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**ANJUMANABAD, BHATKAL-581320**  
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8SC 4 CARBOXYLIC ACID - PowerPoint

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2 CARBOXYLIC ACIDS & THEIR DERIVATIVES UNIT-2 CHAPTER-6

3 Introduction

4 Classification

5

6

SLIDE 2 OF 31 ENGLISH (INDIA)

NOTES COMMENTS

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by  
**Principal Mushtaq K. Shaikh, Associate Prof. in Chemistry**

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Carbo-acid\_mks\_v04

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**Classification**

- C.A containing 1,2 & 3 carboxyl groups are known as mono, di & tri C.A respectively.
- These may be aliphatic, alicyclic & aromatic.
- These may further subdivided into saturated, unsaturated & substituted C.A.
- Some representative members are given below.



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**ELECTRO MOTIVE FORCE [Protected View] - PowerPoint**

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**1** **ELECTRO MOTIVE FORCE**  
**STANDARD CELL**  
**WESTON CADMIUM CELL**

**2** The following are the requirements of the standard cell:  
1. The EMF of the cell must be reproducible.  
2. The cell must be reversible.  
3. The EMF of the cell must be constant with time.  
4. The passage of current should not produce a permanent change in the concentration of the cell components.

**3**

**4** **Example**  
The EMF cell constant coefficient for Weston standard cell at 25°C is 1.01864 V. Calculate the EMF of the cell at 25°C.  
Solution: The EMF of the cell is 1.01864 V.

**5**

**SLIDE 1 OF 22** **ENGLISH (INDIA)**

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**SLIDE 3 OF 22** **ENGLISH (INDIA)**

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## BIMOLECULAR HYDROLYSIS OF AN ESTER ( $A_{AC2}$ )

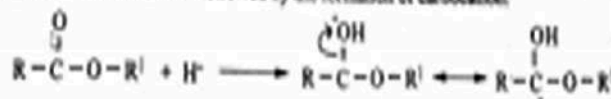
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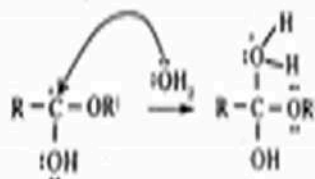


**Mechanism :**

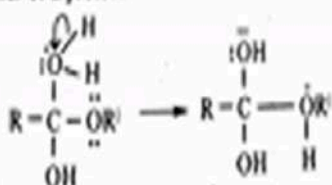
**Step 1 :** Protonation of an ester followed by the formation of carbocation.



**Step 2 :** Attack of nucleophile (i.e., water molecule) to the carbocation.



**Step 3 :** Transfer of a proton.





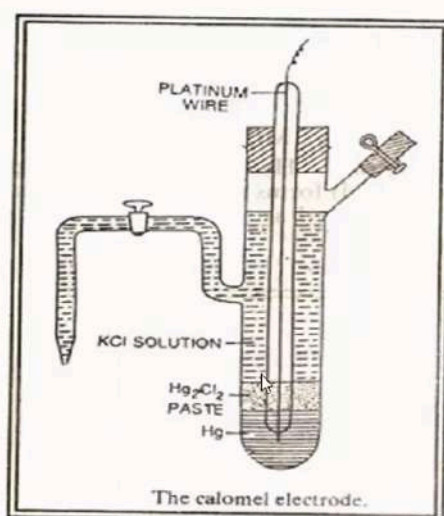


## • TYPES OF ELECTRODES:

- 1> Metal-metal ion electrode  
 $\text{Zn(s)} | \text{Zn}^{2+}$
- 2> Gas electrode  $\text{Pt} | \text{H}_2(\text{g}), \text{HCl}$
- 3> Amalgam  $\text{Pt, Pb(Hg), Pb}^{2+}$
- 4> Metal-metal insoluble salt electrode  $\text{Ag, AgCl(s), Cl}^-$
- 5> Oxidation- Reduction electrode  
 $\text{Pt, Fe}^{2+}, \text{Fe}^{3+}$

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Secondary reference electrode.  
**CALOMEL ELECTRODE**



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**APPLICATIONS OF PARACHOR**

- **Atomic parachor :** The additive property of a molecule is defined as that property, the total value of which is the sum of the values of its constituent atoms. Parachor is an example of such a property. Thus each atom has a definite value of parachor and the total parachor value of a simple molecule is the sum of the parachor values of constituent atoms. The parachor values associated with the atoms are called atomic parachors

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Density of benzene at 20°C, ( $D$ )  
= 0.878 g/ml

Surface tension of benzene at 20°C, ( $\gamma$ )  
= 29.3 dynes/cm

Molecular weight of benzene ( $C_6H_6$ )  
= 78

$\therefore$  Experimental value of parachor, ( $P$ )

$$= \frac{M \gamma^{1/4}}{D} = \frac{78 \times (29.3)^{1/4}}{0.878} = 206.7$$

Thus the experimental value is in close agreement with the calculated value. Hence Kekule structure is confirmed.



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**LIQUID STATE**

The molecular forces of a liquid are held by weak Vander Waal's forces. There are two types of forces in all liquids.

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surface\_ten\_mks\_v02

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**STALAGMOMETER**

0:14:55 0:10:17

surface\_ten\_mks\_v02





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The screenshot shows a Zoom window with a slide titled "Applications of EMF Measurements:". The slide lists five applications:

- 1> Determination of PH of the solution
- 2> Determination of degree of dissociation
- 3> Determination of ionic product of water
- 4> Determination of solubility and solubility product
- 5> The potentiometric titration

Below the list, the text "Reversible and Irreversible Cells" is partially visible. A video feed of a man is in the top right corner.

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The screenshot shows a Zoom window with a slide titled "Metal-Amalgam Electrodes". The slide contains the following text:

The activities and the electrode potentials of highly reactive metals such as sodium, potassium, etc. are difficult to measure in aqueous solution. Hence, the activity of the metal is lowered by dilution with mercury.

$M(Hg)/M^+$

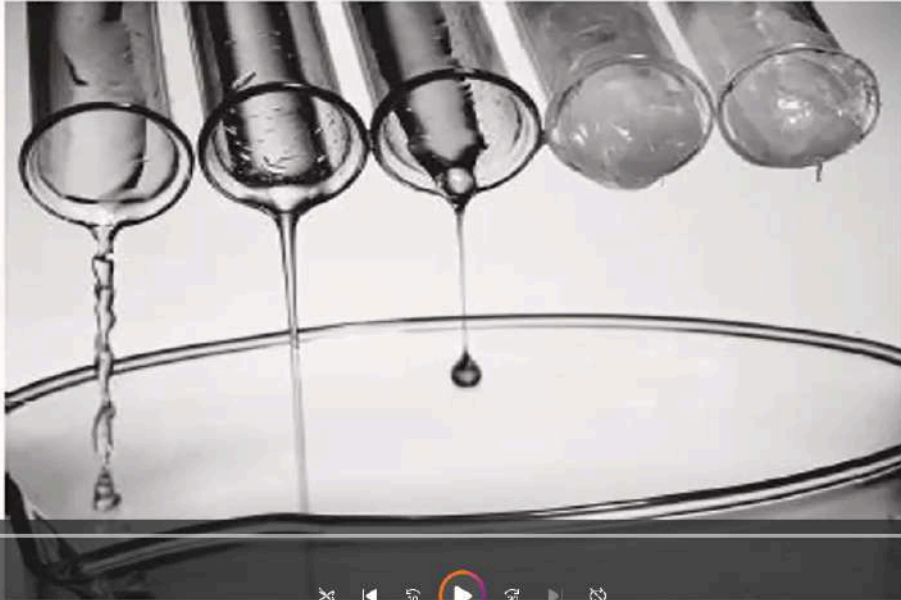
Example  
 $Na, Hg(C)/Na(C)$

The video player interface at the bottom shows the title "Types\_elec\_mks\_v06" and a progress bar. A video feed of a man is in the top right corner.



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## VISCOSITY



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Vis\_Ref\_index\_v02

Zoom interface showing a video player and a participant list.

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## SPCIFIC REFRACTION

- Refractive index of a liquid changes with the wave length of light and also with the temperature. To eliminate the effect of temperature, Lorenz and Lorentz showed purely from theoretical bases that

$$R = \frac{n^2 - 1}{n^2 + 2} \cdot \frac{1}{d}$$

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Vis\_Ref\_index\_v02

Zoom interface showing a video player and a participant list.

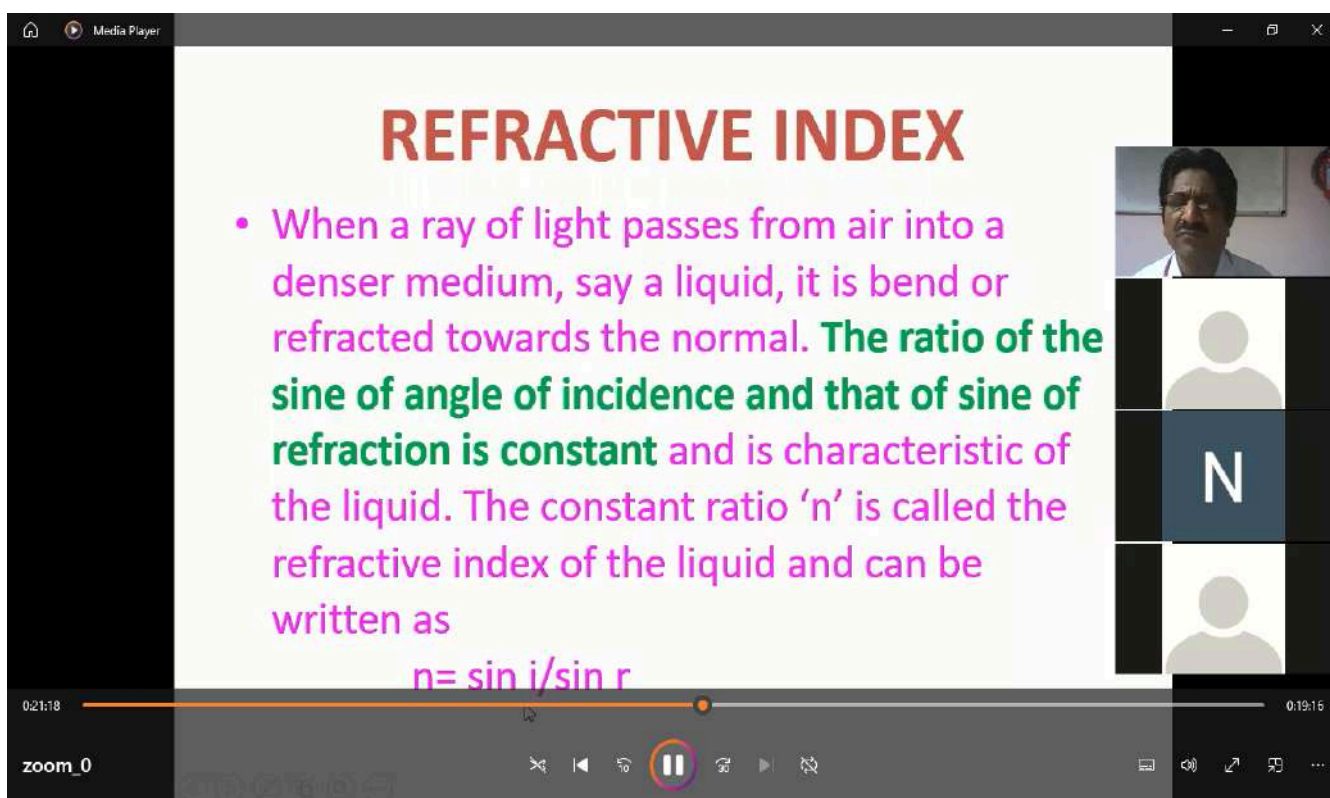




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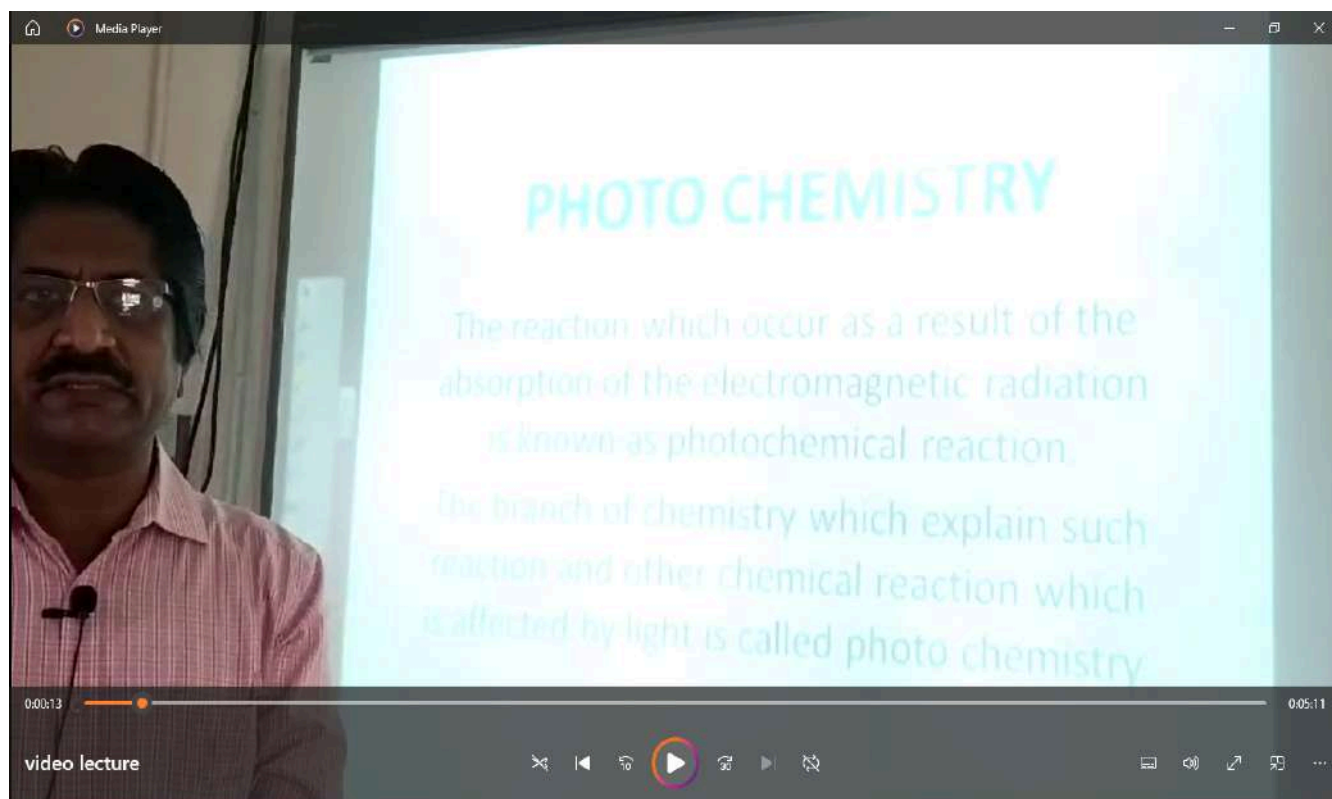


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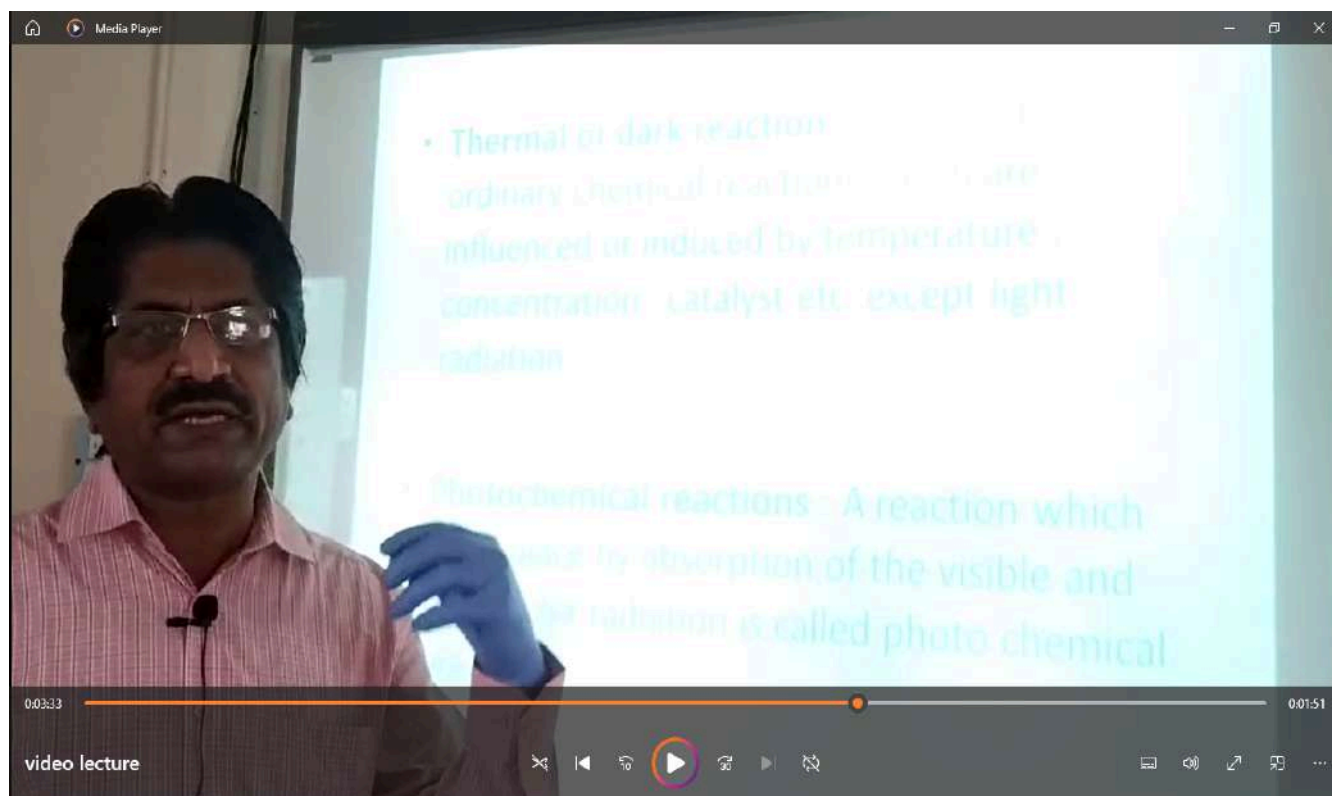


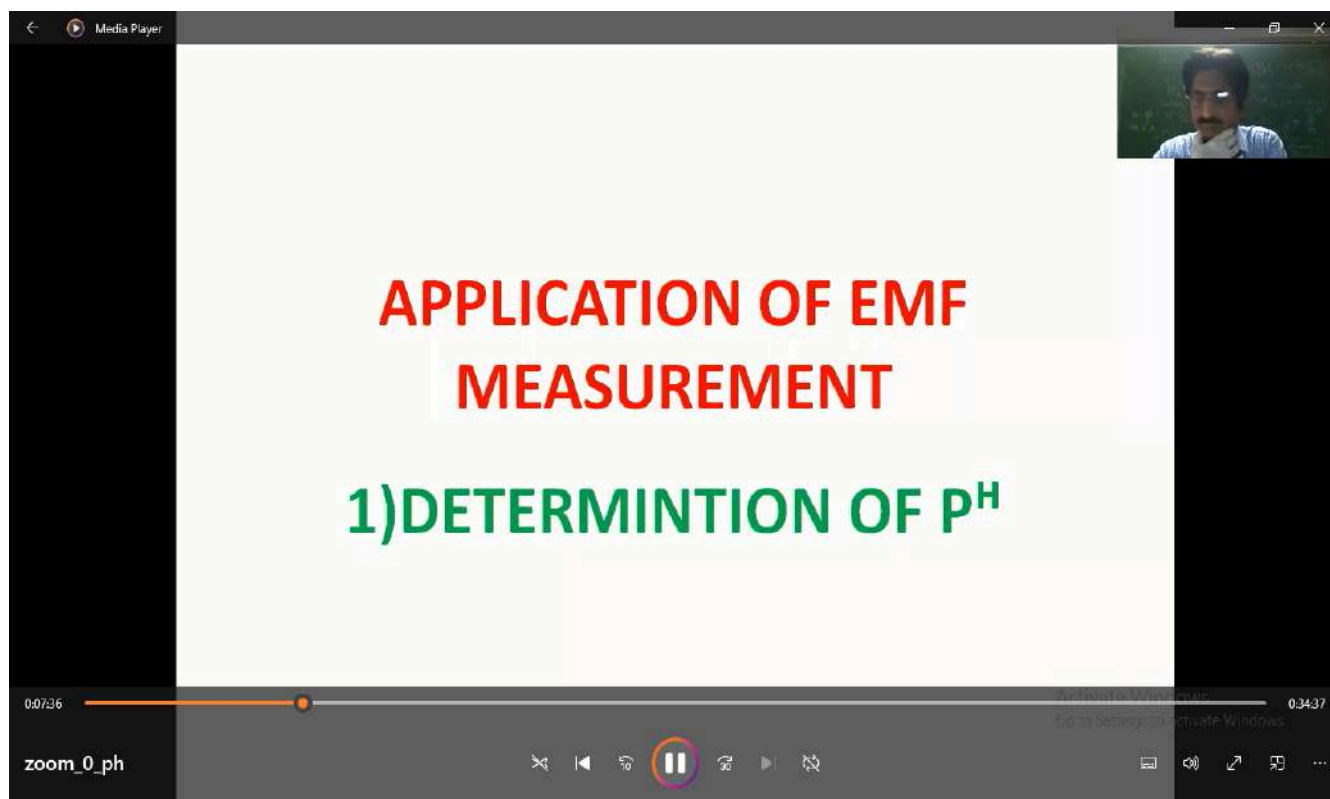


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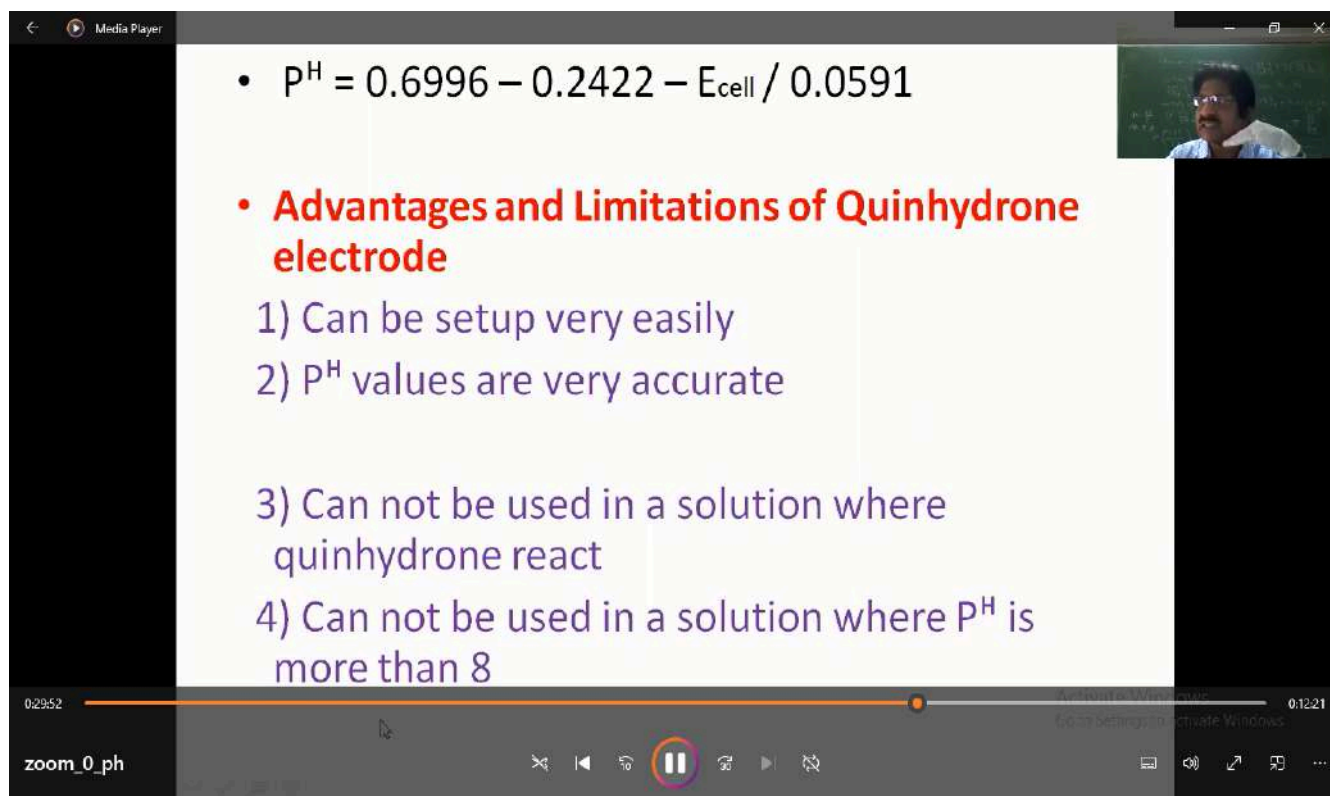


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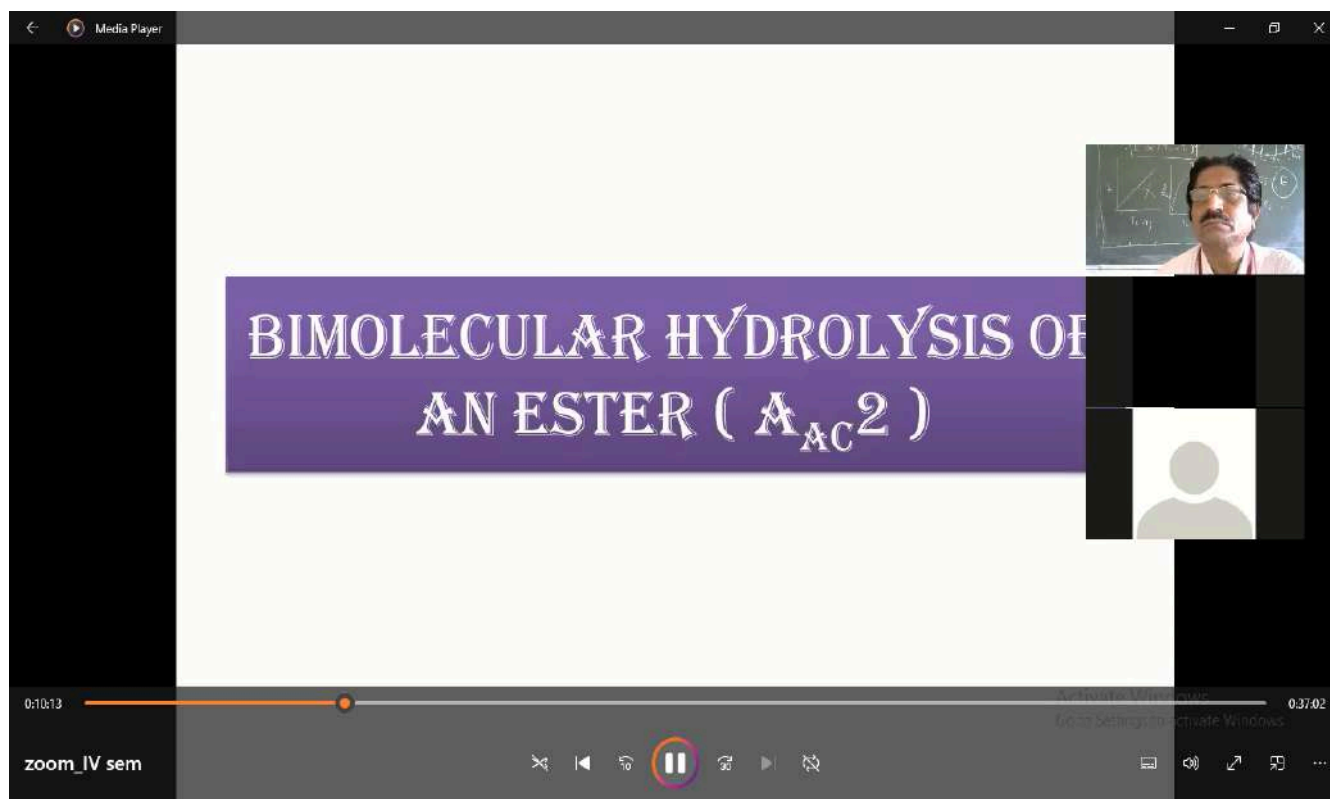




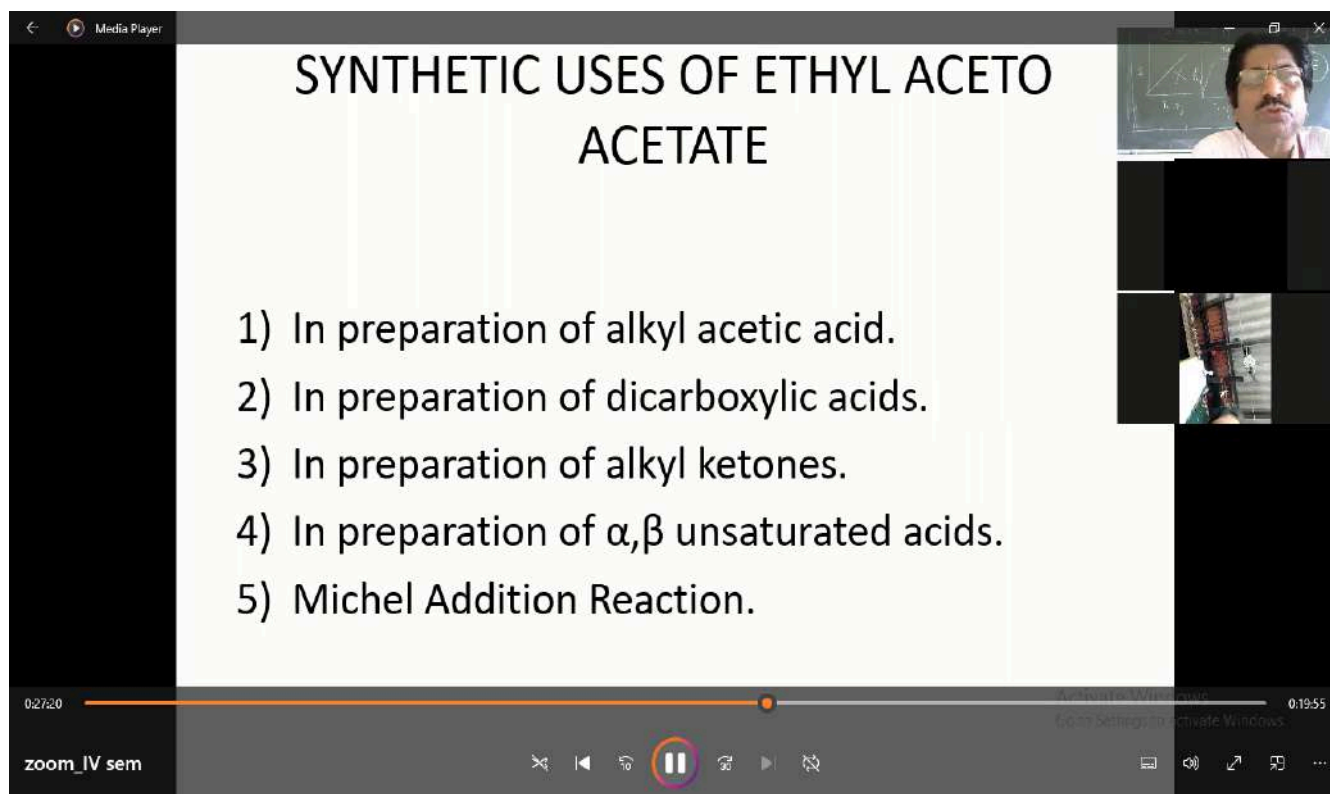
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The slide is titled "Metal-Metal ion electrodes". It contains the following text:

The electrode reaction may be represented as

$$M^n + ne^- \rightleftharpoons M$$

If the metal rod behaves as negative electrode (i.e the reaction involves oxidation) the equilibrium will shift to the left and hence the concentration of the Metal ions in the solution will increase.

On the other hand, if the metal rod behaves as positive electrode (i.e the reaction involves reduction), and the equilibrium will shift to the right and hence the concentration of the metal ions will decrease.

The screenshot also shows a Zoom interface with a video player at the bottom and a participant list on the left.

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The slide is titled "4. Metal - insoluble salt electrodes". It contains the following text:

A metal electrode is covered by the layer of an insoluble salt of the metal. The electrolyte contains the anions of the insoluble salt.

E.g. Ag/AgCl electrode  $Ag | AgCl(s) | KCl(aq)$

$$Ag = Ag^+ + e^-$$
$$Ag^+ + Cl^- = AgCl$$
$$Ag + Cl^- = AgCl + e^-$$

red      ox

$$\mathcal{E} = \mathcal{E}_{AgCl}^0 + \frac{RT}{F} \ln \frac{1}{a_{Cl^-}}$$

73

The screenshot also shows a Zoom interface with a video player at the bottom and a participant list on the left.



**• ELECTRODE POTENTIAL:**

- The tendency of an electrode to lose or gain electrons when it is in contact with its own ion in the solution is called electrode potential.

**• NERNST EQUATION:**

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zoom\_mks\_VIsem

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$2\text{H}^+ + 2\text{e}^- \rightleftharpoons \text{H}_2$

Hydrogen at 1 atm pressure      Temperature 25°C

Platinum electrode coated with platinum black  
Hydrochloric acid

*A standard hydrogen electrode (S.H.E.)*





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Maths\_Polr (Complex Analysis) PPT (2) (Protected View) - PowerPoint

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Cauchy's-Riemann's equations in the Polar form  
If  $f(z) = u + iv$  is an analytic function then C-R equations in the polar form are  $\frac{\partial u}{\partial r} = \frac{1}{r} \frac{\partial v}{\partial \theta}$  and  $\frac{\partial u}{\partial \theta} = -r \frac{\partial v}{\partial r}$

Proof: Let  $x + iy = r(\cos \theta + i \sin \theta)$   
 $\Rightarrow x = r \cos \theta, \quad y = r \sin \theta$   
 $\Rightarrow r^2 = x^2 + y^2 \quad \text{and} \quad \theta = \tan^{-1}\left(\frac{y}{x}\right)$   
Now  $r^2 = x^2 + y^2 \Rightarrow 2r \frac{\partial r}{\partial x} = 2x$   
 $\Rightarrow \frac{\partial r}{\partial x} = \frac{x}{r} = \frac{r \cos \theta}{r} = \cos \theta$   
Similarly  $\frac{\partial r}{\partial y} = \frac{y}{r} = \sin \theta$   
 $\theta = \tan^{-1}\left(\frac{y}{x}\right) \Rightarrow \frac{\partial \theta}{\partial x} = -\frac{y}{x^2 + y^2} = -\frac{r \sin \theta}{r^2} = -\frac{\sin \theta}{r}$   
 $\frac{\partial \theta}{\partial y} = \frac{x}{x^2 + y^2} = \frac{\cos \theta}{r}$   
Since  $u$  and  $v$  are functions of  $x$  and  $y$ , where  $x$  and  $y$  are themselves the functions of  $r$  and  $\theta$   
 $\therefore$  By Chain-rule

0:01:27 0:29:18

B.Sc VI Sem \_Complex Analysis-300621

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Ex (2) If  $u = x^2 - y^2$ ,  $v = -\frac{y}{x^2 + y^2}$ , prove that  $u$  and  $v$  satisfy Laplace eqn but  $u + iv$  is not an analytic function.

Sol<sup>n</sup>:

$u = x^2 - y^2 \Rightarrow \frac{\partial u}{\partial x} = 2x \dots (1) \quad \frac{\partial u}{\partial y} = -2y \dots (2)$   
 $\therefore \frac{\partial^2 u}{\partial x^2} = 2, \quad \frac{\partial^2 u}{\partial y^2} = -2$   
 $\therefore \nabla^2 u = \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}$   
 $= 2 - 2 = 0$   
 $\Rightarrow u$  satisfies Laplace eqn

$v = -\frac{y}{x^2 + y^2} \Rightarrow \frac{\partial v}{\partial x} = \frac{2xy}{(x^2 + y^2)^2} \dots (3)$   
 $\frac{\partial v}{\partial y} = \frac{y^2 - x^2}{(x^2 + y^2)^2} \dots (4)$   
 $\therefore \frac{\partial^2 v}{\partial x^2} = \frac{2y(x^2 - 3x^2)}{(x^2 + y^2)^3}, \quad \frac{\partial^2 v}{\partial y^2} = \frac{2y(x^2 - 3x^2)}{(x^2 + y^2)^3}$   
 $\therefore \nabla^2 v = 0 \Rightarrow v$  satisfies Laplace eqn

From (1) and (4)  $\frac{\partial u}{\partial x} \neq \frac{\partial v}{\partial y}$



**Ex :** If  $f(z)$  is a regular function of  $z$  such that  $f'(z) \neq 0$ , then prove that

$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) \log |f'(z)| = 0$$

**Proof:** We know that  $\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} = 4 \frac{\partial^2}{\partial z \partial \bar{z}}$

$$\begin{aligned} \left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) \log |f'(z)| &= 4 \frac{\partial^2}{\partial z \partial \bar{z}} \{\log |f'(z)|\} \\ &= 2 \frac{\partial^2}{\partial z \partial \bar{z}} \{\log |f'(z)|^2\} \\ &= 2 \frac{\partial^2}{\partial z \partial \bar{z}} \{\log f'(z) \overline{f'(z)}\} \\ &= 2 \frac{\partial^2}{\partial z \partial \bar{z}} \{\log f'(z) f'(\bar{z})\} \quad \because \overline{f'(z)} = f'(\bar{z}) \\ &= 2 \frac{\partial^2}{\partial z \partial \bar{z}} \{\log f'(z) + \log f'(\bar{z})\} \end{aligned}$$

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$$\therefore \left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) \log |f'(z)| = 0$$

**Ex :** If  $\phi$  and  $\varphi$  are functions of  $x$  and  $y$  satisfy Laplace equations. S

$u + iv$  is analytic where  $u = \frac{\partial \phi}{\partial y} - \frac{\partial \varphi}{\partial x}$  and  $v = \frac{\partial \phi}{\partial x} + \frac{\partial \varphi}{\partial y}$

**Sol<sup>n</sup> :** Since  $\phi$  and  $\varphi$  satisfy Laplace equations

$$\therefore \frac{\partial^2 \phi}{\partial x^2} + \frac{\partial^2 \phi}{\partial y^2} = 0 \dots (1)$$

$$\text{and } \frac{\partial^2 \varphi}{\partial x^2} + \frac{\partial^2 \varphi}{\partial y^2} = 0 \dots (2)$$

Let  $f(z) = u + iv$ , where  $u = \frac{\partial \phi}{\partial y} - \frac{\partial \varphi}{\partial x}$  and  $v = \frac{\partial \phi}{\partial x} + \frac{\partial \varphi}{\partial y}$

$$\therefore \frac{\partial u}{\partial x} = \frac{\partial}{\partial x} \left( \frac{\partial \phi}{\partial y} - \frac{\partial \varphi}{\partial x} \right) = \frac{\partial^2 \phi}{\partial x \partial y} - \frac{\partial^2 \varphi}{\partial x^2} \dots (3)$$





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Maths - Part (Complex Analysis) PPT - PowerPoint

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Preview

None Appear Fade Fly In Float In Split Wipe Shape

Effect Options

Add Animation - Animation Painter

Animation Pane

Trigger

Start: On Click

Duration: Auto

Delay: 00.00

34

Ex ( 3 ) Find the analytic function whose imaginary part is  $3x^2y$

Sol<sup>n</sup> :

Let  $v = 3x^2y - y^3$

$\Rightarrow \frac{\partial v}{\partial x} = 6xy, \quad \frac{\partial v}{\partial y} = 3x^2 - 3y^2$

$\therefore \psi_1(z, 0) = \left( \frac{\partial v}{\partial y} \right)_{(z, 0)} = 3z^2$

$\psi_2(z, 0) = \left( \frac{\partial v}{\partial x} \right)_{(z, 0)} = 0$

$\therefore$  By Milne's-Thomson's method

$f(z) = \int [\psi_1(z, 0) + i\psi_2(z, 0)]dz + c$

$= \int [3z^2 + i(0)]dz = \int 3z^2 dz$

$= z^3 + c$

$\therefore f(z) = z^3 + c$

0:05:55

0:34:21

B.Sc VI Sem\_Complex Analysis-230621

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OR : Let  $v = 3x^2y - y^3$

$\Rightarrow \frac{\partial v}{\partial x} = 6xy, \quad \frac{\partial v}{\partial y} = 3x^2 - 3y^2$

By Total differential

$du = \frac{\partial u}{\partial x} dx + \frac{\partial u}{\partial y} dy$

$= \frac{\partial v}{\partial y} dx - \frac{\partial v}{\partial x} dy$  By C-R Equations

$= (3x^2 - 3y^2) dx - 6xy dy$

$= Mdx + Ndy$

which is an exact eqn  $\therefore \frac{\partial M}{\partial y} = \frac{\partial N}{\partial x} = -6y$

$\therefore$  The solution is

$u = \int_{y-\text{const}} (3x^2 - 3y^2) dx + \int 0 dy$

$\Rightarrow u = x^3 - 3xy^2 + c$

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Note : If  $f(z) = u + iv$  is an analytic function then C-R Equations are satisfied



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Ex ( 2 ) Show that  $e^z$  is an analytic function and find its derivative .

Sol<sup>n</sup>: Let  $f(z) = e^z$

$$= e^{x+iy}$$

$$= e^x e^{iy}$$

$$= e^x (\cos y + i \sin y)$$

$$= e^x \cos y + i e^x \sin y = u + iv$$

$$\therefore u = e^x \cos y ,$$

$$v = e^x \sin y$$

$$\Rightarrow \frac{\partial u}{\partial x} = e^x \cos y \dots\dots (1)$$

$$\frac{\partial v}{\partial x} = e^x \sin y \dots\dots (3)$$

$$\frac{\partial u}{\partial y} = -e^x \sin y \dots\dots (2)$$

$$\frac{\partial v}{\partial y} = e^x \cos y \dots\dots (4)$$

$$\therefore \text{From (1) and (4)} \quad \frac{\partial u}{\partial x} = \frac{\partial v}{\partial y}$$

$$\text{From (2) and (3)} \quad \frac{\partial u}{\partial y} = -\frac{\partial v}{\partial x}$$

$\Rightarrow$  C-Reg  $\Rightarrow f(z) = e^z$  is analytic function





Note : If  $f(z) = u + iv$  is an analytic function then C-R Equations are satisfied

i.e  $\frac{\partial u}{\partial x} = \frac{\partial v}{\partial y}$  and  $\frac{\partial u}{\partial y} = -\frac{\partial v}{\partial x}$

$\therefore \frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 v}{\partial x \partial y}$  and  $\frac{\partial^2 u}{\partial y^2} = -\frac{\partial^2 v}{\partial y \partial x}$

$\Rightarrow \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = \frac{\partial^2 v}{\partial x \partial y} - \frac{\partial^2 v}{\partial y \partial x} = 0$

$\Rightarrow \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$  i.e  $\nabla^2 u = 0$

This equation  $\nabla^2 = 0$  i.e  $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$  is known as Laplace equation or Potential equation

00:07 0:30:04

VI Sem\_M-III\_Complex Analysis\_190621

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**Construction of Analytic function**

**Method - I : milne's-Thomson's method**

We have  $z = x + iy$  and  $\bar{z} = x - iy$  so that

$x = \frac{z+\bar{z}}{2}$  and  $y = \frac{z-\bar{z}}{2i}$

$\therefore f(z) = u(x, y) + iv(x, y)$

$= u\left(\frac{z+\bar{z}}{2}, \frac{z-\bar{z}}{2i}\right) + i v\left(\frac{z+\bar{z}}{2}, \frac{z-\bar{z}}{2i}\right)$

which is a function of two independent variables  $z$  and  $\bar{z}$

By taking  $x = z$  and  $y = 0$  so that  $z = \bar{z}$ , we get

$f(z) = u(z, 0) + iv(z, 0)$

We know that

$f'(z) = \frac{\partial u}{\partial x} + i \frac{\partial v}{\partial x}$

$= \frac{\partial u}{\partial x} - i \frac{\partial u}{\partial y}$  By C-R Eq<sup>ns</sup>

Taking  $\frac{\partial u}{\partial x} = \phi_1(x, y) = \phi_1(z, 0)$

and  $\frac{\partial u}{\partial y} = \phi_2(x, y) = \phi_2(z, 0)$

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**LAPLACE TRANSFORMS**

*By : Prof S. A. Indikar*

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**Mr. S. A. Indikar, Associate Prof. in Mathematics**

8. Find  $L\{t^n\}$ , where  $n$  is a +ve integer

Sol<sup>n</sup>: Let  $f(t) = t^n$

By the definition of L.T we have

$$L(f(t)) = \int_0^{\infty} e^{-st} f(t) dt$$
$$\therefore L\{t^n\} = \int_0^{\infty} e^{-st} t^n dt$$

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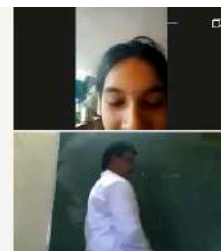
8. Find  $L\{t^n\}$ , where n is a +ve integer

Sol<sup>n</sup>: Let  $f(t) = t^n$

By the definition of L.T we have

$$L\{f(t)\} = \int_0^{\infty} e^{-st} f(t) dt$$

$$\therefore L\{t^n\} = \int_0^{\infty} e^{-st} t^n dt$$



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**Definition:**

Let  $f(t)$  be a real valued function defined for all +ve values of  $t$  [ i.e  $0 \leq t \leq \infty$  ]. Then the Laplace Transform of  $f(t)$  denoted by  $L\{f(t)\}$  and is defined by

$$L\{f(t)\} = \int_0^{\infty} e^{-st} f(t) dt, \text{ where } s \text{ is a real or complex number}$$

Provided that the integral is exist.

Since the integral on R.H.S is a function of  $s$ , it is also denoted by  $F(s)$  or  $f(s)$  or  $\bar{f}(s)$

$$\therefore L\{f(t)\} = F(s) = \int_0^{\infty} e^{-st} f(t) dt$$





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2. To find  $L\{k\}$ , where  $k$  is any constant

Sol<sup>n</sup>: By the definition of L.T we have

$$L\{f(t)\} = \int_0^{\infty} e^{-st} f(t) dt$$

$$\begin{aligned}\therefore L\{k\} &= \int_0^{\infty} e^{-st} k dt = k \int_0^{\infty} e^{-st} dt \\ &= k \left[ \frac{e^{-st}}{-s} \right]_0^{\infty} = -\frac{k}{s} [e^{-\infty} - e^{-0}] \\ &= -\frac{k}{s} [0 - 1] = \frac{k}{s}\end{aligned}$$

$$\therefore L\{k\} = \frac{k}{s}$$

3. To find  $L\{e^{at}\}$ , where  $a$  is any constant

Sol<sup>n</sup>: By the definition of L.T we have

$$L\{f(t)\} = \int_0^{\infty} e^{-st} f(t) dt$$

$$\therefore L\{e^{at}\} = \int_0^{\infty} e^{-st} e^{at} dt = \int_0^{\infty} e^{-(s-a)t} dt$$



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Partial derivatives ppt - Microsoft PowerPoint

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REAL ANALYSIS

By: Prof S. A. Indikar

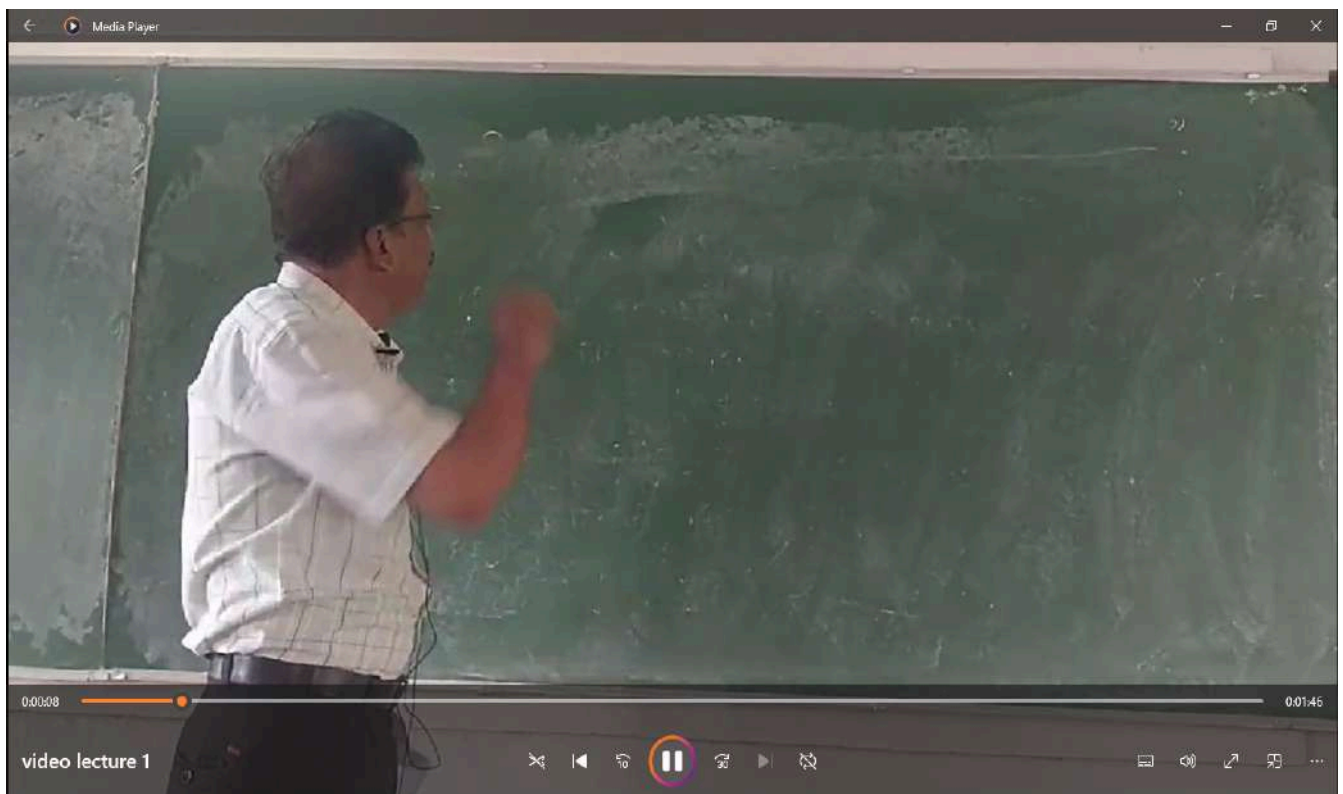
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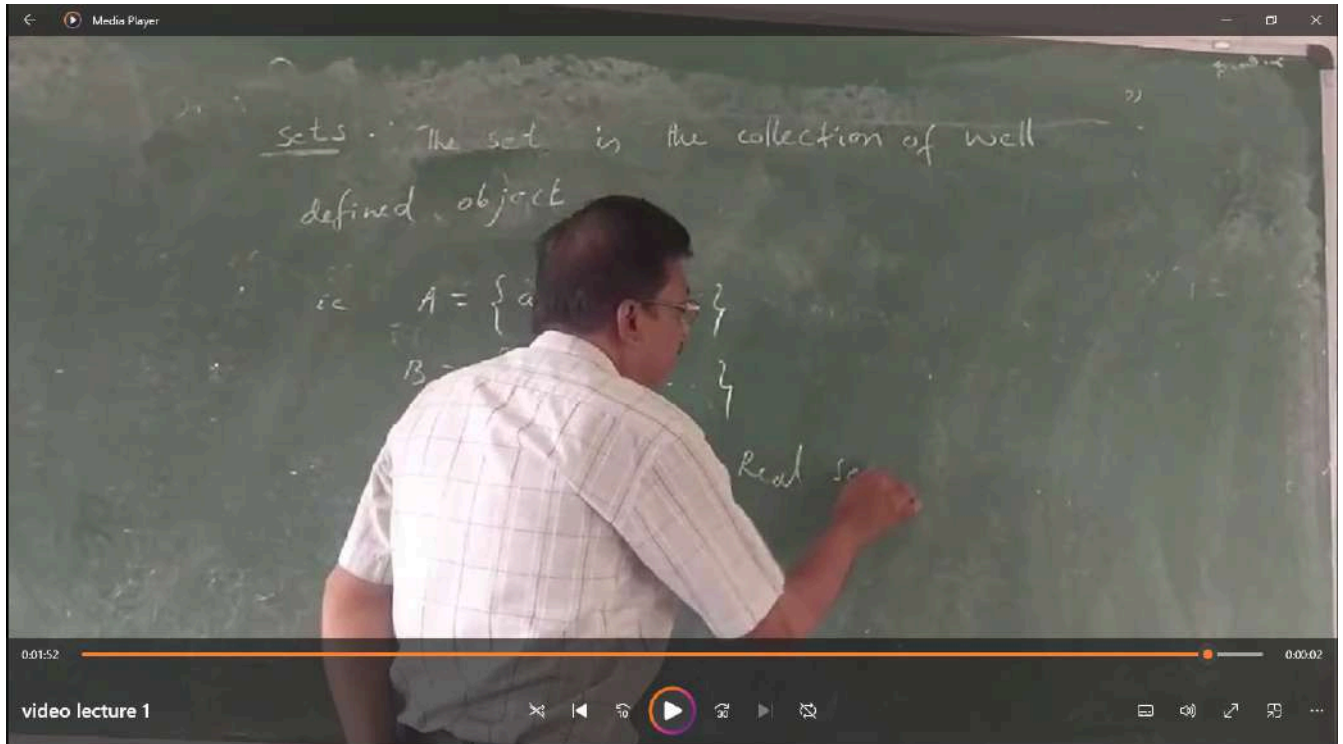
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