ö©Zv I Av‡cwÿK Av`Ö©Zvi msÁv ej‡Z cvi‡eb| wkwki¼ wK Zv wjL‡Z cvi‡eb,
- Av‡cwÿK Av`Ö©Zv wbYq cÖYvjx eYbv Ki‡Z cvi‡eb,
- Av`Ö©ZwgwZ msµvšÍ wKQy c‡ki DËi I wKQy cvKwZK NUbv eYbv Ki‡Z cvi‡eb|

**11.6.1 t evqyi Av`Ö©Zv** *t evqyi Av`Ö©Zv‡K `yBfv‡e cKvk Kiv hvq| h_v: (1) cig Av`Ö©Zv I (2) Av‡cwÿK Av`Ö©Zv|*

**cig Av`Ö©Zv (Absolute Humidity) t** *wbw`ó AvqZ‡bi evqy‡Z wbw`ó mg‡q Dcw¯'Z Rjxq ev‡®úi fi‡K H AÂ‡ji cig Av`Ö©Zv ejv nq|*

cig Av`Ö©Zv 0.003 kg / m^3 *ej‡Z eySvq cwZ NbwgUvi evqy‡Z* 0.003kg *Rjxq ev®ú Av‡Q|*

**Av‡cwÿK Av`Ö©Zv (Relative Humidity)** *t wbw`ó ZvcgvÎvq evqyi Rjxq ev®ú avi‡Y ¶gZv wbw`ó _v‡K| mvaviYZ hZUzKz Rjxq ev®ú avi‡Y Ki‡Z cv‡i evqy‡Z ZZUzKz Rjxq ev®ú _v‡K bv, Zvi †P‡q Kg _v‡K|*

†Kvb ¯'v‡bi evqygÛ‡j wbw`ó ZvcgvÎvq cKZc‡¶ hZUzKz Rjxqev®ú Dcw¯'Z i‡q‡Q Ges D³ ZvcgvÎvq hZUzKz Rjxq ev®ú avi‡Y Ki‡Z cv‡i G `yB‡qi Abycv‡Z‡K Av‡cwÿK Av`Ö©Zv e‡j|

Av‡cwÿK Av`Ö©Zv‡K R *Øviv cKvk Ki‡j Avgiv wjL‡Z cvwi,*

R = (evqyi ZvcgvÎvq wbw`ó AvqZ‡bi evqy‡Z Dcw¯'wZ‡Z Rjxq ev‡®úi fi) / (evqyi ZvcgvÎvq H AvqZ‡bi evqy‡K m¤ú„³ Ki‡Z c‡qvRbxq Rjxq ev‡®úi fi)

†h‡nZz wbw`ó AvqZ‡bi Rjxq ev‡®úi fi Pv‡ci mgvbycvwZK,

∴ R = (evqygÛ‡j Dcw¯'Z Rjxq ev‡®úi Pvc) / (evqyi ZvcgvÎvq H ¯'vb‡K m¤ú„³ Ki‡Z c‡qvRbxq Rjxq ev‡®úi Pvc)

= (wkwki¼ m¤ú„³ Rjxq ev®ú Pvc) / (evqyi ZvcgvÎvq m¤ú„³ Rjxq ev®ú Pvc)

Av‡cwÿK Av`Ö©Zv‡K kZKiv wn‡m‡e cKvk Kiv nq|

aiv hvK

wkwki¼ ms¤ú„³ ev®úPvc = f

evqyi ZvcgvÎvq ms¤ú„³ ev®ú Pvc = F

AZGe, Av‡cwÿK Av`Ö©Zv, $R = \frac{f}{F} \times 100\%$

Av‡cw¶K Av`Zv 70% ej‡Z Avgiv eySv, evqyhZUkzRjxq ev®ú avivY Ki‡Z cviZ Zvi kZKiv 70 fvM Rjxq ev®ú evqy‡Z Dcw¯Z Av‡Q|

Avenvlqv weÁvb wefvM (Meteorological department) evqygÛ‡ji Av‡cw¶K Av`Zv cwigvc K‡i Avenvlqv m¤ú‡K cevfvm w`‡q _v‡K|

**wewfb Zvcgvîvq ms¤ú„³ Rjxq ev®ú Pv‡ci ZwjKv wb‡¤i mviYx‡Z (mviYx-1) †`qv n‡jv|** *(GLv‡b Zvcgvîv‡K †mjwmqvm †¯‹j I ms¤ú„³ ev®úPvc‡K wgUv‡i cvi`¯‡¤i Pv‡c cKvk Kiv n‡q‡Q)|*

mviYx - 1 t (†itbvi ZwjKv)

Zvcgvîv	m¤ú„³ ev®úPvc	Zvcgvîv	m¤ú„³ ev®úPvc	Zvcgvîv	m¤ú„³ ev®úPvc
(0^0 c)	(m)	(0^0 c)	(m)	(0^0 c)	(m)
0	4.58×10^{-3}	14	11.99×10^{-3}	28	28.35×10^{-3}
2	4.58×10^{-3}	16	13.63×10^{-3}	30	31.83×10^{-3}
4	6.10×10^{-3}	18	15.48×10^{-3}	32	35.66×10^{-3}
6	7.01×10^{-3}	20	17.54×10^{-3}	34	39.90×10^{-3}
8	8.05×10^{-3}	22	19.83×10^{-3}	36	44.42×10^{-3}
10	9.21×10^{-3}	24	22.38×10^{-3}	38	49.58×10^{-3}
12	10.52×10^{-3}	26	25.21×10^{-3}	40	55.52×10^{-3}

11.6.2 t Av`Zv gvcK hš (Hygro meter)

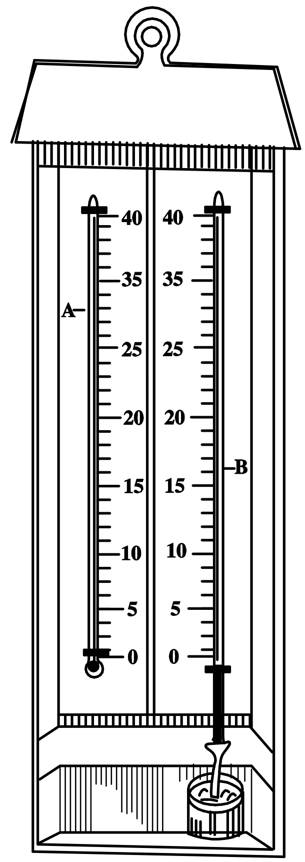
wm³ I ï® evjenvB‡MwgUvi t *†h h‡ši mvnv‡h¨ evqy Av`Zv cwigvc Kiv nq Zv‡K nvB‡MwgUvi ejv nq|*

wm³ I ï® evje nvB‡MwgUvi G ai‡Yi GKwU hš| wb‡P wm³ I ï® evje nvB‡MwgUv‡ii eYbv I KvhcYvjx †`qv n‡jv|

h‡ši eYbv t *G h‡š `yd cvi`_v‡gwgUvi A I B cvkvcwk GKwU Kv‡Vi †d‡g Dj¤fv‡e jvMv‡bv _v‡K| GKwU _v‡gwgUvi Øviv evqygÛ‡ji Zvcgvîv MnY Kiv nq| Ab¨wUi wb‡Pi As‡k Aew¯Z evj‡e gmwj‡bi cj‡Z Rov‡bv _v‡K Ges GwU GKwU cv‡Î cwi®vi cwbi g‡a¨ Wvzv‡bv|*

cwb cj‡Z †e‡q Dc‡i I‡V Ges B _v‡gwgUv‡ii evje memgq wm³ iv‡L| gmwjb †_‡K cwb ev®úvwqZ nq| d‡j wm³ evje _v‡gwgUvi ï® evje _v‡gwgUv‡ii †P‡q Kg Zvcgvîv c`kb K‡i| `yB _v‡gwgUv‡ii Zvcgvîvi e¨eavb evqygÛ‡ji Av`Zv Dci wbfi K‡i| Av`Zv hZ Kg n‡e ev®úvqb ZZ `“Z n‡e Ges wm³ evje_v‡gwgUv‡ii Zvcgvîv ZZ Kg n‡e|

_v‡gwgUviØ‡qi cv‡Vi e¨eavb hZ †ewk n‡e, AvenvIqvi ï®‹Zv ZZ †ewk n‡e| `yB _v‡gwgUv‡ii ZvcgvÎvi e¨eavb Kg n‡j eySv hv‡e †h, evqygÛj Rjxq ev¯ú Øviv mg¤ú„³, d‡j ev®úvqb n‡"Q bv|



wPÎ : 11.5

KvhcYvjx t †Kvb ¯v‡bi Av‡cw¶K Av`Zv wbYq Ki‡Z n‡j †mB ¯v‡b hšwU †i‡L _v‡gwgUvi `yÕwUi cvV †bqv nq| †গ্লইসা‡ii mvi Y †_‡K wkwkiv¼ wbYq K‡i Av‡cw¶K Av`Zv †ei Kiv nq|

aiv hvK, ï®‹ evje _v‡gwgUv‡ii cvV = $\theta_1{}^0$ C

wm³ evje _v‡gwgUv‡ii cvV = $\theta_2{}^0$ C

D³ mg‡q wkwkiv¼ = θ^0 C

Zvn‡j, †গ্লইসা‡ii mÎvbymv‡i

$(\theta_1 - \theta) = G\,(\theta_1 - \theta_2)$ ------------------------------------ (1)

GLv‡b G n‡"Q $\theta_1{}^0$ c ZvcgvÎvq †গ্লইসা‡ii Drcv`K|

†গ্লইসা‡ii Drcv`‡Ki ZvwjKv (mviYx - 2) †_‡K G Gi gvb ewm‡q 1 bs mgxKiY †_‡K wkwkiv¼ (θ) cvIqv hvq|

Gevi, †ibwÿ ZvwjKv †_‡K wkwkiv¼ (θ^0 c) ms¤ú„³ ev®úPvc f I evqyÿ ZvcgvÎvq (θ_1) ms¤ú„³ ev®úPvc F †ei K‡i Av‡cw¶K Av`Zv wbYq Kiv nq,

Av‡cw¶K Av`Zv, $R = \frac{f}{F} \times 100\%$

mviYx - 2 (†গ্লইসা‡ii Drcv`‡Ki ZwjKv)

ï®‹ ev j‡ei Zvcgv Îv (^{0} c)	†MBmv‡ii Drcv`K (G)	ï®‹ ev j‡ei Zvcgv Îv (^{0} c)	†MBmv‡ii Drcv`K (G)	ï®‹ ev j‡ei Zvcgv Îv (^{0} c)	†MBmv‡ii Drcv`K (G)
4	7.82	15	1.90	27	1.68
5	7.82	16	1.87	28	1.67
6	6.62	17	1.85	29	1.66
7	5.77	18	1.83	30	1.65
8	4.92	19	1.81	31	1.64
9	4.04	20	1.79	32	1.63
10	2.06	21	1.77	33	1.62
11	2.02	22	1.75	34	1.61
12	1.99	23	1.74	35	1.60
13	1.95	24	1.72	36	1.59
14	1.92	25	1.70	37	1.58
		26	1.69	38	1.57
				39	1.56

11.6.3 t Av`ZwgwZ msµvš K‡qKwU ck

(1) eIvKvj A‡c¶v kxZKv‡j †fRv Kvco ZvovZwo ïKvq †Kb?

DËi t kxZKv‡j Zvcgv Îv eIvKvj A‡c¶v Kg nIqv m‡ËI ev®úvqb `"Z nq e‡j ZvovZwo Kvco ïKvq| ev®úvqb wbfi K‡i Av‡cw¶K Av`Zvi Dci| eIvKv‡j Av‡cw¶K Av`Zv †ewk _v‡K| kxZKv‡j evZv‡m Rjxq ev®ú Kg _v‡K| G Kvi‡Y evZv‡mi Av‡cw¶K Av`Zv Kg _v‡K e‡j ‡fRv Kvco ‡_‡K ev®úvqb `"Z nq| d‡j Kvco ZvovZwo ïKvq|

(2) GKB Zvcgv Îvq XvKv A‡c¶v K·evRv‡i †ewk A¯^w¯ †eva nq †Kb?

DËi t K·evRvi mgỳZxieZx e‡j †mLv‡b Av‡cw¶K Av`Zv †ewk| XvKv A‡c¶vKZ.`‡i nIqvq †mLvbKvi Av‡cw¶K Av`Zv Kg|

Avgiv Rvwb, evqy Û‡ji Av‡cw¶K Av`Zv †e‡o †M‡j ev®úvq‡bi nvi K‡g hvq| d‡j XvKvq kixi †_‡K wbMZ Nvg `"Z ïKv‡e Ges kixi †_‡K †ewk mßZvc MnY Ki‡e| d‡j †`n kxZj †eva nq I ¯^w¯ j‡M| XvKv †_‡K K·evRv‡i kixi †_‡K wbMZ Nvg Kg ïKv‡e I ev®úvq‡bi Rb¨ Kg mßZvc c‡qvRb n‡e| d‡j XvKv A‡c¶v K·evRv‡i †ewk A¯^w¯ †eva nq|

(3) AvKvk †gNjv _vK‡j wkwki c‡o bv †Kb?

DËi t iv‡Z f"cô Zvc wewKiY K‡i VvÛv nq| evqy Û‡ji Rjxq ev®ú w`‡bi Zvcgv Îvq Ams¤ú"³ _v‡K| iv‡Zi †ejvq f"cô msjM evqy VvÛv n‡j wb¤ Zvcgv Îvq †mB evqy Rjxq ev®ú Øviv ms¤ú"³ nq I Rjxq ev¯ú NYxfZ n‡q wkwki R‡g| wKšZ AvKv‡k hw` †gN _v‡K, Zvn‡j f"cô Zvc wewKiY Ki‡Z cv‡i bv| KviY †gN Zvc‡ivax c`v_| Zvc mÂvjb Ki‡Z cv‡i bv e‡j f"cô VvÛv nq bv| d‡j AvKvk †gNjv _vK‡j wkwki c‡o bv|

(4) evqy Û‡ji Ae¯v †Kgb n‡j Gi Zvcgv Îv I wkwkiv¼ mgvb nq?

DËi t mvaviYZ evqy ‡Z me mgqB wKQy Rjxq ev®ú _v‡K| wbw`ó Zvcgv Îvq wbw`ó AvqZ‡bi evqy Rjxq ev®ú aviY ¶gZv mxgve×| Zvcgv Îv Kg‡Z _vK‡j wbw`ó cwigvY Rjxq ev¯ú Øviv evqy ms¤ú"³ n‡Z _v‡K| †h Zvcgv Îvq evqy ms¤ú"³ nq, †m Zvcgv Îv‡K wkwkiv¼ e‡j| hw` evqy Û‡j Aew¯Z Rjxq ev®ú Øviv evqy Ûj ms¤ú"³ _v‡K, Zvn‡j evqy Û‡ji Zvcgv Îv I wkwkiv¼ GKB n‡e| A_vr hw` KLbI evqy Û‡ji Zvcgv Îv I wkwkiv¼ mgvb nq Zvn‡j Avgiv eyS †h, evqy Û‡j Aew¯Z Rjxq ev®ú Øviv evqy ms¤ú"³ Ae¯vq Av‡Q|

11.6.4 t evqygÛ‡j Rjxq ev‡®úi mv‡_ RwoZ K‡qKwU cvKwZK NUbv

Kzqvkv I KzqvkvUKv (Mist and fog) t †Kvb †Kvb A‡j KLbI †Kvb evqyevnnxb iv‡Z we¯Zxb ¯vb Rjvo ZvcgvÎv wkwkivsK †cŠQv‡bvi d‡j †mLvbKvi evqygÛj Rjxq ev®ú Øviv m¤ú„³ nq| m¤ú„³ nevi ci ZvcgvÎv AviI K‡g †M‡j Rjxq ev®ú NYxfyZ n‡q ¶z ¶z cvwbi KYvq cwiYZ nq| GB cvwbi KYv evqyZ Aew¯Z awjKYvi Dci R‡g fvm‡Z _v‡K| Gfv‡e GK‡Î A‡bK¸wj fvmgvb cvwbi KYvi mgv‡ek‡K Kzqvkv e‡j| GB cvwbi KYv Lye Nb mwbweó n‡q _vK‡j Zv‡K KzqvkvUKv e‡j|

†gN (Cloud) t f~-c„ô †_‡K hZ Dc‡i IVv hvq ZvcgvÎv ZZ Kg‡Z _v‡K| f~-c„ô‡i mvMi, b`xbvjv, Lvj-wej, cyKzi †_‡K m‡hi Zv‡c Rjxq ev®ú ˆZix nq| DËß Rjxq ev®ú nvé e‡j Dc‡i I‡V| µgk hZ Dc‡i D‡V ZZB kxZj nq Ges GKwU ¯‡i wM‡q Rjxq ev®ú ¶z ¶z cvwbi KYvi AvKv‡i cwiYZ n‡q evqyZ DaŸvKv‡k †f‡m †eovq| Gme cvwb KYvi mgwóB †gN| gš‘Z: Kzqvkv I †gN GKB| Kzqvkv myó nq f~-c„ô †_‡K wKQy Dc‡i Avi †gN †f‡m †eovq A‡bK Dc‡i| †g‡Ni KYv hLb †ewk fvix n‡q hvq ZLb †m¸wj wb‡Pi w`‡K bvg‡Z _v‡K| Avevi wb‡Pi DòZvq evqyi ms¯ú‡k G‡m ev‡®ú cwiYZ n‡q Dc‡i P‡j hvq| †gN Gfv‡e IVvbvgv K‡i|

evwó (Rain) t †g‡N Aew¯Z cvwbi KYv¸wj cvi¯úwiK AvKl©‡Yi Kvi‡Y wgwjZ n‡q eo eo KYvq cwiYZ nq| ZLb Avi Giv evqygÛ‡j †f‡m _vK‡Z cv‡i bv| AwfKl©xq Zi‡Yi d‡j wb‡Pi w`‡K bvg‡Z _v‡K| G†KB evwó e‡j|

wkjv (Hail) t A‡bK mgq Zxe evqyevn‡ni d‡j evqygÛ‡ji wb¤œ¯Íi cvwb KYv Dc‡ii w`‡K D‡V hvq| cvwb KYv kxZj ¯‡i c‡ek K‡i| cvq –20°c ZvcgvÎvi KvQvKwQ †M‡j cvwb KYv R‡g ei‡d cwiYZ nq| Ges Pvic‡ki cvwb KYv wb‡q R‡g e‡j `“Z AvqZb †e‡o hvq `“Z †e‡o hvevi d‡j NYxfyZ wcÛwU wKQy evqyAve× K‡i †d‡j Ges †Mvj‡Ki AvKvi avi Y K‡i| c‡i AwfKl©xq Zi‡Yi d‡j wb‡Pi w`‡K ‡b‡g Av‡m G‡K wkjv e‡j|

D`vniY

1| †Kvb ¯v‡b †Kvb GKw`b evqyi ZvcgvÎv 18°C I wkwkivsK 10°C | 18°C I 10°C ZvcgvÎvq m¤ú„³ ev®úPvc h_vµ‡g $15.48\times10^{-3}$ m I $9.21\times10^{-3}$ m cvi`| H w`‡bi Av‡cw¶K Av`ªZv KZ?

mgvavb t

Avgiv Rvwb,

Av‡cw¶K Av`ªZv, $R = \frac{f}{F} \times 100\%$

GLv‡b, f = wkwkivsK m¤ú„³ ev®úPvc = 9.2×10^{-3} m cvi`

F = evqyi ZvcgvÎvq m¤ú„³ ev®úPvc = 15.48×10^{-3} m cvi`

AZGe, Av‡cw¶K Av`ªZv, $R = \frac{9.2 \times 10^{-3}}{15.48 \times 10^{-3}} \times 100\%$

$= 59.43\%$

2| evqỳ ZvcgvÎv 28^{o}C Ges Av‡cw¶K Av`Zv 60% | $28^{o}$C ZvcgvÎvq cvi` m¤ú„³ Rjxq ev®ú Pvc = 28.35×10^{-3} m cvi` | evqỳ Rjxq ev‡®úi Pvc KZ?

mgvavb t

GLv‡b evqỳ ZvcgvÎvq A_vr 28^{o} C ZvcgvÎvq m¤ú„³ Rjxq ev®ú Pvc,

F = 28.35×10^{-3} m cvi`

Av‡cw¶K Av`Zv = 60% $= \frac{60}{100}$

evqỳ ZvcgvÎvq ev®ú Pvc = wkwki v‡¼ ev®úPvc = f = ?

Avgiv Rvwb, Av‡cw¶K Av`Zv, $R = \frac{f}{F}$

ev, $f = R \times F = \frac{60}{100} \times 28.35 \times 10^{-3}$

$= 17.01 \times 10^{-3}$ m cvi`

3| †Kvb ¯’v‡b †Kvb GKw`‡b wkwki v¼ $8.5^{o}$ C Ges evqỳ ZvcgvÎv $20.5^{o}$ C | Av‡cw¶K Av`Zv wbYq Ki| [8^{o} C, 9^{o} C, 20^{o} C, 21^{o} C ZvcgvÎvq m¤ú„³ Rjxq ev®ú Pvc h_vµ‡g 8.05×10^{-3} m , 8.63×10^{-3} m , 15.48×10^{-3} m I 16.51×10^{-3} m cvi`]|

mgvavb t

8^{o} C ZvcgvÎvi ci (9-8) = 1^{o} C ZvcgvÎv e„×i Rb¨ m¤ú„³ Rjxq ev®úPvc e„×

$= (8.63-8.05) \times 10^{-3} = 0.58 \times 10^{-3}$ m

$\therefore$ (8.5 - 8) = 0.5^{o} C ZvcgvÎv e„×i Rb¨ m¤ú„³ Rjxq ev®ú Pvc e„×,

$= 0.58 \times 10^{-3} \times 0.5 = 0.29 \times 10^{-3}$ m cvi` |

$\therefore$ wkwki v‡¼ (8.5^{o}) m¤ú„³ Rjxq ev®ú Pvc, $f = (8.05 + 0.29) \times 10^{-3} = 8.34^{o}\ 10^{-3}$ m cvi`

Avevi, 20^{o} C ZvcgvÎvi ci (21-20) ^{o} C = 1^{o} C e„×i Rb¨ m¤ú„³ Rjxq ev®úPvc e„×

$=(16.51-15.48) \times 10^{-3}$ m $= 1.03 \times 10^{-3}$ m

$\therefore$ (20.5 - 20) = 0.5^{o} C e„×i Rb¨ m¤ú„³ Rjxq ev®úPvc e„× = 0.515×10^{-3} m cvi`

$\therefore$ evqỳ ZvcgvÎvq (20.5^{o} C) m¤ú„³ Rjxq ev®úPvc, $F = (15.48 + 0.515) \times 10^{-3} = 15.995$ m cvi`

Avgiv Rvwb, Av‡cw¶K Av`Zv, $R = \frac{f}{F} \times 100\%$

$$= \frac{8.34 \times 10^{-3}}{15.995 \times 10^{-3}} \times 100\% = 52.14\%$$

4| GKwU wbw`ó mg‡q ï®‹ I Av` evjenvB‡Mwg‡Uv‡ii `yÕ\_v‡gwgUv‡ii Zvcgv‡Îv h\_vµ‡g* $25^{o}$ C *I* $20^{o}$ C *| H mg‡qi Av‡cw¶K Av`Zv KZ? [25^{o} C *Zvcgv‡Îvq m¤ú„³ ev®úPvc =* 23.80×10^{-3} m *cvi`* *I* $16.5^{o}$ C *Zvcgv‡Îvq m¤ú„³ ev®úPvc =* $14.09 \times 10^{-3}$ m *cvi`]*

mgvavb t

Avgiv Rvwb, †গ্লইসা‡ii m~Îvbymv‡i,

$(\theta_1 - \theta) = G(\theta_1 - \theta_2)$

GLv‡b, $\theta_1 = 25^{o}$ C

$\theta_2 = 20^{o}$ C

$\theta =$ *wkwkiv¼|*

†গ্লইসা‡ii Drcv‡Ki ZwjKv †_‡K 25^{o} C *Zvcgv‡Îvq,* G = 1.70

$\therefore (25 - \theta) = 1.70\ (25-20)$

ev, $25 - \theta = 8.5$

ev, $\theta = 16.5^{o}$ C

Av‡cw¶K Av`Zv, $R = \frac{f}{F} \times 100\%$

GLv‡b, f = 16.5^{o} C *Zvcgv‡Îvq m¤ú„³ ev®úPvc =* 14.09×10^{-3} m *Pvc*

F = 25^{o} C *Zvcgv‡Îvq m¤ú„³ ev®úPvc =* 23.80×10^{-3} m *cvi`*

$\therefore$ *Av‡cw¶K Av`Zv,* $R = \frac{14.09}{23.80} \times 100\% = 59.20\%$

mvims‡¶c

***Av`ZwgwZ*** *t c`v_weÁv‡bi †h kvLvq evqygÛ‡j Rjxq ev‡®úi cwigvY m¤ú‡Ü Av‡jvPbv Kiv nq Ges †Kvb wbw`ó AvqZ‡bi evqy‡Z Aew¯'Z Rjxq ev‡®úi cwigvY wbYq c×wZ eYbv Kiv nq, Zv‡K Av`ZwgwZ ejv nq|*

***Av‡cw¶K Av`Zv*** *t †Kvb mg‡q wbw`ó Zvcgv‡Îvq wbw`ó AvqZ‡bi evqy‡Z Dcw¯'Z Rjxq ev‡®úi fi I GKB Zvcgv‡Îvq GKB AvqZ‡bi evqy‡K m¤ú„³ Ki‡Z c‡qvRbxq Rjxq ev‡®úi f‡ii Abycv‡Z‡K H ¯'v‡bi Av‡cw¶K Av`Zv e‡j|*

cv‡VËi g~j¨vqb

K. ‰be¨w³K ck t mwVK DË‡ii cv‡k wUK wPý (√) w`b|

1| wkwki³¼ ej‡Z wK eySvq ?

(K) evqy¯Z Rjxq ev‡®úi cwigvY

(L) Rjxq ev‡®úi ZvcgvÎv

(M) Am¤ú„³ Rjxq ev‡®úi ZvcgvÎv

(N) †h ZvcgvÎvq evqy¯Z Rjxq ev®ú m¤ú„³ nq

2| XvKv A‡c¶v K·evRv‡i †ewk A¯w¯ †eva nIqvi KviY wK?

(K) XvKvq K·evRvi A‡c¶v ZvcgvÎv †ewk|

(L) K·evRv‡i XvKv A‡c¶v ZvcgvÎv †ewk|

(M) K·evRv‡i XvKv A‡c¶v Av‡cw¶K Av`Zv †ewk|

(N) XvKvq K·evRvi A‡c¶v Av‡cw¶K Av`Zv †ewk|

3| Av‡cw¶K Av`Zv wb‡Pi ‡Kvb m¤úKwU †_‡K wbYq Kiv hv‡e ?

(K) Av‡cw¶K Av`Zv = wkwki‡¼ m¤ú„³ Rjxq ev®úPvc / evqyi ZvcgvÎvq m¤ú„³ Rjxq ev®úPvc

(L) Av‡cw¶K Av`Zv = evqyi ZvcgvÎvq m¤ú„³ Rjxq ev®úPvc / wkwki‡¼ m¤ú„³ Rjxq ev®úPvc

(M) Av‡cw¶K Av`Zv = evqyi ZvcgvÎvq m¤ú„³ Rjxq ev®úPvc - wkwki³¼ m¤ú„³ Rjxq ev®úPvc

(N) Av‡cw¶K Av`Zv = wkwki‡¼ m¤ú„³ Rjxq ev®úPvc+evqyi ZvcgvÎvq m¤ú„³ Rjxq ev®úPvc

L. msw¶ß ck

1| Av‡cw¶K Av`Zvi msÁv wjLyb|

2| GKB ZvcgvÎvq XvKv A‡c¶v K·evRv‡i †ewk A¯w¯ †eva nq †Kb?

iPbvg~jK cÖkœ

1| M¨v‡mi mÂ¸wj wjL| I eYbv Ki“b|
2| M¨v‡mi Pvc, AvqZb I Zvcgv‡Îvi g‡a¨ m¤úK©¯’vcb Ki“b|
3| Av`k© M¨vm mgxKiY PV = RT cÖwZcv`b Ki“b|
4| M¨v‡mi MwZZ‡Ëi †gšwjK ¯^xKvh©¸wj wjL|
5| AvYweK †eM e›Ub mÂvwU eYbv Ki“b|
6| MwZZË Abymv‡i M¨v‡mi Pvc I AYyi Mo eM©‡e‡Mi m¤úK cÖwZcv`b Ki“b|
7| MwZZË Abymv‡i M¨vm AYyi gya Mo eM©‡e‡Mi mv‡_ Zvcgv‡Îvi m¤úK cÖwZcv`b Ki“b|
8| M¨v‡mi MwZZË Abymv‡i Zvcgv‡Îvi e¨vL¨v c`vb Ki“b|
9| (K) m¤ú„³ ev®úPvc I wkwki v‡¼i msÁv wjL|
(L) m¤ú„³ I Am¤ú„³ ev®úPv‡ci g‡a¨ cv_©K¨¸wj wjL|

MwYwZK ck

1| w¯i Zvcgvîvq 1.5×10^5 N m^{-2} Pv‡c wbw`ó wKQyM¨v‡mi AvqZb 0.003 m^3 ; 5×10^5 N m^{-2} Pv‡c M¨vmwUi AvqZb KZ?

2| w¯i Zvcgvîvq 10^5 N m^{-2} Pv‡c wbw`ó f‡ii wKQyM¨v‡mi AvqZb 0.005 m^3 5×10^5 N m^{-2} Pv‡c M¨vmwUi AvqZb KZ?

3| w¯i Pv‡c 27^oC Zvcgvîvi 200 m^3 AvqZ‡bi M¨vm‡K 327^oC Zvcgvîvq DËß Kiv n‡jv| M¨vmwUi AvqZb KZ n‡e?

4| 27^oC Zvcgvîvq 4g bvB‡Uv‡R‡bi †gvU MwZkw³ KZ?

5| 27^oC Zvcgvîvq Aw·‡R‡bi gvÎv Mo eM‡eM KZ?

6| †Kvb ¯v‡b †Kvb GKw`b evqy‡ Zvcgvîv $18^oC$ I wkwkiv¼ $12^oC$ ; $18^oC$ I $12^oC$ Zvcgvîvq m¤ú„³ ev®úPvc h_vµ‡g $15.48 \times 10^{-3}$ m I $10.52 \times 10^{-3}$ m cvi`| H w`‡bi Av‡cw¶K Av`Zv KZ?

7| evqy‡ Zvcgvîv 32^oC Ges Av‡cw¶K Av`Zv 55% ; $32^oC$ Zvcgvîvq m¤ú„³ Rjxq ev®úPvc 35.66 $\times 10^{-3}$ m cvi`| evqy‡ Rjxq ev‡®úi Pvc KZ?

8| †Kvb wbw`ó mg‡q ï® I Av` evje nvB‡MwgUv‡ii `yB _v‡gwgUv‡ii Zvcgvîv h_vµ‡g $24^oC$ I $18^oC$; H mg‡q Av‡cw¶K Av`Zv KZ? [24^oC Zvcgvîvq m¤ú„³ ev®úPvc = 22.38×10^{-3} m cvi`; $13.68^oC$ Zvcgvîvq m¤ú„³ ev®úPvc = 11.62m cvi`|]