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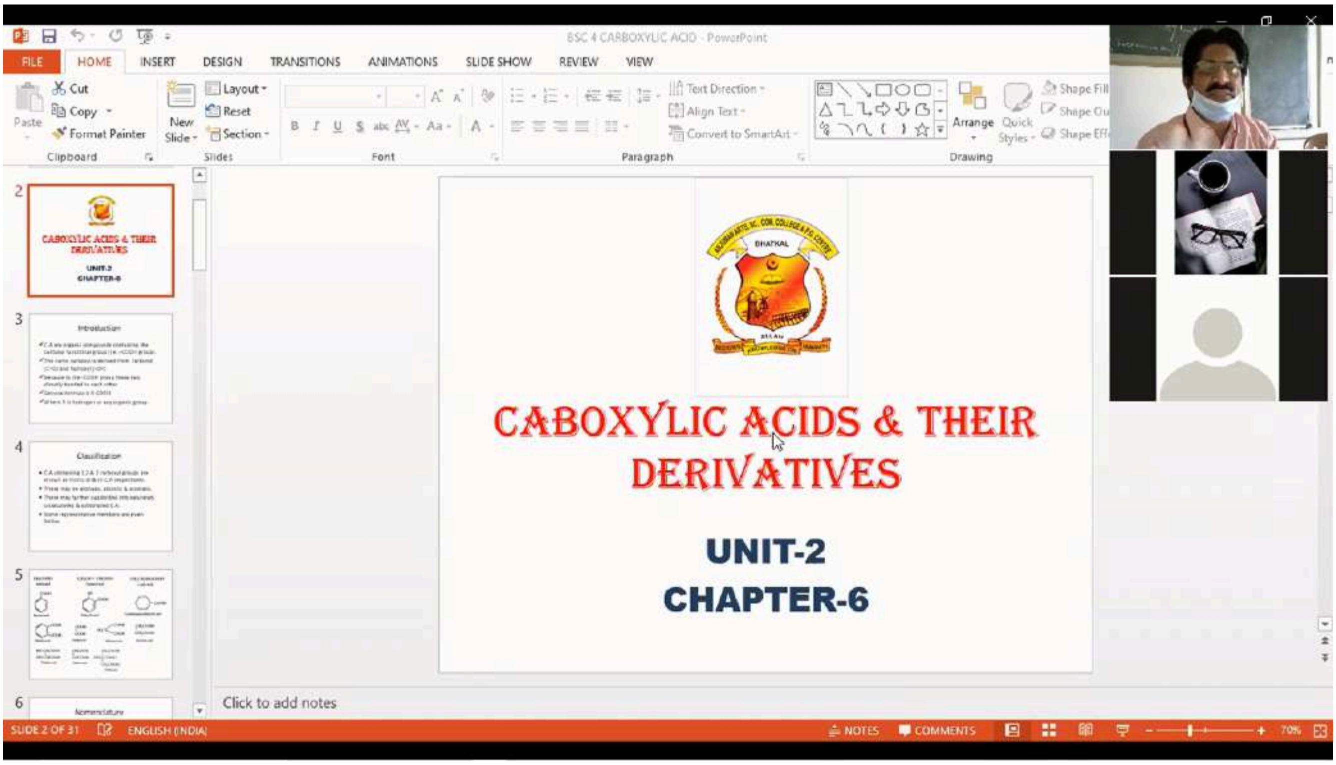

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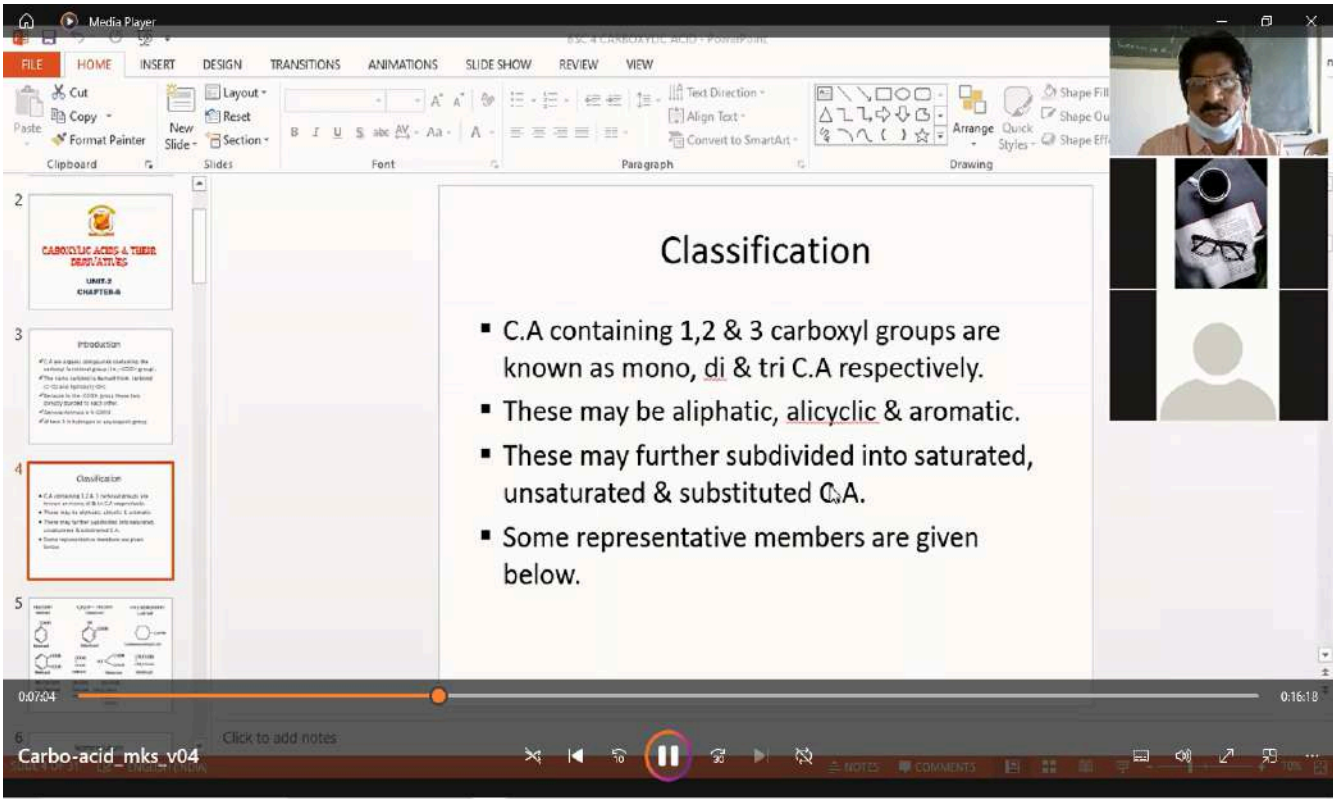

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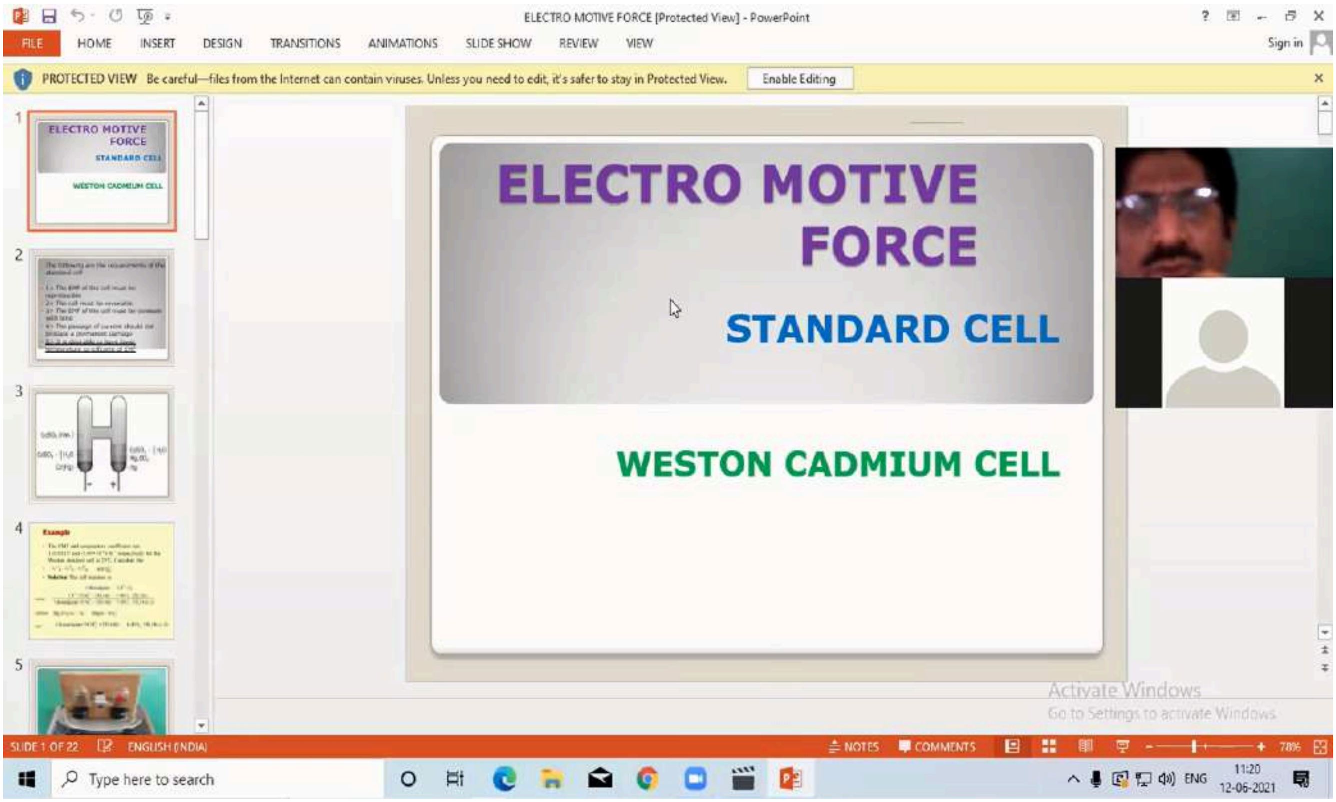

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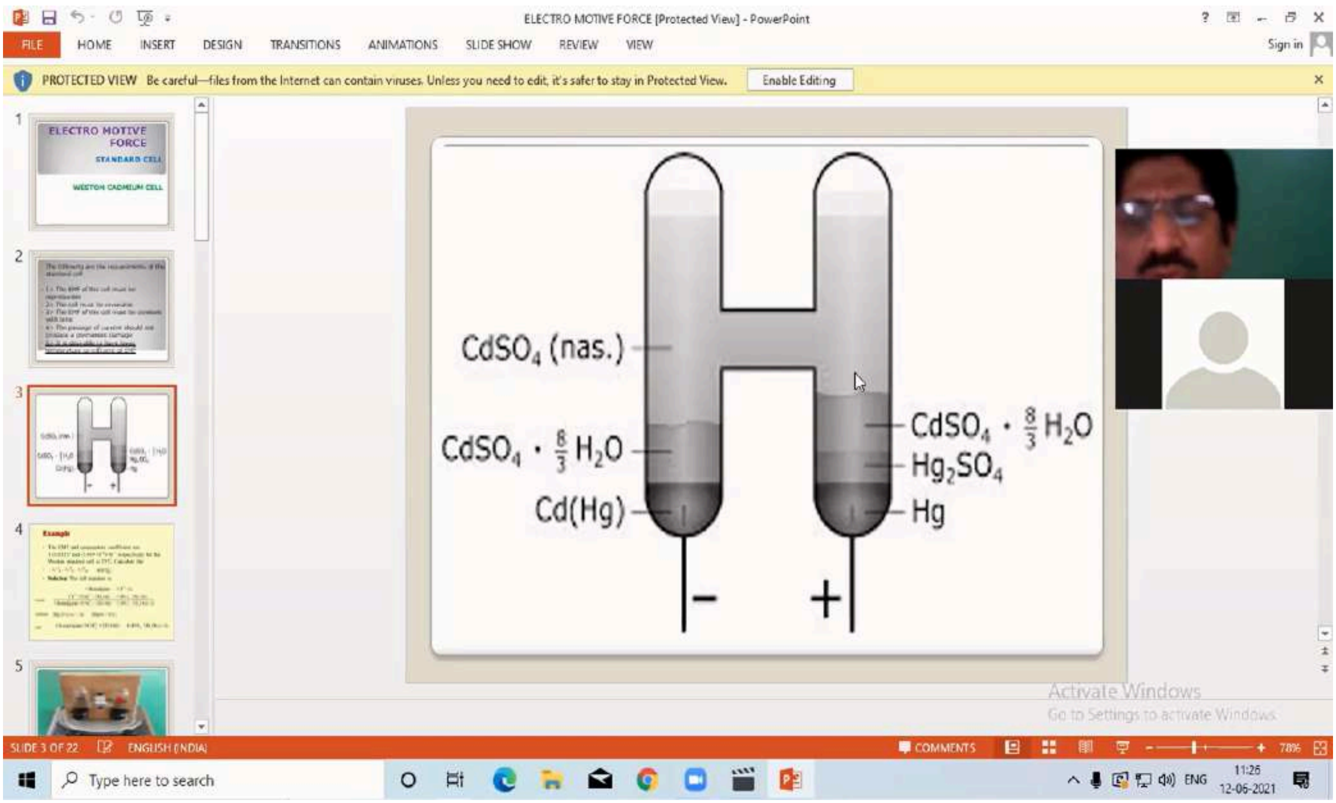

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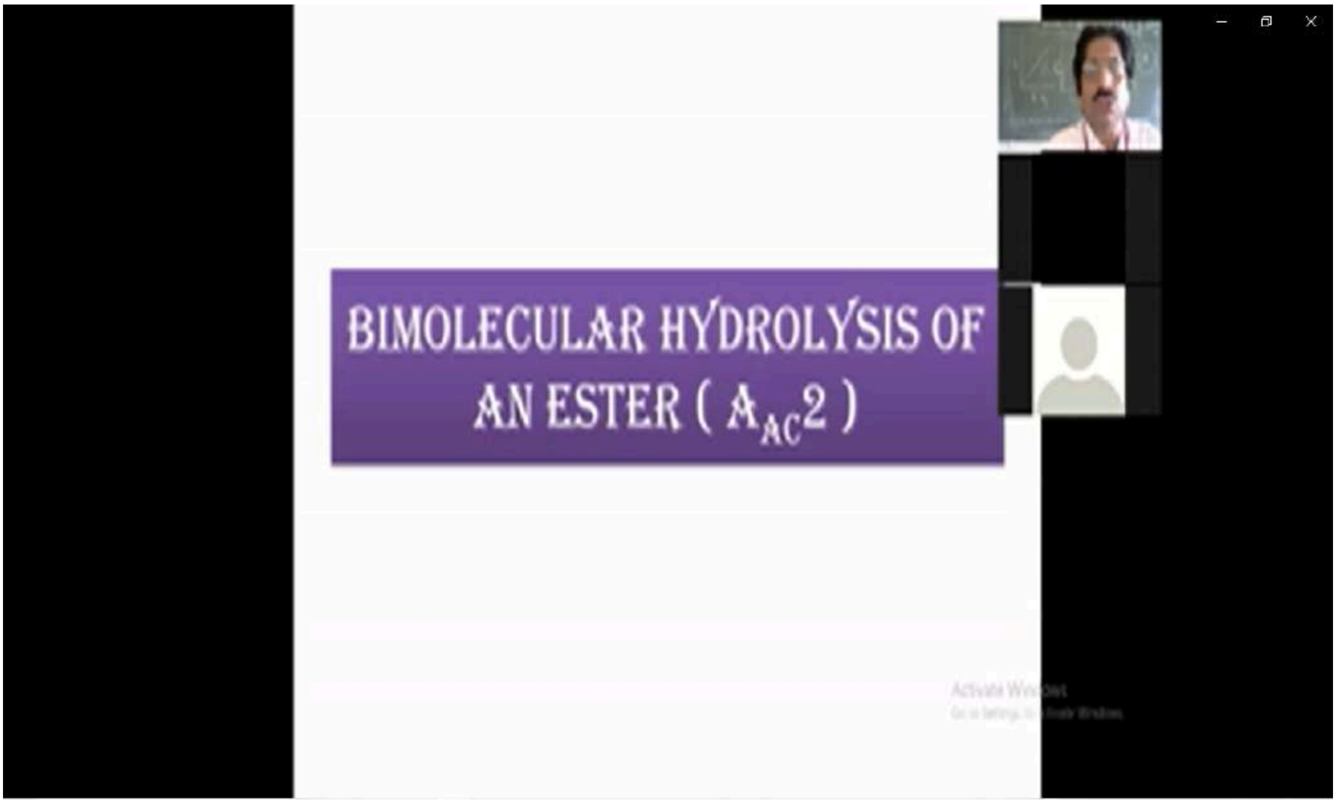

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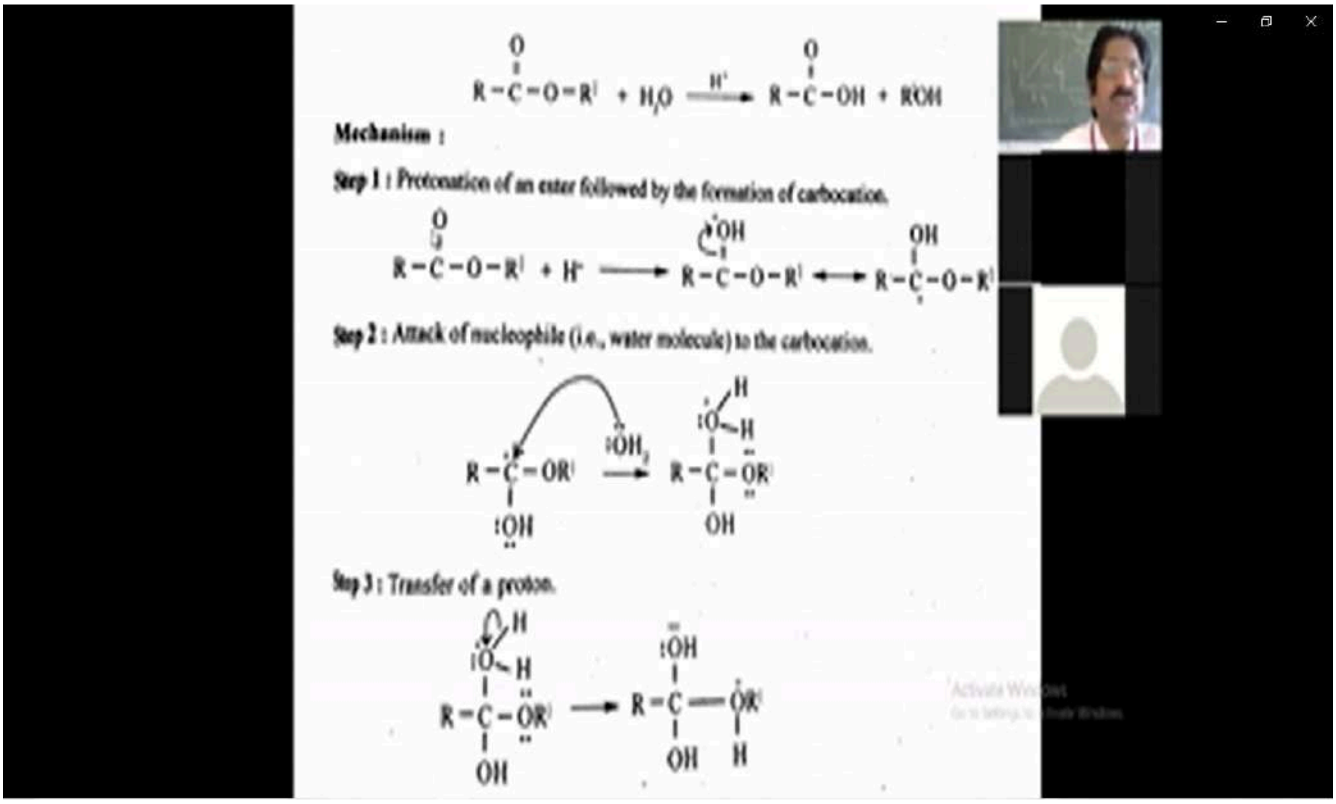

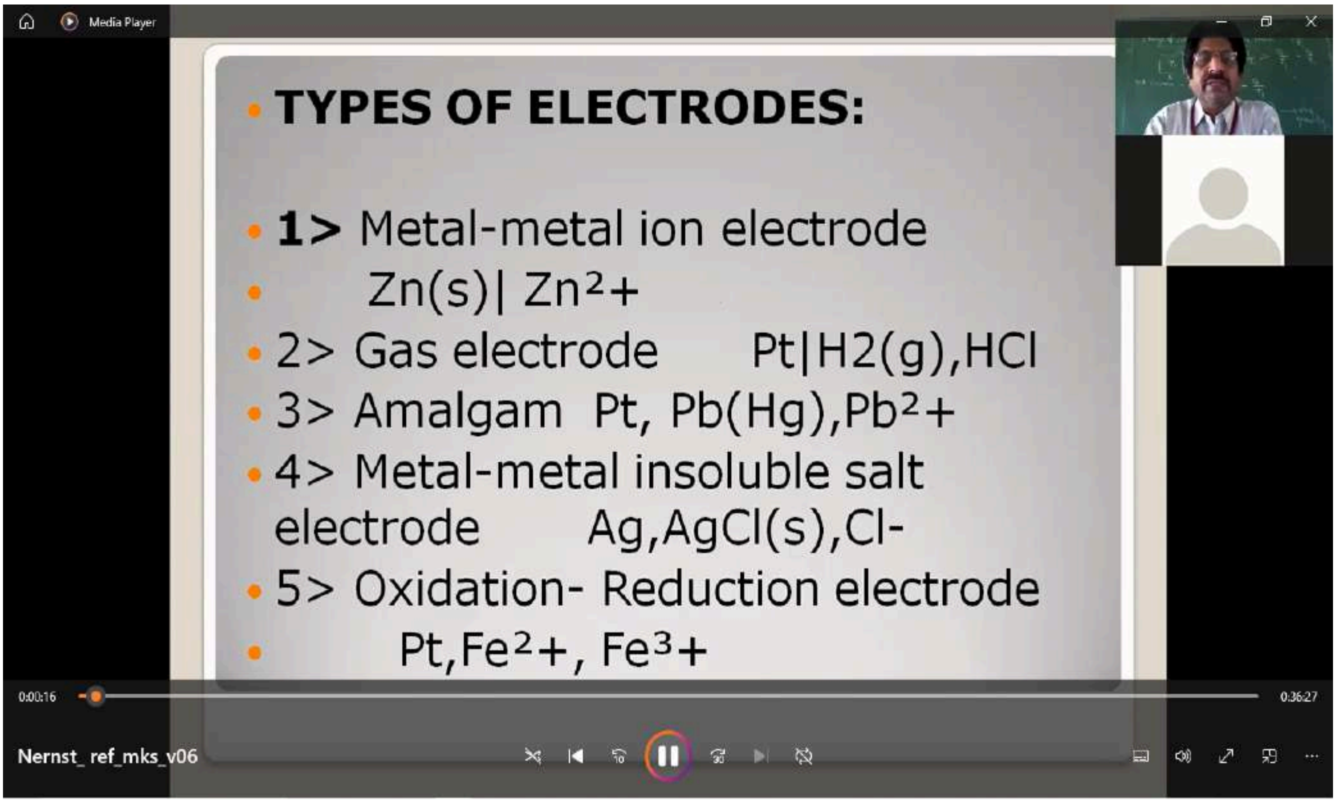

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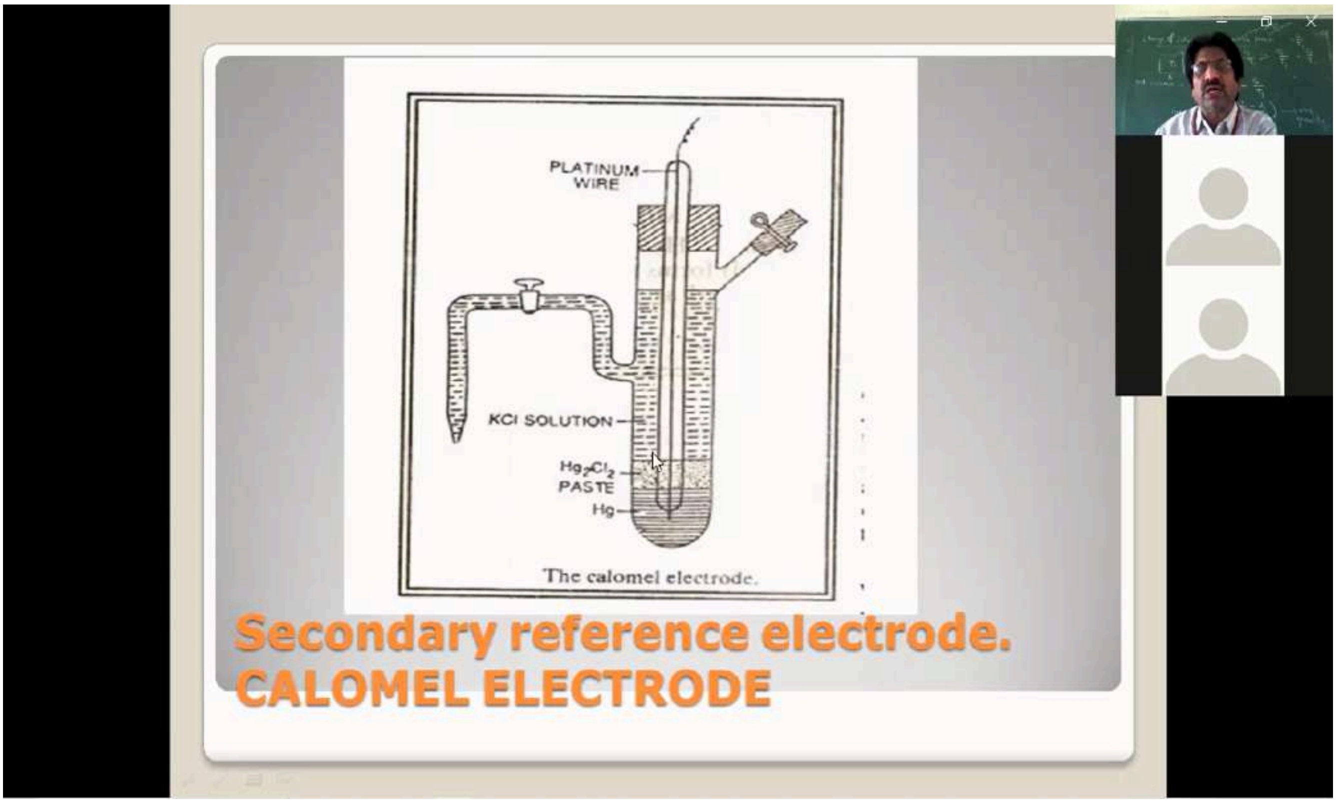

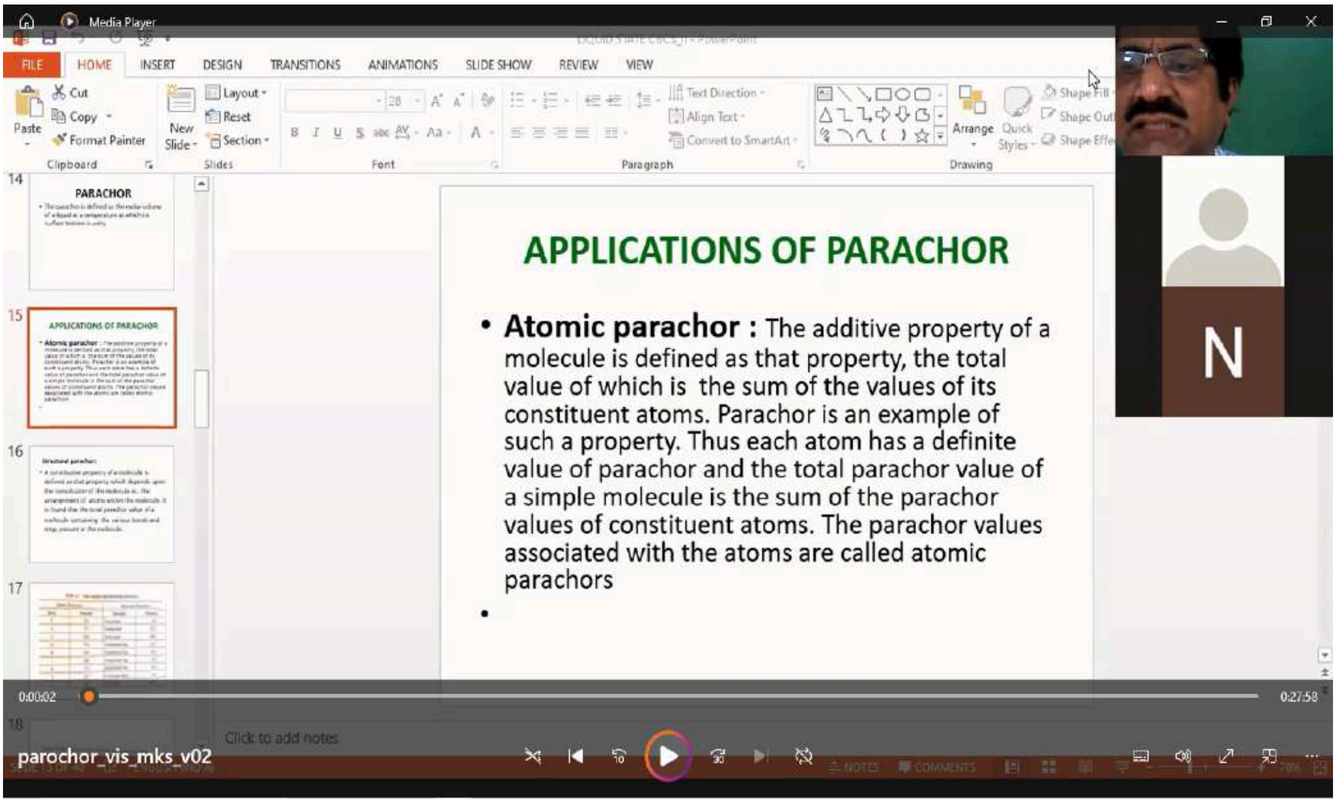

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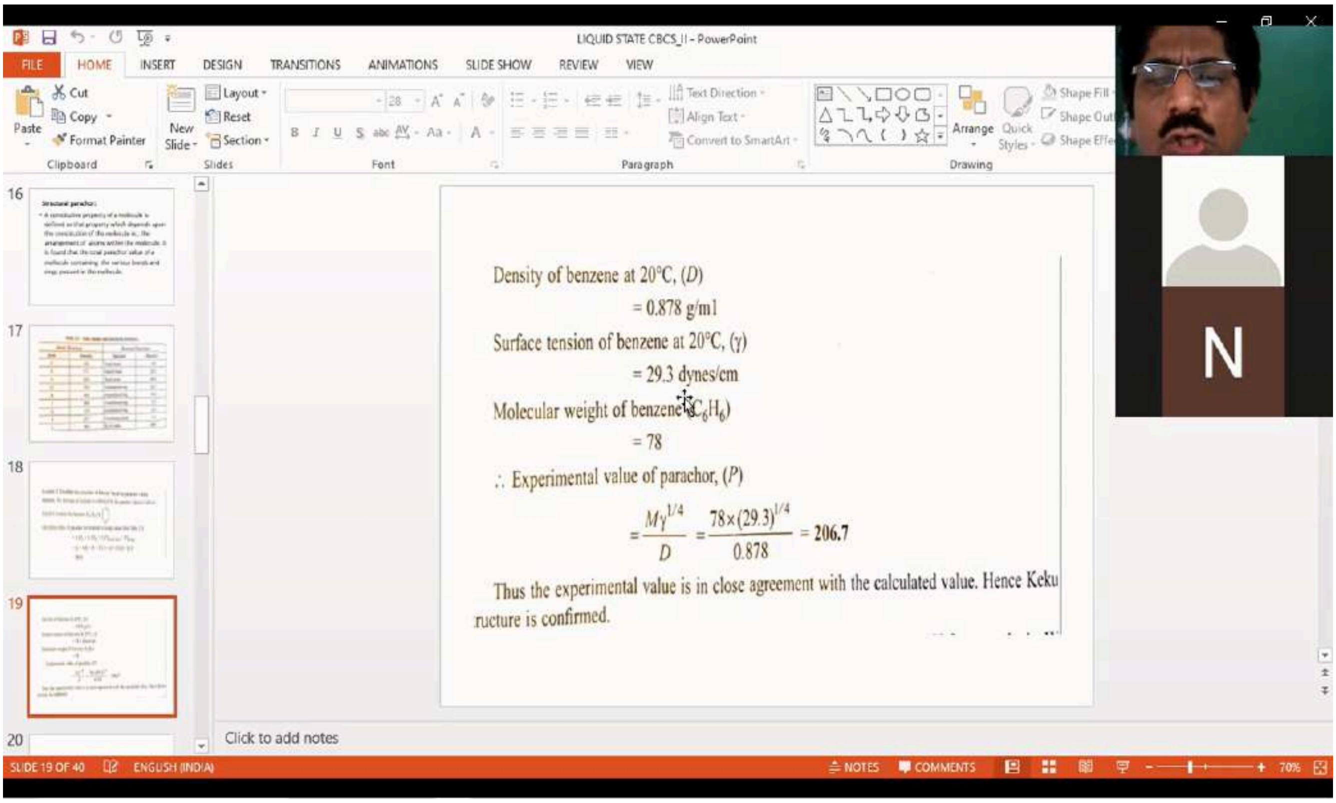

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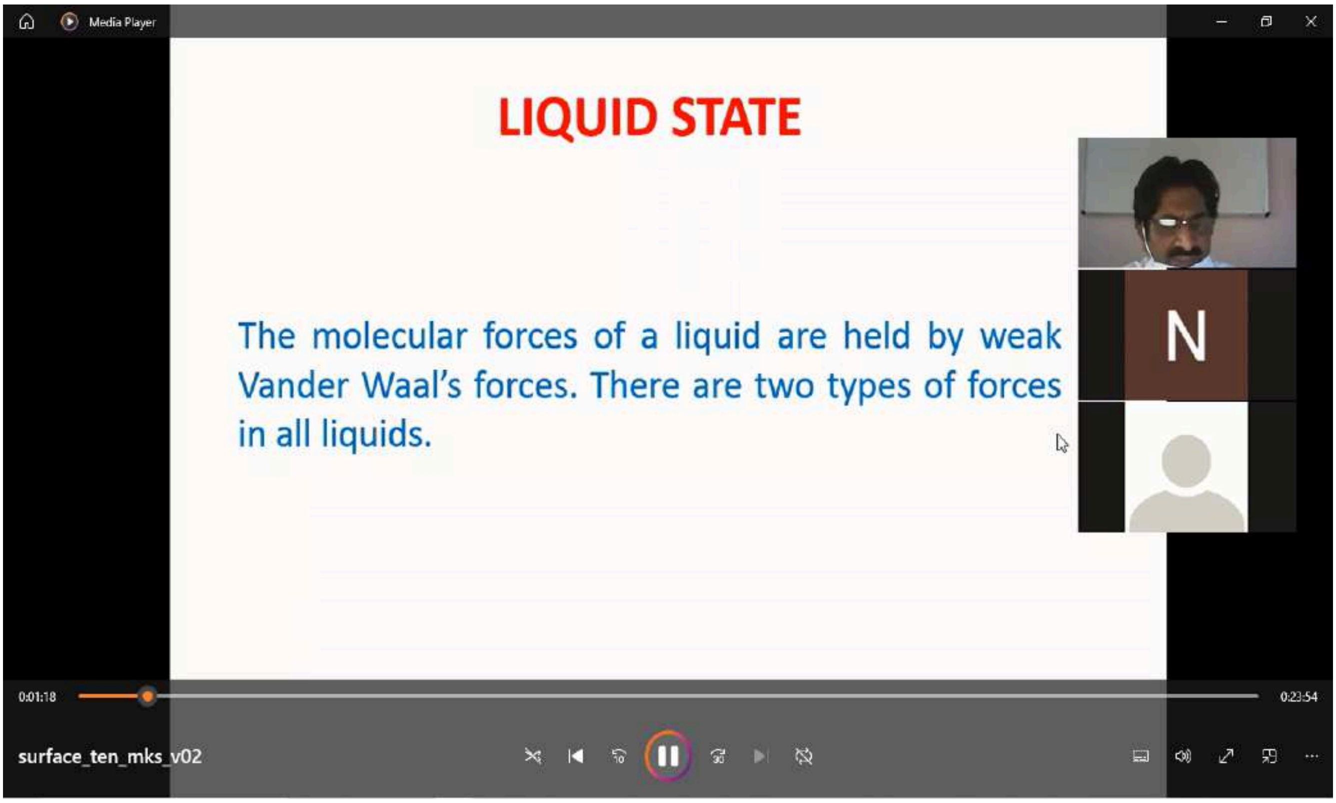

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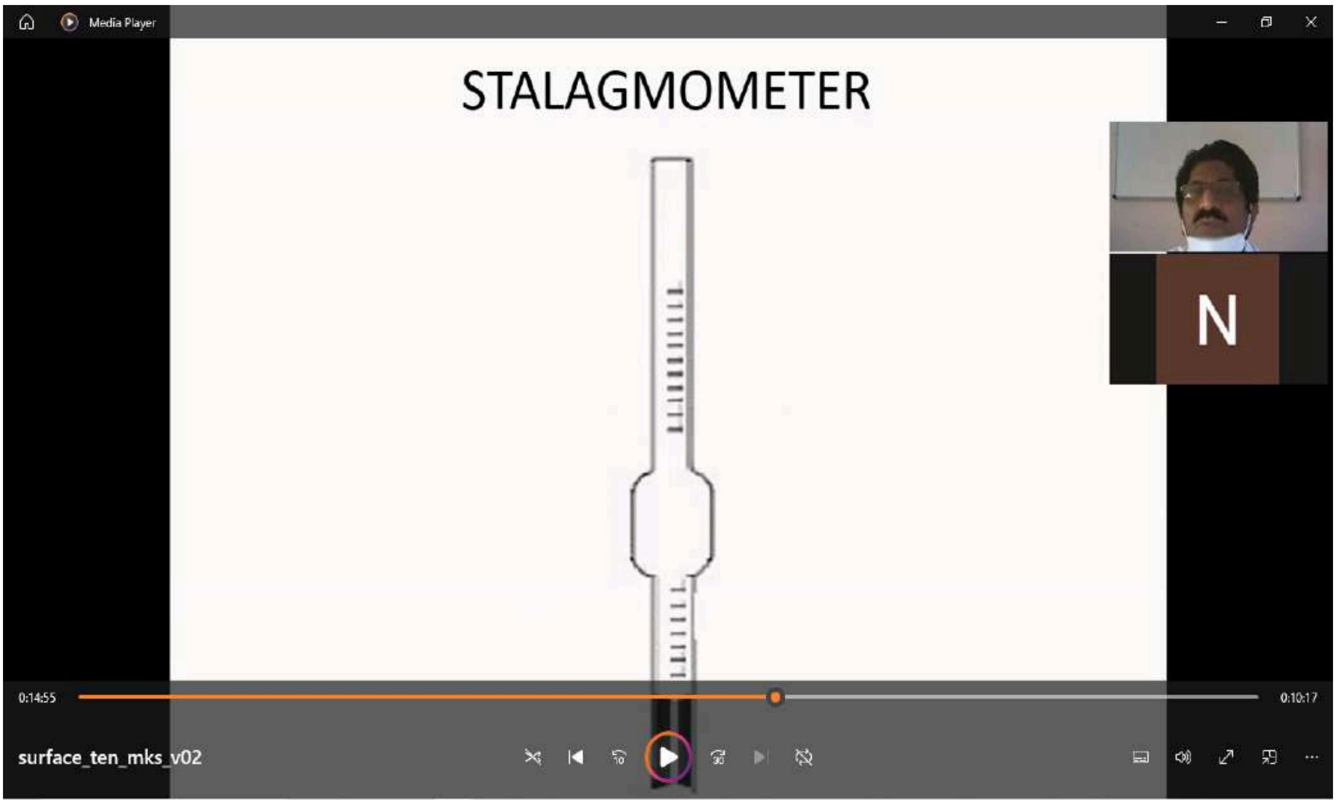

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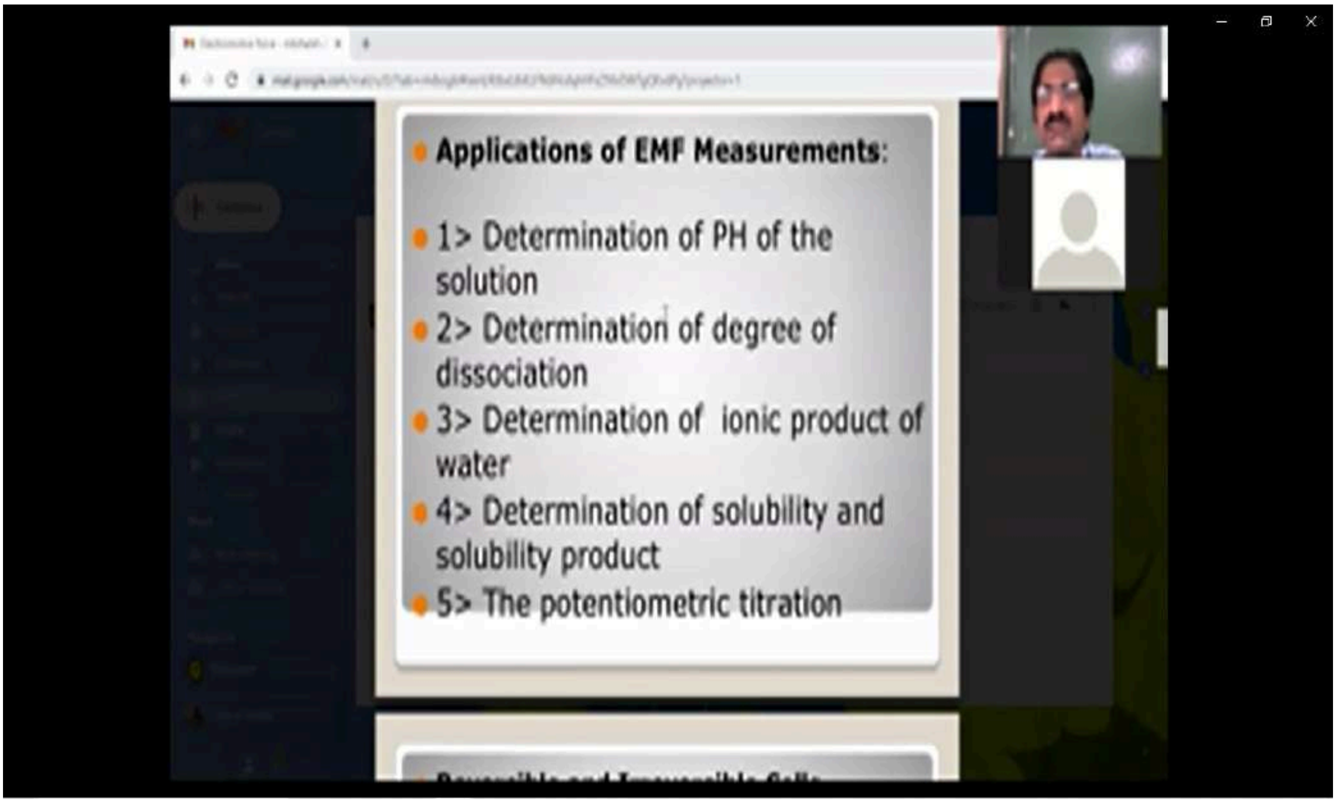

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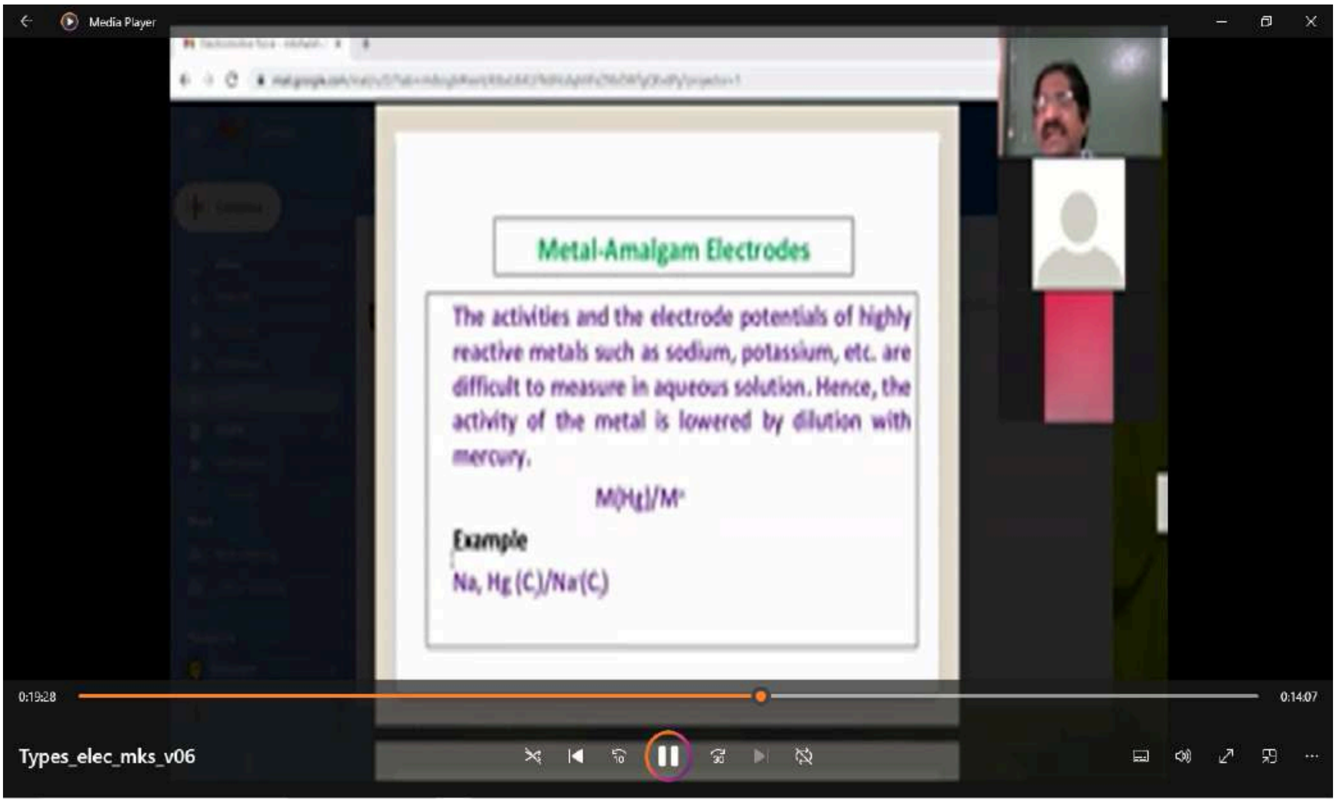

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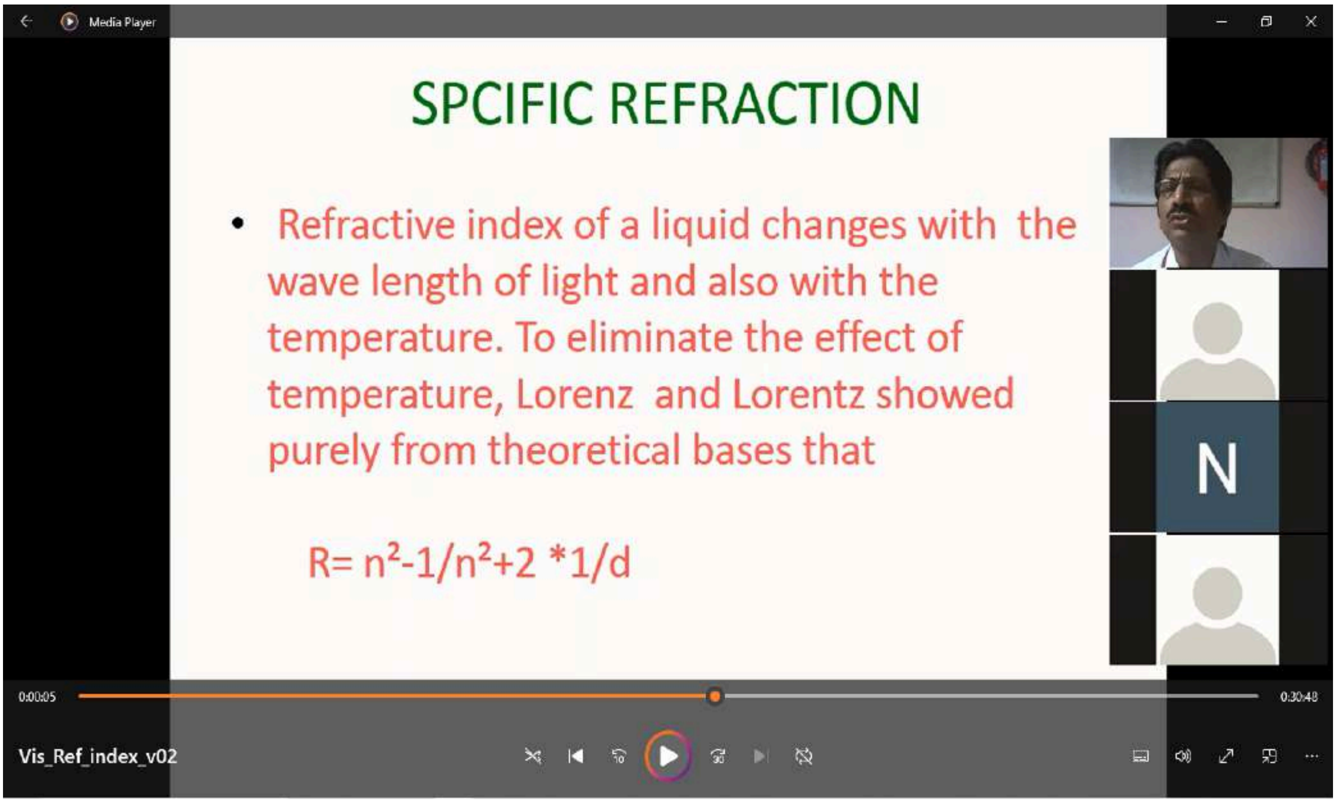

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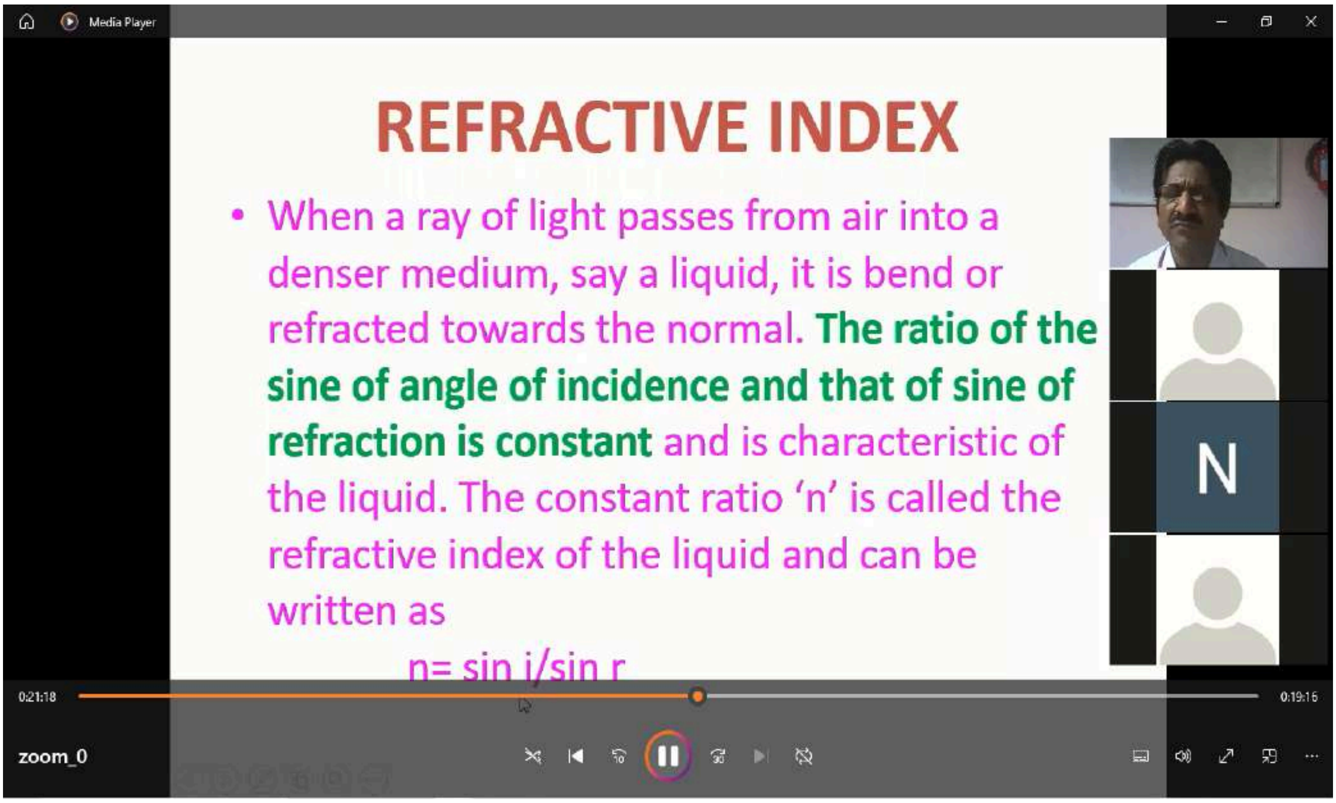

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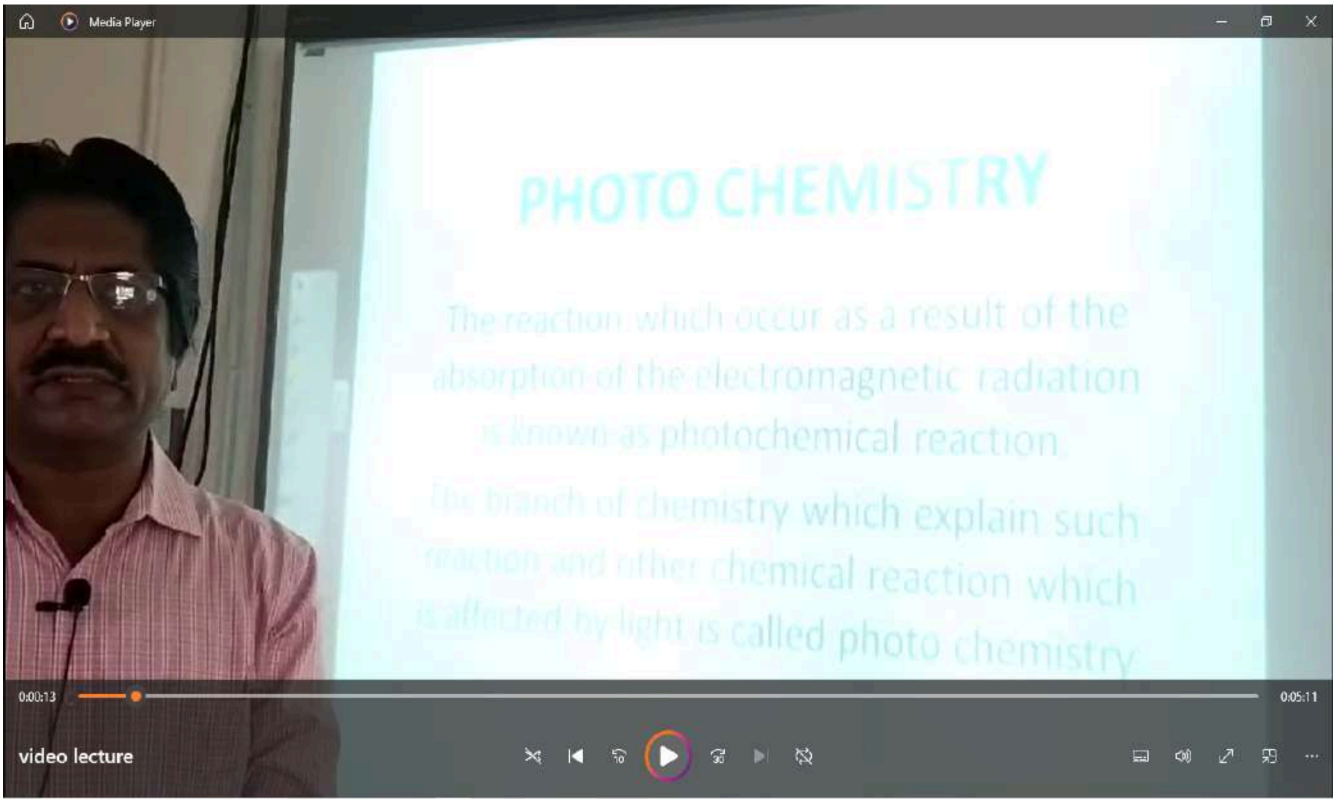

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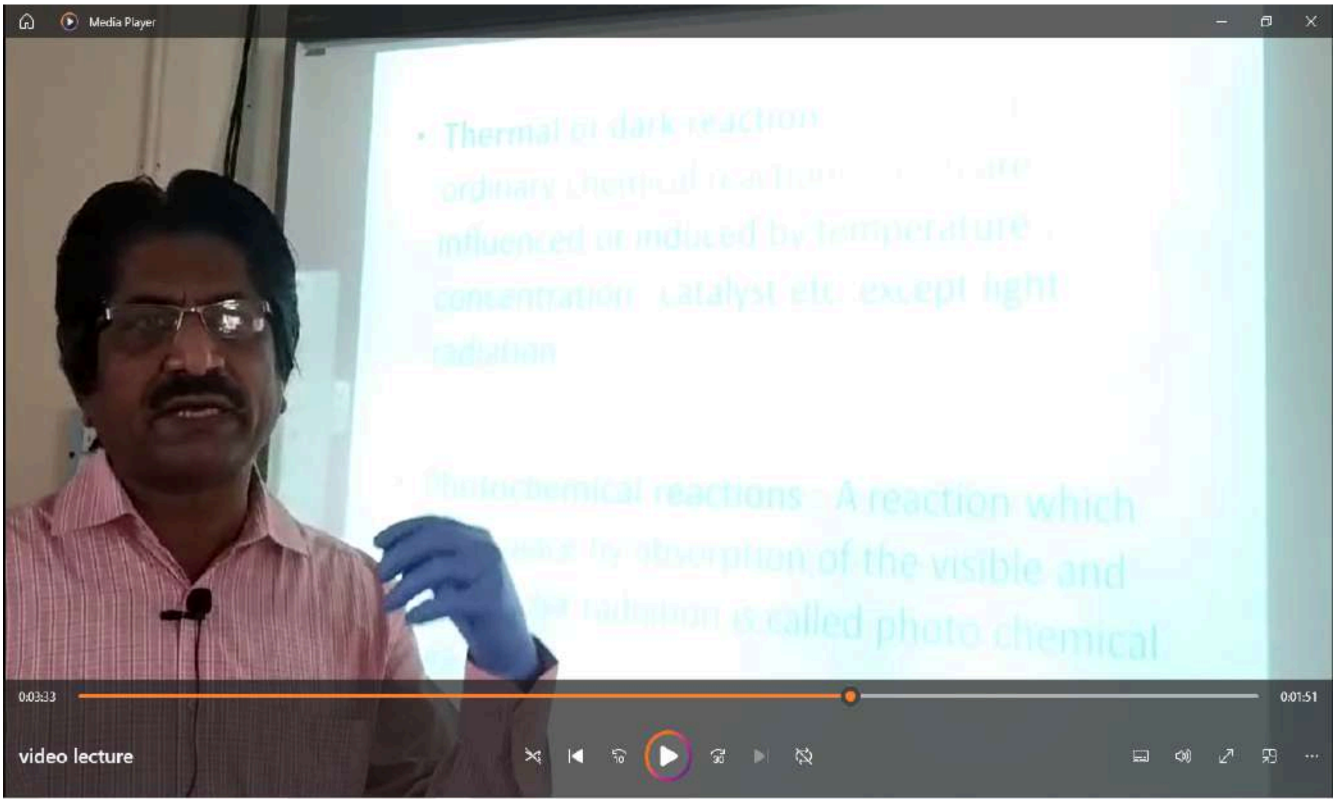

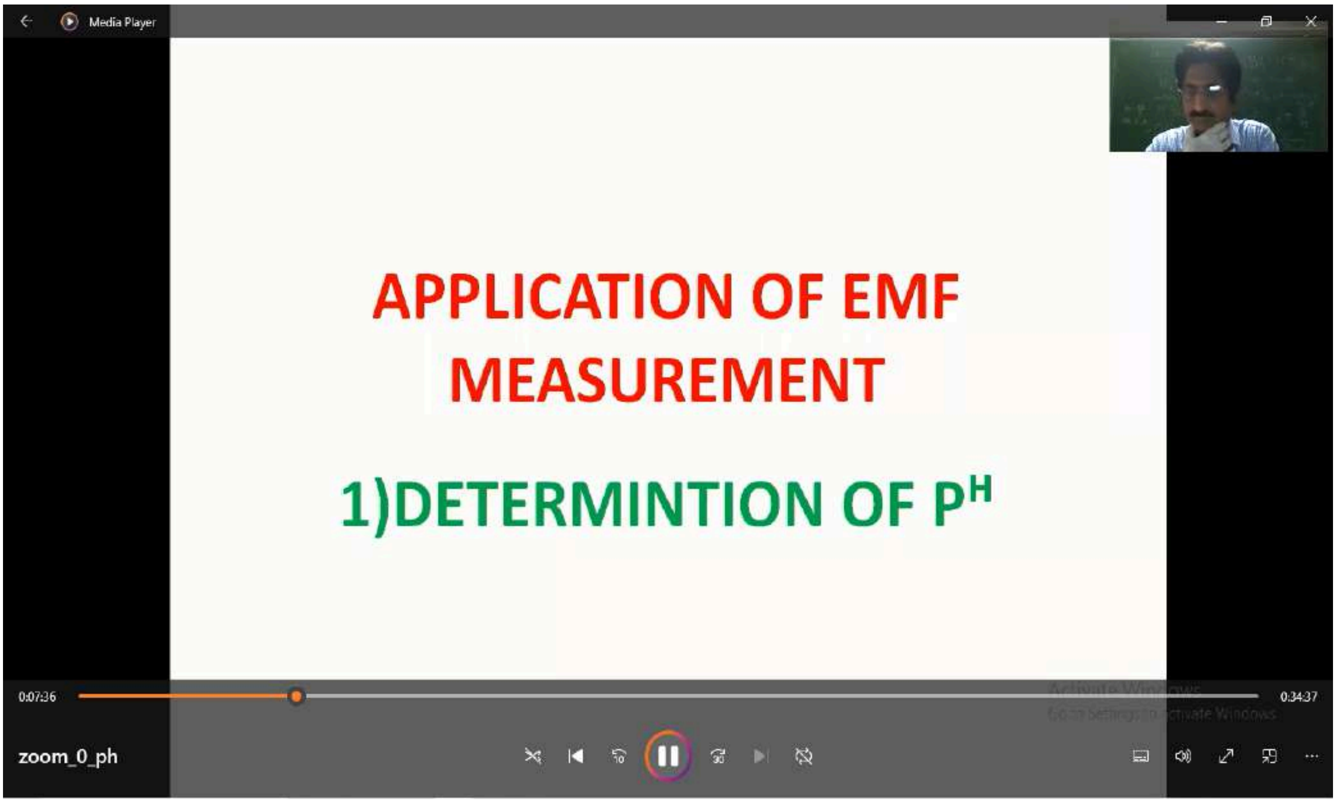

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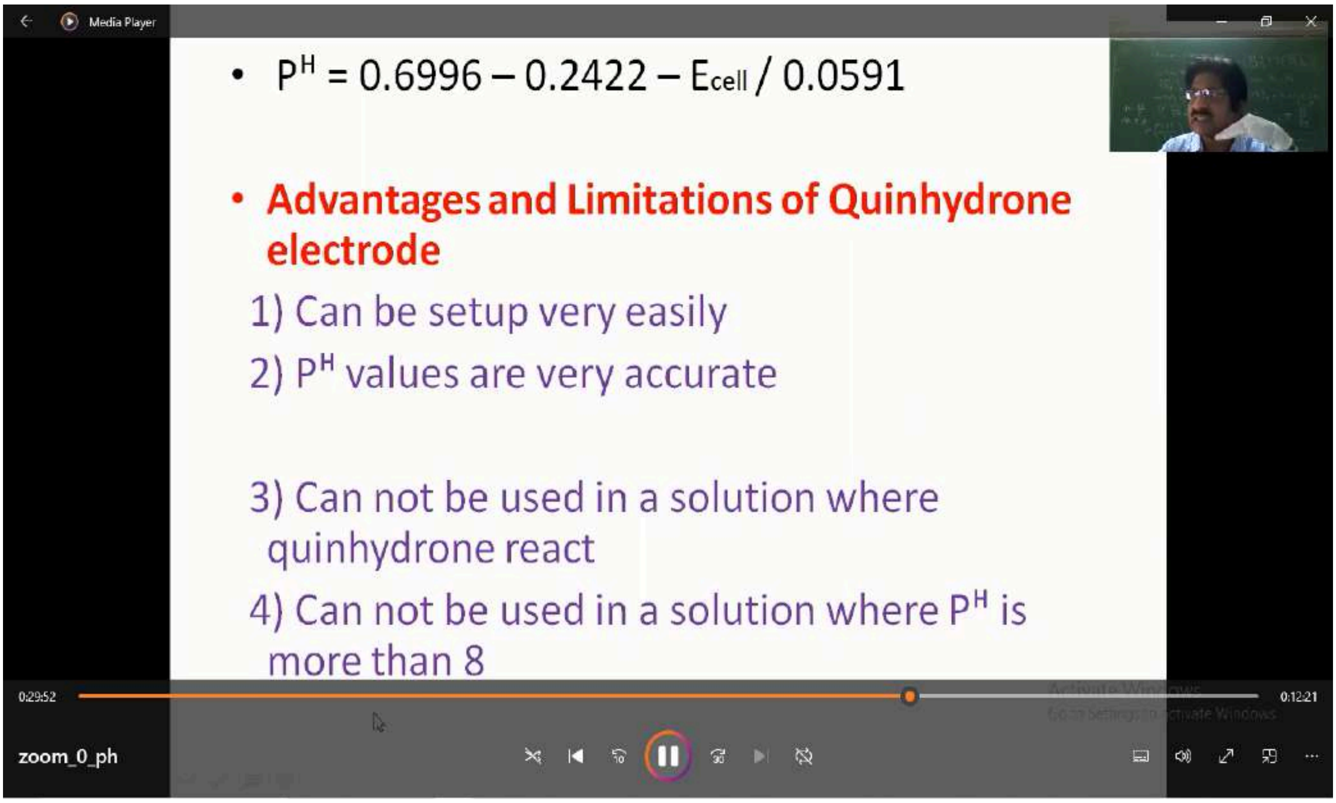

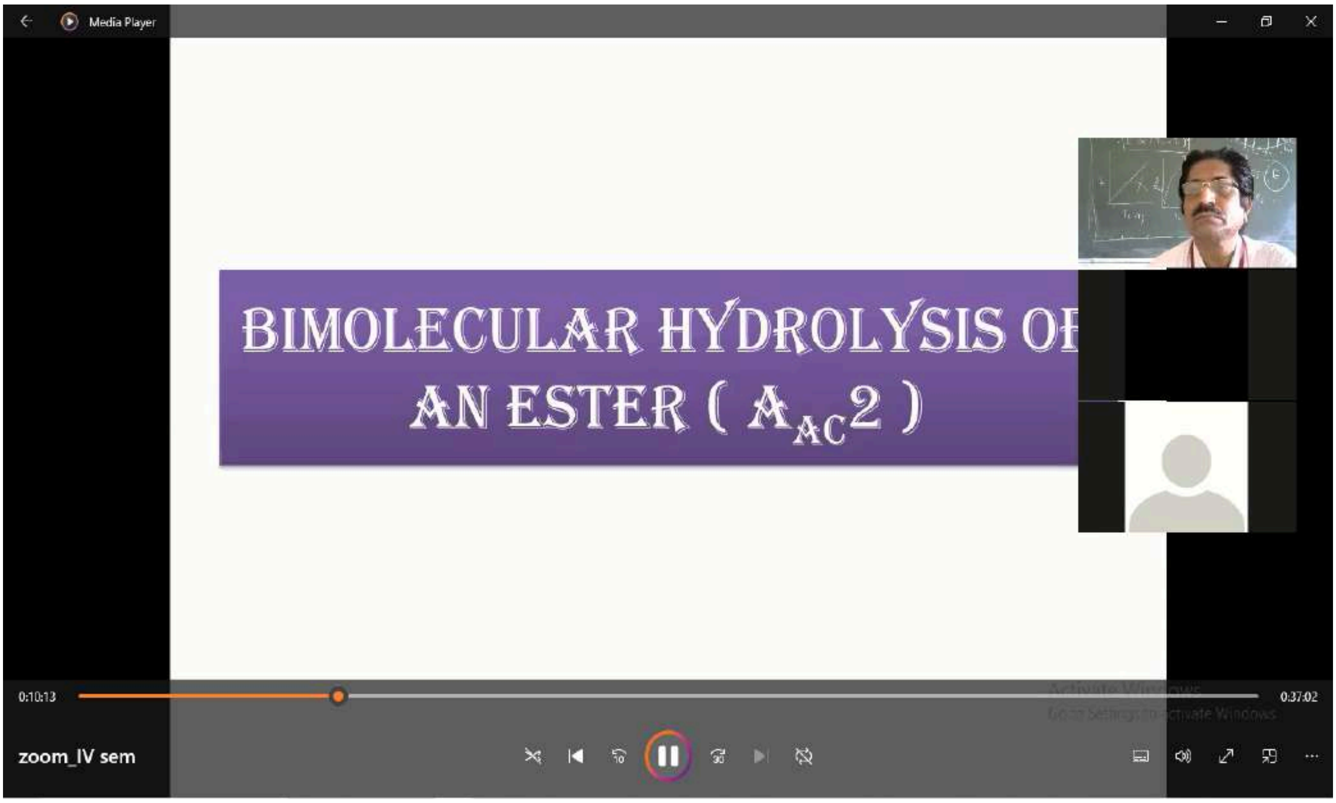

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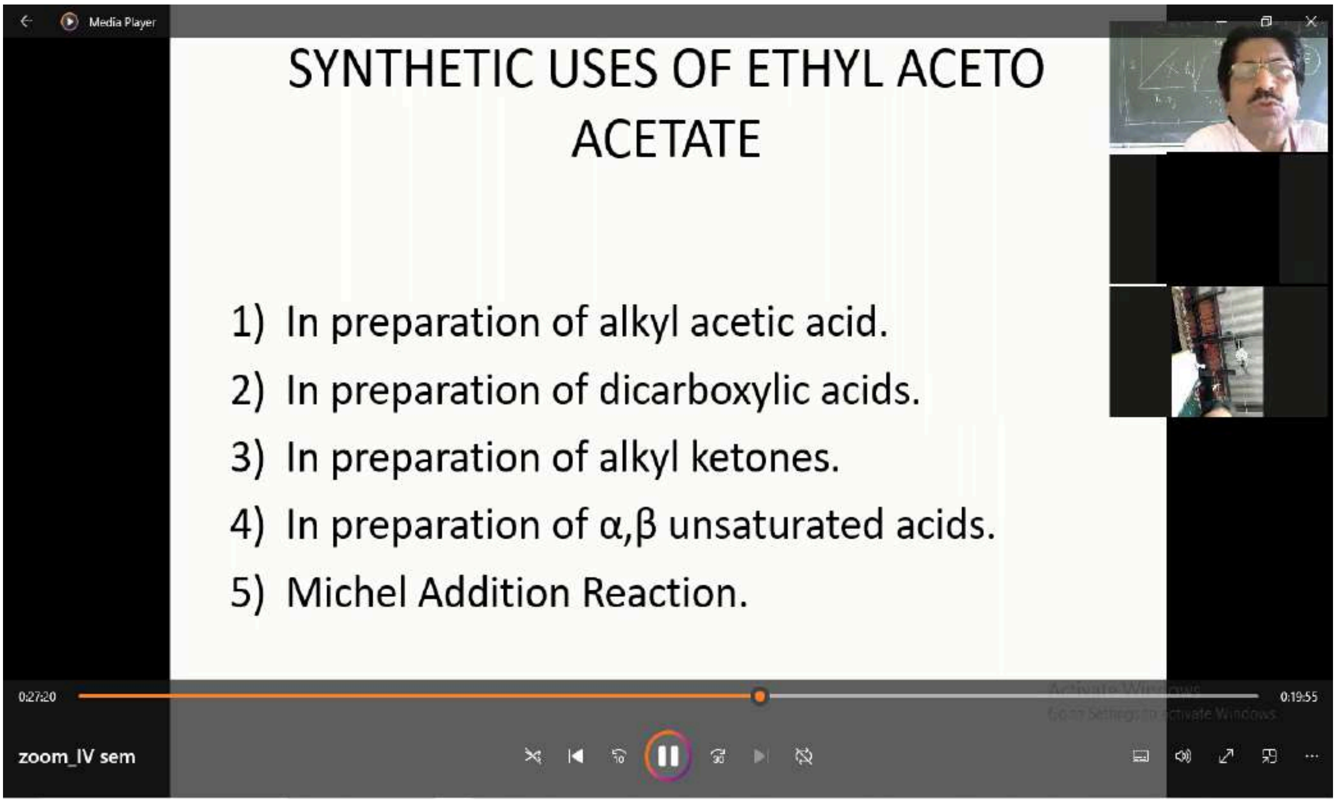

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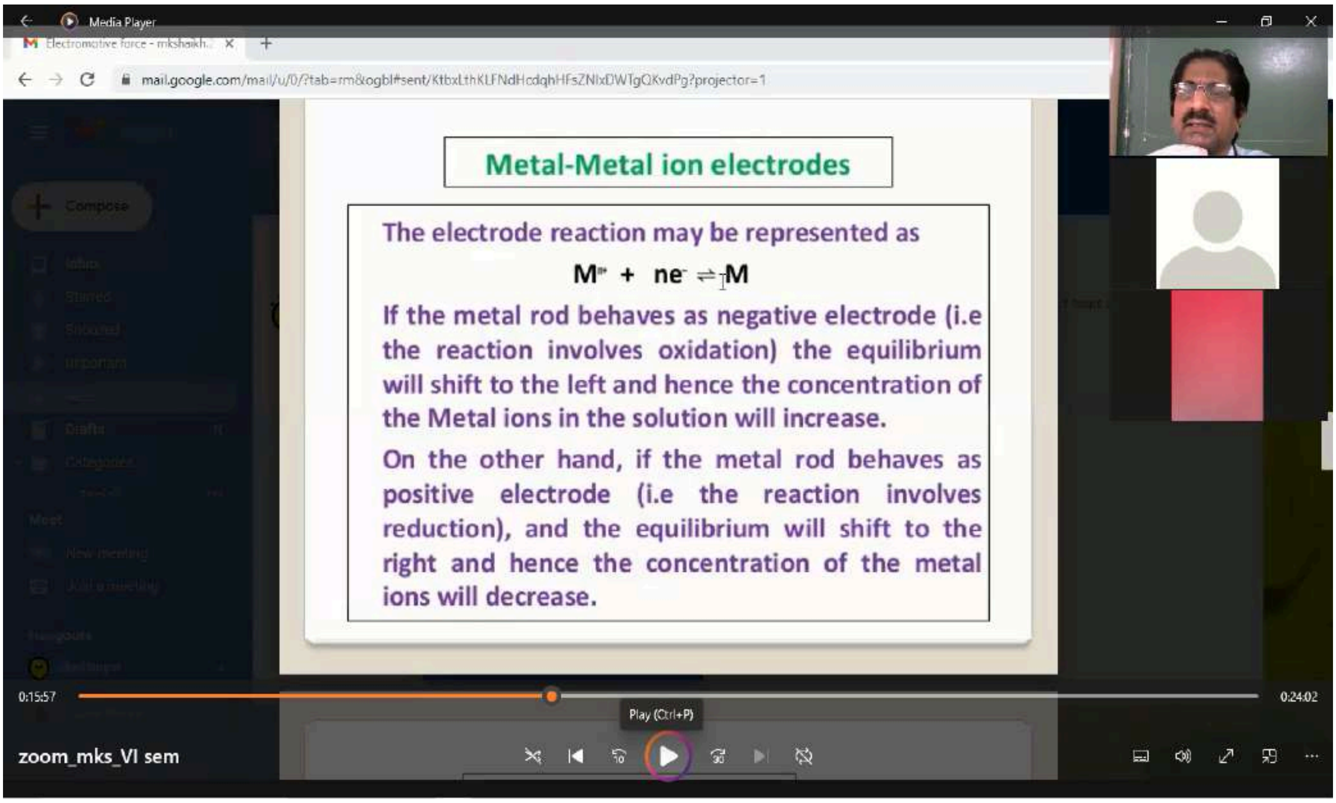

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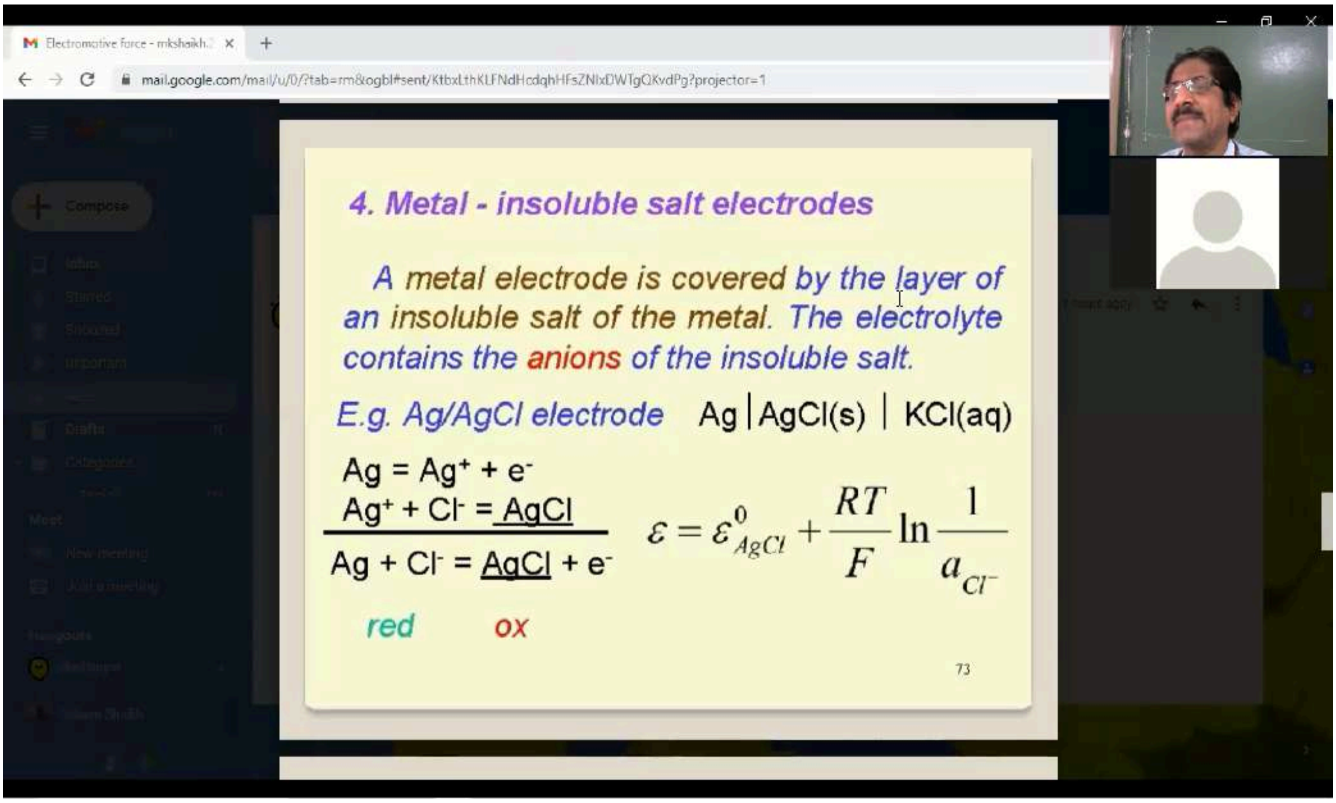

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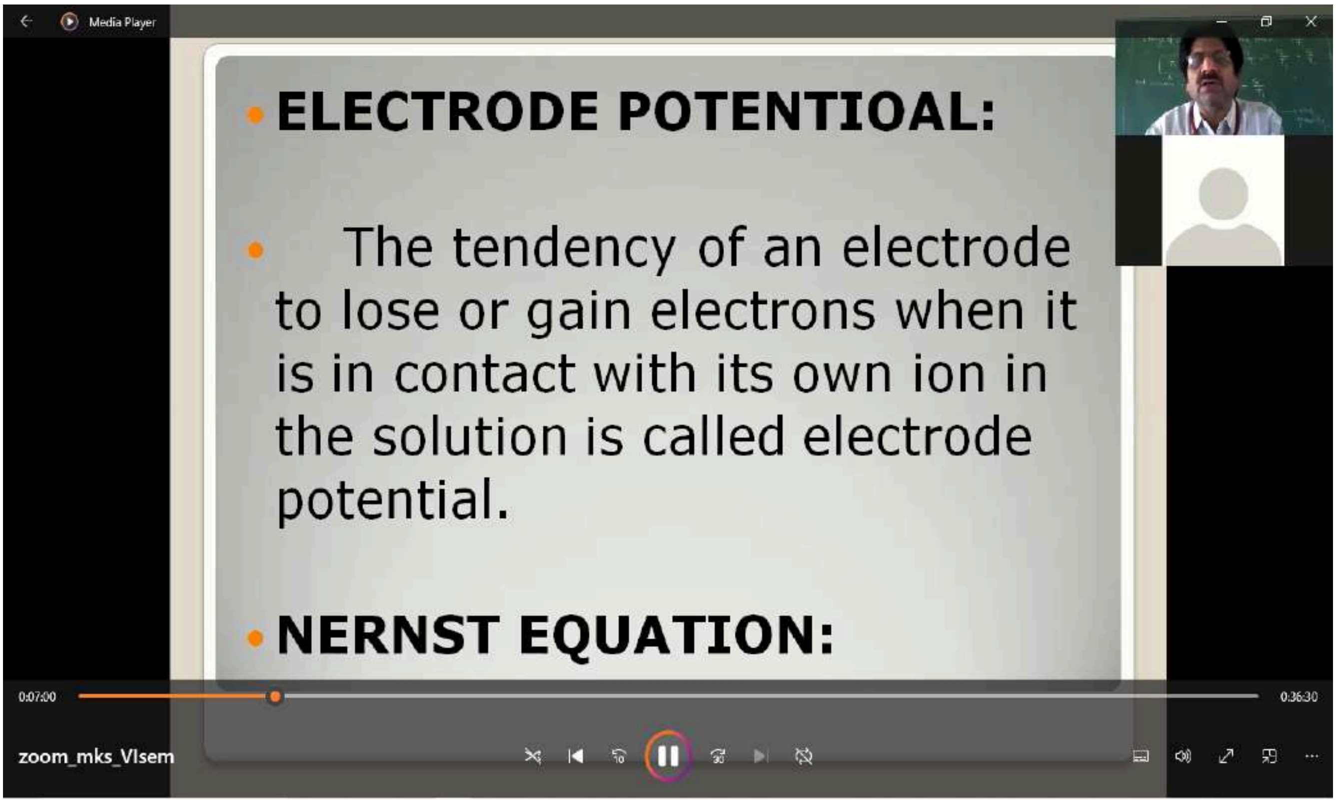

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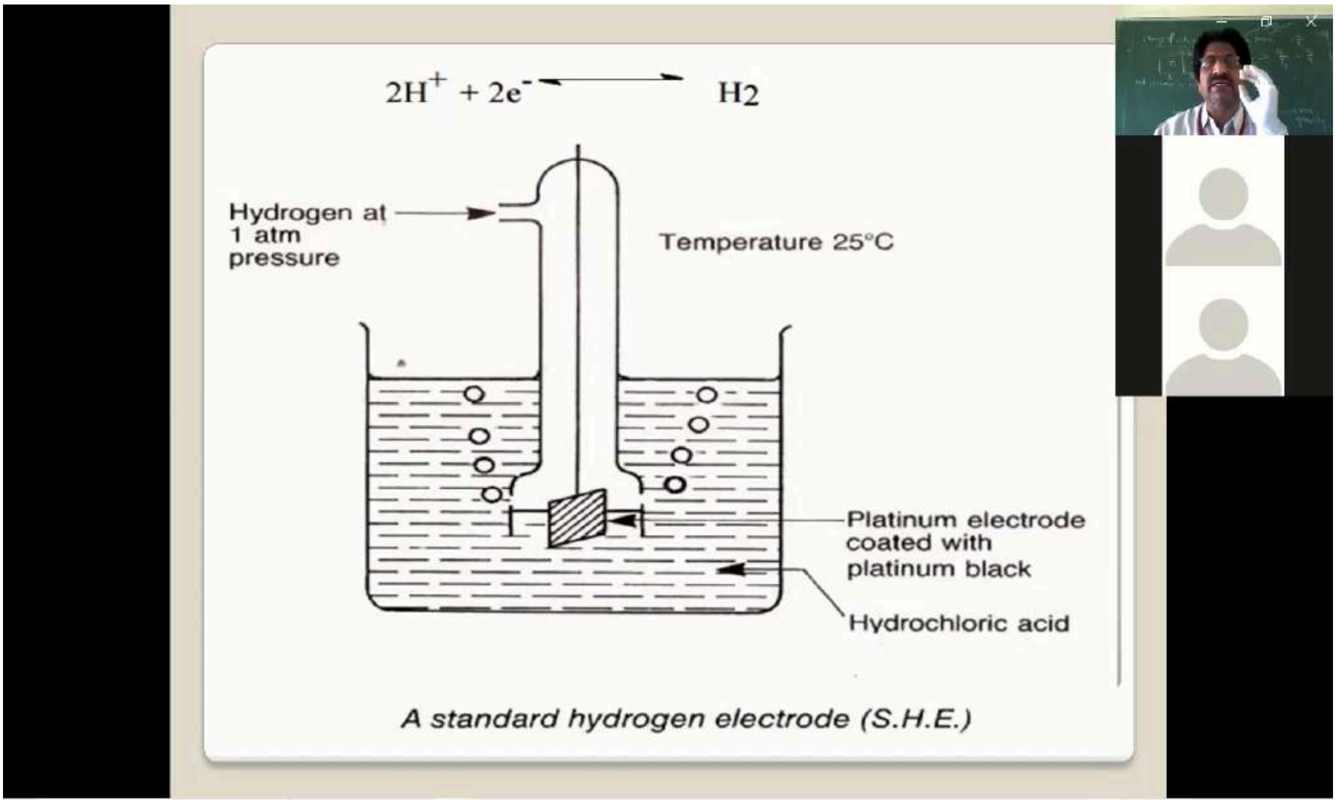

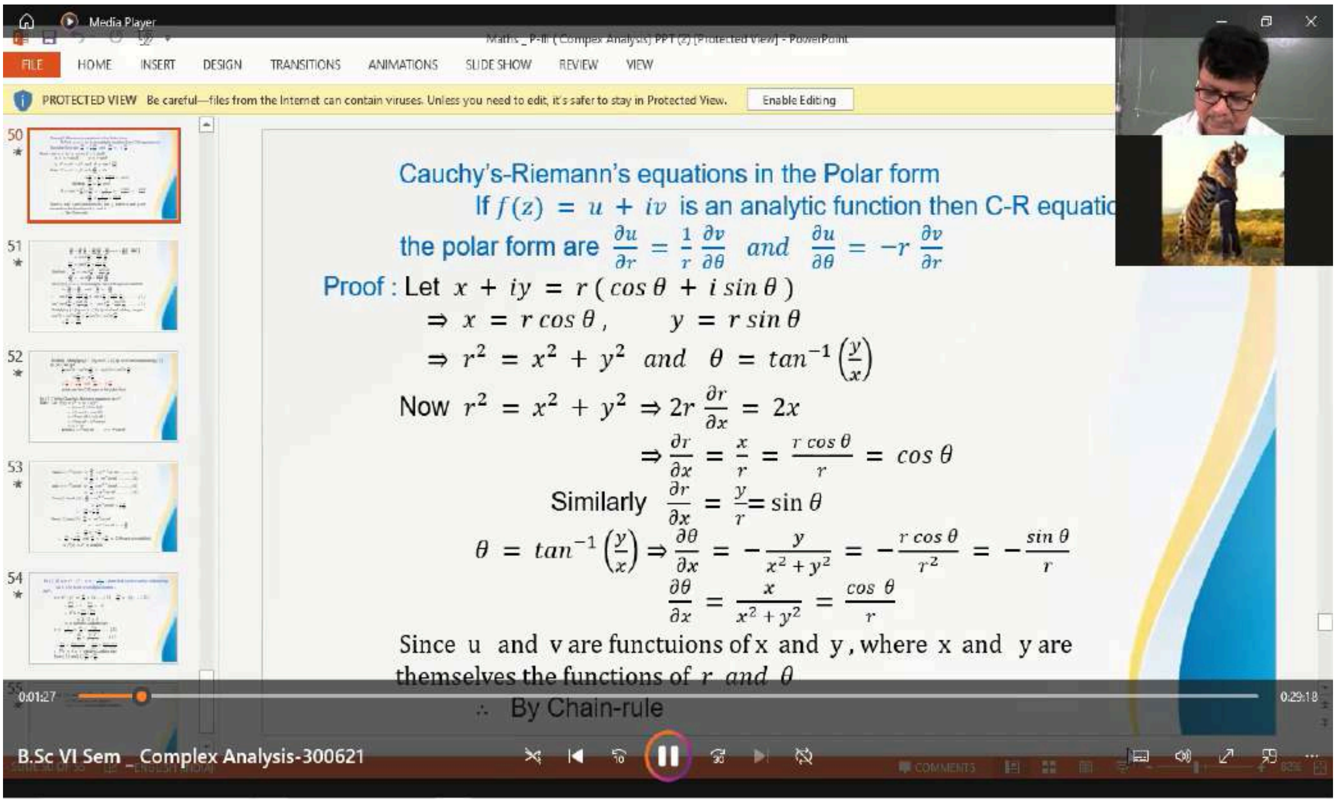

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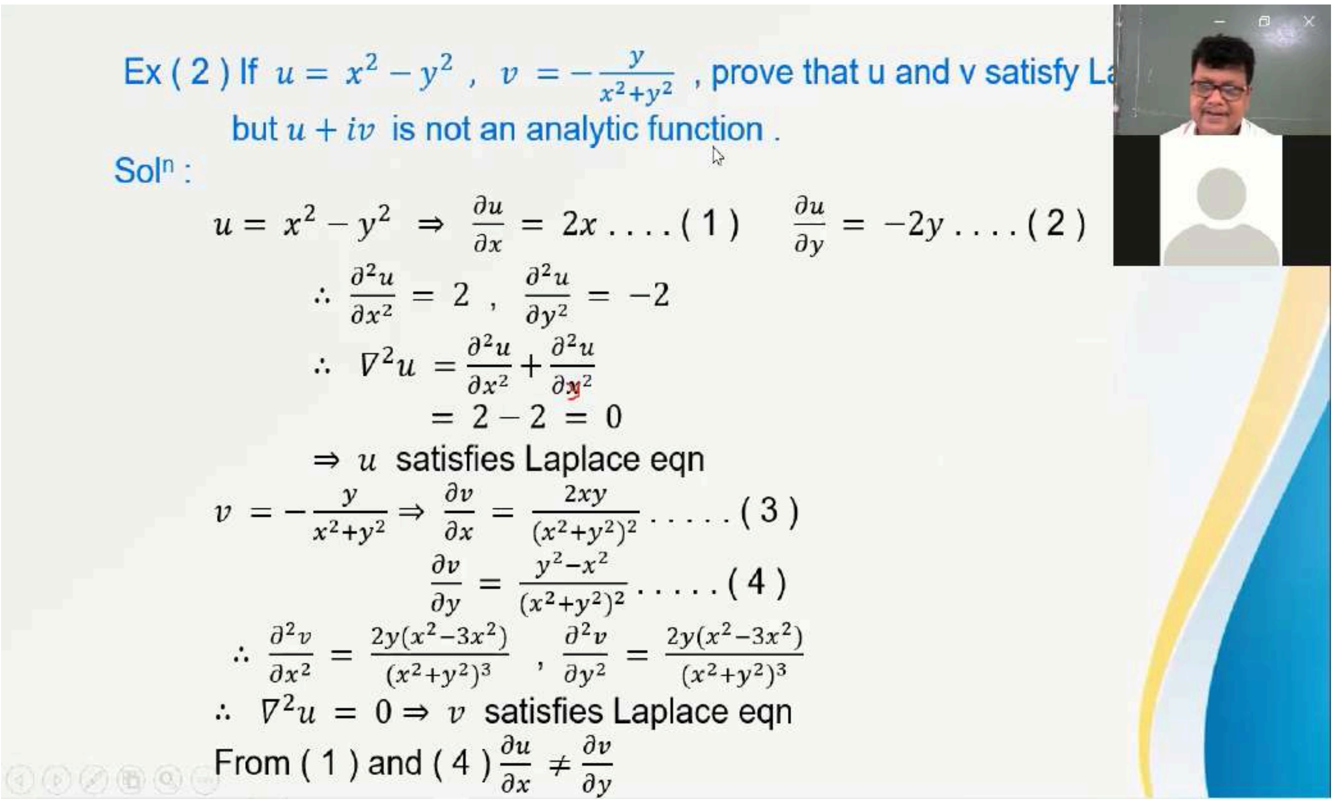

Ex : *If* $f(z)$ *is a regular function of z such that* $f'(z) \neq 0$ *, then prove th*

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

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

$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) \log|f'(z)| = 4\frac{\partial^2}{\partial z.\partial \bar{z}}\{\log|f'(z)|\}$$

$$= 2\frac{\partial^2}{\partial z.\partial \bar{z}}\left\{\log|f'(z)|^2\right\}$$

$$= 2\frac{\partial^2}{\partial z.\partial \bar{z}}\left\{\log f'(z)\overline{f'(z)}\right\} \qquad \because |z| = zz$$

$$= 2\frac{\partial^2}{\partial z.\partial \bar{z}}\{\log f'(z) f'(\bar{z})\} \qquad \because \overline{f'(z)} = f'(\bar{z})$$

$$= 2\frac{\partial^2}{\partial z.\partial \bar{z}}\{\log f'(z) + \log f'(\bar{z})\}$$

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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 $\emptyset$ *and* φ are functions of x and y satisfy Laplace equations. S

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

Sol^n : Since $\emptyset$ *and* φ satisfy Laplace equations

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

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

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

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

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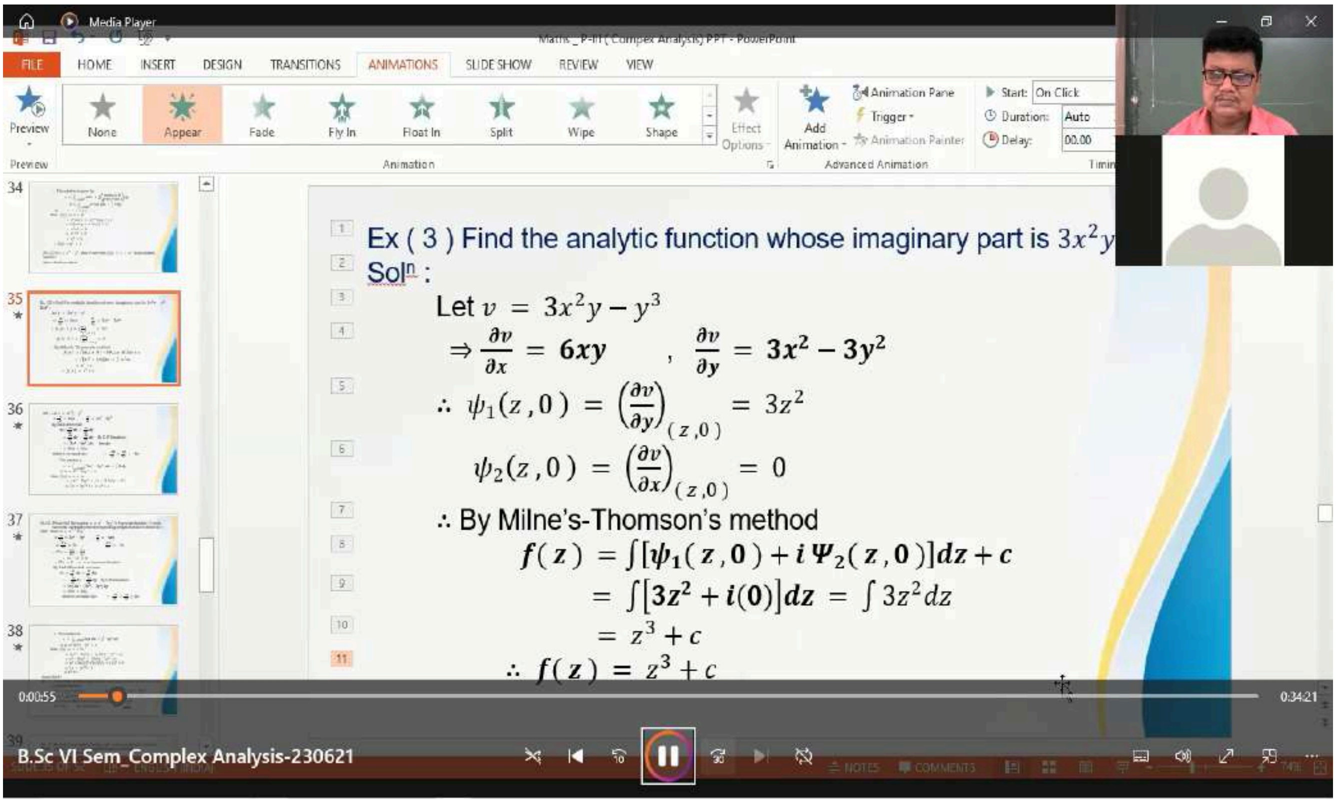

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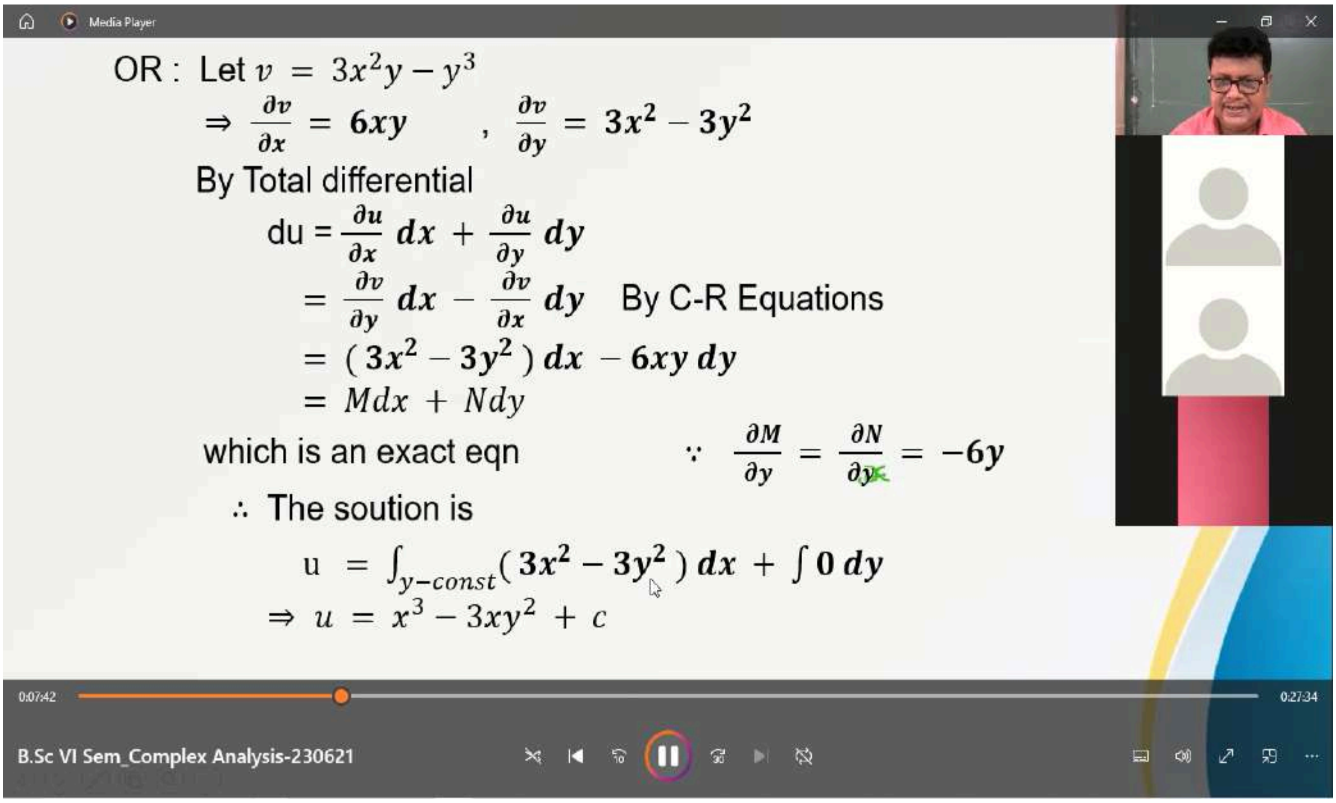

Note : If $f(z) = u + iv$ is an analytic function then C-R Equations a satisfied

u v

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

Sol^n: Let $f(z) = e^z$

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

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

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

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

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

$\Rightarrow \dfrac{\partial u}{\partial x} = e^x\cos y \ .....(1)$ $\qquad \dfrac{\partial v}{\partial x} = e^x\sin y \ ....(3)$

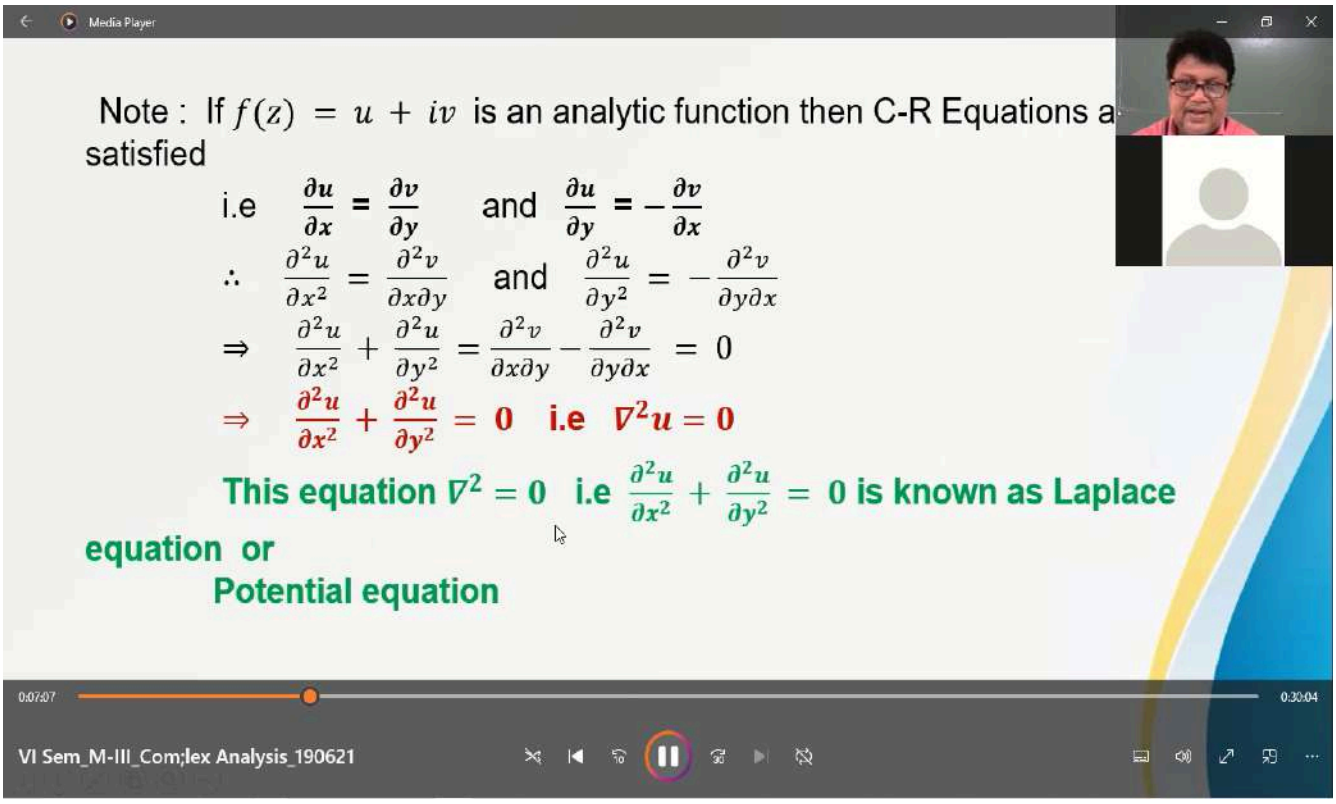
$\dfrac{\partial u}{\partial y} = -e^x\sin y \ ....(2)$ $\qquad \dfrac{\partial v}{\partial y} = e^x\cos y \ ....(4)$

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

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

$\Rightarrow$ C-Req

$\Rightarrow f(z) = e^z$ is analyic function



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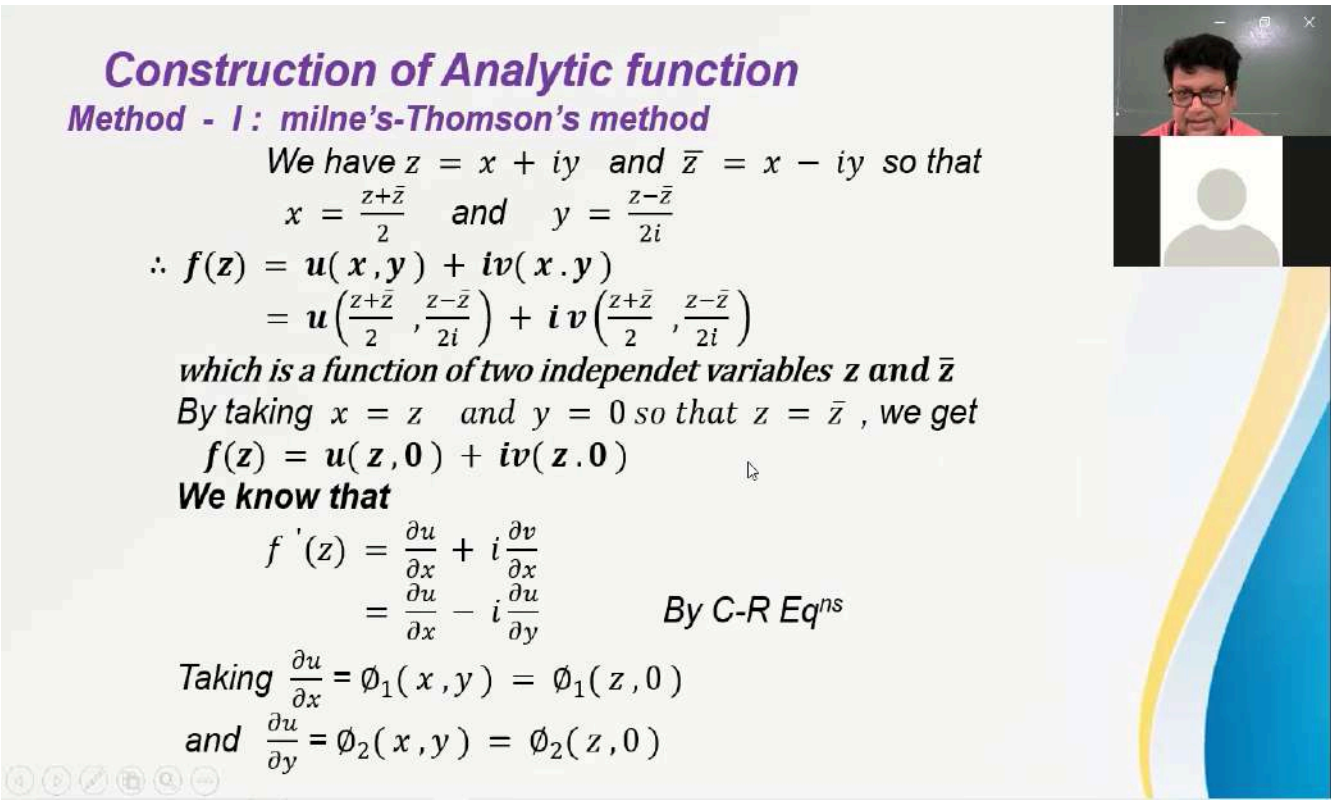

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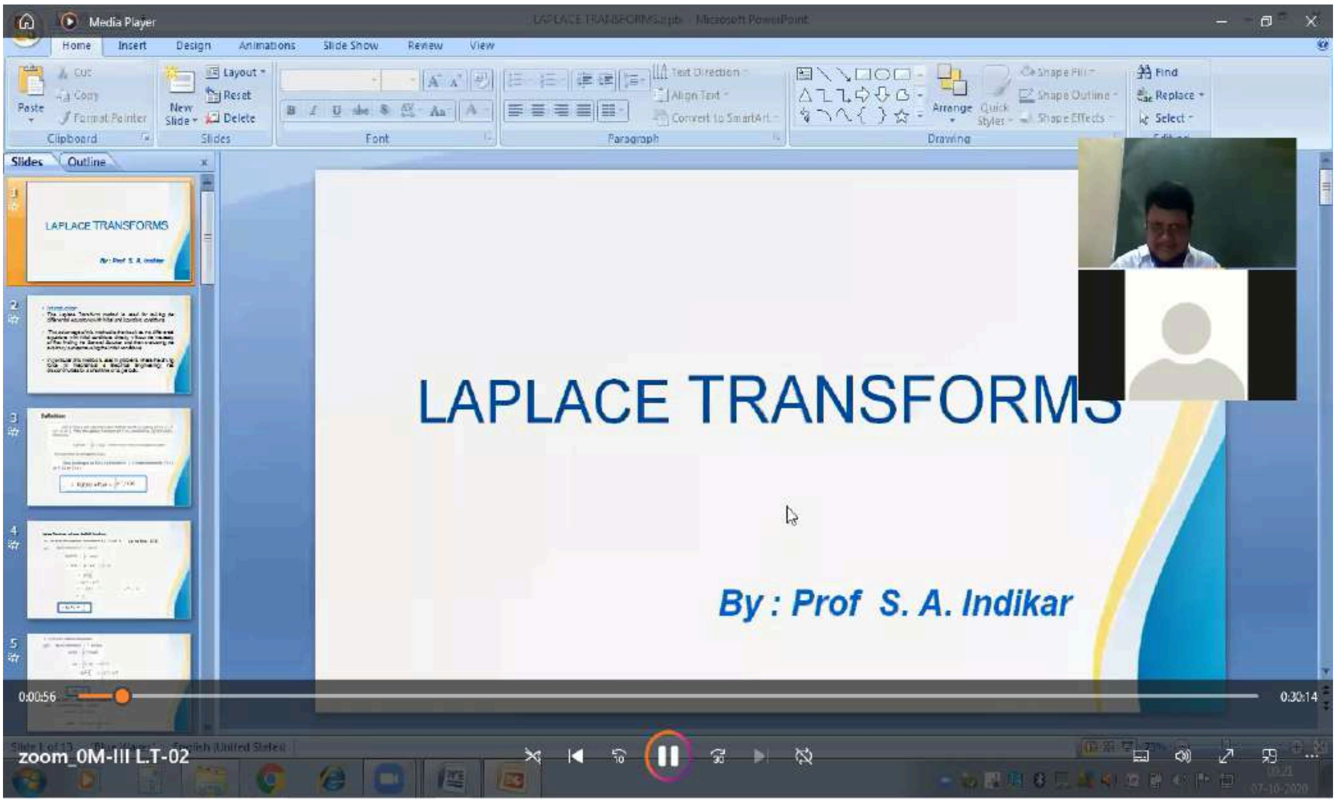

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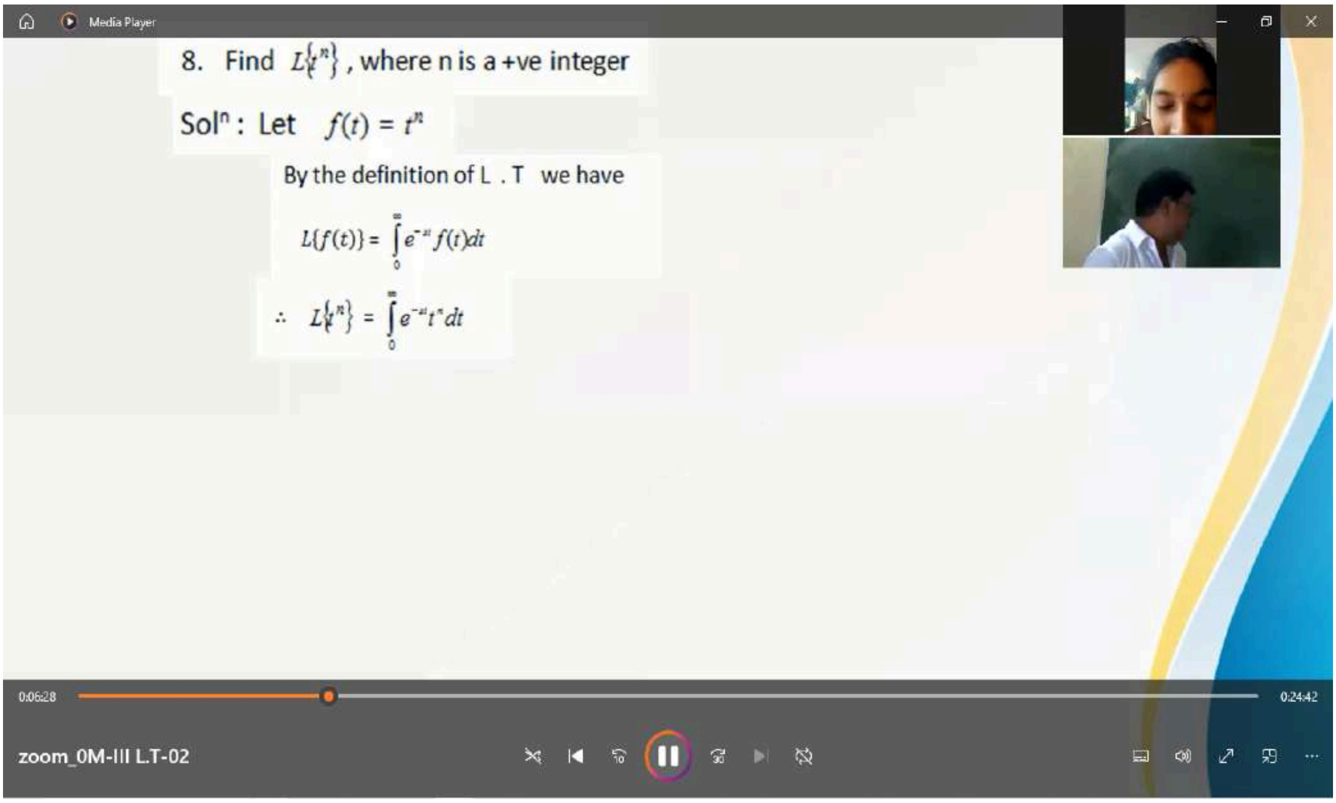

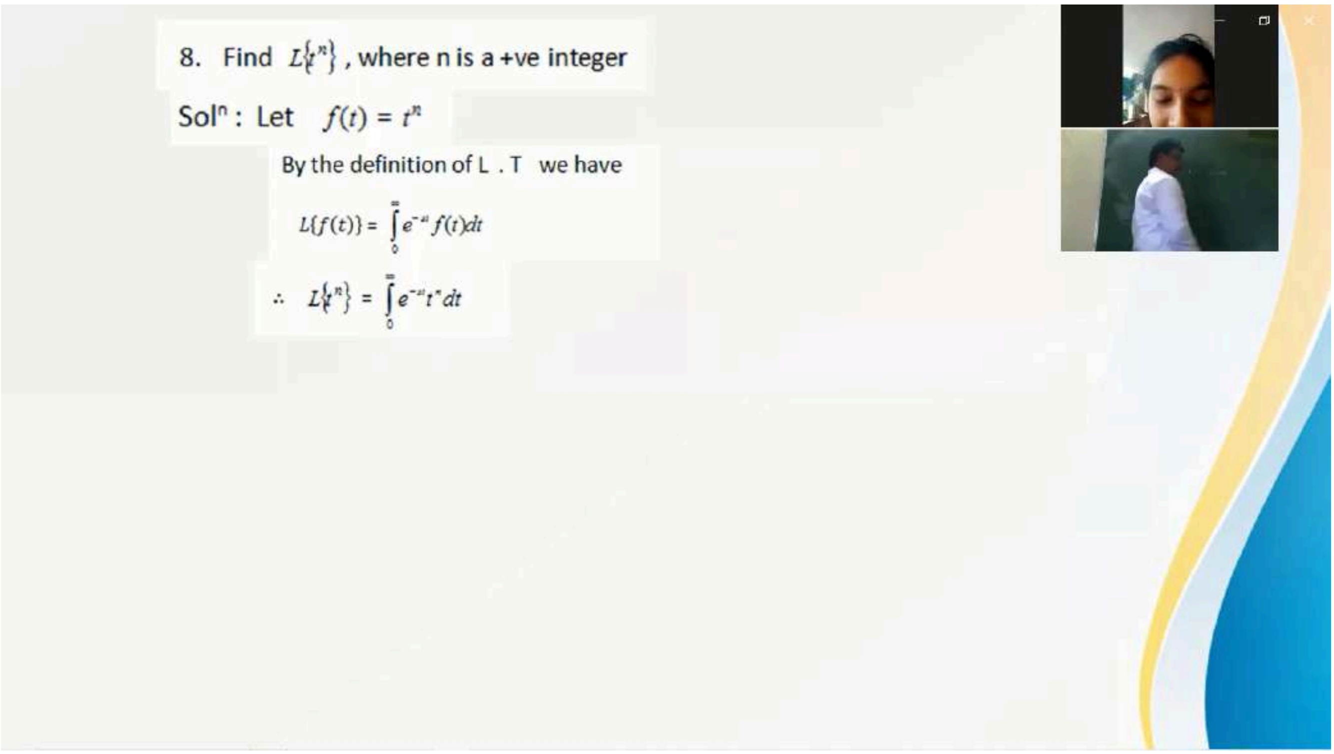

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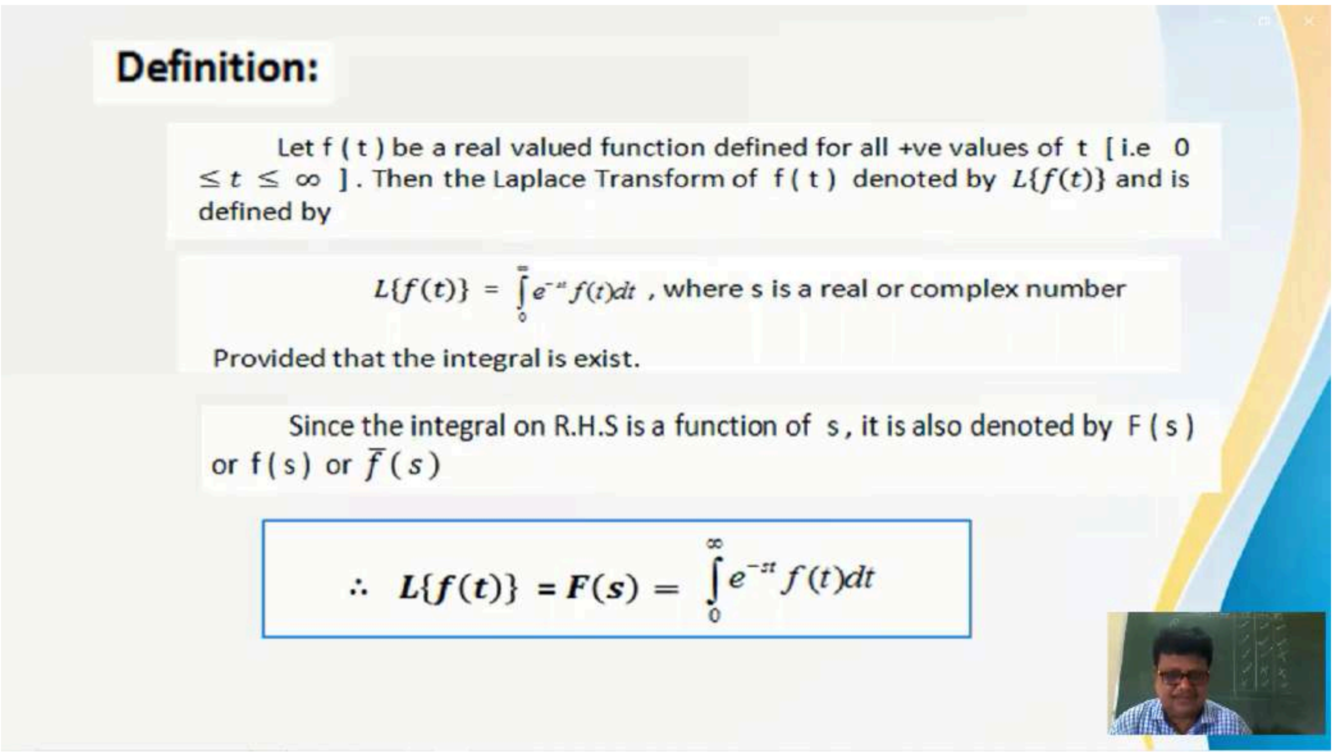

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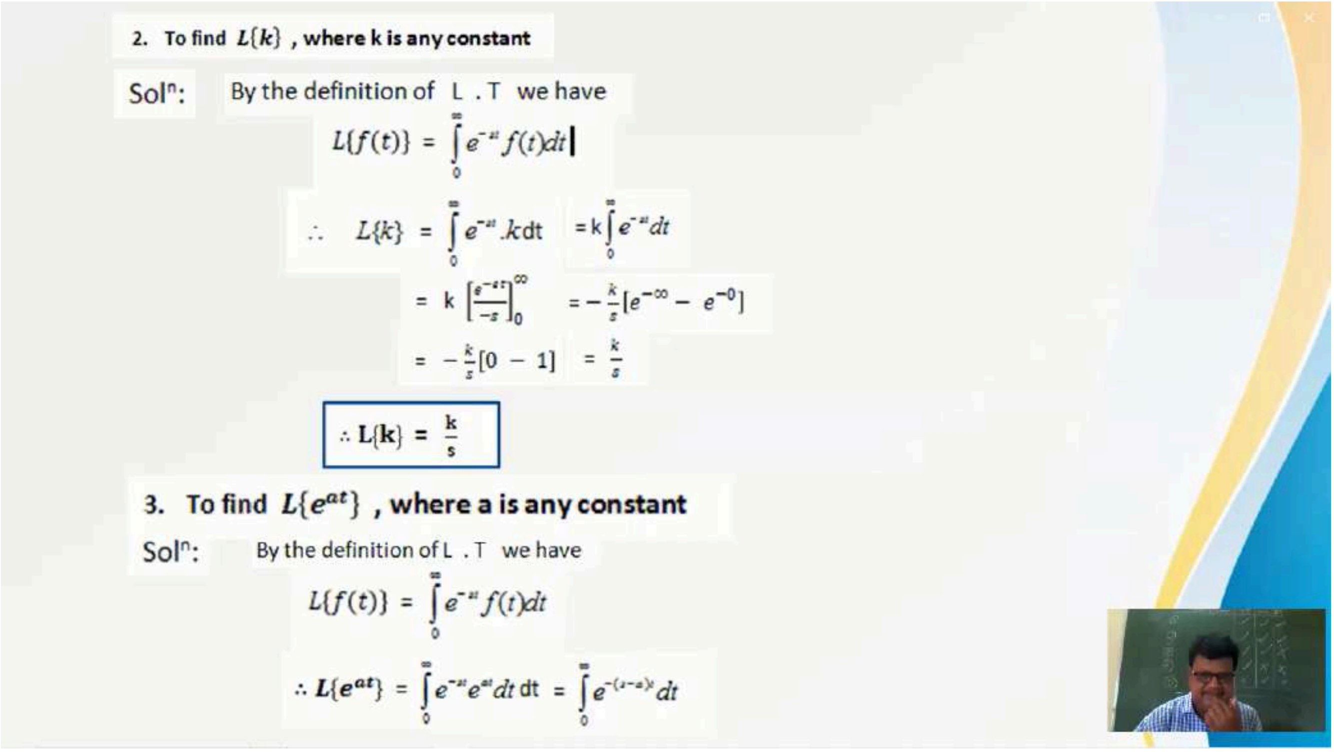

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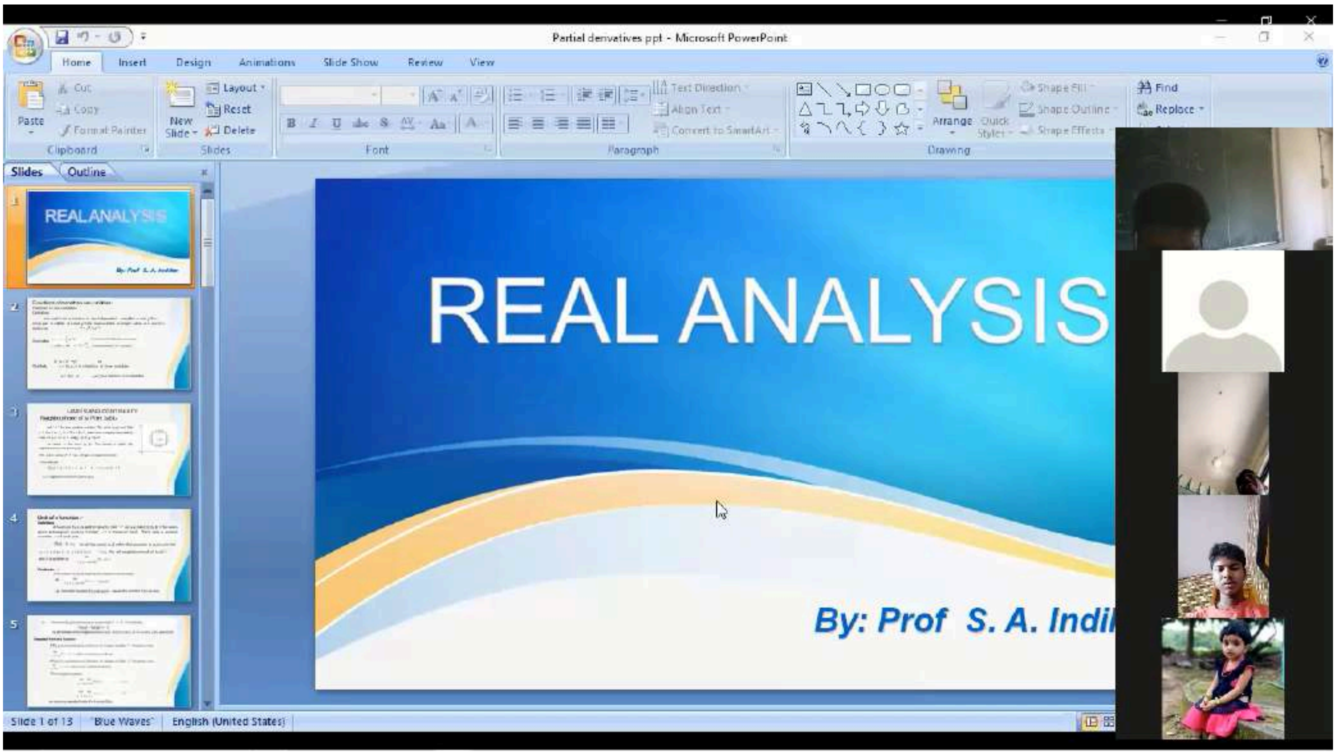

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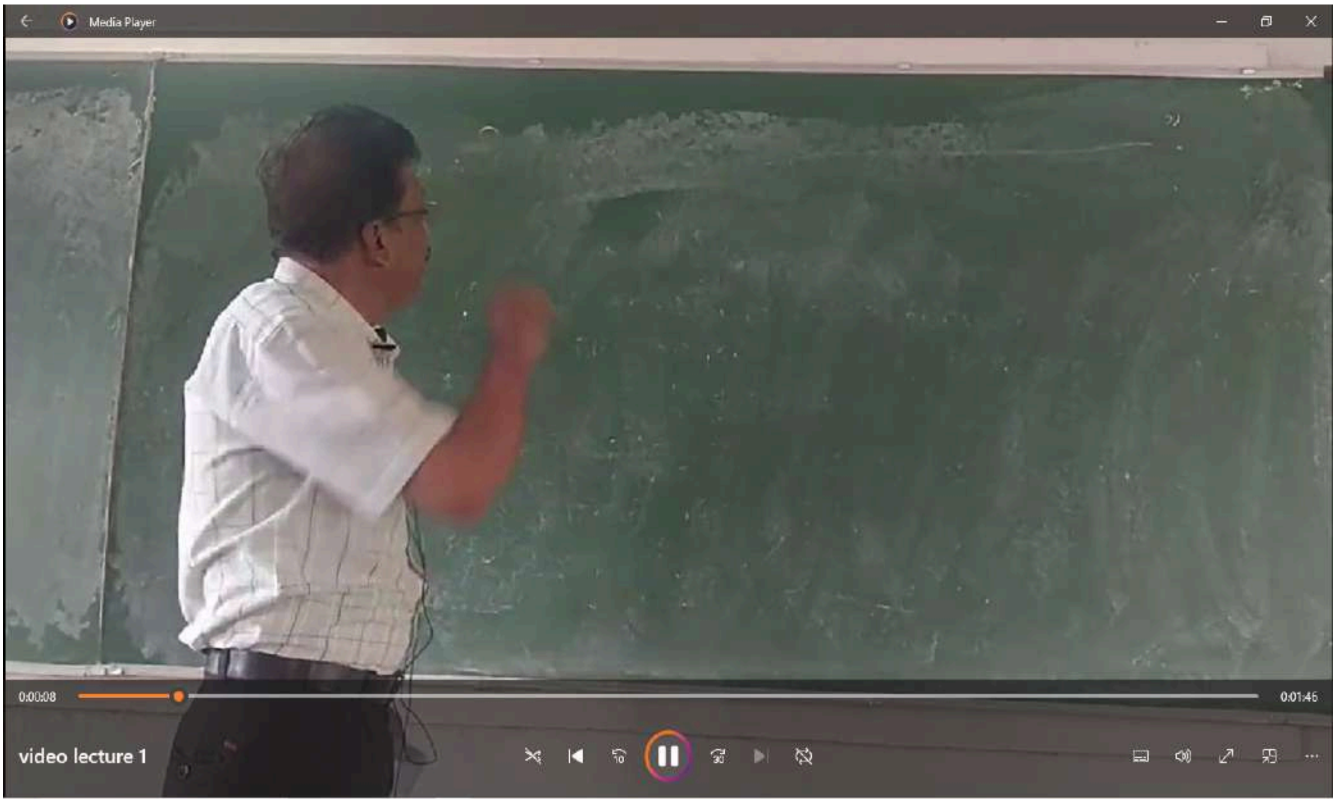

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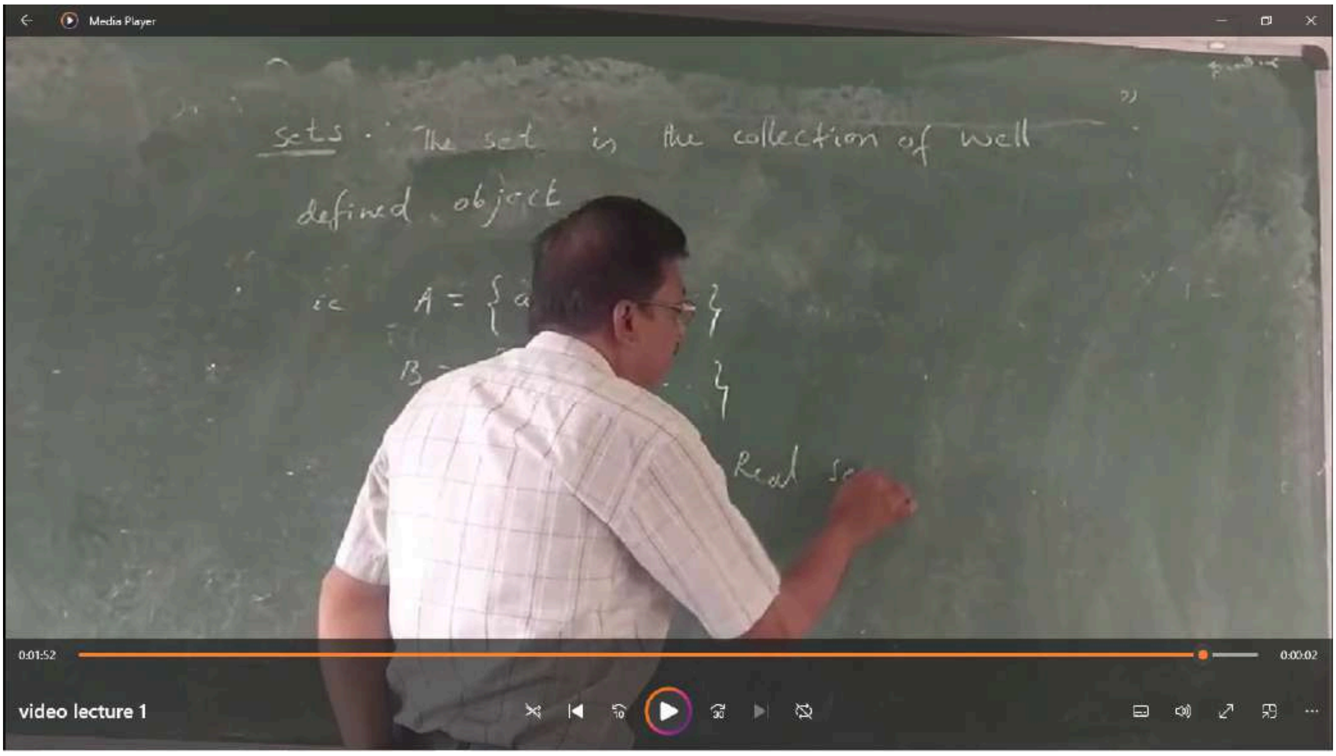

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