CERTIFICATE

Name : Vinita Kumawat *Class :* BSC Iyear Sem II

Roll No.: 131 *Exam No.:*

Institution Vivek P.G. College. Kalwar

This is certified to be the bonafide work of the student in the Botany

semester II *Laboratory during the academic year* 2023 /2024

No of practicals certified 10 *out of* 12 *in the subject of* Botany.

.....
Examiner's Signature

.....
Teacher in-charge

.....
Principal

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706
institution Rubber stamp

Date : 12 May 2024

Vinita kumawat

INDEX

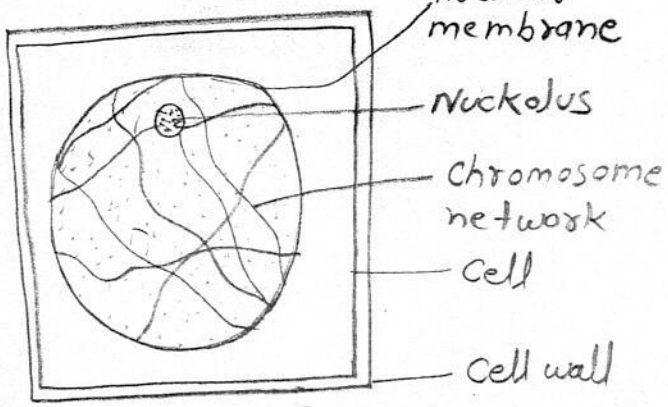
S. No.	Name of Experiment	Page No.	Date of Experiment	Date of Submission	Remarks
1.	Study of Meiotic Division Meiosis - I	1-2	13/03/24	14/03/24	Attend 14/3/24
2.	Salivary Gland Polytene Chromosome	3	14/03/24	15/03/24	Attend 15/3/24
3.	Structure of Cell Onion Cell	4	16/03/24	18/03/24	Attend 18/03/24
4.	Spirogyra	5	19/03/24	20/03/24	Attend 20/3/24
5.	Study Electronmicrograph of Eucaryotic cell organelles	6	22/03/24	23/03/24	Attend 23/03/24
(1)	Cell wall कोशिका भित्ति	7	22/03/24	23/03/24	Attend 23/03/24
(2)		8	22/03/24	23/03/24	Attend 23/3/24
(3)	Nucleus माइटोकॉन्ड्रिया	9	22/03/24	23/03/24	Attend 23/3/24
(4)		10			
(5)	Chloroplast	11	23/03/24	25/03/24	Attend 25/3/24
(6)	Ribosome	12	23/03/24	25/03/24	Attend
(7)	Peroxisomes	13	23/03/24	25/03/24	Attend 25/3/24
(8)	Lysosomes	14	30/03/24	01/04/24	Attend
(9)	Golgi bodies	15	30/03/24	01/04/24	Attend
(10)	Endoplasmic Reticulum	16	30/03/24	01/04/24	Attend 01/4/24
	Genetics	17-25			
6.	Monohybrid cross	17	03/04/24	5/4/24	Attend 11/4/24
7.	Dihybrid cross	18	7/04/24	12/04/24	Attend 12/4/24
8.	Mendel's Rules	19	15/04/24	16/04/24	Attend 16/4/24
9.	Test cross & Back cross	25	18/04/24	19/04/24	Attend

Vinita kumawat

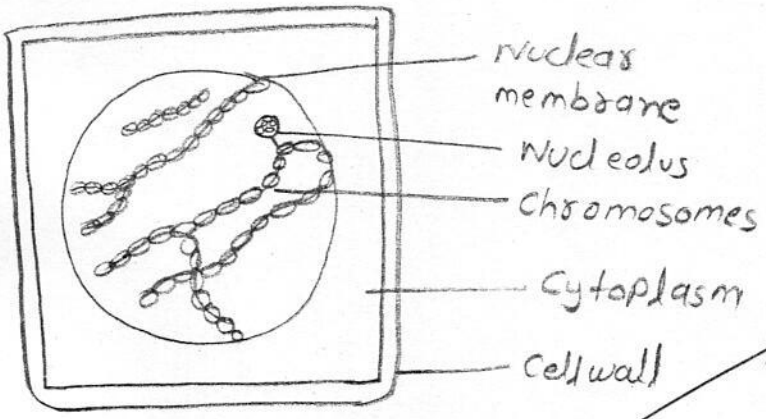
INDEX

S. No.	Name of Experiment	Page No.	Date of Experiment	Date of Submission	Remarks
1.	Study of Meiotic Division Meiosis - I	1-2	13/03/24	14/03/24	Attested 14/3/24
2.	Salivary Gland Polytene Chromosome	3	14/03/24	15/03/24	Attested 15/3/24
3.	Structure of Cell Onion Cell	4	16/03/24	18/03/24	Attested 18/03/24
4.	Spirogyra	5	19/03/24	20/03/24	Attested 20/3/24
			22/03/24	23/03/24	Attested 23/03/24

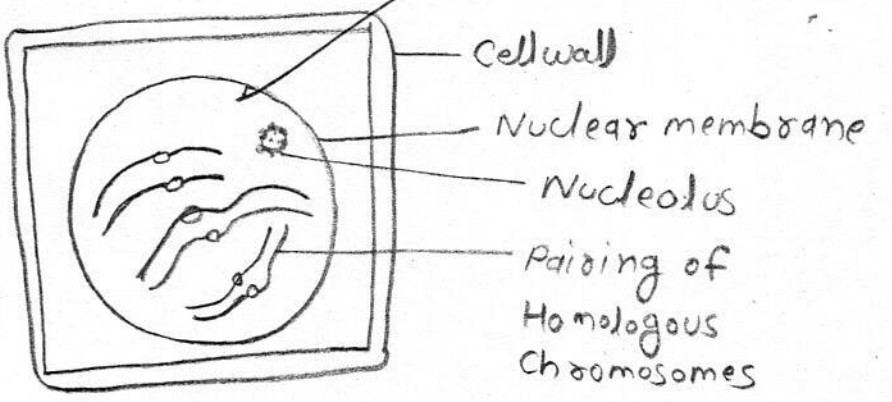
PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706



PROPHASE



(A) Leptotene



(B) Zygotene

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Study of Meiotic Division

Meiosis – I

प्रेक्षण

प्रथम अर्द्धसूत्री विभाजन

1. Prophase – I

यह अर्द्धसूत्री विभाजन की प्रथम व सबसे लंबी प्रावस्था होती है। यह पांच उप-प्रावस्थाओं में जैसे लेप्टोटीन, जायगोटीन, पेकीटीन डिप्लोटीन व डाइकार्नेसिस में विभाजित रहती है जो आगे वर्णित है।

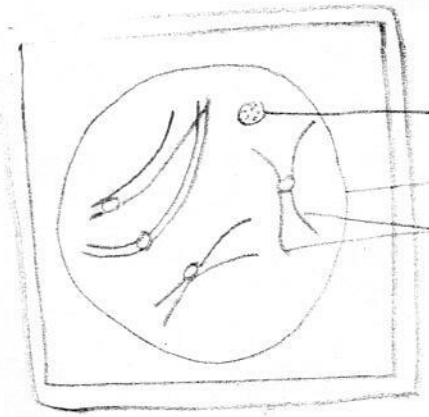
पूर्वावस्था की विभिन्न अवस्थायें

Stages	Process
1. Leptotene	आरएनए व प्रोटीन के निर्माण द्वारा केन्द्रक के आकार में वृद्धि, गुणसूत्रों का कुण्डलन द्वारा छोटे व मोटे होना।
2. Zygotene	समजात गुणसूत्रों का युग्मन, सूत्रियुग्मन दोनों अर्द्धगुणसूत्र द्वारा सिनेप्टिनिमल संकुल का निर्माण।
3. Pachytene	क्रॉसिंग ओवर, विजातीय गुणसूत्र मे जीन विनिमय।
4. Diplotene	समजात गुणसूत्रों का प्रतिकर्षण बल द्वारा अलग-2 होना काएज्मेटा का दिखाई देना काएज्मेटा की गुणसूत्रों की भुजायें का 180° कोण पर घुम जाना। × जैसा।
5. Diakinesis	काएज्मा का पूर्ण रूप से उपांतीकरण व क्रोमोसोम स्प्रा का संघनन।

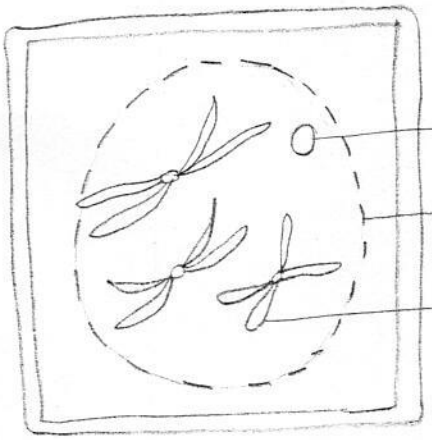
PRINCIPAL
VIVEK PG COLLEGE
ALWAR, JAIPUR-303706

PRIYANSHU

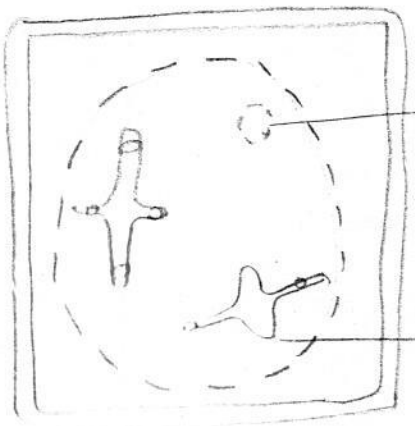
Teacher's Signature.....



(c) Pachytene



(d) Diplotene



(e) Diakinesis

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Leptotene :- 1. इसमें क्रोमोसोम लंबे, पतले, अर्न्तगुंथे धागे समान दिखाई देते है।
2. क्रोमोमीयर की उपस्थिति के कारण यह मालावत् आभासित होते है।
3. इस प्रावस्था में क्रोमोसोम द्विगुणित अवस्था प्रदर्शित करते है।

Zygotene :- 1. जोड़ा बनाने की यह प्रक्रिया सिनेप्सिस कहलाती है यह सिनेप्सिस बहुत सटीक बनते है।
2. धीरे-2 क्रोमोसोम छोटे व मोटे होते जाते है।
3.

Pachytene :- 1. क्रोमोसोम के दो धागे क्रोमेटिड कहलाते है।
2. एक क्रोमोसोम से क्रोमेटिड भगिनी क्रोमेटिड कहलाते है।
3 इस उप प्रावस्था मे कायेस्मेटा दिखाई देते है जो x आकार के होते है।

Diplotene :- 1. क्रोमेटिड के धागे एक दूसरे से पृथक् होते हुए दिखाई देते है।
2. प्रत्येक सिनेप्सिस युक्त जोड़े मे चार धागे उप. होते है।
3. इस समय क्रोमोसोम मोटे व छोटे होते है।

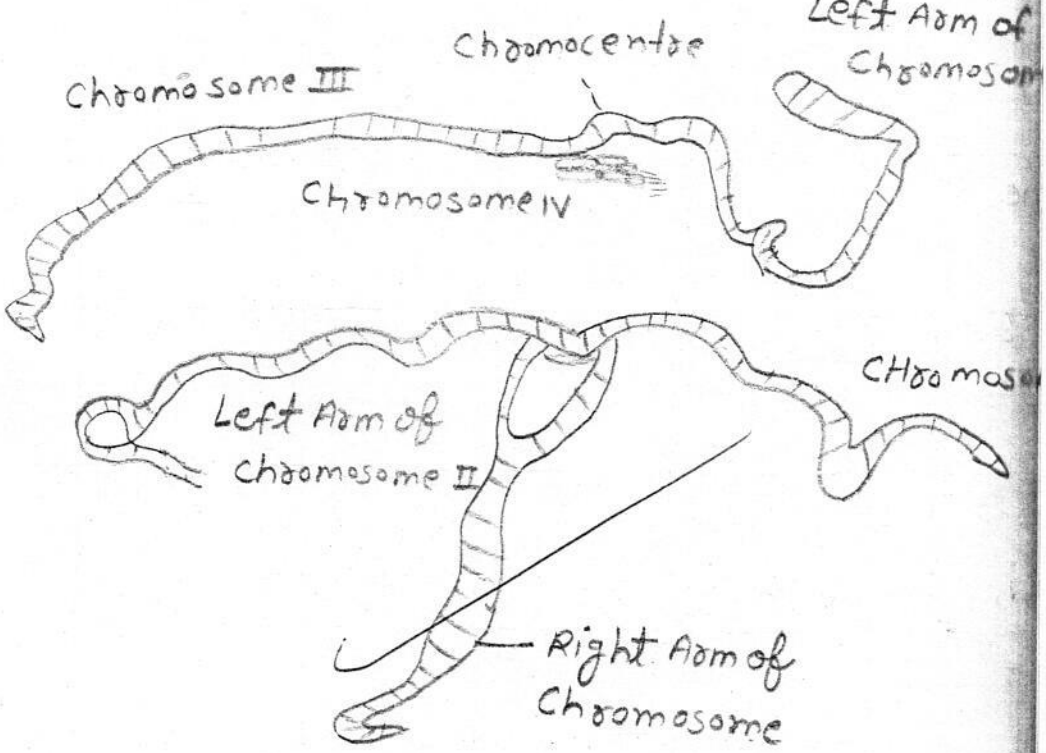
Diakinesis :- 1. टेट्राड संकुचित होकर केन्द्रक मे पृथक् रूप से दिखाई देने लगते है।
2. प्रत्येक क्रोस्म क्रोमोसोम और अधिक सुस्पष्ट हो जाते है
3. केन्द्रिका व केन्द्रक झिल्ली दिखाई देने लगती है।

14/03/24

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

PRIYANSHU

Teacher's Signature



पॉलीटीन गुणसूत्र की संरचना

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

PAGE NO. 3 DATE

Salivary Gland Polytene Chromosome

Practical Exercise :- To study Salivary gland chromosome

Requirement :- काइरोनोमस लार्वा अथवा लारग्रन्थि गुणसूत्र का चार्ट, नोट बुक, पेन, नीडल

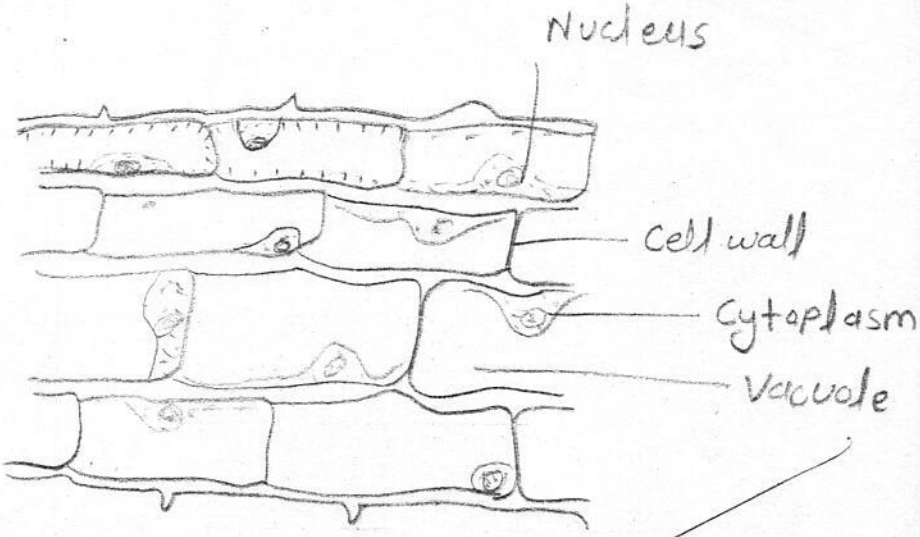
Structure of Salivary gland Chromosomes :-

1. यह इ. जी. बैलबियानी द्वारा 1881 मे रिपोर्ट किये गये थे।
2. यह विशिष्ट गुणसूत्र आकार मे काफी बड़े होते है। यह सामान्य गुणसूत्रों से 200 गुणा तक बड़े हो सकते है।
3. अभिरंजित गुणसूत्रों पर गहरे क्रोमेटिक व हल्के क्रोमेटिक रंग की एकान्तरित अनुप्रस्थ पट्टियां पाई जाती है।
4. पट्टी क्षेत्र में क्रोमोसेन्टर उप. होता है। क्रोमेनिमेटा के पार्श्व मे लूप बन जाने के कारण पट्टी क्षेत्र का व्यास बढ़ जाता है।
5. यह पार्श्वीय क्षेत्र फूला होता है। तथा यह बेलबियानी तलय कहलाते है।
6. यह सक्रिय RNA संश्लेषण के विस्थल है जो अनुलेखन विस्थलों को इंगित करते है।
7. पॉलीटीन गुणसूत्र चिर प्रोफेज अवस्था मे पाये जाते है।

15/3/24

PRINCIPAL
SUVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher's Signature .....



प्याज की पत्तियों की कोशिका संरचना

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

PAGE NO. 1 DATE

Structure of Cell

Onion Cell

Practical Exercise :- Study of Cells in onion

Requirements :- प्याज के कंद स्लाइड, कवर स्लिप, वॉच ग्लास, आसुत जल, सेफ्रेनिन, ग्लिसरीन।

Cell :- पादप काय की सबसे छोटी संरचनात्मक तथा कार्यात्मक इकाई कोशिका कहलाती है। पादप कोशिका में भित्ति उपस्थित होती है।

Procedure :- प्याज कंद मॉसल इनकी निचली सतह की बाह्य त्वचा हटा कर जल में रखें।

Cell Stru. in Onion peel :-

1. पर्ण मे यूकेरियोटिक कोशिका संगठन उपस्थित है।
2. कोशिका भित्ति के भीतर प्लाज्मा उपस्थित है।
3. प्लाज्मा झिल्ली के भीतर प्रोटोप्लाज्म उप. है। जिससे सुस्पष्ट केन्द्रक पाया जाता है।
4. प्रोटोप्लाज्म मे कई डिस्क समान अवर्णी लवक उप. है।
5. रिक्तिकायें पायी जाती है जिनमें कोशिका रस भरा रहता है।

Inference :- प्याज की कोशिकायें संगठित है। कोशिकांग कोशिका भित्ति एवं प्लाज्मा झिल्ली सुरक्षित है। सुस्पष्ट केन्द्रक व हरितलवक उप. है। अतः यह यूकेरियोटिक Cell है।

18/3/24

PRIYANSHU

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher's Signature .....

Spirogyra

Practical Exercise :- Study of cells of algae Spirogyra

Requirements :- स्पाइरोगाइरा पादप, स्लाइड, कवर स्लिप, वाच ग्लास आसुत जल, सैफ्रेनिन, ग्लिसरीन

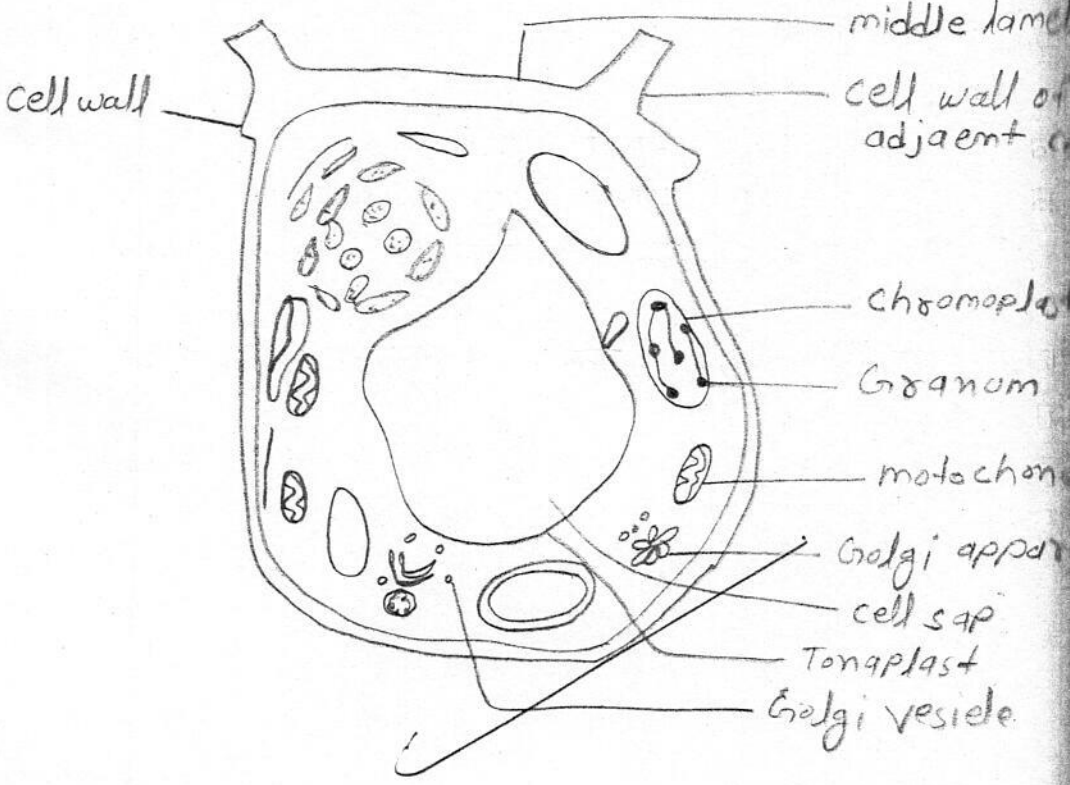
Cell Structure of Spirogyra :-

1. स्पाइरोगाइरा की कोशिका मे यूकेरियोटिक कोशिका संगठन पाया जाता है।
2. कोशिका आयताकार होती है।
3. कोशिका के चारों ओर दृढ़ कोशिका भित्ति पायी जाती है व इसके बाहर श्लेष्मा का आवरण उपस्थित होता है।
4. कोशिका भित्ति के भीतर प्लाज्मा कला पायी जाती है।

20/3/24

PRINCIPAL
VIVEKPG COLLEGE
KALWAR, JAIPUR-303706

Teacher's Signature .....



पादप कोशिका की परासंरचना

Study of Electronmicrograph of Eucaryotic Cell Organelleles

Practical Exercise :- Study of Various organelleles of Eukaryotic cell using electromicrograph

Requirements :- यूकेरयोटिक कोशिका जीव का इलैक्ट्रॉन माइक्रोग्राफ

Ultrastructure of Eukaryotic Cell :- यूकेरियोटिक कोशिका जटिल होती है। माइटोकोन्ड्रिया की संख्या एक कोशिका मे 1700 तक हो सकती है। परऑक्सीजोम 400 तथा लायसोजोम 300 तक हो सकते है। एक यूकेरियोटिक कोशिका मे निम्नलिखित कोशिकांग उप० हो सकते है।

1. कोशिका भित्ति
2. प्लाज्मा कला
3. केन्द्रक
4. माइटोकोन्ड्रिया
5. हरित लवक
6. राइबोसोम
7. परआक्सीसोम
8. लाइजोजोम
9. गाल्जी सम्मिश्र
10. अन्त: प्रद्रव्यी जालिका

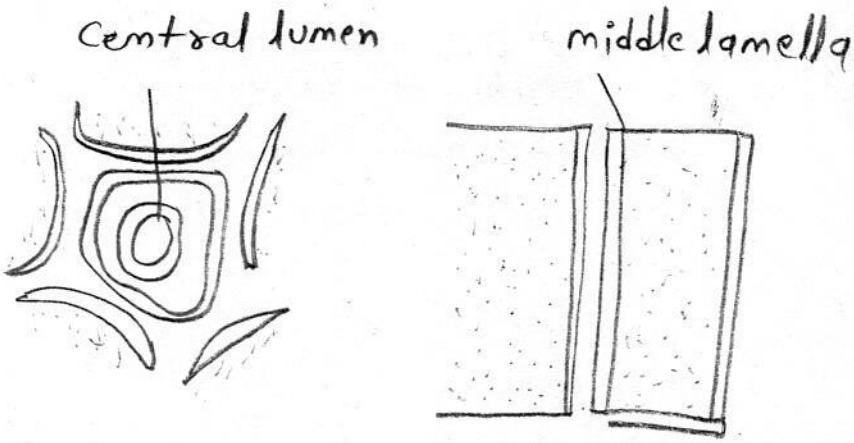
कोशिका द्रव्य

यूकेरियोटिक कोशिका की परासंरचना जन्तु एवं पादप की अलग - 2 चित्रों में है।

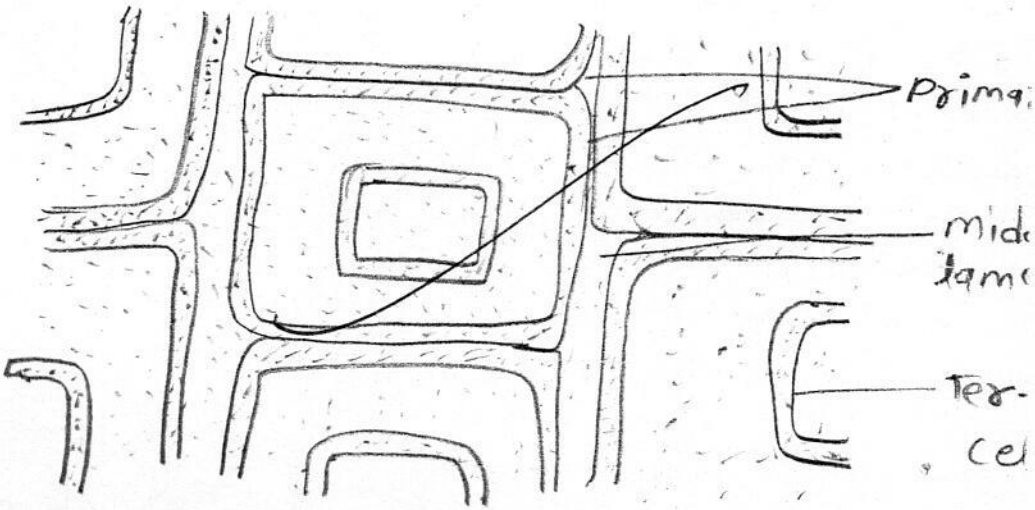
23/03/24

PRINCIPAL
VIVEK PG COLLEGE
RAJIWAR, JAIPUR-303706

Teacher's Signature.....



कोशिका भित्ति की संरचना



कोशिका का भित्ति की संरचना प्राथमिक द्वितीय तृतीयक भित्ति

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

1. Cell wall

यह पादपों का बाहरी आवरण है जो जन्तु कोशिका में अनुपस्थित होती है। यह कठोर, बाहरी निर्जीव होता है जो कोशिका की बाहरी वातावरण से रक्षा करती है।

कोशिका भित्ति की संरचना :- यह निम्न भागो से निर्मित है- प्राथमिक कोशिका, द्वितीयक कोशिका तृतीयक कोशिका व मध्यपटलिका।

प्राथमिक कोशिका भित्ति :- यह सबसे पहले बनती जो मध्य के दोनों ओर उपस्थित रहती है। यह पतली व लचीली होती है।

द्वितीयक भित्ति :- यह प्राथमिक भित्ति पर लिगनिन आदि पदार्थो के निक्षेपन से बनती है, कोशिका की परिपक्व अवस्था मे यह मोटी, स्पष्ट व 9-10 स्थूल होती है।

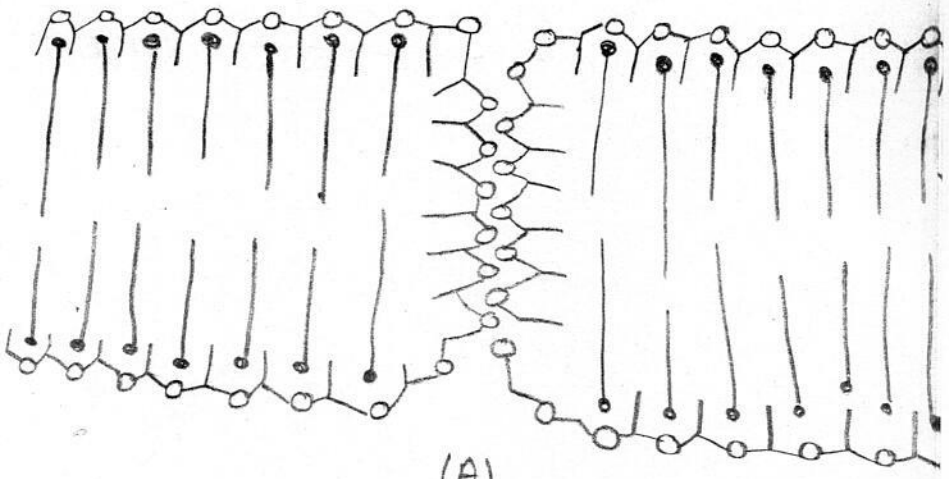
मध्य पटलिका :- यह दो कोशिकाओं की कोशिका भित्ति के मध्य उपस्थित रहती है। यह केल्सीयम पेक्टेट से बनी अक्रिस्टलीय पर्त होती है।

तृतीयक कोशिका भित्ति :- यह भित्ति जायलॉन से बनी होती है जो प्रत्येक कोशिका मे नही पायी जाती है।

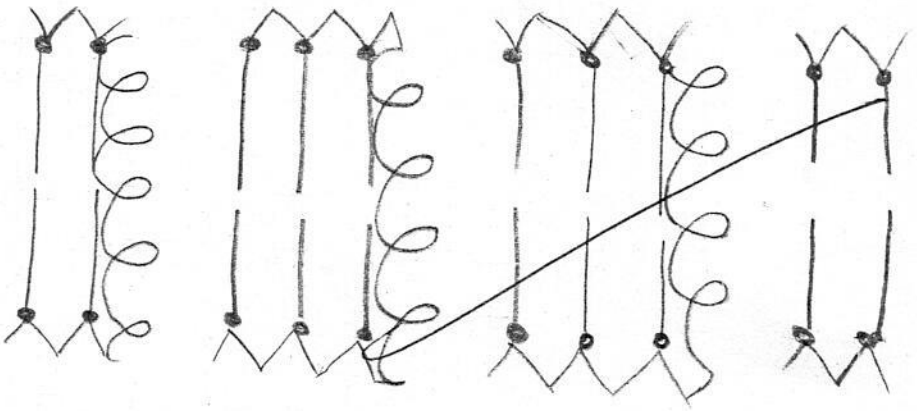
23/03/24

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher's Signature.....



(A)



(B)

रार्बटसन की स्काई कला सिल्वी मॉडल

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

2. प्लाज्मा झिल्ली

यह चयनात्मक पारगम्य झिल्ली पादप व जन्तु दोनों प्रकार की कोशिका मे पायी जाती है। यह फॉस्फोलिपिड, प्रोटीन, कोलेस्ट्रॉल से बनी होती है।

रॉबर्टसन यूनिट मेम्ब्रेन मॉडल :-

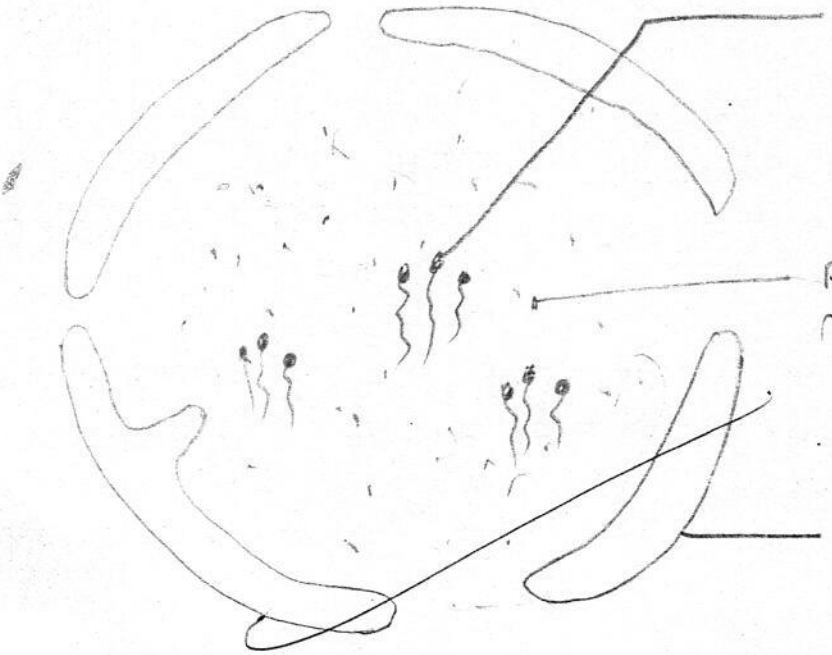
1. रॉबर्टसन ने इलेक्ट्रान माइक्रोस्कोप से अध्ययन करके प्लाज्मा झिल्ली की त्रिस्तरीय संरचना रिपोर्ट की।
2. दो बाहरी सतह $20-25\,A^{\circ}$ की होती है जो सघन ऑस्मोफिलिक होती है। यह प्रोटीन से बनी होती है।
3. मध्य पर्त हल्के रंग की $30-35\,A^{\circ}$ होती है। यह मोटी ऑस्मोफिलिक सतह होती है। यह लिपिड सतह दो प्रोटीन पर्तो के बीच उप. होती है।
4. रॉबर्टसन ने इसे स्कार्इ झिल्ली मॉडल नाम दिया।

23/03/24

PRINCIPAL
UNIVERSAL PG COLLEGE
KALWAR, JAIPUR-303706

Teacher's Signature.....

PRIYANSHU



PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

3. केन्द्रक (Nucleus)

यह दोहरी सिल्ली से घिरा रहता है जिसमें छिद्र उप. होते है। इसमें केंद्रिक व क्रोमोसोम पाये जाते है। केन्द्रक कोशिका की सभी क्रियाओं को नियंत्रित करती है। तथा जनन के लिये इसमें विभिन्न प्रकार के कोशिका विभाजन होते है।

1. केन्द्रक की संख्या :- यह सभी कोशिकाओं में पाया जाता है जबकि इसकी संख्या सब से अलग होती है।

2. केन्द्रक का आमाप :- इसका आमाप 0.5μ से 1.5μ होता है।

3. केन्द्रक का आकार :- यह कोशिका के आंतरिक वातावरण तथा क्रियात्मकता पर निर्भर करता है। यह गोलाकार, अंडाकार अथवा अन्य कई आकारों का हो सकता है। केन्द्रक का आकार इसकी अवस्था पर निर्भर करता है।

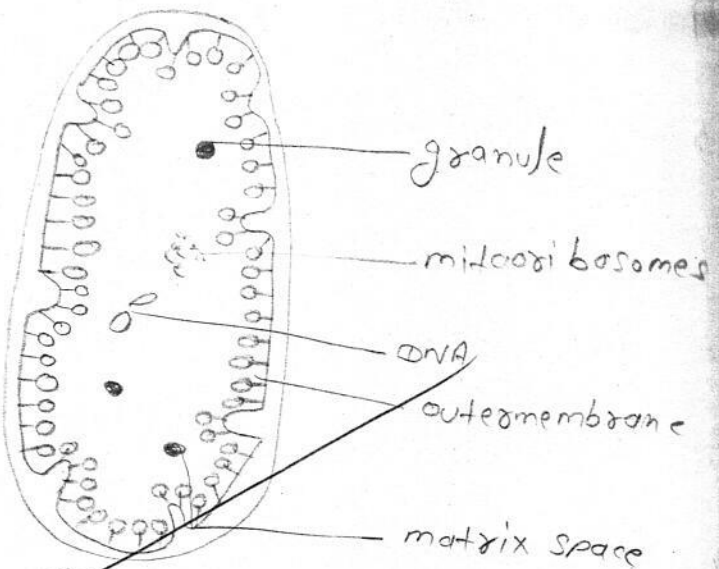
4. केन्द्रिका :- यह केन्द्रक मे पायी जाने वाली एक गोलाकार संरचना है। जो प्रोटीन संश्लेषण के लिये स्थल के रूप मे काम करता है।

5. इसमें सिल्ली अनुपस्थित होती है। इसको 1978 में फॉन्टाना ने रिपोर्ट किया था।

23/03/24

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher's Signature.....



चित्र - माइटोकॉन्ड्रिया की परासंरचना

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

4. माइटोकॉंड्रिया

यह कोशिकाद्रव्य मे उपस्थित कणिकामय सदृश्य अंगक है जो खाद्य पदार्थ की ऊर्जा स्थितिज ऊर्जा को जैविक ऊर्जा मे बदलती है। अत: यह कोशिका के ऊर्जा घर कहलाते है।

इसकी आंतरिक सिल्ली मे कई वलय पाये जाते है। इसमे वृतकार डीएनए, 10% फॉस्फेट कण, 70% प्रोटीन, लिपिड तथा आर एन ए पाया जाता है। 80% इसके मेट्रिक्स मे 1% होने वाली जैव संश्लेषण क्रियाशील है।

कण काफी जटिल होते है व निम्न है-

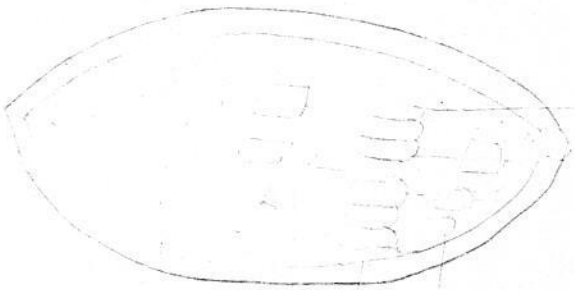
(i) शीर्ष (ii) वृत (iii) F_0 उपइकाई

स्टीगेन्टरी कण आंतरिक सतह की m- सतह पर पाये जाते है जो ऑक्सीसोम या F_1 कण कहलाते है।

23/03/24

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher's Signature



चित्र - हरितलवक की संरचना

PAGE NO. 11

DATE .....

5. हरित लवक (Chloroplast)

ये रिबोटिका पादप कोशिकाओं में हरित लवक पाया जाता है जो प्रकाश संश्लेषण मे सहायता करता है।

1. हरित लवक - यह विशिष्ट कोशिकांग होते है जो जीवद्रव्य मे बिखरे पाये जाते है। यह जन्तु बैक्टीरिया कवक मे अनुपस्थित होते है।

2. कुछ रंजक जैसे एन्थेसायनिन प्लास्टिड मे उप. नही होती है बल्कि जीवद्रव्य मे घुलित अवस्था मे पाये जाते है।

3. हरित लवक अनेक आकार के हो सकते है जैसे गोल, अंडाकार, रिबन समान डिस्क समान, जालिकावत् तारकार आदि।

4. क्लोरोप्लास्ट का आमाप इसके आकार पर निर्भर कराता है सामान्य: यह 4-6 μ व्यास मे 1-3 μ मोटाई का होता है।

5. प्रकाश संश्लेषण की प्रकाशिक क्रिया ग्रेना मे होती है।

6. क्लोरोप्लास्ट मे थायलाकोइड चट्टे समान एकत्रित होकर ग्रेना का निर्माण करते है।

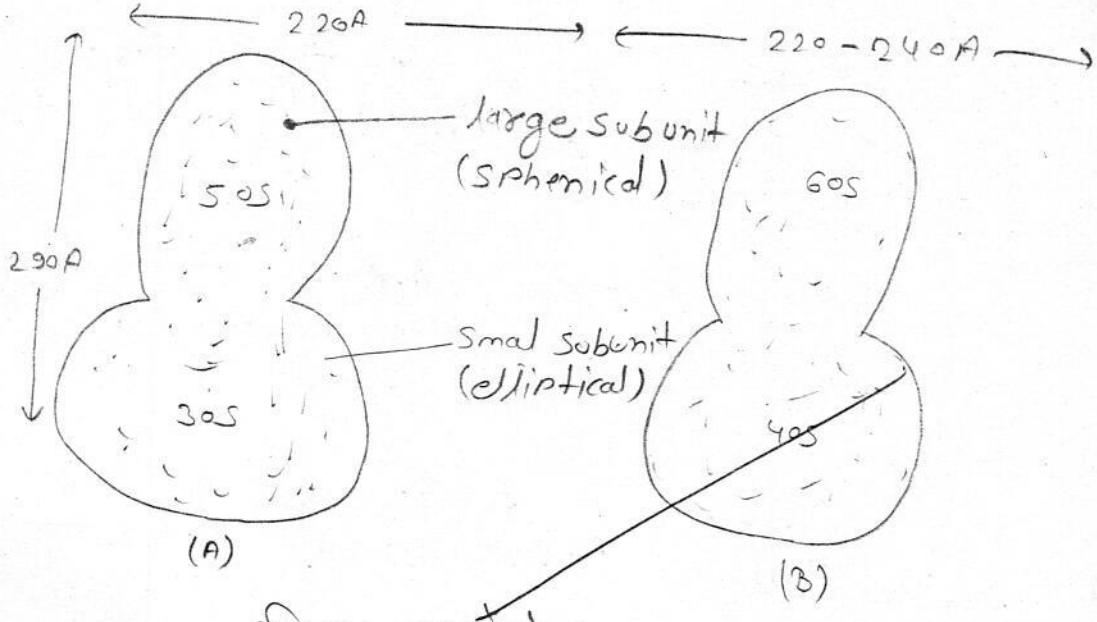
7. इसमें DNA पाया जाता है।

25/03/24

PRINCIPAL
VIVEKANAND COLLEGE
KALWAR, JAIPUR-303706

Teacher's Signature.....

PRAYAGRAJ



चित्र - राइबोसोम

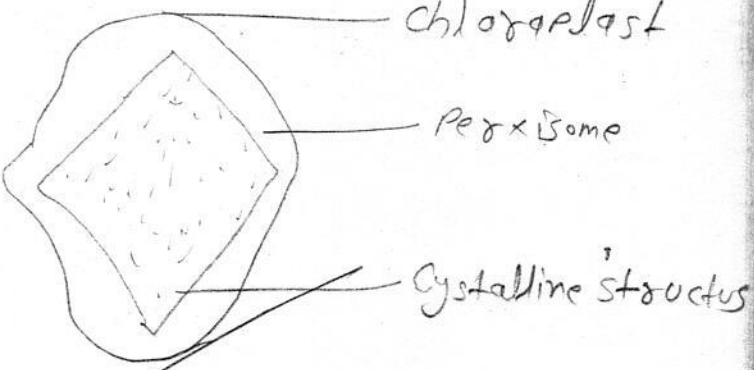
PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

6. राइबोसोम (Ribosome)

1. यूकेरियोटिक कोशिका का यह सबसे छोटा कोशिकांग है। जिसमें बड़ी व छोटी उप इकाइयां होती है।
2. यह प्रोटीन व आरएनए से निर्मित होती है।
3. राइबोसोम प्रोटीन संश्लेषण के स्थल है।

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher's Signature.....



चित्र – परऑक्सीसोम

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

7. परआक्सीसोम (Peroxisomes)

1. यह गोलाकार एक कला तथा कैटलेज एन्जाइम युक्त होता है।
2. इनका प्रमुख कार्य हाइड्रोजन परआक्साइड का अपघटन करना है।
3. पादपों में ग्लायोक्जेलेट चक्र परआक्सीसोम मे सम्पन्न होता है।

25/03/24

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher's Signature.....

DATE .....

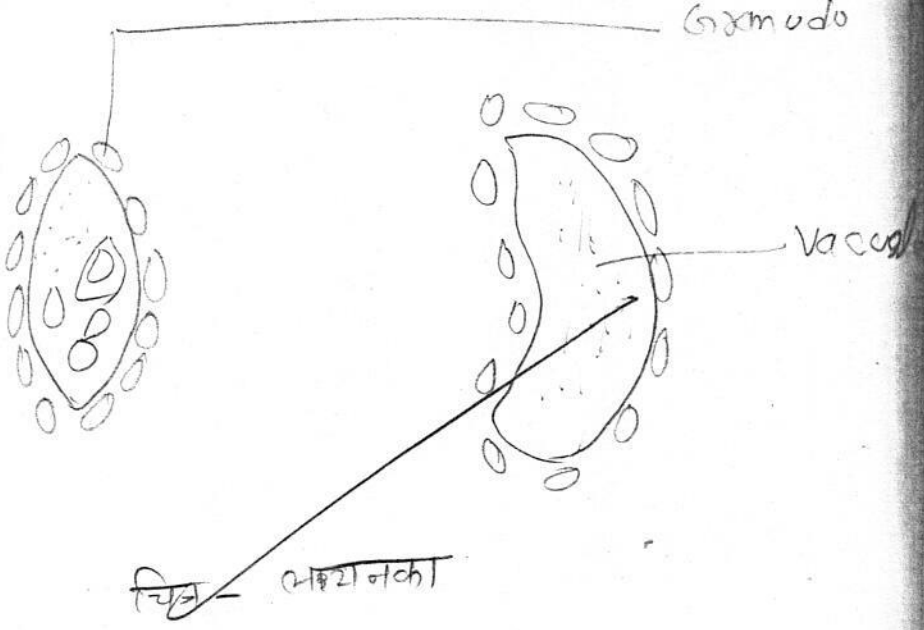
7. परआक्सीसोम (Peroxisomes)

1. यह गोलाकार एक कला तथा कैटलेज एन्जाइम युक्त होता है।
2. इनका प्रमुख कार्य हाइड्रोजन परआक्साइड का अपघटन करना है।
3. पादपों में ग्लायोक्जैलेट चक्र परआक्सीसोम मे सम्पन्न होता है।

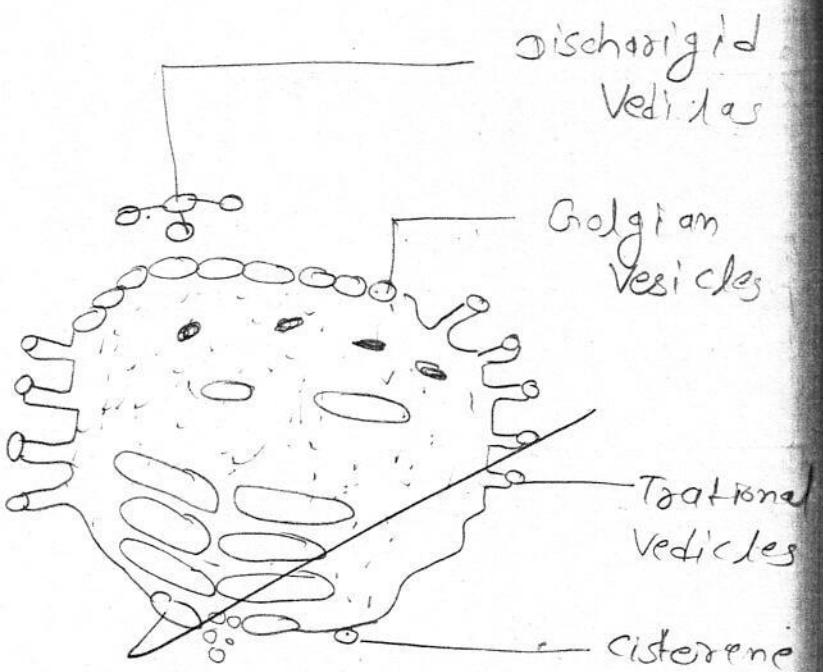
25/03/24

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher's Signature.....



PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706



चित्र :- गॉल्जी सम्मिश्र

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

PAGE NO. .....15.....

DATE .....

9. गाल्जी सान्निकाय (Golgi bodies)

1. यह प्लेट समान अनेक केन्द्रीय चपटी थैलेनुमा नलिकाकार व दूसरी का आशय निर्मित करती है। एक के ऊपर एक व्यवस्थित

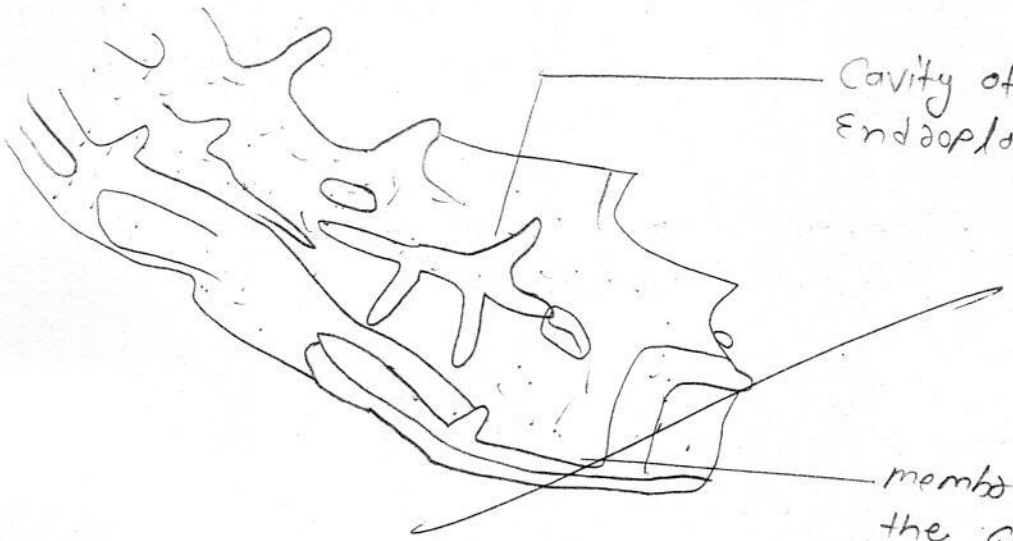
2. इनका कार्य आन्तरिक विधि व स्थानान्तरण सिस्टम ER से प्रोटीन, गाल्जी से दूसरे अंगों की ओर पाने का संचरण तथा मीसोजोम का निर्माण करना है।

3. यह ग्लाइकोप्रोटीन तथा ग्लाइकोलिपिड संश्लेषण के प्रमुख विस्थल है।

01/04/24

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher's Signature.....



चित्रः- अन्तः प्रदृव्यी जालिका

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

10. अन्तः प्रद्रव्यी जालिका (Endoplasmic Reticulum)

1. यह चपटे एक झिल्ली आवरित सिस्टर्नी नलिकाओं व आशययुक्त केन्द्रक आवरण की बाहरी सतह से लेकर प्लाज्मा कला तक बिखरी रहती है।

2. इनकी सतह पर राइबोसोम उपस्थित रहते है वह रुक्ष कहलाते है।

3. राइबोसोम द्वारा निर्मित प्रोटीन को सिस्टर्नी के द्वारा स्थानान्तरित करते है।

4. कुछ चिकने अन्तर्द्रव्यी जालिका राइबोसोम रहित होते है जो लिपिड व स्टीरॉइड के संश्लेषण विस्थल है।

01/04/24

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher's Signature.....

Genetics

एक संकर क्रास : एक जोड़ी विपर्यासी लक्षणों की वंशागति को सुनिश्चित करने के लिए किए गए संकरण को एक संकर क्रास कहते हैं।

- एक संकर क्रास को निम्न प्रकार से दर्शाया जाता है-

लम्बा (TT) ♂ × बौना (tt) ♀

(Tt)

♂ \ ♀	T	t
T	TT	Tt
t	Tt	tt

लक्षण प्ररूपी अनुपात = लम्बे : बौने

3 : 1

जीन प्ररूपी अनुपात = शुद्ध लम्बे : संकर लम्बे : शुद्ध बौने

TT : Tt : tt

1 : 2 : 1

06/04/24

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher's Signature.....

2. द्विसंकर क्रास :- जब दो लक्षणों मे विपर्यासी लक्षणों की वंशागति के अध्ययन के लिए संकरण किया जाता है, उसे द्विसंकर क्रास कहते हैं।

गोल पीले बीज (RRYY) × हरे झुर्रीदार बीज (rryy)

↓

गोल पीले (RrYy)

↓ स्वनिषेचन

♀ ♂	RY	Ry	rY	ry
RY	RRYY	RRYy	RrYY	RrYy
Ry	RRYy	RRyy	RrYy	Rryy
rY	RrYY	RrYy	rrYY	rrYy
ry	RrYy	Rryy	rrYy	rryy

— F_2 पीढ़ी

लक्षण प्ररूपी अनुपात –

गोल व पीले : गोल व हरे : झुर्रीदार व पीले : झुर्रीदार व हरे

9 : 3 : 3 : 1

12/04/24

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher's Signature.....

PAGE NO. 18

DATE .....

द्विसंकर क्रास :- जब दो लक्षणों मे विपर्यासी लक्षणों की वंशागति के अध्ययन के लिए संकरण किया जाता है, उसे द्विसंकर क्रास कहते हैं।

गोल पीले बीज (RRYY) × हरे झुर्रीदार बीज (rryy)

↓

गोल पीले (RrYy)

↓ स्वनिषेचन

♀ ♂	RY	Ry	rY	ry
RY	RRYY	RRYy	RrYY	RrYy
Ry	RRYy	RRyy	RrYy	Rryy
rY	RrYY	RrYy	rrYY	rrYy
ry	RrYy	Rryy	rrYy	rryy

— F_2 पीढ़ी

लक्षण प्ररूपी अनुपात –

गोल व पीले : गोल व हरे : झुर्रीदार व पीले : झुर्रीदार व

9 : 3 : 3 : 1

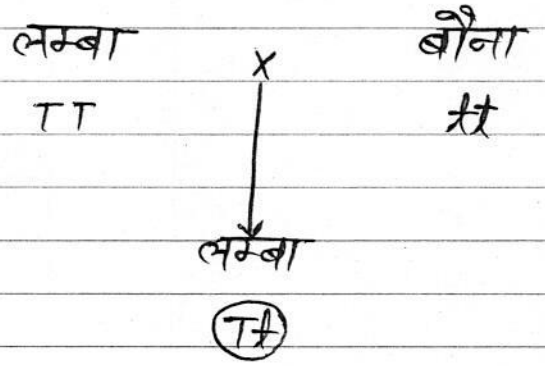
12/04/24

PRINCIPAL
VIVEK PG COLLEGE
KUMHAR, JAIPUR-303706

Teacher's Signature.....

मेण्डल के वंशागति के नियम :-

1. प्रभाविता का नियम :- इस नियम के अनुसार जब एक जोड़ी विपर्यासी लक्षणों वाले समयुग्मजी या शुद्ध पौधों में क्रास करवाया जाता है तो F_1 संतति पीढ़ी मे जो लक्षण अभिव्यक्त होता है। उसे प्रभावी लक्षण तथा जो अभिव्यक्त नही होता, उसे अप्रभावी लक्षण कहते है। इस प्रकार F_1 पीढ़ी मे केवल एक ही लक्षण अभिव्यक्त होता है, इसे प्रभावी लक्षण कहते है।



PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

PRIYANSHU

Teacher's Signature.....

2. पृथक्करण का नियम :- इसके अनुसार F_1 पीढ़ी जो विषम-युग्मजो तथा समलक्षणी प्रभावी होती है के पौधों के मध्य स्वपरागण द्वारा F_2 पीढ़ी प्राप्त की जाती है तो F_2 पीढ़ी में प्रभावी तथा अप्रभावी दोनों लक्षण प्रकट हो जाते हैं। इनमें प्रभावी लक्षण 75% तथा अप्रभावी लक्षण 25% पौधो मे दिखाई देते हैं। इस प्रकार संकर जीव में दोनो विपर्यासी कारक या जीन साथ-2 रहते हुए संदूषित नही होते अथवा अपनी शुद्धता बनाए रखते हैं तथा युग्मक निर्माण के समय एक-दूसरे से पृथक होकर अलग-2 युग्मकों मे पहुँच जाते है इसलिए इसे पृथक्करण अथवा युग्मकों की शुद्धता का नियम कहते हैं।

(लम्बा) TT × (बौना) tt

(लम्बा) Tt

↓ Selfing

TT : Tt : tt

1 : 2 : 1

शुद्ध लम्बा — संकर लम्बा — शुद्ध बौना

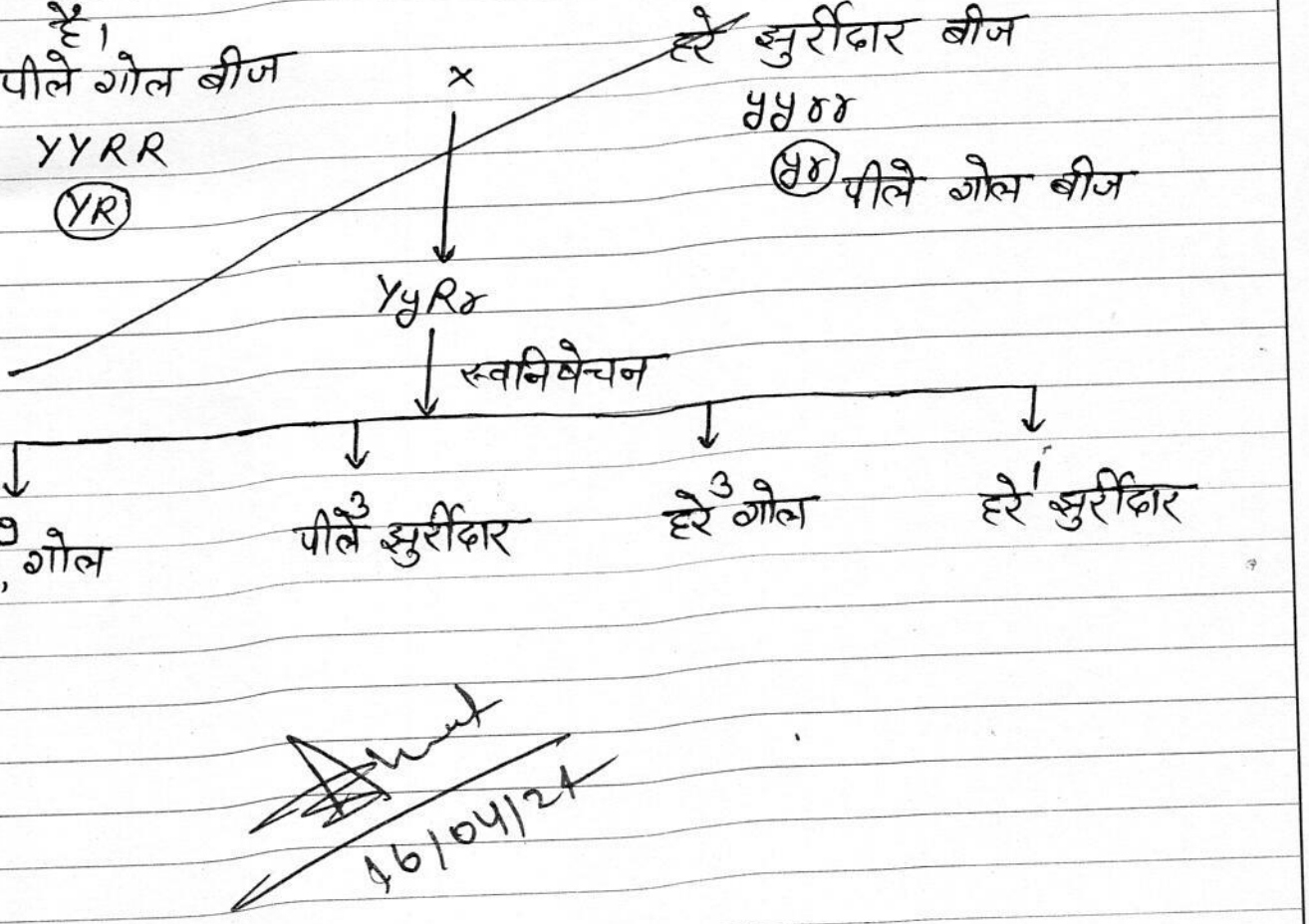
लम्बा 3 : 1 बौना

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher's Signature.....

DATE .....

3. स्वतन्त्र अपव्यूहन का नियम :- इस नियम के अनुसार जब दो या दो से अधिक जोड़े विपर्यासी लक्षणों की वंशागति के अध्ययन के लिए क्रॉस करवाया जाता है तो जोड़ी मे उप. लक्षणों की वंशागति पूर्णतया एक - दूसरे से स्वतंत्र होती है अर्थात् युग्मविकल्पियों के प्रत्येक जोड़े के ऐलील पृथक होकर विभिन्न लक्षणों के युग्मविकल्पियों के साथ स्वतंत्र अपव्यूहन करते हैं। दूसरे शब्दों मे यह कह सकते है कि अलग - 2 लक्षणों के कारकों का व्यवहार एक - दूसरे से पूर्णतया स्वतंत्र होता है जिसके फलस्वरूप नए संयोजन या पुनः संयोजन प्रकट होते हैं।



16/04/21

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher's Signature.....

PRIYANSHU PUBLICATION

मेन्डेलिज्म पर अभ्यास

1. मटर के लम्बे (DD) तथा बौने (dd) पौधों के संकरण से प्राप्त पीढ़ी संतति के एक पौधे का पितृ पौधों से F_1 संकरपूर्वज संकरण किया गया। संकरपूर्वज संकरण से प्राप्त संततियों के जीन प्ररूप व लक्षण प्ररूप बताइए।

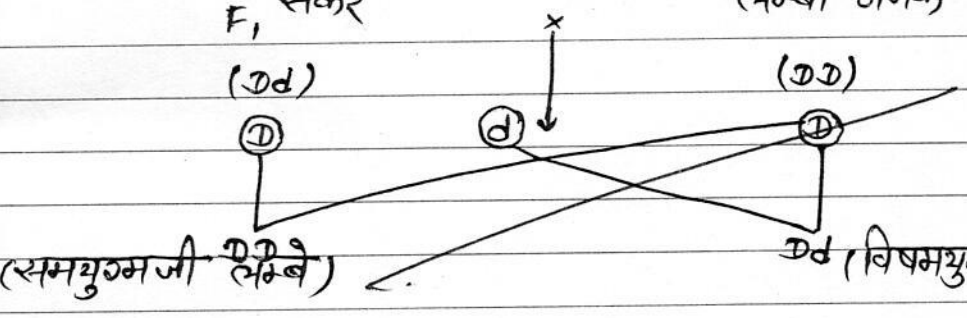
A.

जनक पादप — लम्बे (DD) × बौने (dd)

जनकों के युग्मक — (D) (d)

F_1 संतति — (Dd) लम्बे

(i) F_1 संतति का लम्बे जनक के साथ संकरपूर्वज संकरण :-



उपरोक्त क्रॉस मे प्राप्त सभी पादप लम्बे होंगे अर्थात्

लक्षण प्ररूप = 100% लम्बे

जीन प्ररूप = 50% समयुग्मकी : 50% विषमयुग्मकी

= DD : Dd

= 1 : 1

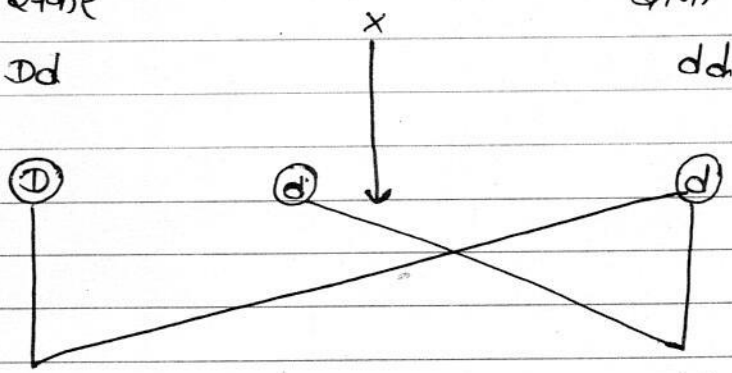
PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher's Signature.....

PRIYANSHU PUBLICATION

ii) F_1 का बौने जनक के साथ संकरण :-

F_1 संकर — Dd



लक्षण प्ररूपी अनुपात - 50% लम्बे व 50% बौने
अर्थात् - 1 : 1

जीन प्ररूपी अनुपात - DD : dd
1 : 1

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

PAGE NO. 25 DATE .....

दिये गये चार्ट पर टिप्पणी लिखे -

1. यह चार्ट मेन्डल के पृथक्करण नियम को दर्शाता है।

2. जब लाल पुष्प के मटर पादप का संकरण सफेद पुष्प के पादप से करवाया जाता है तो F_1 संतति केवल लाल पुष्प वाली प्राप्त होती है। क्योंकि लाल रंग सफेद रंग पर प्रभावी है।

3. जब F_1 पीढ़ी के पौधों मे स्वनिषेचन कराया जाता है तो F_2 पीढ़ी मे लाल पुष्प व सफेद पुष्प दोनों प्रकार के पौधों 3:1 मे प्राप्त होते है। इसे पृथक्करण का नियम कहते है।

4. F_2 संतति में 25% शुद्ध लाल 50% संकर लाल तथा 25% शुद्ध सफेद पुष्पो वाले पौधे होते है, जो युग्मको की शुद्धता को दर्शाता है।

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher's Signature.....

दिये गये चित्र पर टिप्पणी लिखिये।

ns.
1. यह चार्ट टेस्ट क्रास को दर्शाते है।

2. समयुग्मजी लाल पुष्प वाले पादप का संकरण समयुग्मजी सफेद पुष्प वाले पादप से कराया जाता है तो F_1 पीढ़ी मे संकर सु० लाल पुष्प वाले विषमयुग्मजी पादप प्राप्त होते है।

3. जब विषमयुग्मजी संकर लाल पुष्प वाले पादप का अप्रभावी शुद्ध सफेद पुष्प वाले जनक पादप से कराया जाता है, तो 50% पौधे संकर लाल पुष्प वाले तथा 50% पौधे सफेद पुष्प वाले प्राप्त होते है।

4. टेस्ट क्रास हमेशा विषयुग्मजी F_1 पीढ़ी एवं शुद्ध समयुग्मजी जनन के मध्य कराया जाता है तो संतति 1:1 में प्राप्त होती है।

17/04/24

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher's Signature.....

Certificate

ame : Heena Agarwal Class : M.Sc (Final) zoology

oll No.: 03 Exam No.: 1859840

stitution Vivek P.G. college

his is certified to be the bonafide work of the student in the

Zoology Laboratory during the academic

ar 20 23 /20 24

of practicals certified 14 out of 16 in the

bject of Zoology [Environment & Ethology]

.....
Teacher in-charge

Rishavi Sharma
.....
Examiner's Signature

.....
PRINCIPAL
Vivek P.G. Mahavidhyala
Kalwar Jaipur-303706
Principal

Date : 12/05/24.....

Institution Rubber stamp

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

INDEX

S. No.	Name of Experiment	Page No.	Date of Experiment	Date of Submission	Remarks
1.	The PH of given water Sample.	1 to 3	10/8/2023	Ayesha 11.8.23	
2.	The acidity of given water Sample	4 to 9	11/8/23	Ayesha 12.8.23	
3.	The alkanity of given water sample.	10 to 15	12/8/23	Ayesha 18.8.23	
4.	The free Co_2 of given Sample	16 to 19	18/8/23	Ayesha 19.8.23	
5.	The salinity of given water sample	20 to 25	19/8/23	Ayesha 5/9/23	
6.	Collection & identification of planklon	26 to 31	5/8/23	Ayesha 8.9.23	
7.	To study the food preference of stored insect pest in whole grain.	32 to 35	8/9/23	Ayesha 11.9.23	
8	To study the food preference of stored insect pest in powder grain	36 to 39	11/9/23	Ayesha 13.9.23	
9.	observe of Effect of Toxicants on movement of fish.	40 to 43	13/9/23	Ayesha 15.9.23	
10.	Observe of communication in Earthworm by pheromone.	44 to 47	15/9/23	Ayesha 16.9.23	
11	Observe of learning by trial	48 to 53	16/9/23		Ayesha

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

S. No.	Name of Experiment	Page No.	Date of Experiment	Date of Submission	Remarks
	and error in eat.				
12.	Observe of imprinting in chicks during critical period.	54 to 59	18/9/23		Ayesha 16.1.24
13.	To determine dissolved oxygen of given water sample	60 to 67	7/2/24		
14.	Determination of BOD in water sample	68 to 75	12/2/24		Ayesha 21/2/24

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Experiment - 1

Aim:- To determine the pH of given water sample

Requirements - Paper strip, universal indicator, water sample, beaker, dropper.

Principle - Generally in nature water is alkaline due to presence of carbonates. water ph keeps on changing due to waste substances released in it by industries mixing of sewage. Production of CO_2 due to photosynthesis change in tem. etc

According to indian council of medical research(ICHR) ph of potable water should be in between 7 to 8.5 water with ph less than 6.5 or more than 9.2 cannot be used for drinking. if ph is below 4 then water taster sour and it is more than 8.5 then it is alkaline in taste water with more ph tends to release metals like zinc lead, Cd, Cu from pipe lines and may be harmful for domestic as well as industrial use.

ph is a logarithmic scale used to specify the acidity or basicity of an aqueous it is the -ve of the base 10 logarithm of the activity of the hydrogen ion it is measured by the help of 2 electrodes A galvanic cell is set up to measure the electromotive force between a reference electrode and an electrode sensitive to the hydrogen ion activity when both are immersed in the same aqueous solution

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Procedure - (i) ph paper strip method - It is easiest method

Teacher Signature.....

S.No	Colour of Indicator	Water ph	Water acidity
1.	yellow	4.0	Very intense acidic
2.	greenish yellow	4.5	intense acidic
3.	yellow green	5.0	Acidic
4.	light green	5.5	Medium acidic
5.	greenish blue	6.5	Very weak acidic
6.	Dark blue	7.0	Neutral
7	Purple	7.5	Alkaline

pH strip

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

to determine ph simply by putting paper strip into a filtered solution of water and one can notice change in the colour of the strip this colour is matched with the help of colour chart provide on the box of paper strip. Corresponding ph with colour indicates the ph of water.

(ii) Indicator solution method :-

Mix equal amount of universal indicator in it.

Colour will be seen which is to be matched with the colour chart given on table of bottle note down the water ph of matched colour

Result :-

A. The ph of given water sample is 7

B. The result of water sample are 6.5

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher Signature.....

Acidity

Sample (50ml)

↓

Methyl orange indicator

↓

yellow → Methyl orange (-ve)

Pink → Titrate with 0.05 N NaOH → faint orange → Note reading (A)

↓

Continue

↓

add phenopthalin indicator

Pink → Phenopthalin indicator (-ve)

Faint orange → titrate with 0.05 N NaOH → Pink colour → Note reading (B)

Date : 11/08/2023

Experiment-2

Aim :-

To determine the acidity of given water sample

Requirements :-

(i) Sodium hydroxide ($NaOH$) - 0.05 N. $NaOH$ molecular weight of $NaOH$ is 40.50 dissolve 2 gm $NaOH$ and dilute to 1000 ml using distilled water.

(ii) Methyl orange indicator - Dissolve 0.5 gm and dilute to 100ml distilled water

(iii) Phenopthalin indicator - Dissolve 0.5 gm hpH in 50ml water 95% ethanol add 50ml distilled water add drop wise 0.05 N $NaOH$ in the solution till faint pink colour accordingly.

(iv) Glassware and other requirements - Beaker pipette, long dropper, indicator bottles, stand

Principle - To determine acidity by titration, water sample is titrate by $NaOH$ to determine end point chemical indicator are used we know that chemical indicator indicate end point by changing colour of solution at particular ph when ph is below neutral ph 7. it is acidic. if sample ph is less than 3.7 then its titrated by $NaOH$ by adding methyl orange indicator in water sample

The colour indicated end point at 3.7 ph this is know as methyl orange acidity or mineral acidity Phenopthalin indicator change colour at 8.3 ph in this case when water sample in 6mce of HPH is

PRINCIPAL
VIVEK PG COLLEGE
KALWAR JAIPUR 303706

Teacher Signature.....

Date :.....

titrated by NaOH then end point is indicated by pink colour this is called total acidity of soln. acidity is measured in between 8.7 ph and 8.3ph is called phenopthalin acidity or CO_2 acidity.

Total acidity - mineral + CO_2 acidity

procedure :-

Collect sample in plastic or borosilicate bottle if should be used for titration within 24hrs it is better to use it as soon as possible take 500ml of sample waters in clean and dry conical flask fill the burette with 0.05 N NaOH and note reading of its level.

add 2-3 drop of methyl orange indicator in conical flask having sample if soln become yellow then it mean that methyl orange acidity is not [mean ph is more than 8.7] if soln turns pink by addition of methyl orange then titrate with 0.05 N NaOH drop wise burette when pink colour of sample soln turn into yellow colours note the reading on burette at this end point.

Now add drop of hph indicator in same soln in conical flask and titrate again when soln turns into pink then again note reading in burette as it will be used in calculation -

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher Signature.....

Calculation

Acidity of sample Ist = $\frac{(A+B)\ N \text{ of } NaOH \times 50 \times 1000}{ml \text{ of sample}}$

$= \frac{(9+0) \times 0.05 \times 50 \times 1000}{50}$

$= 450 \text{ mg/l}$

Acidity of sample IInd = $\frac{(A+B) \times N \text{ of } NaOH \times 50 \times 1000}{ml \text{ of sample}}$

$= \frac{(2.2+0)\ 0.05 \times 50 \times 1000}{50}$

$= 110 \text{ mg/l}$

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Observation table -

S.No.	Water sample taken (ml)	Burette reading of used NaOH sol^n (ml) with methyl orange in titrate	Burette reding of used NaOH sol^n after titration of hPH indicator (ml)	total quantity of NaOH sol^n used in (ml)
1	50ml	9	0	9
2	50 ml	2.2	0	2.2

Calculation -

(i) Methyl orange acidity -

$$\text{Acidity (mg/l caco}_3\text{)} \quad \frac{A \times N \text{ of NaOH} \times 50 \times 1000}{\text{ml of Sample}}$$

(ii) Phenopthalin acidity -

$$\text{(mg/l caco}_3\text{ equivalent)} = \frac{B \times N \text{ of NaOH} \times 50 \times 1000}{\text{ml of Sample}}$$

(iii) total acidity -

$$\text{(mg/l as caco}_3\text{)} = \frac{(A+B) \times N \text{ of NaOH} \times 50 \times 1000}{\text{ml of Sample}}$$

Result :- The acidity of given water sample is -

(a) - 450 mg/l

(B) - 110 mg/l

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Alkanity

Sample (50ml)

↓

Add phenopthalin

↓

Colourless

↓

Phenopthalin alkanity ⟵ mf

Pink

↓

titreate with 0.1 N HCl

↓

Colourless

↓

Note reading (A)

↓

Continue

↓

add methyl orange

↓

Pink

↓

methyl orange alkanity ⟵ mf

yellow

↓

titreate 0.1 N HCl

↓

Pink orange

↓

Note reading (B)

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Experiment = 3

Aim :-

To determine the alkanity of given water sample

Requirements :-

(i) 0.1 N HCl acid - dilute 12 times 12 N of concentrated HCl means mix 8.4 ml of HCl in distilled water and make it 100 ml or make 300 ml solution by adding distilled water into 12 N HCl this is 0.1 N HCl take 100 ml of this 0.1 N HCl and add distilled water to make it upto 1000 ml this is 0.1 N HCl.

(ii) HPH indicater - dissolved 0.5 gm hPH into 50ml of 95% ethanol or ethyl alcohol add to few deops of CO_2 free 0.05 NaOH until the sol^n become light pink

(iii) Methyl orange indicator - Dissolve 0.5gm methyl orange in 100 ml of distilled water to make the indicator

Principle :-

Alkanity in water sample is due to carbo-nate, bicarbonate and hydroxyl ion their quantity can be measured by titrating it with strong acid if sol^n is sufficient carbonate is present then such sol^n turns pink to pH which is more than 8.3 if this sol^n is titrated with acid then at ph 8.3 all carbonate turn into bicarbonate and pink colour disappear and sol^n become colourless

Teacher Signature .....

Due to alkanity carbonate of all the 3 forms of buffer system can be measured separately but for convergence alkanity is show as equivalent to mg/l or ppm calcium carbonate therefore if total alkanity of solution is 125 mg/l then it mean that if in pure water 125 mg/l $CaCO_3$ is mixed and as result the amount of alkanity produced due to this is the same alkanity of given solution

Procedure :-

Collect sample to titrate the sample once 100 ml of sample is required so accordingly collect sample in plastic or borosilicate bottle

→ take 150 ml of sample in clean & dry conical flask and mix 2-3 drop of phenopthalin indicator if soln remain colourless then it mean that HPH alkanity in the sample is 0.

→ If sample turns pink by adding phenopthalin indicator then titrate it with 0.1 N HCl filled in burette if soln become colourless then note to the end point

→ if it is colourless by adding HPH then add alkinity is 0 2-3 drop of methyl orange indicator and bicarbonate alkinity is 0 and in this condition HPH alkanity is the total alkinety are equal if colour of soln become yellow then titrate it with 0.1 NHCl until the colour turns into light pink.

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR 303706

Teacher Signature

Calculation :-

Alkanity of Sample Ist $= \frac{(A+B) \times N \text{ of } HCl \times 1000 \times 50}{ml \text{ of sample}}$

$= \frac{(0+1.5) \times 0.1 \times 1000 \times 50}{50}$

$= 150 \text{ mg/l}$

Alkanity of sample IInd $= \frac{(A+B) \text{ N of } HCl \times 1000 \times 50}{ml \text{ of sample}}$

$= \frac{(0+7.6) 0.1 \times 1000 \times 50}{50}$

$= 760 \text{ mg/l}$

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Observation table -

S.No.	S.quantity in ml	(with burette reading in (ml) HPH indicater Initial	Final	total (A)	Methy orange Initial	final	total (B)
1.	50 ml	0	1.5		0	1.5	1.5
2.	50 ml	0	7.6		0	7.6	7.6

Calculation - Phenopthalin alkanity -

$$(PA \text{ as } CaCO_3 \text{ mg/l}) = \frac{A \times N \text{ of } HCl \times 1000 \times 50}{\text{ml of sample}}$$

methyl orange alkanity

$$(MO \text{ as } CaCO_3 \text{ mg/l}) = \frac{B \times N \text{ of } HCl \times 1000 \times 50}{\text{ml of sample}}$$

$$\text{Total alkanity} = \frac{A+B \times N \text{ of } HCl \times 1000 \times 50}{\text{ml of sample}}$$

Result - The alkanity of given water sample is
a. 150 mg/l
b. 760 mg/l

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher Signature.....

Free CO_2

Sample (50ml)

↓

Add phenepthalin

↓

Pink

↓

CO_2 Emt

Colourless

↓

titrate with 0.0 NaOH

↓

Pink

↓

Note reading

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

No.....17.....

Date :.....18-8-2023.....

Experiment - 4

n :-

To determine the free CO_2 of given sample

quirements :-

(i) 0.05N NaOH - prepare 1l sol^n by dissolve 1.0gm of NaOH in distilled water strain this sol^n y standard glass filter so that Na_2CO_3 is filtered remain in filter 1N NaOH obtained through this can be stored in airtight bottle

(ii) Phenopthalin indicator - Dissolve 500mg PH in 50 ml 95% ethanol add 50 ml of distilled ater then add 0.05 N CO_2 free NaOH sol^n dropwise until the sodium turns light pink.

rinciple :-

Na_2CO_3 is formed by the neutralization of carbonic acid After the neutralization sol^n ecome alkaline this can be measured by using PH indicator which produce pink colour at 8.3 p^h method to estimate free CO_2 - titrate by NaOH

titrate by Na_2CO_3

Procedure - Collect water sample carefully in 250-300ml bottle or 100 ml nessler tube while collecting water ubbles should not be there in water should be disturbed more if water sample is to be collected from depth then Kammerer water sampling bottle is appropriate to use.

PRINCIPAL
VIVEK PG COLLEGE
DAUSA (RAJ.) PIN-303706

Teacher Signature.....

Calculation :-

$$\text{free } CO_2 \text{ of Sample I}^{st} = \frac{A \times N \text{ of } NaOH \times 1000 \times 44}{ml \text{ of Sample}}$$

$$= \frac{12.2 \times 0.05 \times 1000 \times 44}{50}$$

$$= 536.8 \text{ mg/l}$$

$$\text{Free } CO_2 \text{ of Sample II}^{nd} = \frac{A \times N \text{ of } NaOH \times 1000 \times 44}{ml \text{ of Sample}}$$

$$= \frac{8.1 \times 0.05 \times 1000 \times 44}{50}$$

$$= 356.4 \text{ mg/l}$$

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

→ take 100 ml of water sample in clean & dry conical flask add few drops of HPH indicator in it soln are pink
→ if sample remain colourless then it should be titrate by 0.05 N NaOH filled in burette.
→ Note the end point when the soln turns pink in colour turn off the burette knobe and write down the reading of volume of 0.05N NaOH.

Observation table -

S.No.	Volume of Sample(ml)	Burette reading (ml) initial	final	total	mean
1.	50 ml	0	12.2	12.2	
2.	50 ml	0	8.1	8.1	

Calculation -

$$\text{Free } CO_2 \text{ (mg/l)} = \frac{A \times N \text{ of NaOH} \times 1000 \times 44}{\text{ml of Sample}}$$

Result - The free CO_2 of given water sample are -
A. 536.8 mg/l
B. 356.4 mg/l

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher Signature.....

Salinity (Chloride)

Sample

↓

Potassium dichloride indicator

↓

Yellow colour

↓

titrate with 0.02 N $AgNO_3$

↓

Milky Colour

↓

Red brick colour

↓

Note reading

Experiment - 5

Aim :-

To determine the salinity of given water Sample.

Requirements :-

(i) 0.02 N silver Nitrate - Dissolve 3.4 g $AgNO_3$ in water and make it upto 1000 ml by adding distilled water keep this soln in coloured glass bottle or normal transparent bottle wrapped with carbon and opaque paper for $AgNO_3$ in soln react due to sunlight and become inactive

(ii) 5% potasium ~~Chloride~~ Chromate (K_2CrO_4) - dissolve 5gm K_2CrO_4 in 100ml of distilled water

Principle - Chloride is too soluble in water so it is very difficult to remove it is very difficult to remove it from water. chloride gives salty taste to water at 250 to 500 mg/l but upto 1500 mg/l they are not harmful According to indian council of medical research (ICMR 1975) the amount of chloride in potable water should not be more than 1000 mg/l. Excess of chloride in water are armful for building too because these react with calcium cmt in concrete to form calcide and lower the strength of concrete so water having $MgCl_2$ should not be ~~concrete~~ used in boilers. Chloride cmt in water react with silver nitrate and forms white precipitate of silver chloride

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher Signature.....

Calculation :-

Salinity of sample Ist = $\frac{A \times N \text{ of } AgNO_3 \times 1000 \times 35.5}{ml \text{ of sample}}$

$= \frac{7.1 \times 0.02 \times 1000 \times 35.5}{50}$

$= 100.82 \text{ mg/l}$

Salinity of sample IInd = $\frac{A \times N \text{ of } AgNO_3 \times 1000 \times 35.5}{ml \text{ of sample}}$

$= \frac{8.7 \times 0.02 \times 1000 \times 35.5}{50}$

$= 123.55 \text{ mg/l}$

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

When all chloride are precipitated then silver nitrate is found in free state in the soln it can be confirmed by using potassium chromate indicator because this indicator forms brick coloured silver chromate as end point when titrated -

$$NaCl + AgNO_3 \longrightarrow AgCl\downarrow + NaNO_3$$

White PPt

$$2AgNO_3 + K_2CrO_3 \longrightarrow Ag_2CrO_4 + 2KNO_3$$

Procedure - Collect sample in plastic or borosilicate bottle for one time titration 50ml sample is required. Sample can be kept for 7 days for measuring chloride.

- take 50 ml of sample in a conical flask add 2ml of potassium chromate indicator into it colour change from yellow to milky if flask is not shaken continuously then you see the red colour but on shaking it disappear but at some point red colour comes and if does not disappear on shaking this is the end point.

Observation table -

S.No	Volume of Sample	Burette reading (ml) intial	final	total	Mean
1.	50 ml	0	7.1	7.1	
2.	50 ml	0	8.7	8.7	

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher Signature.....

Date :.....

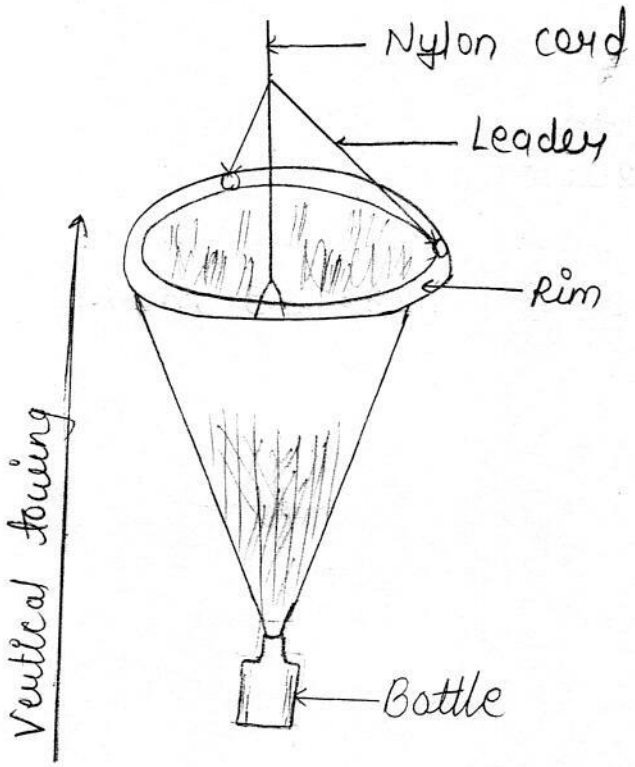
Calculation -

$$\text{Chloride (mg/l)} - \frac{A \times N \text{ of } AgNO_3 \times 1000 \times 35.5}{\text{ml of Sample}}$$

Result - The salinity of the given water sample are - A. 100.82 mg/l

B. 123.55 mg/l

PRINCIPAL
VIVEK PG COLLEGE
KATWAR, JAIPUR-303706



Plankton net

e No.....27.....

Date :....5-8-23.....

Experiment - 6

Aim :-

Collection, isolation and identification of plankton (phyto and zoo plankton)

Plankton Collection - Plankton can be studied properly if they are collected and method for collection are as follows -

(i) Bottle Sampling - Sample is collected by immersing bottle in water so that plankton came into the bottle along with water this method is easy but has disadvantages too firstly plankton try to escape & Secondly their no is too less in the sample taken so one has to collect sample 3 to 4 tym to study then properly beaker can also be used instead of bottle.

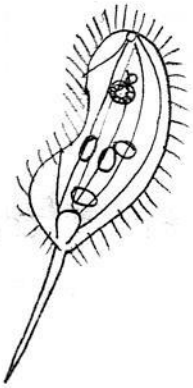
(ii) Plankton Net - Plankton net is used collect plankton it is made up of thin silk or nylon fibre its mesh size is fixed.

net is made up of a circular iron ring attached to handle the ring is tied with bolting silk cloth having different mesh size out of which 60 no most common net is used with slow motion 60cm sec. Depth of place where sample water for plankton is collected can be measured by string plankton net collect plankton by cylindrical column of water we know that volume of a cylinder can be calculated as

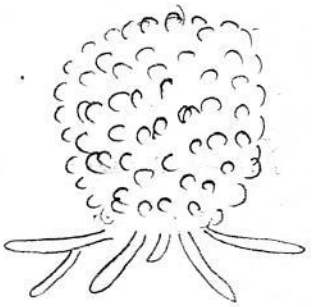
$V = \pi r^2 L$

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

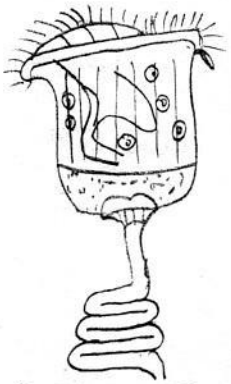
Teacher Signature.....



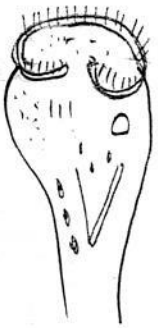
Urpatricha



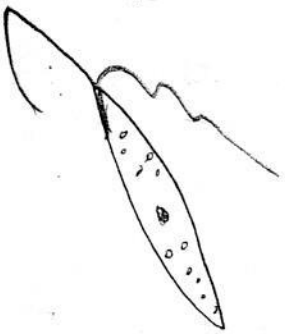
Difflugia



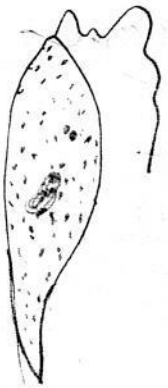
Vorticella



Stentor



Paramecia



Euglena

Organisms of protozoa

Where $\pi = 3.14$, r = radius of rim of net, l is length covered by net through this method large no of plankton are collected.

(B) Fixation and preservation of plankton - To identify and count the plankton it is essential to keep them for long through try to study them live with the help of microscope for better result. plankton are fixed using following solution -

(i) lugol's solution - This soln preserve plankton as well as stain them too but they cannot be preserved in this solution for long plankton sample preserved in lugol should be kept in dark.

(ii) formalin - this solution is simple & easily available 4% formalin is adapt for preservation formalin is saturated soln for formaldehyde in water.

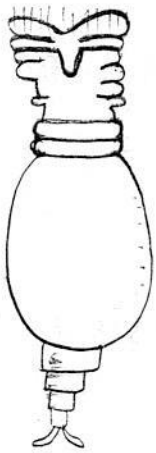
Qualitative study of plankton - plankton are affected by the physical & chemical factor of water some are found in clean water & some can survive in the most polluted water too some plankton live in soft water & some live in salty water some plankton inform about the pollution level of water in which they live and therefore called bio indicators for eg. Euglena, oscillatoria

(i) Protozoa - Organism are one called some are colonial, chlorophyll is not only in Euglena for locomotion cilia flagella or pseudopodia may be not

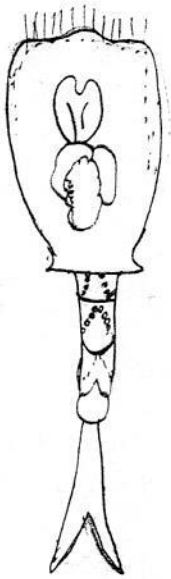
PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher Signature.....

Rotaria

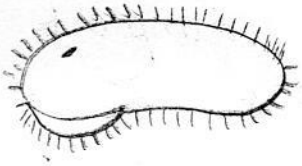


Philodina

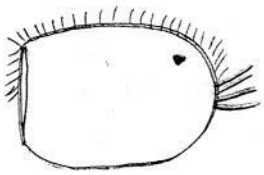


Organism of Rotifera

Scaridium

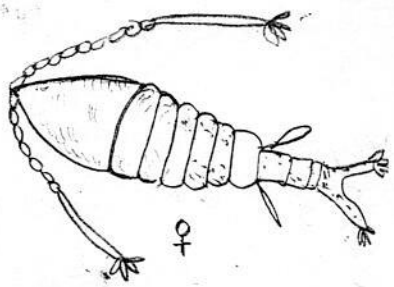


Heterocypris



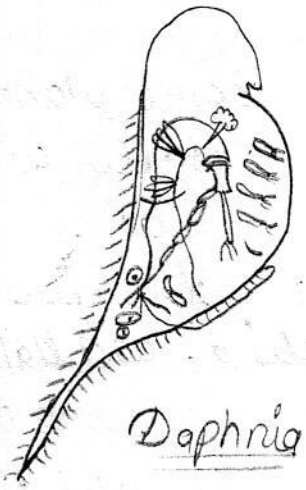
Centrocypris

Organism of Ostracoda

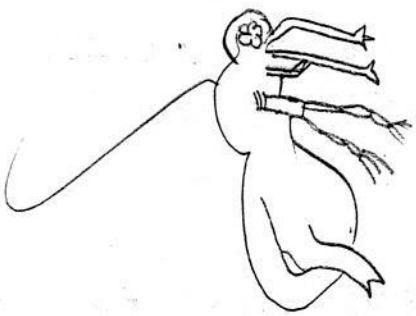


Spicodiaptomus

Organism of Copepoda



Daphnia carinata



Moina (male)

Organism of Cladocera

Date :

(ii) Rotifera - generally worm like organism for locomotion one or two circlet of cilia are cmt on body called corona.

(iii) Ostracoda - Organism with jointed appendages external skeleton cmt. this exoskeleton (shell) is bivalve type like in unio they can be retracted in shell if required.

(iv) Copepoda - Body divided into 2 parts jointed appendages antenna non-branching

(v) Cladocera - Body division are not clear. Body is flat and posterior part is covered by carapace locomotion is by second antenna.

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher Signature.....

Date : 8-8-23

Experiment - 7

Aim:-

To study the food preference of stored insect pest (tribolium) in whole grain

Requirement:-

Tribolium, multicompartment box, types of whole grain, wheat, rice, barley, pearl millet

Principle- It can be an interesting subject to study the food preference of insect pest take a container which have places where different kind of food material can be kept and they won't get mixed this container should be closed so that other insect can't go inside and insects which are inside cannot go out.

A large plastic trough or dry fruit tray can be used for this purpose put different material in different chamber and note the no. of insect in each chamber repeat the experiment in different chamber and note the no. of insect in each chamber repeat the experiment with same food material the Sonaling flour all purpose flour wheat, maida etc are the product of basic substances wheat keep these product and then test which product are like more by insect this can be done with different species also it can be checked that if disliked food is given then what happen these are proved to be informative

Teacher Signature.....

Calculation :-

Substance	live	dead
Wheat %	$\frac{34}{61} \times 100 = 55.73$	$\frac{0}{61} \times 100 = 0$
Bajra %	$\frac{20}{61} \times 100 = 32.78$	$\frac{1}{61} \times 100 = 1.63$
Rice %	$\frac{5}{61} \times 100 = 8.19$	$\frac{1}{61} \times 100 = 1.63$
Pearlmillet	0	0

as well as interesting by these studies we can know the precaution to be taken in storage of food and how food substances can be kept safe by using what kind of product this way many experiment can be performed.

Procedure :- first of all multicompartment box in which different types can be kept but they do not mix with each other
tribolium is left in the middle space of the box around which different types of grain are placed.
→ close the box out of which other insect can't go inside and the insect could not come out
→ give the no. of tribolium in every type of substances on the next day.

Observation table -

S.No	grain	tribolium		total
		live	dead	
1.	Wheat	34	0	
2.	Rice	5	1	
3.	Barley	20	1	
4.	Pearl millet	0	0	
				62

Result - The food preference tribolium in grain wheat

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher Signature.....

Date :..11/9/23.....

Experiment -8

Aim :-

To study the food preference of stored insect pest (Tribolium spe) in powder grain.

Requirements :-

Tribolium, multi compartment box type of whole powder grain, wheat flour, maize flour chickpea flour (besan) suji, maida etc.

Principle :-

It can be an interesting subject to study the food preference of insect pest take a container which have places where different kind of food material can be kept and they won't get mixed this container should be closed so that othes insect can't go inside which are inside cannot go out A large numetic trough or dey fruit tray be used for this purpose put different material in different chamber and note the no. of insect in each chamber repeat the experiment with same food material the someting flour all purpose flour wheat maida etc are the products of basic substances wheat keep these product and then test which product or products are like more By insect this can be done with different specie also it can be checked that if disliked food is given then what happen these are proved to be informative as well as interesting by these studies we can know the precaution to be taken in

Teacher Signature.....

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Calculation :-

Substance	live	dead
Wheat powder grain	$\frac{4}{70} \times 100 = 5.71$	$\frac{1}{70} \times 100 = 1.42$
Suji	$\frac{14}{70} \times 100 = 20$	$\frac{1}{70} \times 100 = 1.4$
maize powder	$\frac{24}{70} \times 100 = 34.28$	$\frac{1}{70} \times 100 = 1.4$
Besan	$\frac{9}{70} \times 100 = 12.85$	0
maida	$\frac{16}{70} \times 100 = 22.85$	0

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Storage of food and how food substances can be kept safe by using what kind of products this way many experiment can be performed.

Procedure - Multicompartment box add & put different types of grain flour in all compartment and there is a circle in the middle then cover that box overnight and break it then after observing if the next day count the % of tribolium % in the flour the flour which contain more tribolium is a animal food.

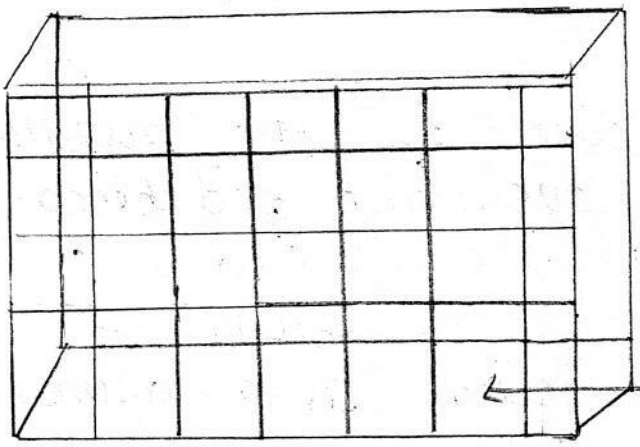
Observation table -

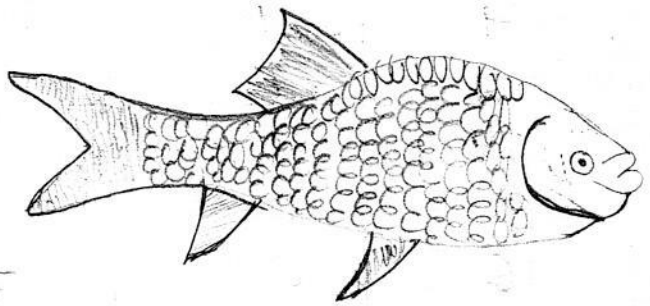
S.No	food grain	No of tribolium		total
		live	dead	
1	Wheat powder	4	1	
2.	Suji	14	2	
3.	maize powder	24	1	
4	besan	9	0	
5	maida	16	0	70

Result - The food preference tribolium in powder maize.

PRINCIPAL
VIVEK PG COLLEGE
BANSWAR, JAIPUR-303706

Teacher Signature





Aquarium with square & fish

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Experiment - 9

Aim:-

Observe of Effect of Toxicants on Movement of fish.

Material:-

Chana punctatus (Ophiocephalus), a cat fish or any other medium sized easily available fish, aquarium (3 Ft x 1.5 Ft), permanent marker, stop watch, a toxicant.

Method:-

Draw vertical and horizontal lines on the outer sides of the aquarium with a thick water proof marker pen, at least three inches apart, on all five sides of the aquarium (four sides and bottom). This way squares will be formed. To see the effect of a toxicant it can either be injected, or given orally by force feeding with the help of tube, or mixed in water (the dose has to be decided in consultation with an expert). Take six fish, keep three as control i.e. untreated and three as experimental i.e. treated.

Start the preliminary experiment, watch their movement, practice and count how many squares a fish enters in two minutes (use the stop watch, this interval can be changed - if the fish is very active then time interval can be reduced but if the fish is slow then it can be increased, and once decided then it has to be kept constant through out the experiment). Once you have practiced, then take the actual observations. First on untreated fish then on treated fish.

Number of days can be decided by the experimenter. Compare the means, if you wish to analyze the data statistically then increase the number of fish and days of observations, then analyze data using 't' test.

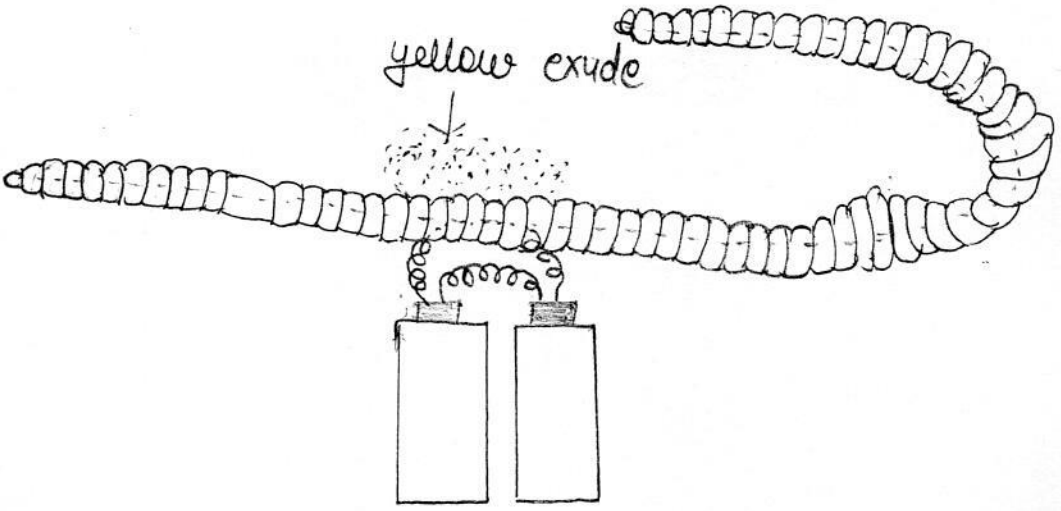
Teacher Signature.....

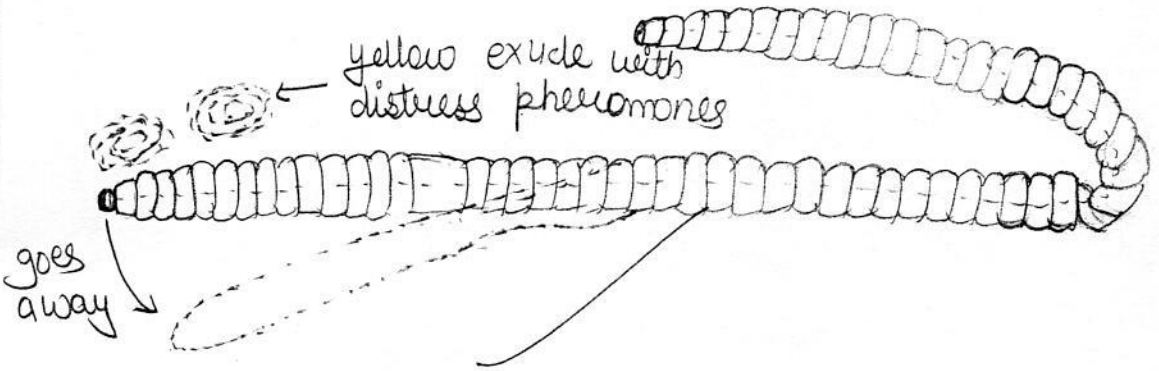
PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Note how many squares untreated normal fish covers in compare it with treated fish and evaluate the affect toxicant on movement of the fish.

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher Signature.....





Mild current is given to earthworm
Earthworm goes away from distress
pheromones

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

lo.....45.....

Date :.15/9/23.....

Experiment - 10

n:-

Observe of communication in Earthworm by Pheromone

oduction:-

Visual and auditory stimuli can not carry message arthworm since they do not have visual or auditory organs. nical stimuli can be used for communication but this would be ed to a time when worms are in proximity. However, earthworm most on chemical communication.

rial:-

Blunt Forceps, paper-towels, scissors, waxed paper, or hed tiles (which are usually put on top of the tables in labs) size D batteries connected in series with a wire. A strong solu- n of table salt and water. Live earthworms (earthworms should handled carefully and gently).

ods:-

At first cut strips of paper towels 2 cm wide, soak them in lt solution and arrange them in a square on a piece of waxed . Then put two earthworms in the centre of square and then ve their reponse of each other, to the waxed paper and to salt ion.

t another earthworm on the waxed paper or a tile give mild to earthworm by touching it briefly with the wires coming om the two size D batteries. The shock will cause the worm trude yellowish coelomic fluid from the grooves between the ents. Remove this earthworm and put another worm in this and observe its reaction towards the yellow fluid which ozed out of the first worm.

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher Signature

servation:-

If the response is negative, the worm will jerk head up and move back, away from the yellow exude, thus sing that the coelomic fluid given out by the worm due to tric shock was a repelling pheromone. If the experiment is e 100 times then 95% of times earthworms will show nega- ve response.

As an additional exercise you can study ants also. Follow the trails. Watch ants communicating with each other by tapping tennae.

ult:-

The earthworms communicate by pheromones which the chemicals expelled from an organism and elicits a sponse in a conspecific organisms.

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher Signature.....

Date :..16/9/23.....

Experiment- 11

im:-

Observe of learning by Trial and Error in Rat with the elp of Hebb - William Maze.

ntroduction:-

Learning represents change in behaviour, it is ifferent than instinct learning because it is not genetically ontrolled and is flexible.

earning is a relatively permanent modification of behaviour e to motivation. It is associated with reward and punishm . However, in the absence of reward or punishment it can o extinct.

Learning has been classified differently by various scientists. orpe's (1963) classification is most widely used:

) Flexible. (i) Habituation; (ii) Classical conditioning; i) Trail and Error; (iv) latent; (v) Discrimination

) Restricted. (i) Imprinting.

ien animals are motivated by thirst, hunger, sex or fear y show restlessness, and exploratory of appetitive behaviour uring the course of which it performs spontaneously a variety motor patterns viz - sniffing, walking and looking around. one of these patterns is followed by reinforcement e.g. a ngry animal while exploring the surrounding receives d and if this association is repeated the animal learns perform a pattern regularly to that particular situation. imals learn to eliminate behaviour, which lead to no reward d increase the frequency of behaviours that is rewarding trial and error.

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher Signature.....

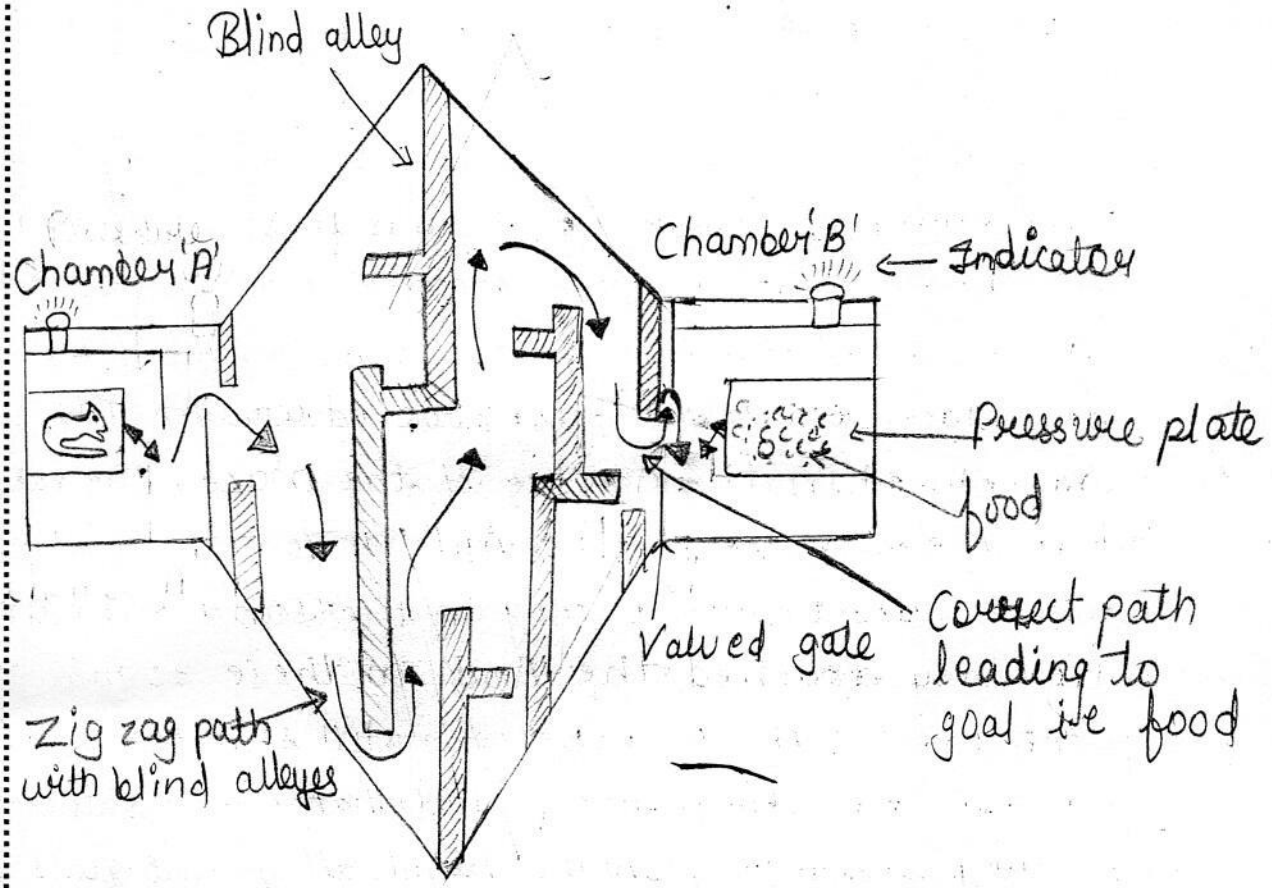
Network of few lines and paths is called a "simple maze" A system of complex passages where only one leads to the goal while others come to a dead end is called a "complex maze." Maze experiments have played an important role in studying the learning behaviour. An important role in or measure for learning is the number of trials which an animal takes to find the goal without error that is, without entering the blind alley - learning of complex path was first studied by Small (1899-1900). He built a 6'x8' research Maze and used it as an instrument in research. It was constructed by a wire mesh and placed on sand dust covered wooden Floor. Some food was placed in the centre of the maze. The rats were placed at the entrance working independently, they explored the whole maze trying to dig in the sand dust or bite the wire. They reached the food in these 30 minutes. On subsequent trials, the time became still shorter and the error were decreased. It was noted that when rats were not hungry, they would play in the blind alley but quikly dash to the goal box when hungry.

Material:-

One cage, 4 white male rats, maze (readymade maze are available with firms selling instruments for psychological tests, a maze can be fabricated using the design given below), stopwatch, water and Food for the rats. Before any experiment is carried on animals. It is necessary for the students to get familarity with the animal. This familarity can be achieved by observation nd handling of the animals.

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher Signature.....



HEBB WILLIAM MAZE

Hebb William maze with two chamber & zig zag path

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

No. 23 Date :

ethods :-

(1) Check all the light points.

Mark 4 male rats (the number can be increased) lifferently (use a permanent marker, mark one on head, oo on trunk, three at tail joint and don't mark the ourth one).

Starve the animals 24 hours prior to reading, but ive them water.

) keep a starved rat in chamber A the bulb lights.

) keep nice odorous food in chamber B.

) tart the stopwatch when the rats comes out of the mber A, close the door of chamber A.

Whenever rat enters a blind alley note it as an error. Note the time when the rat reaches chamber B, the bulb lights.

By this time we will have total number of errors and total time taken.

) Repeat the same with remaining rats.

) After training put the rats back to the cage. Give hem food.

) keep the cages clean and repeat the procedure after ry second day after starving them. Day one you will ve the rats, second day take reading, third day ve, fourth day reading so on and so forth.

ult :-

With subsequent trails, the time taken to reach mber B, and number of errors is reduced indicating t rats learnt the maze by trial and error.

Teacher Signature .....

PRINCIPAL
VIVEK P.G. COLLEGE
KALWAR, JAIPUR-303706

No.....

Date : 18/9/23

Experiment - 12

n:-

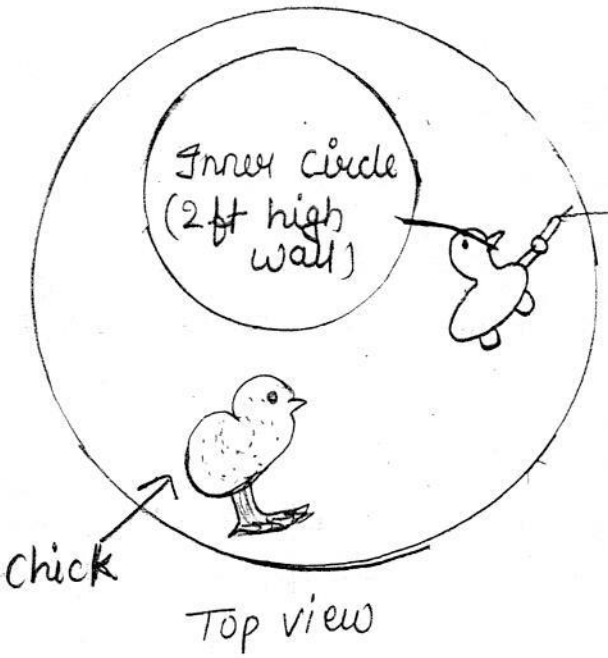
Observe of Imprinting in chicks During critical period.

troduction:-

Imprinting is a learning process that occurs at remarkably early age. Konrad Lorenz (1935) was the first to notice this type of Learning and he coined the term mprinting". He was a naturalist, lived on his farm with a iety of animals. For his work on imprinting he was given a el Prize in 1973. Konrad Lorenz's observation and interpre- ons on imprinting are remarkable. He mainly worked with ylag geese and Jackdaws. The easiest way to explain the ea of imprinting is to how Konrad Lorenz's first studied it. his farm, he found an abandoned clutch of graylag goose eggs collected them and put them in an incubator, after hatching the lings started following Lorenz where ever he went. Then he dec- ed to do a simple experiment. This time he deliberately picked half of the eggs from a clutch, he left rest for the mother incubate. When the chicks hatched, he got all of them to- ther under a box, when they were released half of them t to mother and half came to Lorenz. Lorenz called this enomenon Praegung, which is a German word meaning amping in" because the gosling were stamped an impression the particular parent object with which they had their first ial experience. Lorenz also noticed that the initial social erience must take place during a critical period early life. According to Lorenz imprinting is a unique form learning because it-

PRINCIPAL
VIVEK P.G. COLLEGE
KALWAR, JAIPUR-303706

Teacher Signature.....



Circular runaway showing a chick following a toy

PRINCIPAL
VIVEK P.G. COLLEGE
KALWAR, JAIPUR-303706

Takes place only during a brief sensitive period early in life.
has stability, generally lasting for the rest of the animal's
e and
nfluences the animal's choice of parents and sexual partner.
wly hatched precocial bird (chicks move soon after hatching)
ucks, geese, chickens turkey follow a wide range of object
move before them, say within 48 hours after hatching,
young bird's following response will continue for many
s or weeks (species specific). However, if following beha-
r is not elicited during the early period, it generally
not be produced at a later age. The following or strength
imprinting is increased if the stimulus makes noise as it
es. In nature the chicks always see their parents when
y hatch that noise and move around, so the chick start
owing them. To study the phenomenon of imprinting in
newly hatched chicks have to be procured from the
ltry farm.

erial-

Newly hatched chicks, two circular aluminium enclosure,
fitting inside another a duck toy. The chicks should be kept
parate compartments (approximately 15x10x10 cm) to
ntained visual and tactile isolation (if the chicks can see each
r they get imprinted with each other). The birds should be
to 18 hours old (post hatch) for maximum responsiveness.

od:-

Take one chick at a time for training. Put one chick
circular runway. Put the toy duck in front of the chick
pull it slowly at a speed comparable to that a normal

Teacher Signature.....

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

chick, the toy should also make a noise.

If the model is made to move and stop the proportion of following will increase. Expose each chick individually to the model for 20 minutes. Make your observations from behind a curtain or screen. Record the number of minutes the chicks actually spend following the model. Train the chicks every day and for a week.

If you have time and space train chicks to follow you, they will get imprinted to you.

Result :-

After 7 days, test the chicks for imprinting. Take them out in an open but secure space and drag the toy duck and see how chicks follow this mother model. What actually you would see that some times they are following sometimes not. You leave the room, come back after an hour, you will find all the chicks near the toy. The chicks have got imprinted with this toy.

Ayesha 16.1.24

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher Signature.....

No. 01 Date

Experiment-13

ject - To determine dissolved Oxygen of given Water sample.

uirements - Titration flask, titration tube, magnous sulphate solution, Alkali iodide azide reagent concentrated sulphuric acid, sodium thiosulphate Solution & starch solution

Principle - If maganous sulphate is added to the sample containing alkaline potassium iodide maganous hydroxide is formed which is oxidised by the dissolved Oxygen on addition of stg Sulphuric acid is added the basic magane oxide liberates iodine equivalent to that of dissolved oxygen originally present in the sample The liberated iodine is titrated with Standard Solution of sodium thiosulphate using starch as indicator by calculating the amount of iodine liberated the DO could be determined.

Preparation of reagent -
Maganous Sulphate solution - Take 250 ml titration flask weigh 91.0 gm of maganous sulphate mono-hydrate and dissolve it in titration flask in 9 litres of distilled water then dilute with distilled water upto 250 ml mark.

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher Signature

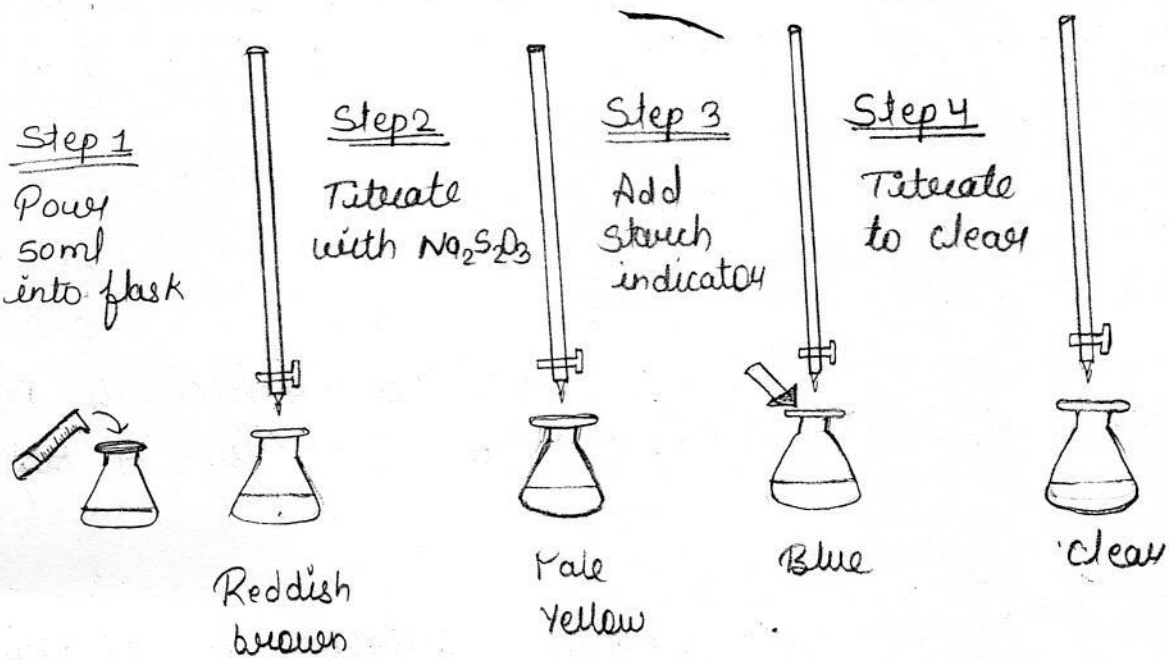


Fig: Dissolved oxygen

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Date :

iii) Alkali iodide azide reagent - In a titration flask dissolve 175 g potassium hydroxide and 37.5 g potassium iodide in a little distilled water & dilute with distilled water upto 250 ml.

iv) Sodium thiosulphate solution - Dissolve 24.82 g $Na_2S_2O_3$ thiosulphate in a little double distilled water in a volumetric flask dilute with distilled water upto 1000 ml to make 0.025 N sodium thiosulphate solution take 250 ml of 0.1 N sodium thiosulphate & dilute it to 1000 ml with double distilled water.

Starch solution - Take 1 gm starch in a little water make a thin paste & pour it in 100 cc boiling water keep on boiling for 2 minute and then cool.

Procedure - Collect the sample in BOD bottles Add 2ml maganous sulphate solution in the bottle by pipette The pipette should never touch the water level it should always be above the water level

Add 2 ml alkali iodide azide solution

Close the bottle with stopper & invert the bottle 10 times A brown precipitate appear indicating presence of oxygen if white precipitate no oxygen.

Allow the precipitate to settle completely

PRINCIPAL
VIVEK PG COLLEGE
KAUWAR, JAIPUR-303706

Teacher Signature.....

Calculation :-

Sample 1 -

$$DO_1 = \frac{V_1 \times N \times E \times 1000}{[V_4 (V_2 - V_3)/V_2]}$$

$$= \frac{1.5 \times 0.025 \times 8 \times 1000}{[50 (300 - 4)/300]}$$

$$= \frac{300}{49.33}$$

$$= 6.08 \text{ mg/l}$$

Sample 2

$$DO_2 = \frac{V_1 \times N \times E \times 1000}{[V_4 (V_2 - V_3)/V_2]}$$

$$= \frac{2.83 \times 0.025 \times 8 \times 1000}{[50 (300 - 4)/300]}$$

$$= \frac{566}{(50 \times 296)/300}$$

$$= \frac{566}{49.33}$$

$$= 11.35 \text{ mg/l}$$

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

→ Remove stopper carefully & add 2ml of concentrated sulphuric acid by the side of the bottle.
→ Take 203 ml of the solution from the bottle into a conical flask of 500 ml capacity.
→ Titrate immediately with 0.025 N sodium thiosulphate solution using starch as indicator

Observation table -

S.No	Quantity of BOD bottle	Total volume of water sample	Burette reading Initial	Burette reading final	Average reading
1	Sample I 300 ml	50 ml	0	1	$\frac{1+1.5+2}{3}$
		50 ml	0	1.5	
		50 ml	0	2	= 1.5 ml
2	Sample II 300 ml	50 ml	0	2.6	$\frac{2.6+2.9+3}{3}$
		50 ml	0	2.9	
		50 ml	0	3	= 2.83 ml

Calculation -

$$\text{Dissolve oxygen (mg/l)} \quad \frac{V_1 \times N \times E \times 1000}{[V_4 (V_2 - V_2)/V_2]}$$

Here: V_1 = Volume of titrant $Na_2S_2O_3$ (ml)
V_2 = Total volume of water sample (ml)
V_3 = Volume of ($MnSO_4$ + KI soln) added ml)
V_4 = Volume of analyte taken in titration
E = Equivalent weight of O_2
N = Normality of $Na_2S_2O_3$ sol^n

Ayesha

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher Signature .....

Result - The dissolve Oxygen of water sample 1 = 6.08 mg/l

The dissolve Oxygen of water sample 2 = 11.35 mg/l

Ayesha

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR 303706

Teacher Signature.....

Date sheet - Sample I^st

Sample : Out side plant Nursery Kalwar, Jaip

Date of sample collection - 7 february 2024

Time : 11 Am

Amount : 300ml + 300ml

Day 1 : 7 february 2024

Day 5 : 12 february 2024

Date sheet - Sample II^nd

Sample : Tank form farm

Date of sample collection : 15 febeuary 20.

time : 9 Am

Amount : 300ml + 300ml

Day 1 : 15 febeuary 2024

Day 5 : 19 febeuary 2024

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Experiment - 14

Aim :-

Determination of BOD in water sample.

Requirements - Titration flask, titration tube, maganous sulphate solution, Alkali iodide azide reagent, Concentrated sulphuric acid, sodium thiosulphate solution & starch solution.

Principle - Biochemical oxygen demand is the amount of oxygen taken by the micro-organism that decompose the organic waste matter.

→ BOD correlate with organic matter present in water body / sample which in term is a measure of pollution level

→ The test has its widest application in measuring waste loading to treatment plant and in evaluting the efficiency of such treatment system.

→ It is calculated by extimating dissolved oxygen @ two different time points.

Preparation of reagent -

i) Maganous Sulphate solution - Take 250 ml titration flask weigh 91.0 gm of maganous sulphate monohydrate and dissolve it in titration flask in 9 litre of distilled water Then dilute with distilled water upto 250 ml mark.

PRINCIPAL
VIVEK P.G. COLLEGE
KALWAR, JAIPUR-303706

Teacher Signature.....

(ii) Alkali iodide azide reagent - In a titration flask dissolve 175 g potassium hydroxide and 37.5 g potassium iodide in a little distilled water & dilute with distilled water upto 250 ml.

(iii) Sodium thiosulphate solution - Dissolve 24.82 g sodium thiosulphate in a little double distilled water in a volumetric flask dilute with distilled water upto 1000 ml to make 0.025 N sodium thiosulphate & dilute it to 1000 ml with double distilled water.

(iv) Starch solution - Take 1 gm starch in a little water make a thin paste & pour it in 100 cc boiling water keep on boiling for 2 minute & then cool.

Procedure - Collect water sample in 2 BOD bottle without making air bubbles.

→ In one bottle calculate dissolve oxygen that is DO_1

→ Another BOD bottle place in BOD incubator for 5 days where temperature is almost constant ie - 20c

→ After 5 days calculate the DO of 2nd BOD bottle that is DO_2

→ Difference between these two DO that is DO_1 & DO_2 is BOD

Reaction - $MnSO_4 + 2KOH \longrightarrow Mn(OH)_2 + K_2SO_4$
(White PPt)

PTC

Teacher Signature.....

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303108

Calculation

Sample 1

$$DO_1 = \frac{V_3 \times N \times 8 \times 1000}{V_2\left(\frac{V_1 - V_4}{V_1}\right)}$$

$$= \frac{2.83 \times 0.025 \times 8 \times 1000}{50(300-4)/300}$$

$$= \frac{566}{49.33}$$

$$= \underline{11.47} \text{ mg/L}$$

$$DO_5 = \frac{V_3 \times N \times 8 \times 1000}{V_2(V_1 - V_4)/V_1}$$

$$= \frac{1.5 \times 0.025 \times 8 \times 1000}{50(300-4)/300}$$

$$= \frac{300}{49.33}$$

$$= \underline{6.081} \text{ mg/L}$$

$$BOD = DO_1 - DO_5$$

$$= 11.47 - 6.081$$

$$= \underline{5.389} \text{ mg/L}$$

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

$Mn(OH)_2 + O_2 \longrightarrow MnO(OH)_2$
(Brown ppt)

$MnO(OH)_2 + H_2SO_4 + 2KI \longrightarrow MnSO_4 + K_2SO_4 + H_2O + I_2$

Observation Table :-

S.NO	Quantity of BOD bottle	Total volume of water sample	Burette reading Initial	Burette reading final	Average reading
1	Sample 1st DO_1 300 ml	50 ml	0	2.9 ml	
		50 ml	0	3.0 ml	$\frac{2.9+3.0+2.6}{3}$
		50 ml	0	2.6 ml	$= 2.83$ ml
2.	(DO_2)	50 ml	0	1 ml	
		50 ml	0	2 ml	$\frac{1+2+1.5}{3}$
		50 ml	0	1.5 ml	$= 1.5$ ml

S.NO	Quantity of BOD bottle	Total volume of water sample	Burette reading initial	Burette reading final	Average reading
1.	Sample 2 (DO_1) 300 ml	50 ml	0	4.5	$\frac{4.5+4.9+4.7}{3}$
		50 ml	0	4.9	
		50 ml	0	4.7	$= 4.7$
2.	(DO_2) 300 ml	50 ml	0	1.3	$\frac{1.3+1.2+1.2}{3}$
		50 ml	0	1.2	
		50 ml	0	1.2	$= 1.23$

PRINCIPAL
VIVEK PG COLLEGE
ALWAR, JAIPUR-303706

Teacher Signature.....

Calculation

Sample 2

$$DO_1 = \frac{V_3 \times N \times 8 \times 1000}{V_2 (V_1 - V_2) / V_1}$$

$$= \frac{4.7 \times 0.025 \times 8 \times 1000}{50 (300 - 4) / 300}$$

$$= \frac{940}{49.33}$$

$$= 19.05 \text{ mg/L}$$

$$DO_5 = \frac{V_3 \times N \times 8 \times 1000}{V_2 (V_1 - V_4) / V_1}$$

$$= \frac{1.23 \times 0.025 \times 8 \times 1000}{50 (300 - 4) / 300}$$

$$= \frac{246}{49.33}$$

$$= 4.98 \text{ mg/L}$$

$$BOD = DO_1 - DO_5$$

$$= 19.05 - 4.98$$

$$= 14.07 \text{ mg/L}$$

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Date :.....

Calculation -

formula - $$\frac{V_3 \times N \times 8 \times 1000}{V_2 (V_1 - V_4)}$$

Where V_1 = Volume of BOD bottle = 300ml

V_2 = Sample used = 50ml

V_3 = titration volume of sodium thiosulphate

V_4 = Volume of $MnSO_4$ + alkali azide = 4ml

Result -

No.1 - Biological O_2 demand (BOD) of sample-1
= 5.389 mg/L

2. Biological O_2 demand (BOD) of sample-2
= 14.07 mg/L

Ayesha 21/2/24

PRINCIPAL
VIVEK PG COLLEGE
KALWAR, JAIPUR-303706

Teacher Signature.....