



स्व. द. मि. कदम गुरुजी
संस्थापक अध्यक्ष

शिक्षण प्रसारक मंडळ, मंगळवेढा संघालित
दलित मित्र कदम गुरुजी विज्ञान महाविद्यालय, मंगळवेढा
ता.मंगळवेढा जि.सोलापूर - ४१३३०५

E-mail: dmkgcollegemangalwedha@gmail.com

2.3.2 - Teachers use ICT enabled tools for effective teaching-learning process.

- 1) Seminar using ICT Tools
- 2) WhatsApp Notes
- 3) PPTs
- 4) Teaching Links



Shougale
IQAC
Coordinator
Dalit Mitra Kadam Guruji Vidnyan
Mahavidyalaya, Mangalwedha

Sahawad
For Principal
Dalit Mitra Kadam Guruji
Vidnyan Mahavidyalaya Mangalwedha
Tal-Mangalwedha Dist - Solapur



Department of Chemistry

SEMINAR

2023-24

Notice

All students of B.Sc.I year are hereby informed that SEMINAR activity has been scheduled on 04/09/2023. Students will be evaluated on the basis of their communication skills, body language, content, and participation. Topics for SEMINAR will be shared on the spot.

Note:

1. No reschedule is possible for SEMINAR.
2. Students have to report in formals as per the following schedule:

Time: 11:30AM-1:00 PM

Venue: Class No 62

Class : B.Sc. I Chemistry

Sr. No.	Full Name of Student	Topic
1	Akale Bhagyashri Bharat	Ideal and Non ideal gases Deviation from ideal behaviour
2	Amogoudaru Shrikrishna Baburao	
3	Asabe Pratik Sham	
4	Asabe Swapnil Satish	
5	Asabe Vishal Balasaheb	
6	Awatade Sakshi Dhanaji	
7	Awatade Vaishnavi Tukaram	
8	Babar Sameer Sanjay	
9	Bagwan Mudassar Bilal	
10	Balawantrao Vaishnavi Dattatray	
11	Banasode Prajyot Popat	
12	Bansode Rohit Shrimant	



13	Bhande Malashri Mahadev	
14	Bhopale Rutuja Sanjay	
15	Bhosale Asharani Bharat	
16	Bhosale Shrinath Balaso	
17	Bhusnar Sagar Pirappa	
18	Bijage Sagar Dnyaneshwar	
19	Birajadar Siddheshwar Appaso	
20	Bomanna Sandhya Revansiddha	
21	Chaugule Dharyappa Sidraya	
22	Chaukhande Priyanka Chivadappa	
23	Chaunde Samadhan Jalindar	
24	Chavan Amruta Sajjan	
25	Chavan Sagar Satish	
26	Chavan Sushant Anna	
27	Chelekar Vaishnavi Ganesh	
28	Chougule Shridhar Kallappa	
29	Choukhande Puja Mahadev	
30	Choukhande Sachin Sharanappa	
31	Dange Aishwarya Santosh	
32	Deshmukh Anjali Appaso	
33	Dhage Prajakta Parmeshwar	
34	Dhage Sachin Sidu	
35	Dhasade Ganesh Navnath	
36	Dhekale Harsha Jagannath	
37	Doke Ankita Laxman	
38	Gadade Omkar Ashok	
39	Gadade Vipul Vishnu	
40	Gadekar Shraddha Ishwar	
41	Gadhare Sanjivani Pandurang	
42	Gaikwad Pradnya Shahaji	
43	Gangane Abhijeet Ankush	
44	Ganpatil Shivani Navnath	
45	Gawde Vishaya Popat	
46	Ghodake Ankit Ramesh	
47	Ghodake Ketan Suresh	
48	Godase Sayali Naganath	
49	Hipparkar Kumar Mhalappa	
50	Honmane Vaibhav Genaba	
51	Jadhav Kiran Suhas	
52	Jadhav Pratiksha Navanath	

Van der waals equation
Real gases explanation

Critical phenomenon PV
isotherm



53	Jadhav Saurabh Sanjay	
54	Jadhav Sneha Sudhakar	
55	Jadhav Suraj Pandurang	
56	Jadhav Vaishnavi Mahadeo	
57	Jamdade Pragati Pandurang	
58	Jamdar Vaibhav Anil	
59	Javir Prajakta Dattatray	
60	Jawale Suryabhan Sambhaji	
61	Kadam Apeksha Ashok	
62	Kadam Shweta Dhanaji	
63	Kadam Swapndip Sudam	
64	Kakekar Diksha Dattatray	
65	Kalunge Ashwini Damodhar	
66	Kambale Bhairvanath Shivaji	
67	Kambale Tejashri Ramkrushna	
68	Katare Samadhan Dnyanoba	
69	Khandekar Amit Ashok	
70	Khandekar Avinash Arjun	
71	Khandekar Shital Shripati	
72	Khandekar Tejaswini Shivaji	
73	Kharat Rekha Rama	
74	Khutekar Sachin Kashiram	
75	Koli Vaishnavi Baburao	
76	Kore Shivani Shivaji	
77	Kore Vaishnavi Siddharam	
78	Kshirsagar Chandrakant Mahadev	
79	Kshirsagar Shripad Rajaram	
80	Kulkarni Shrinivas Vijay	
81	Kumbhar Asmita Sitaram	
82	Kumbhar Avinash Yuvaraj	
83	Lavate Abhishek Madhu	
84	Loni Akshay Kantappa	
85	Loni Siddharam Kalgonda	
86	Lugade Dhanshri Ganapati	
87	Madane Puja Uttam	
88	Madane Sakshi Sidram	
89	Mali Akanksha Appasaheb	
90	Mali Siddharam Madagonda	
91	Mane Hrsh Ananda	
92	Mane Vaishnavi Changadev	
93	Mangalure Mahesh Dhanappa	
94	Mendagudale Kallanrao Satish	
95	Metakari Shivaji Dipak	

Relationship between
critical constant and van der
waals constant

Chemical Kinetics
Introduction





96	Metkari Sarika Tukaram	
97	Metkari Umesh Vilas	
98	Metkari Yogesh Prashant	
99	Mudgul Snehal Dilip	
100	Mujawar Badesaheb Saifan	
101	Mulani Alfaj Gaibi	
102	Mulani Gulab Bashir	
103	Nagane Shital Shashikant	
104	Nagtilak Pratiksha Somnath	
105	Nyamgonde Umesh Tamanna	
106	Omane Pratik Biroba	Rate of reaction and order of reaction
107	Patil Chetan Madan	
108	Patil Sakshi Santosh	
109	Patil Shivraj Balasaheb	
110	Patil Vijay Dilip	
111	Pawar Ankita Shahaji	
112	Pawar Balaji Tanaji	
113	Pawar Sakshi Ankush	
114	Pawar Shweta Kisan	
115	Pawar Vaishnavi Sharad	
116	Pawar Varsha Bhaskar	Factors affecting rate of reaction
117	Pujari Abhishek Audusiddha	
118	Pujari Pratiksha Dhananjay	
119	Pujari Sumit Balaji	
120	Randive Anjali Santosh	
121	Rathod Anjali Santosh	
122	Sanadi Anjum Babu	
123	Shaikh Ayan Yusuf	
124	Shaikh Mahek Salim	
125	Shaikh Soliya Dadaso	
126	Shinde Gauri Kondiba	
127	Shinde Pranali Dadaso	
128	Shinde Purushottam Shankar	
129	Shinde Rajnandini Atul	
130	Shinde Shital Umaji	
131	Survase Swapnil Sambhaji	
132	Swami Vijayalaxmi Chanabasayya	
133	Tangawade Aviraj Arjun	
134	Tangawade Suraj Siddheshwar	
135	Telgaon Dharyappa Chidanand	
136	Thengil Nitesh Balaji	
137	Thengil Sonali Dattatray	
138	Thengil Sujata Prakash	

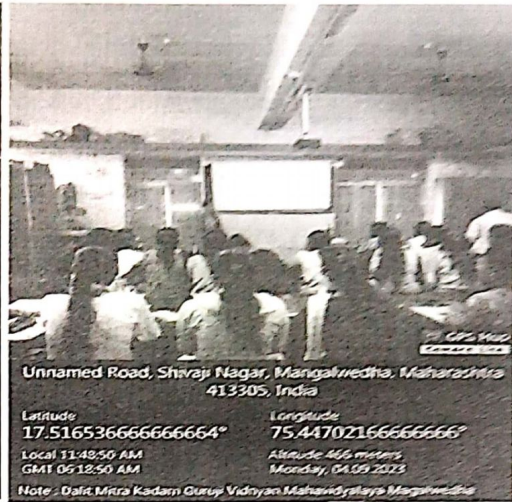
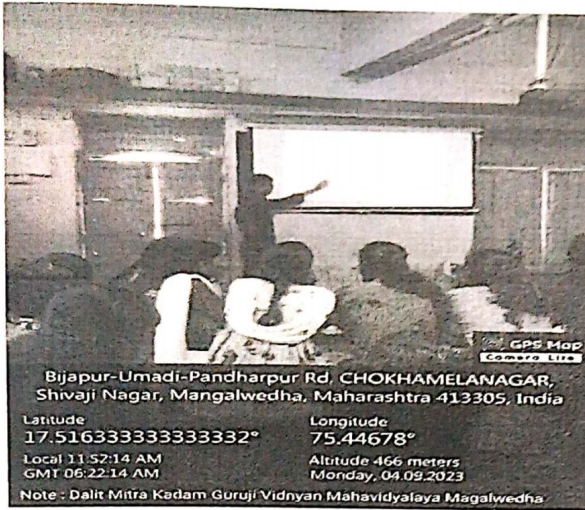
139	Torane Sakshi Valmik	Order and molecularity of reaction
140	Umarani Shankar Chidanand	
141	Vagare Sayali Birappa	
142	Varade Pragati Parmeshwar	
143	Vasekar Pranali Pandurang	
144	Vasekar Renuka Anil	
145	Vibhute Aishwarya Kiran	
146	Wagh Rutuja Annaso	
147	Waghamode Appa Laxman	
148	Waghamode Dhondiba Yesappa	
149	Waghmare Aishwarya Siddheshwar	
150	Waghmare Suraj Maruti	
151	Waghmode Ajay Shivaji	
152	Wale Aditya Nagappa	
153	Waydande Seema Kerappa	
154	Yadav Rohit Chandrakant	
155	Zendekar Bhagyalaxmi Vinayak	

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Sakund
 For Principal
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 Vidnyan Mahavidyalaya Mangalwedha
 Tal-Mangalwedha Dist - Solapur

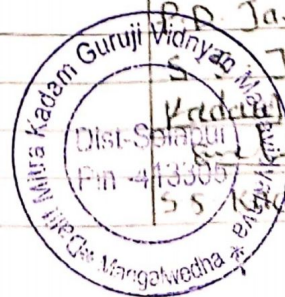
Activity Photos



Attendance of Students

Sr. No.	Full Name of Student	Signature
1	AKALI BHAGYASHRI BHARAT	<i>[Signature]</i>
2	AMOGOU DARU SHIKRISHNA BHARAO	<i>[Signature]</i>
3	ASABI PRATIK SHAM	<i>[Signature]</i>
4	ASABI SWAPNII SATISH	<i>[Signature]</i>
5	ASABI VISHAL DAL ASABI H	<i>[Signature]</i>
6	AWALADE SAKSHI DHANAJI	<i>[Signature]</i>
7	AWALADE VAISHNAVI LUKARAM	<i>[Signature]</i>
8	BAHAR SAMIR SANJAY	<i>[Signature]</i>
9	BAGWAN MUDASSAR BILAL	<i>[Signature]</i>
10	BALAWANTRAO VAISHNAVI DATTATRAY	<i>[Signature]</i>
11	BANSODE PRADYOT POPAT	<i>[Signature]</i>
12	BANSODE ROHIT SHRIMANT	<i>[Signature]</i>
13	BHANDE MALASHRI MAHADEV	<i>[Signature]</i>
14	BHOPALE RUTUJA SANJAY	<i>[Signature]</i>
15	BHOSALE ASHARANI BHARAT	<i>[Signature]</i>
16	BHOSALE SHRINATHI BALASO	<i>[Signature]</i>
17	BHU'SNAR SAGAR PIRAPPA	<i>[Signature]</i>
18	BIJAGE SAGAR DNYANESHWAR	<i>[Signature]</i>
19	BIRAJADAR SIDDHESHWAR APPASO	<i>[Signature]</i>
20	BOMANNA SANDHYA REVANSIDDHA	<i>[Signature]</i>
21	CHAUGULE DHARYAPPA SIDRAYA	<i>[Signature]</i>
22	CHAUKHANDE PRIYANKA CHIVADAPPA	<i>[Signature]</i>
23	CHAUNDE SAMADHAN JALINDAR	<i>[Signature]</i>
24	CHAVAN AMRUTA SAJJAN	<i>[Signature]</i>
25	CHAVAN SAGAR SATISH	<i>[Signature]</i>
26	CHAVAN SUSHANT ANNA	<i>[Signature]</i>
27	CHELEKAR VAISHNAVI GANESH	<i>[Signature]</i>
28	CHOUGULE SHRIDHAR KALLAPPA	<i>[Signature]</i>
29	CHOUEHANDE PUJA MAHADEV	<i>[Signature]</i>
30	CHOUEHANDE SACHIN SHARANAPPA	<i>[Signature]</i>

31	DANGE AISHWARYA SANTOSH	S. A. Dange
32	DESHMUKH ANJALI APPASO	Anjali
33	DHAGE PRAJAKTA PARMESHWAR	P. P. Dhage
34	DHAGE SACHIN SIDDH	Sachin
35	DHASADE GANESH NAVNATH	G. N. Dhasade
36	DHEKALE HARSHA JAGANNATH	Dhekale
37	DOKE ANKITA LAXMAN	A. I. Doke
38	GADADE OMKAR ASHOK	O. A. Gadade
39	GADADE VIPUL VISHNU	V. V. Gadade
40	GADKAR SHRADDHA ISHWAR	S. J. G.
41	GADHAVE SANJIVANI PANDURANG	GADHAVE--
42	GAIKWAD PRADNYA SHAHAJI	Gaikwad. P. S.
43	GANGANE ABHIJEET ANKUSH	A
44	GANPATIL SHIVANI NAVNATH	G. S. N.
45	GAWDE VISHAYA POPAT	V. S. G.
46	GHODAKE ANKIT RAMESH	A
47	GHODAKE KETAN SURESH	K. S. G.
48	GODASE SAYALI NAGANATH	Godase
49	HIPPARKAR KUMAR MIHALAPPA	Kumar
50	HONMANE VAIBHAV GENABA	V. G. Honmane
51	JADHAV KIRAN SUHAS	Jadhav. K. S.
52	JADHAV PRATIKSHA NAVANATH	P. N. Jadhav
53	JADHAV SAURABH SANJAY	S. S. Jadhav
54	JADHAV SNEHA SUDHAKAR	A
55	JADHAV SURAJ PANDURANG	P. M. Jadhav
56	JADHAV VAISHNAVI MAHADEO	Q. M.
57	JAMDAR PRAGATI PANDURANG	Jamdar
58	JAMDAR VAIBHAV ANIL	Jamdars
59	JAVIR PRAJAKTA DATTATRAY	P. P. Javir
60	JAWALL SURYABHAN SAMBHAJI	S. J.
61	KADAM ARIKSHA ASHOK	Kadam
62	KADAM SHWETA DHANAJI	Kadam
63	KADAM SWAPNADIP SUDAM	Kadam



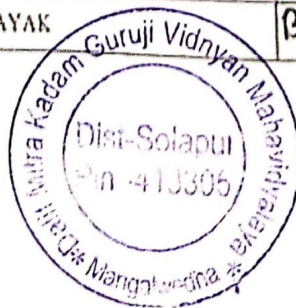
64	KAKI KAR DIKSHA DATTATRAY	DALICAR
65	KALUNGLE ASHWINI DAMODHAR	A. D. Dal
66	KAMBALT BHAI RANATH SHIVAJI	Kambale w.
67	KAMBALT TEJASHIRI RAMKRUSHNA	Kambale
68	KATARI SAMADHAN DNYANODA	D. S. K.
69	KHANDIKAR AMIT ASHOK	A. A. Khande
70	KHANDIKAR AVINASH ARJUN	A. A. K.
71	KHANDIKAR SHITAL SHIRPATI	A. A. K.
72	KHANDIKAR TEJASWINI SHIVAJI	A. A. K.
73	KHARAT RIKHA RAMA	Khandekar
74	KHUTE KAR SACHIN KASHIRAM	Khandekar
75	KOLI VAISHNAVI BABURAO	Sachin K.
76	KORE SHIVANI SHIVAJI	Kore
77	KORE VAISHNAVI SIDDHARAM	Kore & B
78	KSHIRSAGAR CHANDRAKANT MAHADEV	Kore. V.
79	KSHIRSAGAR SHIRPAD RAJARAM	A
80	KULKARNI SHRINIVAS VIJAY	S. Khis
81	KUMBHAR ASMITA SITARAM	Shir
82	KUMBHAR AVINASHI YUVARAJ	Asur
83	LAVATE ABHISHEK MADHU	K. A. X
84	LONI AKSHAY KANTAPPA	Lone
85	LONI SIDDHARAM KALGONDA	A
86	LUGADE DHANSHIRI GANAPATI	Loni S. K.
87	MADANE PUJA UTTAM	Lugade
88	MADANE SAKSHI SIDRAM	Madhane
89	MALI AKANKSHA APPASAHEB	Madhane U.
90	MALI SIDDHARAM MADAGONDA	M. S. S.
91	MANE HRSH ANANDA	Madhane
92	MANE VAISHNAVI CHANGADEV	Madhane
93	MANGALURE MAHESH DHANAPPA	Madhane
94	MENDAGUDALE KALLANRAO SATISH	Madhane
95	METAKARI SHIVAJI DIPAK	Madhane
96	METKARI SARIKA TURARAM	Madhane



97	METKARI UMESH VILAS	Metkari U. V.
98	METKARI YOGESH PRASHANT	Y. P. Metkari
99	MUDGUL SNEHAL DILIP	mudgul S. D.
100	MUJAWAR RADESAHEB SAHJAN	Mujawar B. S.
101	MULANI ALFAL GABRI	mulani G. P.
102	MULANI GULAB HASHIR	S. Nagane
103	NAGANE SHITAL SHASHIKANT	Nagilak P.
104	NAGTHAK PRATIKSHA SOMNATH	Umesh N.
105	NYAMGONDE UMESH TAMANNA	Omane P. B.
106	OMANE PRATIK BIROBA	Patil S. S.
107	PATIL CHETAN MADAN	S. S. Patil
108	PATIL SAKSHI SANTOSH	Shivraj
109	PATIL SHIVRAJ BALASAHEB	Patil S.
110	PATIL VIJAY DILIP	Patil vijay
111	PAWAR ANKITA SHAHAJI	Pawar A. S.
112	PAWAR BALAJI TANAJI	Pawar S.
113	PAWAR SAKSHI ANKUSH	shkshi P.
114	PAWAR SHWETA KISAN	A
115	PAWAR VAISHNAVI SHARAD	V. Pawar
116	PAWAR VARSHA BHASKAR	Pawar V.
117	PUJARI ABHISHEK AUDUSIDDHA	Pujari A.
118	PUJARI PRATIKSHA DHANANJAY	A
119	PUJARI SUMIT BALAJI	Pujari S.
120	RANDIVE ANJALI SANTOSH	Randive A. S.
121	RATHOD ANJALI SANTOSH	A. S. Rathodi
122	SANADI ANJUM BABU	Sanadi H.
123	SHAIKH AYAN YUSUF	Shaiikh Y.
124	SHAIKH MAHEK SALIM	Salim S.
125	SHAIKH SOLIYA DADASO	A
126	SHINDE GAURI KONDIBA	Gauri S.
127	SHINDE PRANALI DADASO	Shinde P.
128	SHINDE PURUSHOTTAM SHANKAR	P. Shinde
129	SHINDE RAJNANDINI ATUL	Atul S.



130	SHINDE SHITAL UMAJI	
131	SURVASE SWAPNIL SAMBHAJI	S.S.U
132	SWAMI VJAYALAXMI CHANDRASAYYA	SS
133	TANGAWADE AVIRAJ ARJUN	T.A.A
134	TANGAWADE SURAJ SIDDHESHWAR	T.S.S.
135	TELGAON DHIRYAPPA CHIDANAND	D.HADYAPPA
136	THENGIL NITESH BALAJI	NTBTH
137	THENGIL SONALI DATTATRAY	S.D.T
138	THENGIL SUJATA PRAKASHI	S.P.T.
139	TORANE SAKSHI VALMIK	<u>SAKSHI</u>
140	UMARANI SHANKAR CHIDANAND	U.S.C
141	VAGARE SAYALI BIRAPPA	SAKALI
142	VARADE PRAGATI PARMESHWAR	V.P.P
143	VASEKAR PRANALI PANDURANG	A
144	VASEKAR RENUKA ANIL	A
145	VIBHUTE AISHWARYA KIRAN	V.R.A
146	WAGH RUTUJA ANNASO	AISHWARYA
147	WAGHAMODE APPA LAXMAN	W.R.A.
148	WAGHAMODE DHONDIBA YESAPPA	APPA
149	WAGHMARE AISHWARYA SIDDHESHWAR	D.D.Y
150	WAGHMARE SURAJ MARUTI	ms
151	WAGHMODE AJAY SHIVAJI	ms
152	WALE ADITYA NAGAPPA	A
153	WAYDANDE SEEMA KERAPPA	Aditya
154	YADAV ROHIT CHANDRAKANT	SEEMA
155	ZENDEKAR BHAGYALAXMI VINAYAK	R
		BAAGALAM



Dalit Mitra Kadam Guruji Vidnyan Mahavidyalaya Mangalwedha

Department of Chemistry

SEMINAR

2023-24

Notice

All students of B.Sc.III year are hereby informed that SEMINAR activity has been scheduled on 26/02/2024. Students will be evaluated on the basis of their communication skills, body language, content, and participation. Topics for SEMINAR will be shared on the spot.

Note:

1. No reschedule is possible for SEMINAR.
2. Students have to report in formals as per the following schedule:

Time: 11:30AM-1:00 PM

Venue: Class No 62

Class : B.Sc. III Chemistry

Sr. No.	Student Name	Topic
1	Anpat Rahul Bankat	Electromagnetic Radiation, Electromagnetic Spectrum, Energy Level diagram
2	Atkare Bhagyawant Tatyasaheb	
3	Atkare Nilesh Dadasaheb	
4	Babar Aditya Satish	
5	Babar Vivek Suresh	
6	Balvantrao Monali Balasaheb	
7	Balvantrav Priyanka Balasaheb	
8	Bankar Priti Shrimant	
9	Bansode Bhavesh Dhanykumar	
10	Bedare Pradip Dhananjay	
11	Bhong Mayur Sanjay	
12	Bhosale Aniket Yuvaraj	
13	Bhosale Rohan Kantilal	
14	Bhosale Vaibhav Nitin	
15	Bhusnar Prakash Shrimant	
16	Birajdar Sudhir Mallikarjun	
17	Chaudhari Ajit Arun	



18	Chavan Shankar Raosaheb	
19	Chavan Tukaram Sanjaykumar	
20	Dalvi Ganesh Nanasaheb	
21	Dange Sushant Sukdev	
22	Dharekar Vaishanvi Arjun	
23	Dhavare Shravika Hanmant	
24	Dudhal Megha Lahu	
25	Dundale Radhika Vitthal	
26	Gadhawe Nandakumar Pandurang	
27	Gavade Sunil Nagnath	
28	Ghutukade Nitin Shivaji	Rotational Spectra Of Diatomic Molecules : Rigid Rotor Model; Moment Of Inertia. Rotational Spectra Of Diatomic Molecules : Rigid Rotor Model; Moment Of Inertia
29	Gujare Satyam Dattatray	
30	Gurav Rohan Somnath	
31	Hegadkar Ashvini Ramchandra	
32	Jadhav Divya Vasant	
33	Jagtap Rohan Sunder	
34	Jankar Vijay Lingappa	
35	Kadam Shailesh Jaysing	
36	Kalal Ajim Husen	
37	Kalunkhe Pratiksha Ravasaheb	
38	Kambale Dattatray Madhukar	Distribution Using Population Distribution (Maxwell - Boltzmann Distribution), Determination Of Bond Length; Isotope Effect. Interaction Of Radiation With Rotatingmolecule
39	Kamble Shreya Suresh	
40	Kapane Ramesh Sukhdev	
41	Katakar Shubham Minanath	
42	Kedar Aniket Ramling	
43	Khandekar Charudatta Pandit	
44	Khandekar Chetana Shivaji	
45	Khandekar Nrusinh Abhiman	
46	Khandekar Samadhan Dagadu	
47	Kharat Amruta Prabhakar	
48	Khatakale Vishal Vishwas	
49	Kokare Rohan Dashrath	
50	Koli Kanchan Siddharam	
51	Kshirsagar Ashwini Shrikant	
52	Kshirsagar Pratham Anil	
53	Kshirsagar Ranajit Shivaji	
54	Kshirsagar Rohit Uttam	
55	Kumbhar Pallavi Kashinath	
56	Langar Saurabh Daji	
57	Lendave Rohan Pitambar	
58	Lonari Ranjit Laxman	



59	Mali Rajkumar Shivanad	Vibrational Spectra Of Diatomic Molecules: Simple Harmonic Oscillator Model
60	Mane Abhishek Arun	
61	Mane Shubham Satyavan	
62	Mane Vishal Sunil	
63	Mane Yamuna Trayambak	
64	Maneri Aftab Ameerjaha	
65	Mhetre Ratnabai Babusha	
66	Misal Priyanka Ashok	
67	Mujawar Ajan Jahangir	
68	Nadaf Sohel Allauddin	
69	Nalavade Suraj Rajendra	
70	Pandhare Tejas Bapurao	
71	Patale Tushar Uddhav	
72	Pathan Adnan Najeer	
73	Patil Aniket Sanjay	
74	Pawar Akshay Bhausahab	
75	Pawar Amar Ramesh	
76	Pawar Mohini Anil	
77	Pawar Shivaji Bhausahab	
78	Phalke Sourabh Arun	
79	Raut Shivam Siddhanath	
80	Rayban Shital Vijay	Vibrational Energies Of Diatomic Molecules, Determination Of Force Constant, Zero Point Energy
81	Sakhare Rohan Tukaram	
82	Sathe Sohan Rajkumar	
83	Satpute Abhijit Rajkumar	
84	Sawant Somnath Namdev	
85	Shete Pratik Prasanna	
86	Shinde Mahesh Vasant	
87	Sirsat Ganesh Hanumant	
88	Sonwale Adarsh Kerappa	
89	Survase Bhagyashri Gahininath	
90	Tate Rohit Mohan	
91	Tavate Rushikesh Bapu	
92	Tawar Sujit Sunil	
93	Telange Kirti Ankush	
94	Terave Pravin Baban	
95	Todkar Gauri Shravan	
96	Torane Nitin Prakash	
97	Torane Vijayashanti Bharat	
98	Varkute Somnath Bharat	
99	Wagh Sumit Satyavan	



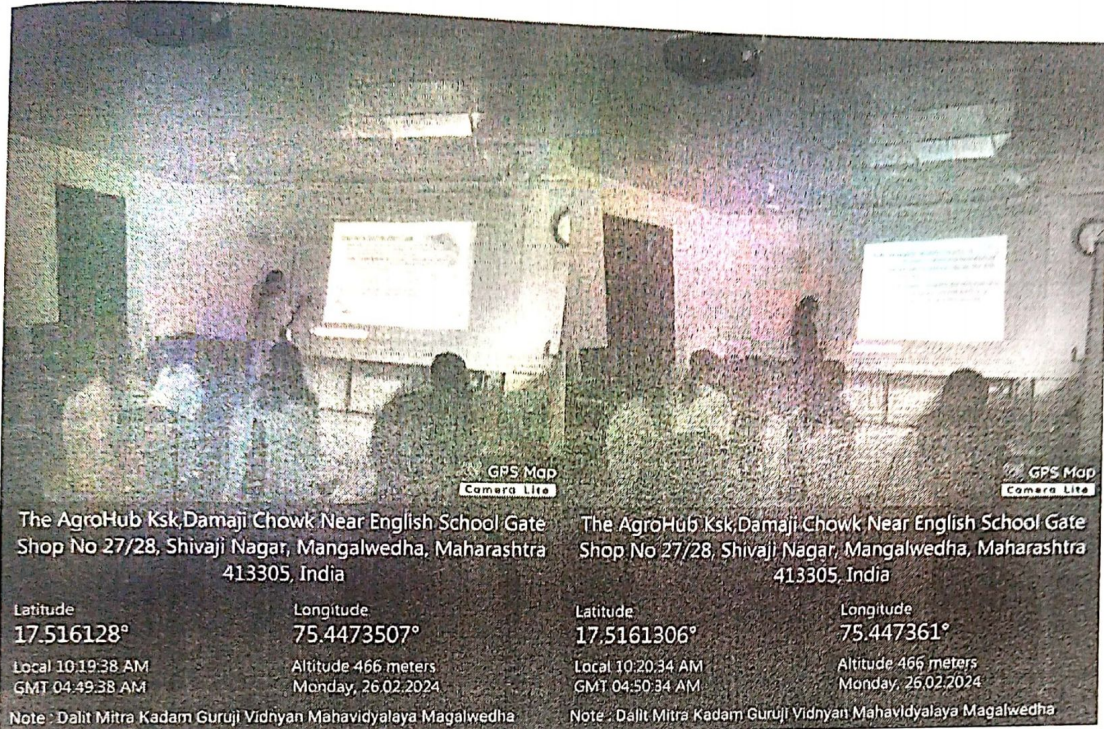
100	Waghachavare Divya Dilip	
101	Waghmode Sandhya Shivaji	
102	Yelmar Prashant Vijay	
103	Zarekari Fatima Khalil	



Shougule
IQAC
Coordinator
Dalit Mitra Kadam Guruji Vidnyan
Mahavidyalaya, Mangalwedha

Sakaal
For Principal
Dalit Mitra Kadam Guruji
Vidnyan Mahavidyalaya Mangalwedha
Tal-Mangalwedha Dist - Solapur

Activity Photos



Sr. No.	Student Name	Sign
1	ANPAT RAHUL BANKAT	ANPAT-PE
2	ATKARE BHAGYAWANT TATYASAHEB	A.P.A.
3	ATKARE NILESH DADASAHEB	Nilesh
4	BABAR ADITYA SATISH	Babar
5	BABAR VIVEK SURESH	Vivek
6	BALVANTRAO MONALI BALASAHEB	monali
7	BALVANTRAV PRIYANKA BALASAHEB	Priyanka
8	BANKAR PRITI SHRIMANT	Priti
9	BANSODE BHAVESH DHANYKUMAR	B.P.D.
10	BEDARE PRADIP DHANANJAY	Pradip
11	BHONG MAYUR SANJAY	mayur
12	Bhosale Aniket Yuvaraj	Aniket
13	BHOSALE ROHAN KANTILAL	rohan
14	Bhosale Vaibhav Nitin	Vaibhav
15	BHUSNAR PRAKASH SHRIMANT	Prakash
16	BIRAJDAR SUDHIR MALLIKARJUN	Sudhir
17	Chaudhari Ajit Arun	Ajit
18	Chavan Shankar Raosaheb	Shankar
19	CHAVAN TUKARAM SANJAYKUMAR	Tukaram
20	DALVI GANESH NANASAHEB	Ganesh
21	Dange Sushant Sukdev	Sushant
22	DHAREKAR VAISHANVI ARJUN	VA.
23	Dhavare Shravika Hanmant	Shravika
24	DUDHAL MEGHA LAHU	Megha
25	DUNDALE RADHIKA VITTHAL	Radhika
26	GADHAVE NANDAKUMAR PANDURANG	Nandakumar
27	Gavade Sunil Nagnath	Sunil
28	Ghatakade Nitin Shivaji	Nitin
29	GUJARE SATYAM DATTATRAY	Satya
30	Gurav Rohan Somnath	Rohan
31	HEGADKAR ASHVINI RAMCHANDRA	Ashvini
32	JADHAV DIVYA VASANT	Divya



33	JAGTAP ROHAN SUNDER	Sunder
34	JANKAR VIJAY LINGAPPA	J.V. Linga
35	KADAM SHAILESH JAYSING	Shaysing
36	KALAL AJIM HUSEN	Kalal
37	KALUNKHE PRATIKSHA RAVASAIH B	Pratiksha
38	KAMBALE DATTATRAY MADHUKAR	K.D. D.
39	KAMBLE SHREYA SURESH	S.S. Kamble
40	KAPANE RAMESH SUKHDEV	Sukhdev
41	KATAKAR SHUBHAM MINANATH	Katakars
42	KEDAR ANIKET RAMLING	Darlingk
43	KHANDEKAR CHARUDATTA PANDIT	Pandit
44	KHANDEKAR CHETANA SHIVAJI	A
45	Khandekar Nrusinh Abhiman	A.N. Khandekar
46	Khandekar Samadhan Dagadu	Samadhan
47	KHARAT AMRUTA PRABHAKAR	Amruta
48	KHATAKALE VISHAL VISHWAS	Vishwas
49	KOKARE ROHAN DASHRATH	Kokare-D
50	Koli Kanchan Siddharam	A
51	KSHIRSAGAR ASHWINI SHRIKANT	KSHRikant
52	Kshirsagar Pratham Anil	A.P. Kshirsagar
53	Kshirsagar Ranajit Shivaji	Ranjit
54	Kshirsagar Rohit Uttam	Uttam
55	kumbhar Pallavi Kashinath	Pallavi
56	LANGAR SAURABH DAJI	A
57	LENDAVE ROHAN PITAMBAR	D.S. Lendave
58	Lonari Ranjit Laxman	Ranjit
59	Mali Rajkumar Shivanad	Rajkumar
60	MANE ABHISHEK ARUN	A.A. Mane
61	Mane Shubham Satyavan	Shubham
62	MANE VISHAL SUNIL	S.V. Mane
63	MANE YAMUNA TRAYAMBAK	Yamuna
64	Maneri Aftab Ameerjaha	Amerjaha
65	MHETRE RATNABAI BABUSHIA	Ratnabai
66	Misal Priyanka Ashok	A.P. Misal
67	Mujawar Ajan jahangir	Ajan
68	NADAF SOHEL ALLAUDDIN	Sohel



69	NALAVADE SURAJ RAJENDRA	N S R
70	PANDHARE TEJAS BAPURAO	T. Pandhare
71	PATALE HUSHAR UDDHAV	H. Patale
72	PATHAN ADNAN NAJIB	P. Pathan
73	PATIL ANIKET SANJAY	A. Patil
74	Pawar Akshay Bhausaheb	A. Pawar
75	Pawar Amar Ramesh	A. Pawar
76	PAWAR MOHINI ANIL	M. Pawar
77	PAWAR SHIVAJI BHAUSAHEB	S. Pawar
78	PHALKE SOURABH ARUN	A. Phalke
79	RAUT SHIVAM SIDDHANATH	S. Raut
80	RAYBAN SHITAL VIJAY	S. Rayban
81	SAKHARE ROHAN TUKARAM	R. Sakhare
82	Sathe Sohan Rajkumar	S. Sathe
83	Satpute Abhijit Rajkumar	A. Satpute
84	SAWANT SOMNATH NAMDEV	S. Sawant
85	Shete Pratik Prasanna	P. Shete
86	Shinde Mahesh Vasant	M. Shinde
87	Sirsat Ganesh Hanumanant	G. Sirsat
88	SONWALE ADARSH KERAPPA	A. Sonwale
89	SURVASE BHAGYASHRI GAHININATH	B. Survase
90	TATE ROHIT MOHAN	R. Tate
91	TAVATE RUSHIKESH BAPU	R. Tavate
92	TAWAR SUJIT SUNIL	S. Tawar
93	TELANGHE KIRTI ANKUSH	K. Telanghe
94	Terave Pravin Baban	P. Terave
95	TODKAR GAURI SHRAVAN	G. Todkar
96	Torane Nitin Prakash	N. Torane
97	TORANE VIJAYASHANTI BHARAT	V. Torane
98	VARKUTE SOMNATH BHARAT	S. Varkute
99	WAGH SUMIT SATYAVAN	S. Wagh
100	Waghachavare Divya Dilip	D. Waghachavare
101	WAGHMODE SANDHIYA SHIVAJI	S. Waghmode
102	YELMAR PRASHANT VIJAY	P. Yelmar
103	Zarekari Fatima Khalil	F. Zarekari





Shikshan Prasarak Mandal's
Dalit Mitra Kadam Guruji Vidnyan
Mahavidyalaya,
**** Mangalwedha ****



Class :- B.Sc I Year

Subject :- Physical Chemistry

Topic Name – Gases State

GENERAL CHARACTERISTICS OF GASES

1. **Expansibility**

Gases have limitless expansibility. They expand to fill the entire vessel they are placed in.

2. **Compressibility**

Gases are easily compressed by application of pressure to a movable piston fitted in the container.

3. **Diffusibility**

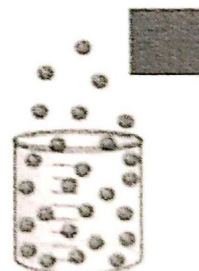
Gases can diffuse rapidly through each other to form a homogeneous mixture.

4. **Pressure**

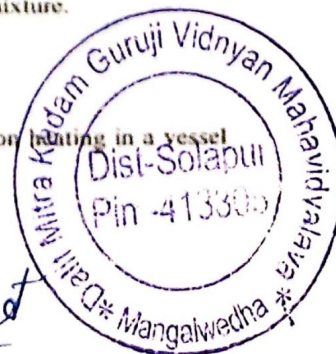
Gases exert pressure on the walls of the container in all directions.

5. **Effect of Heat**

When a gas, confined in a vessel is heated, its pressure increases. Upon heating in a vessel fitted with a piston, volume of the gas increases.



Gas
The individual molecules have little attraction for one another and are free to move about



For *Signature*
Principal
Dalit Mitra Kadam Guruji



POSTULATES OF KINETIC MOLECULAR THEORY OF GASES

Maxwell and Boltzmann (1859) developed a mathematical theory to explain the behaviour of gases and the gas laws. It is based on the fundamental concept that a gas is made of a large number of molecules in perpetual motion. Hence the theory is called the kinetic molecular theory or simply the kinetic theory of gases (The word kinetic implies motion). The kinetic theory makes the following assumptions.

Assumptions of the Kinetic Molecular Theory

- (1) A gas consists of extremely small discrete particles called molecules dispersed throughout the container. The actual volume of the molecules is negligible compared to the total volume of the gas. The molecules of a given gas are identical and have the same mass (m).
- (2) Gas molecules are in constant random motion with high velocities. They move in straight lines with uniform velocity and change direction on collision with other molecules or the walls of the container.
- (3) The distance between the molecules are very large and it is assumed that van der Waals attractive forces between them do not exist. Thus the gas molecules can move freely, independent of each other.
- (4) All collisions are perfectly elastic. Hence, there is no loss of the kinetic energy of a molecule during a collision.
- (5) The pressure of a gas is caused by the hits recorded by molecules on the walls of the container.
- (6) The average kinetic energy $\left(\frac{1}{2}mv^2\right)$ of the gas molecules is directly proportional to absolute temperature (Kelvin temperature). This implies that the average kinetic energy of molecules is the same at a given temperature.

DEVIATION FROM IDEAL BEHAVIOR

An ideal gas is one which obeys the gas laws or the gas equation $PV = RT$ at all pressures and temperatures. However no gas is ideal. Almost all gases show significant deviations from the ideal behaviour. Thus the gases H_2 , N_2 and CO_2 which fail to obey the ideal-gas equation are termed nonideal or real gases.

Compressibility Factor

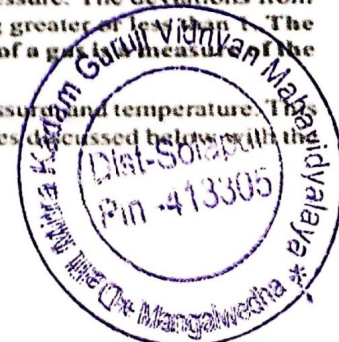
The extent to which a real gas departs from the ideal behaviour may be depicted in terms of a new function called the **Compressibility factor**, denoted by Z . It is defined as

$$Z = \frac{PV}{RT}$$

The deviations from ideality may be shown by a plot of the compressibility factor, Z , against P .

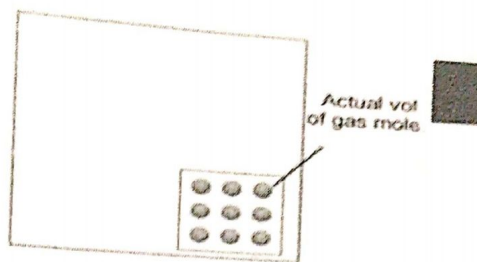
For an ideal gas, $Z = 1$ and it is independent of temperature and pressure. The deviations from ideal behaviour of a real gas will be determined by the value of Z being greater or less than 1. The difference between unity and the value of the compressibility factor of a gas is a measure of the degree of nonideality of the gas.

For a real gas, the deviations from ideal behaviour depend on (i) pressure and temperature. This will be illustrated by examining the compressibility curves of some gases discussed below with the variation of pressure and temperature.

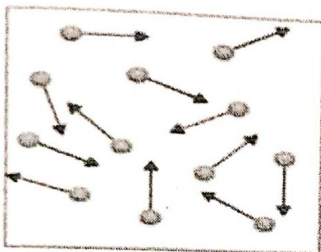




A gas is made of molecules dispersed in space in the container.



Actual volume of the gas molecules is negligible.



Gas molecules are in constant motion in all possible directions.



Molecules move in straight line and change direction on collision with another molecule or wall of container.

Ideal Gases vs. Real Gases

Ideal gases	Real Gases
Ideal gases obey all gas laws under all conditions of temperature and pressure.	Real gases obey gas laws only at low pressures and high temperature.
The volume occupied by the molecules is negligible as compared to the total volume occupied by the gas.	The volume occupied by the molecules is not negligible as compared to the total volume of the gas.
The force of attraction among the molecules are negligible.	The force of attraction are not negligible at all temperatures and pressures.



EXPLANATION OF DEVIATIONS - VAN DER WAALS EQUATION

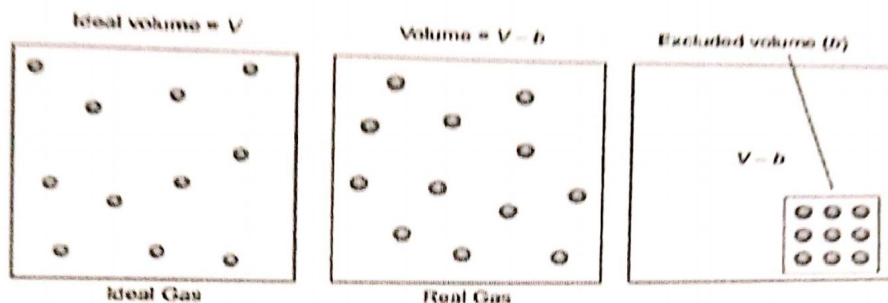
van der Waals (1873) attributed the deviations of real gases from ideal behaviour to two error postulates of the kinetic theory. These are:

- (1) the molecules in a gas are point masses and possesses no volume.
- (2) there are no intermolecular attractions in a gas.

Therefore, the ideal gas equation $PI = nRT$ derived from kinetic theory could not hold for real gases. van der Waals pointed out that both the pressure (P) and volume (V) factors in the ideal gas equation needed correction in order to make it applicable to real gases.

Volume Correction

The volume of a gas is the free space in the container in which molecules move about. Volume V of an ideal gas is the same as the volume of the container. The dot molecules of ideal gas have zero-volume and the entire space in the container is available for their movement. However, van der Waals assumed that molecules of a real gas are rigid spherical particles which possess a definite volume.



Effect of Pressure Variation on Deviations

Fig. shows the compressibility factor, Z , plotted against pressure for H_2 , N_2 and CO_2 at constant temperature.

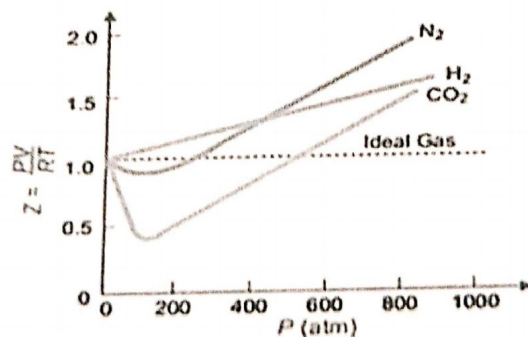


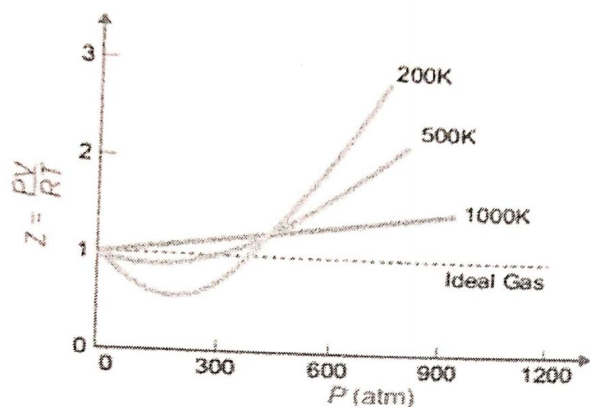
Figure 10.23
 Z versus P plots for H_2 , N_2 and CO_2 at 300 K

At very low pressure, for all these gases Z is approximately equal to one. This indicates that at low pressures (upto 10 atm), real gases exhibit nearly ideal behaviour. As the pressure is increased, H_2 shows a continuous increase in Z (from $Z = 1$). Thus the H_2 curve lies above the ideal gas curve at all pressures.

For N_2 and CO_2 , Z first decreases ($Z < 1$). It passes through a minimum and then increases continuously with pressure ($Z > 1$). For a gas like CO_2 the dip in the curve is greatest as it is most easily liquefied.

Effect of Temperature on Deviations

Fig shows plots of Z or PV/RT against P for N_2 at different temperatures. It is clear from the shape of the curves that the deviations from the ideal gas behaviour become less and less with increase of temperature. At lower temperature, the dip in the curve is large and the slope of the curve is negative. That is, $Z < 1$. As the temperature is raised, the dip in the curve decreases. At a certain temperature, the minimum in the curve vanishes and the curve remains horizontal for an appreciable range of pressures. At this temperature, PV/RT is almost unity and the Boyle's law is obeyed. Hence this temperature for the gas is called Boyle's temperature. The Boyle temperature of each gas is characteristic e.g., for N_2 it is 332 K.



VAN DER WAALS EQUATION

Substituting the values of corrected pressure and volume in the ideal gas equation, $PV = nRT$, we have

$$\left(p + \frac{an^2}{V^2}\right)(V - nb) = nRT$$

This is known as van der Waals equation for n moles of a gas. For 1 mole of a gas ($n = 1$), van der Waals equation becomes

$$\left(p + \frac{a}{V^2}\right)(V - b) = RT$$

Constant a and b in van der Waals equation are called van der Waals constants. These constants are characteristic of each gas.

Determination of a and b

From the expression (1), the value of a is given by the relation

$$a = \frac{pV^2}{n^2}$$

If the pressure is expressed in atmospheres and volume in litres,

$$a = \frac{(\text{pressure}) (\text{volume})^2}{\text{mol}^2} = \frac{\text{atm litre}^2}{\text{mol}^2}$$



Volume of a Real gas.

The volume of a real gas is, therefore, ideal volume minus the volume occupied by gas molecules. If b is the effective volume of molecules per mole of the gas, the volume in the ideal gas equation is corrected as :

$$(V - b)$$

For n moles of the gas, the corrected volume is :

$$(V - nb)$$

where b is termed the excluded volume which is constant and characteristic for each gas.

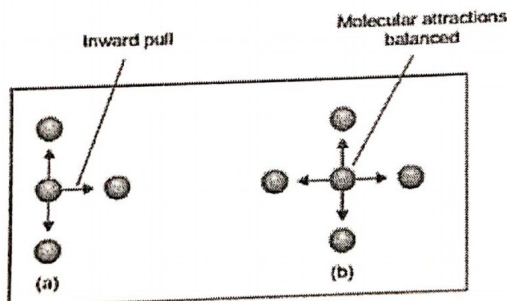
Pressure Correction

A molecule in the interior of a gas is attracted by other molecules on all sides. These attractive forces cancel out. But a molecule about to strike the wall of the vessel is attracted by molecules on one side only. Hence it experiences an inward pull (Fig. 10.27). Therefore, it strikes the wall with reduced velocity and the actual pressure of the gas, P , will be less than the ideal pressure. If the actual pressure P , is less than P_{ideal} by a quantity p , we have

$$P = P_{\text{ideal}} - p$$

or

$$P_{\text{ideal}} = P + p$$



(a) A molecule about to strike the wall has a net inward pull;

(b) A molecule in the interior of gas has balanced attractions.

p is determined by the force of attraction between molecules (A) striking the wall of container and the molecules (B) pulling them inward. The net force of attraction is, therefore, proportional to the concentration of (A) type molecules and also of (B) type of molecules. That is,

$$p \propto C_A \times C_B$$

or

$$p \propto \frac{n}{V} \times \frac{n}{V}$$

or

$$p = \frac{an^2}{V^2}$$

where n is total number of gas molecules in volume V and a is proportionality constant characteristic of the gas. Thus the pressure P in the ideal gas equation is corrected as

$$\left(P + \frac{an^2}{V^2} \right)$$



CONTINUITY OF STATES AND RELATIONSHIP BETWEEN CRITICAL CONSTANTS AND VANDER WAALS CONSTANTS

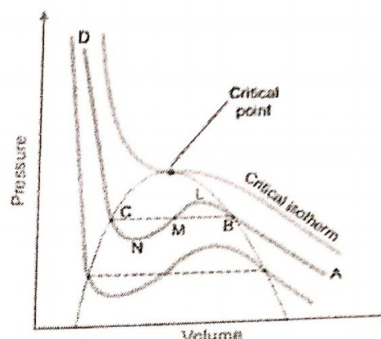
Thomson (1871) studied the isotherms of carbon dioxide drawn by Andrews. He suggested that there should be no sharp points in the isotherms below the critical temperature. These isotherms wavy curve. The curve MLB in Fig. 10.31 represents a gas compressed in a way that it would remain stable. The curve MNC represents a superheated liquid. This type of continuity of state is predicated by van der Waals cubic equation. According to it, for any given values of P and T there should be three values of V . These values are indicated by points B , M and C of the wavy curve. The three values of V become closer as the horizontal part of the isotherm rises. At the critical point, these values become identical. This enables the calculation of T_c , P_c and V_c in terms of van der Waals constants. The van der Waals equation may be written as

$$\left(P + \frac{a}{V^2}\right)(V - b) = RT$$

$$PV - Pb + \frac{a}{V} - \frac{ab}{V^2} - RT = 0$$

Multiplying the whole equation by V^2

$$\text{or } PV^3 - (RT + Pb)V^2 + aV - ab = 0$$



Thus a is expressed in $\text{atm litre}^2 \text{mol}^{-2}$ units.

Since nb is excluded volume for n moles of gas,

$$b = \frac{\text{volume}}{n} = \frac{\text{litre}}{\text{mole}}$$

If volume is expressed in litres, b is expressed in litre mol^{-1} units.

SI units of a and b . If pressure and volume are taken in SI units, we have

$$a = \frac{(\text{pressure})(\text{volume})}{(\text{mol})^2} = \frac{(\text{Nm}^{-2})(\text{m}^3)^2}{(\text{mol})^2}$$

$$= \text{Nm}^4 \text{mol}^{-2}$$

and

$$b = \text{Volume mol}^{-1}$$

$$= \text{m}^3 \text{mol}^{-1}$$

The values of (a) and (b) can be determined by knowing the P , V and T of a gaseous system under two different conditions.



CRITICAL PHENOMENA PV ISOTHERMS OF REAL GASES

LIQUEFACTION OF GASES – CRITICAL PHENOMENON

A gas can be liquefied by lowering the temperature and increasing the pressure. At lower temperature, the gas molecules lose kinetic energy. The slow moving molecules then aggregate due to attractions between them and are converted into liquid. The same effect is produced by the increase of pressure. The gas molecules come closer by compression and coalesce to form the liquid.

Andres (1869) studied the $P - T$ conditions of liquefaction of several gases. He established that for every gas there is a temperature below which the gas can be liquefied but above it the gas defies liquefaction. This temperature is called the critical temperature of the gas.

The **critical temperature**, T_c , of a gas may be defined as that temperature above which it cannot be liquefied no matter how great the pressure applied.

The **critical pressure**, P_c , is the minimum pressure required to liquefy the gas at its critical temperature.

The **critical volume**, V_c , is the volume occupied by a mole of the gas at the critical temperature and critical pressure.

T_c , P_c and V_c are collectively called the **critical constants** of the gas. All real gases have characteristic critical constants.

At critical temperature and critical pressure, the gas becomes identical with its liquid and is said to be in **critical state**. The smooth merging of the gas with its liquid is referred to as the **critical phenomenon**. Andrews demonstrated the critical phenomenon in gases by taking example of carbon dioxide.



Mitochondria

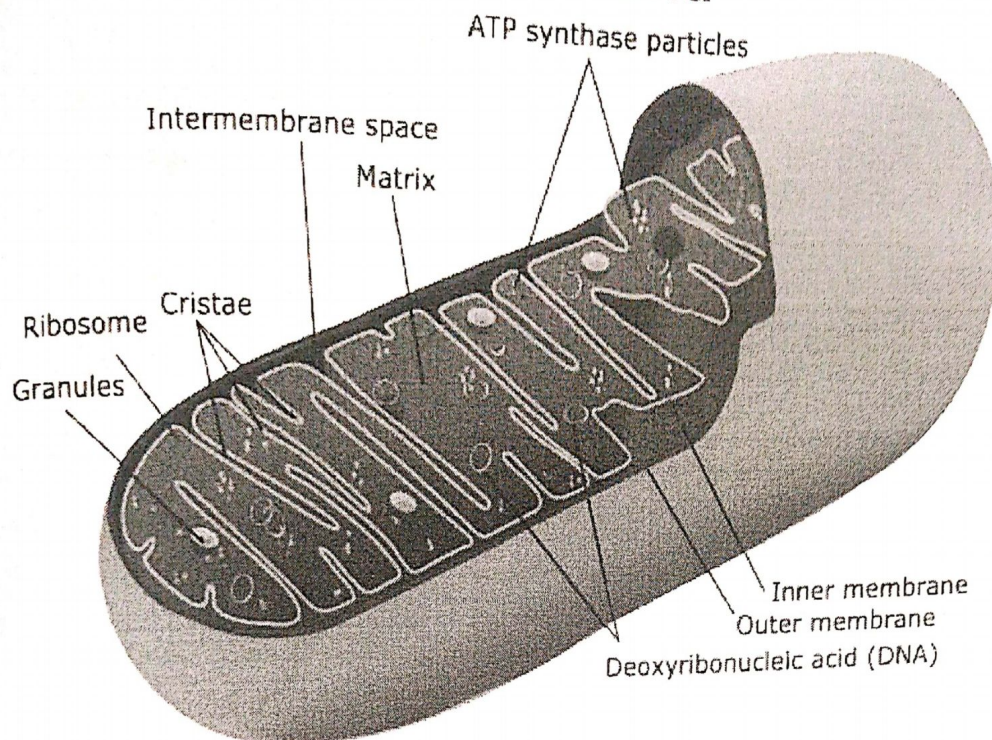
miss. Matwal S. R.

History:

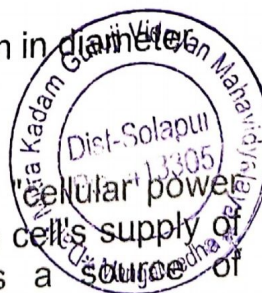
- Kolliker (1880) first observed it as cytoplasmic granules in striped muscles of insects.
- Altman (1894) established them as cell organelles and called **Bioblast**.
- Flemming & Altman was credited for its discovery.
- Term 'Mitochondria' was given by **C.Benda**.
F.Meves (1904) first observed them in plants (Nymphaea).
- Kinsberg & Hogeboom (1948) related them with cell respiration.
- Seikevitz called them power house of cell.



Mitochondria



- Small granular, filamentous bodies of cytoplasm
- Found in all aerobically respiring cells
- Contain enzymes and co-enzymes responsible for energy metabolism.
- Closely related with cellular respiration
- Membrane-enclosed organelle found in most eukaryotic cells.
- These organelles range from 0.5 to 1.0 μm in diameter
- (15000 $\text{\AA}$ long & 5000 $\text{\AA}$ wide)
- Mitochondria are sometimes described as "cellular power plants" because they generate most of the cell's supply of adenosine triphosphate (ATP), used as a source of chemical energy.



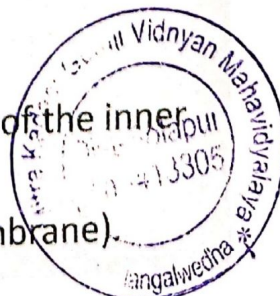
- Shape: Filamentous granular
 - May change became rod, club, ring etc.
 - Size: 3-10 μm and 0.5-1 μm diameter
 - Smallest- 1 μm in yeast
 - Largest- 20-30 μm in oocytes of amphibians
 - pH, cell environment, osmotic pressure related to the shape and size
 - Number of mitochondria: Varies, related to functional state of cell.
 - Liver cell: 1000-1600
 - Renal tubule: 300-400
 - Sea urchin egg 13000-14000
 - Human sperm- 25
 - Scattered in cytoplasm in most of cells
-
- In addition to supplying cellular energy, mitochondria are involved in a range of other processes, such as signaling, cellular differentiation, cell death, as well as the control of the cell cycle and cell growth
 - Mitochondria have been implicated in several human diseases, including mitochondrial disorders and cardiac dysfunction and may play a role in the aging process.



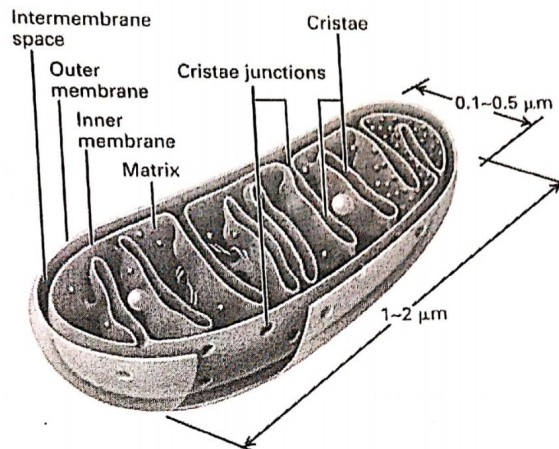
- The number of mitochondria in a cell varies widely by **organism** and **tissue** type.
- Many cells have only a single mitochondrion, whereas others can contain several thousand mitochondria
- The organelle is composed of compartments that carry out specialized functions.
- These compartments or regions include the outer membrane, the intermembrane space, the inner membrane, and the cristae and matrix.

Structure

- A mitochondrion contains outer and inner membranes composed of phospholipid bilayers and proteins
- The two membranes, however, have different properties.
- Because of this double membrane organization, there are five distinct compartments within the mitochondrion.
- There is the
 1. outer mitochondrial membrane,
 2. The intermembrane space (the space between the Outer and inner membranes),
 3. The inner mitochondrial membrane,
 4. The cristae space (formed by infoldings of the inner membrane), and
 5. The matrix (space within the inner membrane).

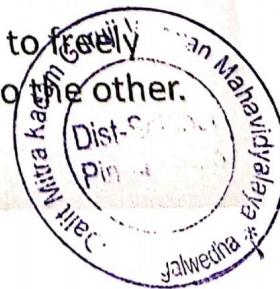


Internal structure of a mitochondrion



Outer membrane

- The outer mitochondrial membrane, which encloses the entire organelle, has a protein-to-phospholipid ratio similar to that of the eukaryotic plasma membrane
- Each membrane about $60 \text{ \AA}$ in thickness
- It contains large numbers of integral proteins called **porins**.
- These porins form channels that allow molecules 5000 Daltons or less in molecular weight to freely diffuse from one side of the membrane to the other.



- **Intermembrane space:**
- The intermembrane space ($60-80 \text{ \AA}$) is the space between the outer membrane and the inner membrane.
- Because the outer membrane is freely permeable to small molecules
- One protein that is localized to the intermembrane space in this way is cytochrome c

- **Inner membrane**

- The inner mitochondrial membrane contains proteins with five types of functions.
 - 1) Those that perform the redox reactions of oxidative phosphorylation
 - 2) ATP synthases, which generates ATP in the matrix
 - 3) Specific transport proteins that regulate metabolite passage into and out of the matrix
 - 4) Protein import machinery.
 - 5) Mitochondria fusion and fission proteins



Cristae:

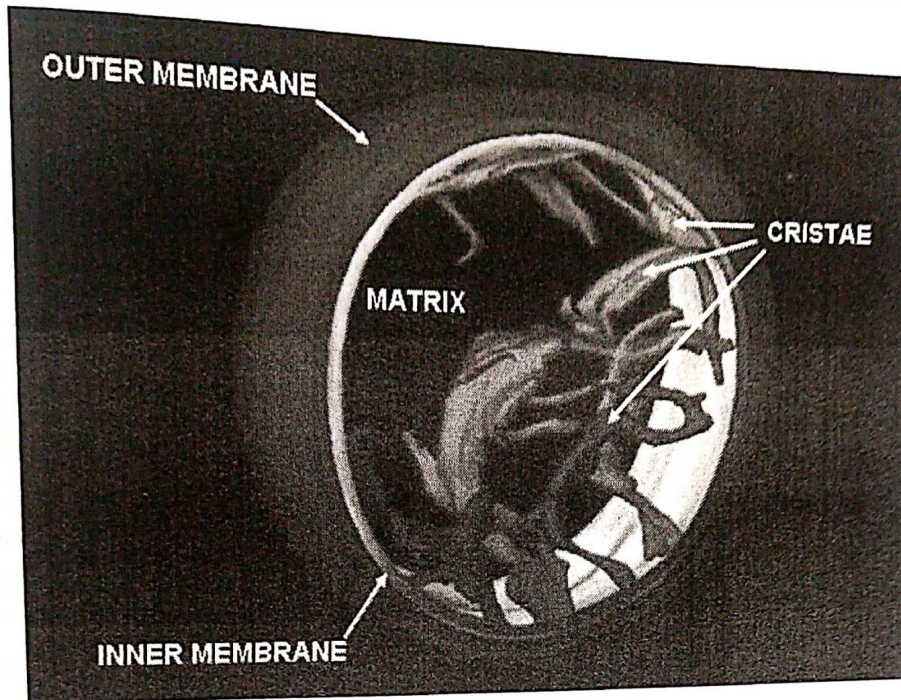
- The inner mitochondrial membrane is compartmentalized into numerous cristae, which expand the surface area of the inner mitochondrial membrane, enhancing its ability to produce ATP.
- For typical liver mitochondria the area of the inner membrane is about five times greater than the outer membrane.
- This ratio is variable and mitochondria from cells that have a greater demand for ATP, such as muscle cells, contain even more cristae.
-
- These folds are studded with small round bodies known as **F₁ particles or oxysomes**.

Elementary particle/F₁ Particle/oxysomes/ETP

- Outer membrane particles; 60 A⁰, stalk less
- Inner membrane particles; 160 A⁰, with head, stalk & base (80 A⁰, 50 A⁰, 80 A⁰,)

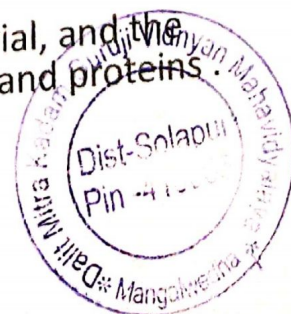


Cross-sectional image of cristae in rat liver mitochondrion to demonstrate the likely 3D structure and relationship to the inner membrane.



- **Mitochondrial matrix:**

- The matrix is the space enclosed by the inner membrane.
- It contains about **2/3** of the total protein in a mitochondrion.
- The matrix is important in the production of ATP
- The matrix contains a highly-concentrated mixture of hundreds of enzymes, special mitochondrial ribosome's, tRNA, and several copies of the mitochondrial DNA genome.
- Of the enzymes, the major functions include oxidation of pyruvate and fatty acids, and the citric acid cycle
- Mitochondria have their own genetic material, and the machinery to manufacture their own RNAs and proteins.



Chemical composition of Mitochondrion

- The mitochondrial memb. has chemical organization
- Each memb. is made up of proteins and lipids
- Proteins 65 to 70%, insoluble in water
- Lipids 25-30% : composed of 90 % of phospholipids, 5 % **cholesterol** and 5 % free fatty acids
- The molecule phospholipids is insoluble in water but structural group of phospholipids molecule called micelle is soluble
- It also consists of 0.5 % RNA, small amount of DNA, S, Fe, Cu and some Vitamins
- The mitochondrial DNA is double stranded and circular
- More than 70 enzymes and co enzymes in matrix of Mitochondrion

Functions:

- The most prominent roles of mitochondria are to **produce ATP** (i.e., phosphorylation of ADP) through respiration, and to regulate cellular metabolism
- The central set of reactions involved in ATP production are collectively known as the **Citric acid cycle**, or the Krebs Cycle.
- However, the mitochondrion has many other functions in addition to the production of ATP.



STEPS IN CELL RESPIRATION

1. **GLYCOLYSIS:** Breakdown of glucose to pyruvic acid
 Glucose + Cytoplasmic enzyme → Pyruvic acid

2. **OXIDATION AND DECARBOXYLATION of PYRUVIC ACID :**
 Pyruvic acid + P. Acid Dehydrogenase enzyme of F1 particle → Acetyl CoA + 2H⁺ + CO₂ ↑

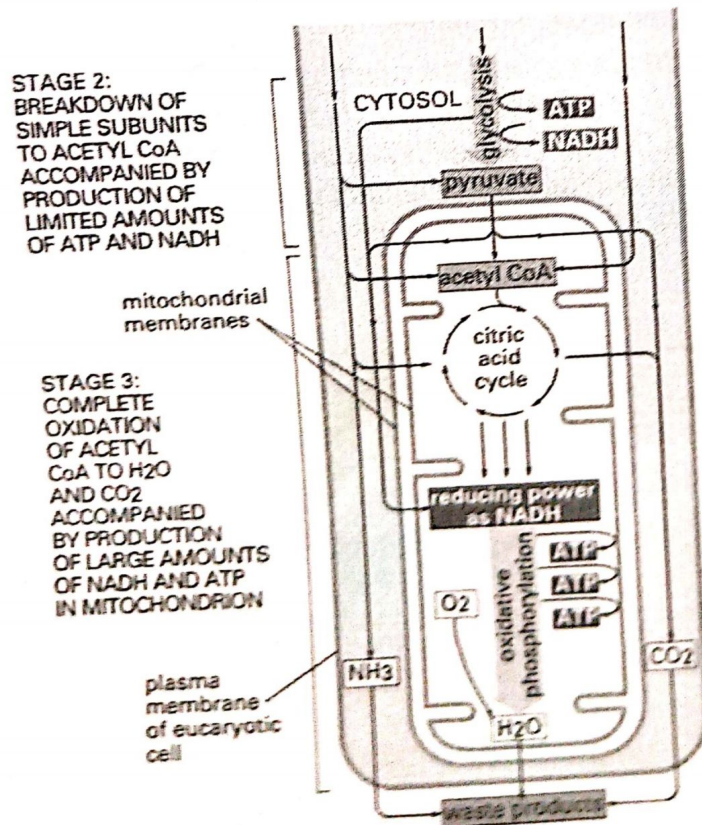
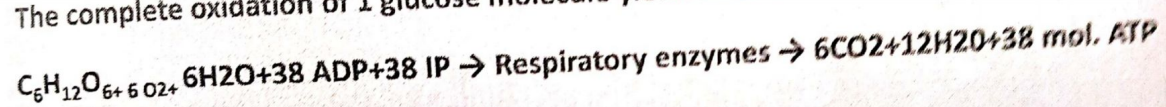
3. **KREBS CYCLE/ CITRIC ACID CYCLE: (1936)**

Acetyl CoA + Oxaloacetic acid, citric acid synthetase → Citric Acid with 6 carbon atom

Succinyl CoA → S.A. Thiokinase → Succinic acid, synthesis of 1 mol. Of ATP

4. **OXIDATIVE PHOSPHORYLATION ;**

The complete oxidation of 1 glucose molecule yields about 38 molecules of ATP



2-70 (Alberts):
 Cellular metabolism



Figure 2-70 part 2 of 2. Molecular Biology of the Cell, 4th Edition.

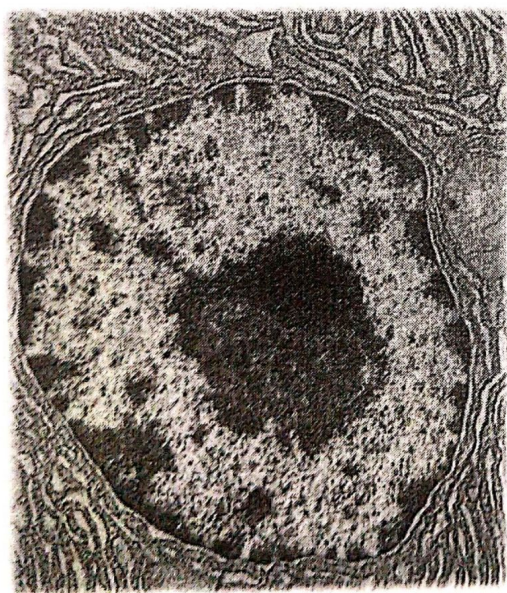
Additional functions of mitochondria...

1. Regulation of the membrane potential
2. Apoptosis-programmed cell death
3. Calcium signaling
4. Cellular proliferation regulation
5. Regulation of cellular metabolism
6. Some mitochondrial functions are performed only in specific types of cells.

(For example, mitochondria in liver cells contain enzymes that allow them to detoxify ammonia, a waste product of protein metabolism. A mutation in the genes regulating any of these functions can result in mitochondrial diseases.)

IQAC
Coordinator
Dalit Mitra Kadam Guruji Vidyan
Mahavidyalaya, Mangalwedha





Nucleus & Nucleolus

Miss. Bhoyar S. S.



Shougule
IQAC
Coordinator
Dalit Mitra Kadam Guruji Vidnyan
Mahavidyalaya, Mangalwedha

The Cell Nucleus

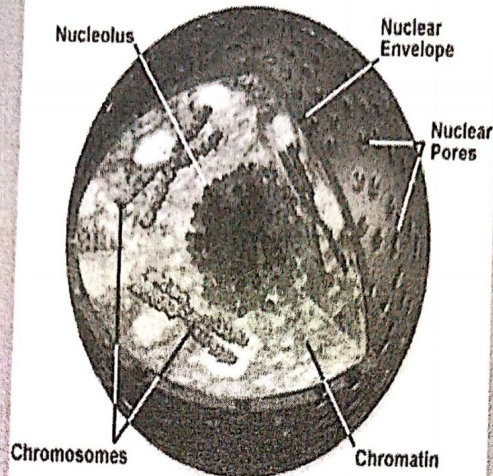


Figure 1

THE CELL NUCLEUS

History

-Discovered in 1831 by Scottish botanist Robert Brown

-Suggested the nucleus played a key role in fertilization and development of the embryo in plants

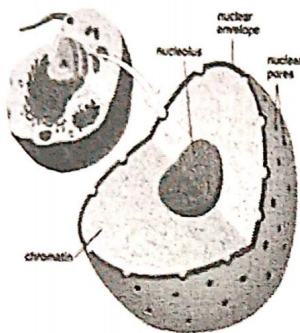
-Name (nucleus) derived from the Latin word for kernel/nut



Robert Brown
1773-1858



Main Characteristics

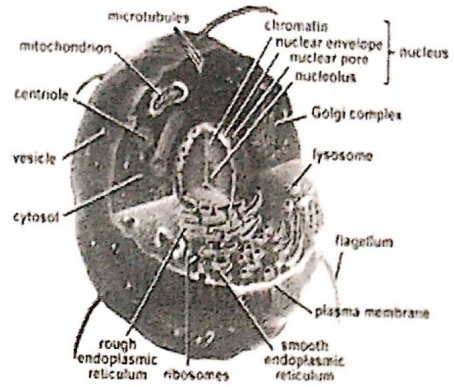
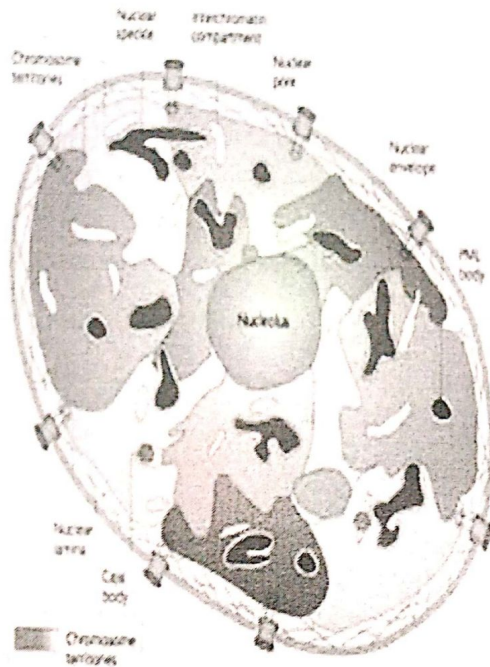


- Membrane-enclosed organelle found in eukaryotic cells
- Generally found in the central region of the cell (in animal cells)
- Roughly spherically shaped
- Largest and most easily seen organelle

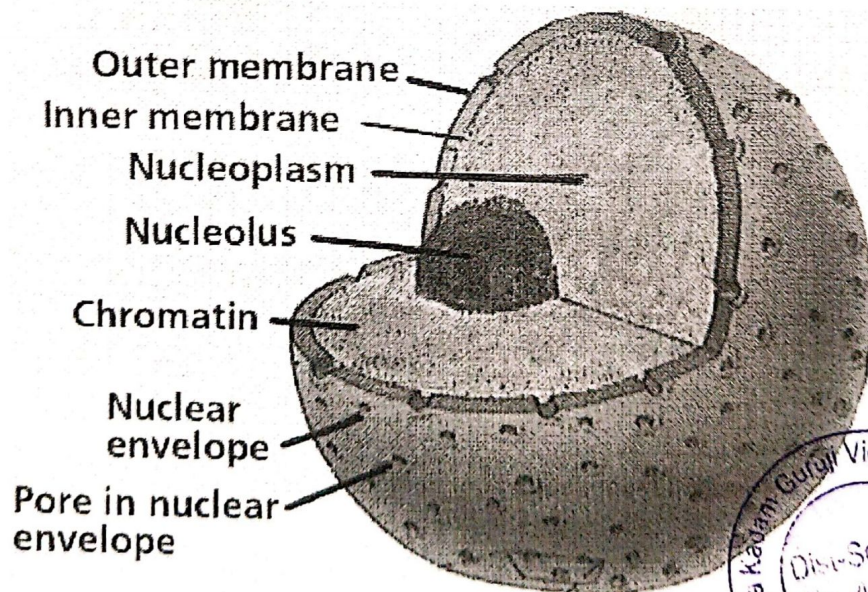
- Shape: Related to the shape of the cell
- Almost irregular shape
- Size: Almost varies 3-25 micron
- Depends on cell type ,function, set of chromosomes
- Mononucleate, binucleate, polynucleate, disc, spherical, oval, bilobed, multi lobed, pyriform, spindle, C Shaped, Twisted etc



THE CELL NUCLEUS



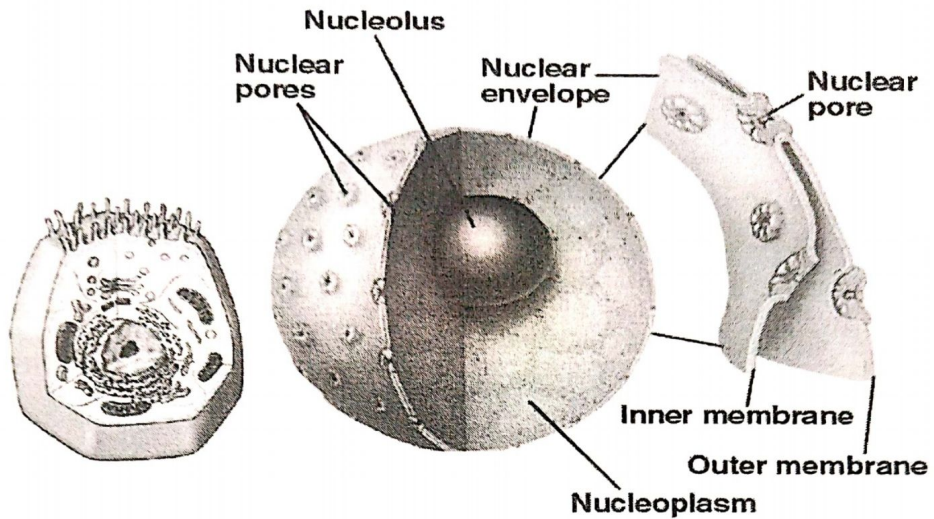
ULTRA STRUCTURE OF NUCLEUS



Structure

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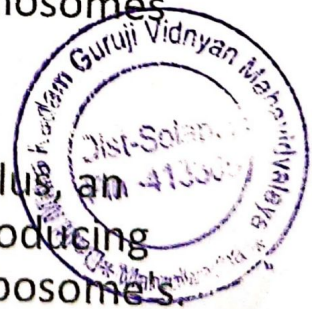
Nucleus



- The nucleus is a highly specialized organelle that serves as the information and administrative center of the cell.
- This organelle has two major **functions**.
 1. It stores the cell's hereditary material, or DNA, and
 2. it coordinates the cell's activities, which include intermediary **metabolism, growth, protein synthesis, and reproduction** (cell division)



- Only the cells of advanced organisms, known as **eukaryotes**, have a nucleus.
- Generally there is only one nucleus per cell, but there are exceptions such as slime molds and the Siphonales group of algae.
- Simpler one-celled organisms (**prokaryotes**), like the bacteria and cyanobacteria, don't have a nucleus.
- In these organisms, all the cell's information and administrative functions are dispersed throughout the cytoplasm.
- The spherical nucleus occupies about 10 percent of a cell's volume, making it the cell's most prominent feature.
- Most of the nuclear material consists of chromatin, the unstructured form of the cell's DNA that will organize to form chromosomes during mitosis or cell division.
- Also inside the nucleus is the nucleolus, an organelle that synthesizes protein-producing macromolecular assemblies called ribosomes.



Cell Nucleus: Structure

The structure of a cell nucleus consists of

- 1) Nuclear membrane (Nuclear envelope),
- 2) Nucleoplasm,
- 3) Nucleolus and
- 4) Chromosomes.

- Nucleoplasm, also known as karyoplasms, is the matrix present inside the nucleus.
- several parts of a cell nucleus.

Nuclear Membrane:

- A double-layered membrane, the nuclear envelope, separates contents of the nucleus from the cellular cytoplasm
- The nuclear membrane is a double-layered structure that encloses the contents of the nucleus.
- The outer layer (50 -90 A°) of the nuclear membrane is connected to the endoplasmic reticulum.
- A fluid-filled space or Perinuclear space (110-140 A°) is present between the two layers of a nuclear membrane.
- The nucleus communicates with the remaining of the cell or cytoplasm through several openings called nuclear pores.(600 A°)
- Nuclear pores are the sites for the exchange of large molecules (proteins and RNA) between the nucleus and cytoplasm.
- Fibrous lamina (300 A°)



Functions of Nuclear Membrane

1. Protection of DNA
2. Nucleo-cytoplasmic material exchange
3. Attachment of structural elements in the cytoplasm
4. Attachment of nuclear component during interphase
5. Contribution to formation of other cell membranes
6. Protein synthesis
7. Antibody production
8. Synthesis of chromosomal enzymes

- **Chromatin/Chromosomes -**

Chromosomes are present in the form of strings of DNA and histones (protein molecules) called chromatin.

- Chromatin is further classified into
- Heterochromatin and Euchromatin based on the function.
- **The heterochromatin is a highly condensed** transcriptionally inactive form, mostly present in adjacent to the nuclear membrane.
- **Euchromatin is a delicate, less condensed** organization of chromatin, which is found abundantly in a transcribing cell.

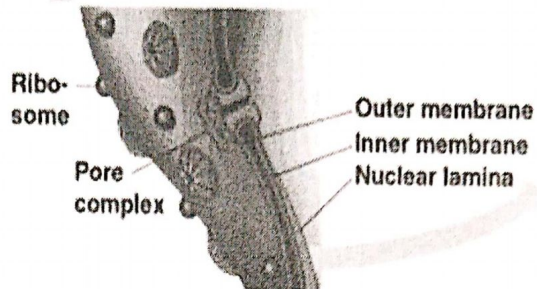
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Nuclear Envelope

Consists of:

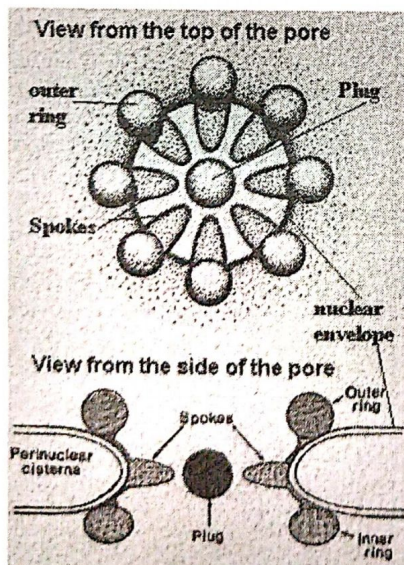
- Phospholipid bi-layer membrane
- Nuclear Pores



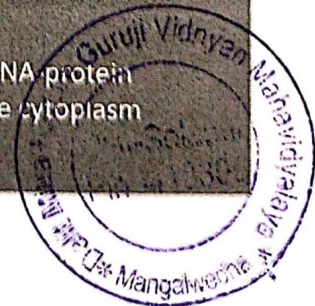
Close-up of nuclear envelope

Ribosomes

Nuclear Pores



- Allow small molecules to diffuse easily between nucleoplasm & cytoplasm
- Control passage of proteins & RNA protein complexes
 - Import: proteins moving in to be incorporated into nuclear structure or to catalyze nuclear activities
 - Export: RNA / RNA protein complexes to the cytoplasm



Nucleolus:

- Parts: Fibrillar region, Granular region, Amorphous region
- The nucleolus is a dense, spherical-shaped structure present inside the nucleus.
- Some of the eukaryotic organisms have nucleus that contains up to four nucleoli.
- The nucleolus plays an indirect role in protein synthesis by producing ribosome's.
- Ribosomes are cell organelles made up of RNA and proteins; they are transported to the cytoplasm, which are then attached to the endoplasmic reticulum.
- Ribosomes are the protein-producing structures of a cell.
- Nucleolus disappears when a cell undergoes division and is reformed after the completion of cell-division.

Functions of Nucleolus

- RNA synthesis and storage
- Supply energy for nuclear activity
- Role in mitosis
- Transfer genetic information
- Biosynthesis of ribosome's
- Cytoplasmic protein synthesis



Cell Nucleus: Functions

- It controls the hereditary characteristics of an organism and is responsible for the protein synthesis, cell division, growth and differentiation.
- Storage of hereditary material, the genes in the form of long and thin DNA (deoxyribonucleic acid) strands, referred to as chromatins.
- Storage of proteins and RNA (ribonucleic acid) in the nucleolus.
- Nucleus is a site for transcription in which messenger RNA (mRNA) are produced for the protein synthesis.
- Exchange of hereditary molecules (DNA and RNA) between the nucleus and rest of the cell.
- During the cell division, chromatins are arranged into chromosomes.
- Production of ribosomes (protein factories) in the nucleolus.
- Selective transportation of regulatory factors and energy molecules through nuclear pores.

