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Electronics and O(ptics) M(aster)



# **Semester S1**

## **Foundations of electromagnetic wave propagation**

### **TUTORIAL 3**

## **WAVE PROPAGATION BETWEEN TWO PARALLEL METALLIC PLANES**

**Part 1 :** Consider the following incident plane wave reflected by a perfect metallic conductor. The electric field is in the y axis direction.  $\theta$  defines the direction of the wave vector  $\vec{k}_i$ , with  $|\vec{k}_i| = \frac{\omega}{c}$ .

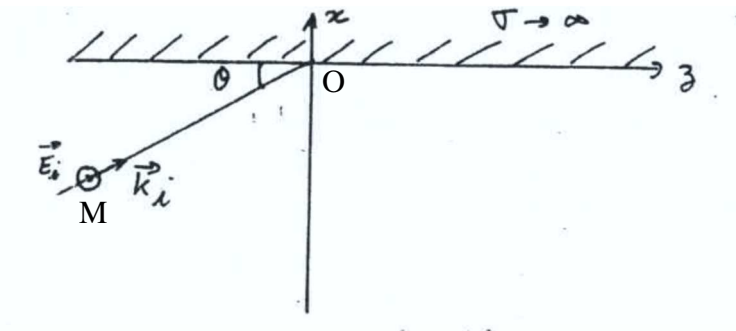


Figure 1

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$\vec{E}_r$ ,  $\vec{H}_r$  are the electromagnetic fields reflected by the perfect metallic conductor. Compute these fields at the point M.

Compute then the components of the total electromagnetic fields E and H as a function of  $\theta$ .

Give the surface current density on the conductor. Does this current seem to propagate?

### Part 2 :

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- From the boundary conditions on this second metallic plane, and using the total electric field already computed, determine a relation between  $\theta$  and  $\omega$ .
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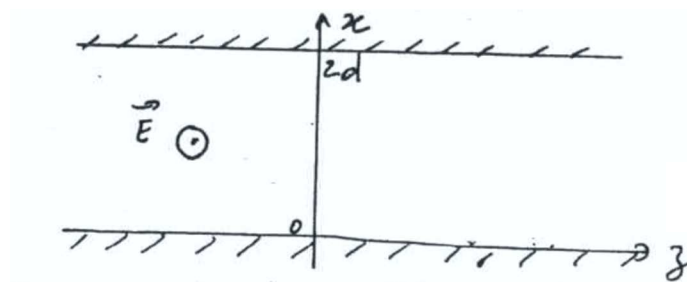


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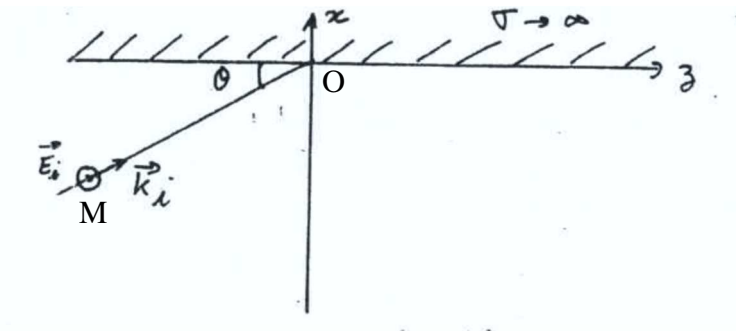


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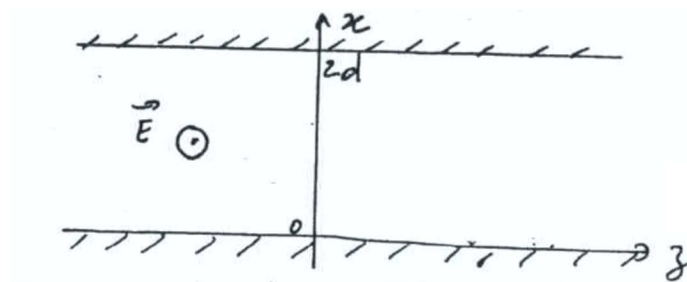


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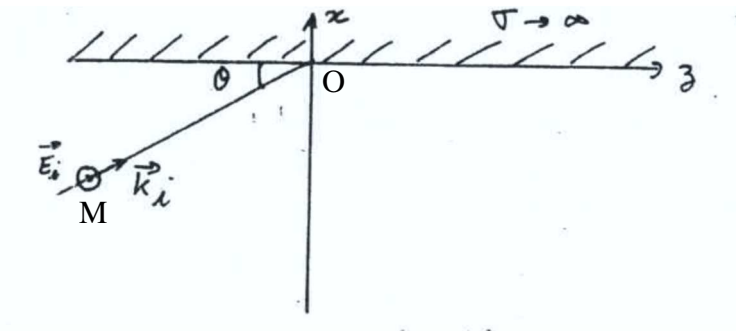


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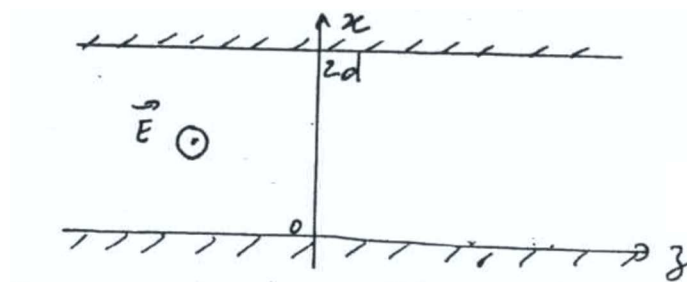
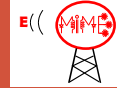


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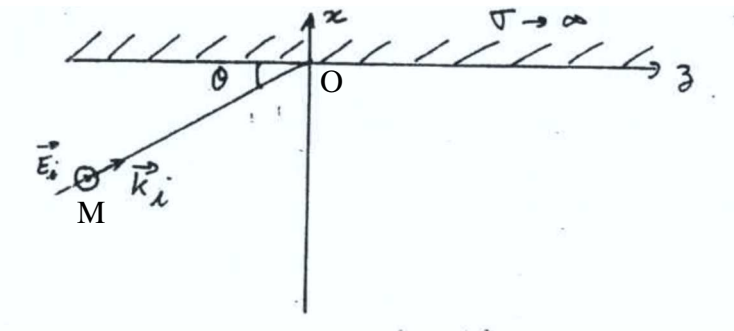


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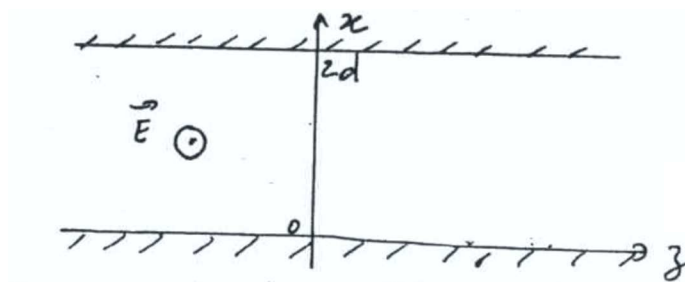


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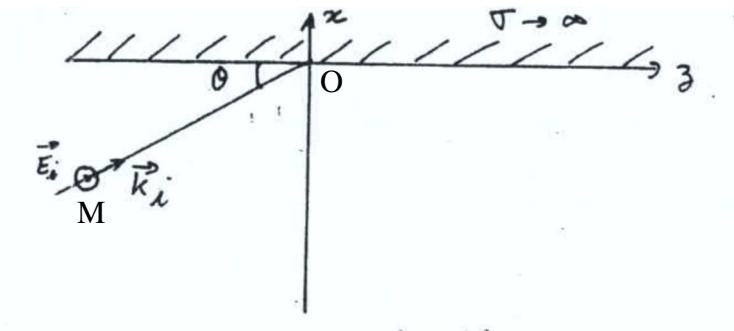


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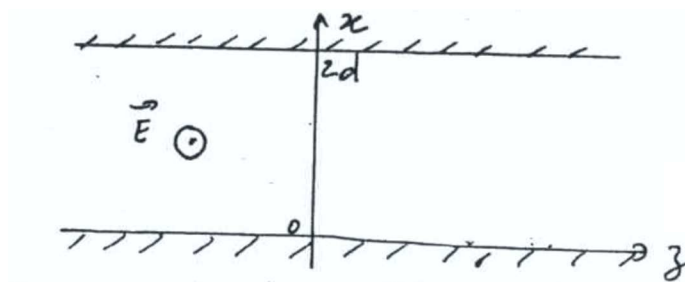


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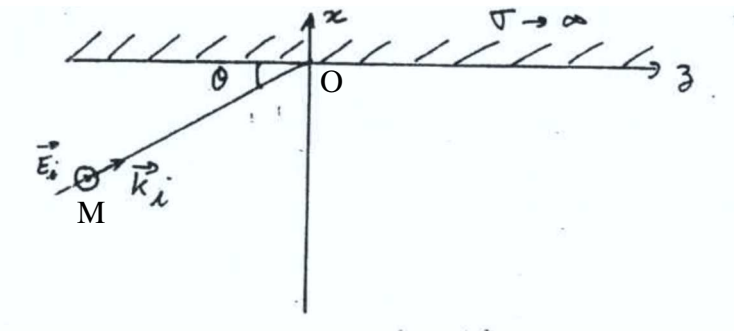


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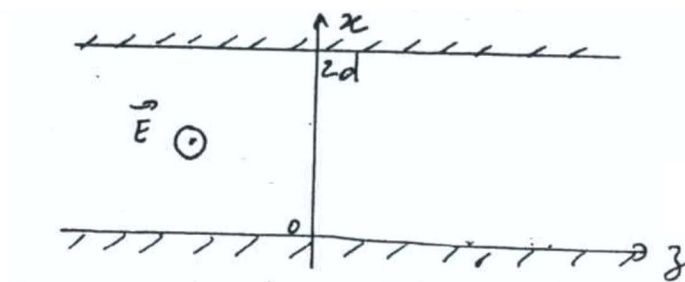


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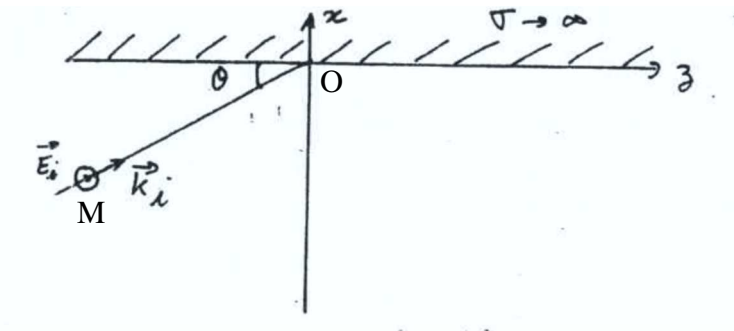


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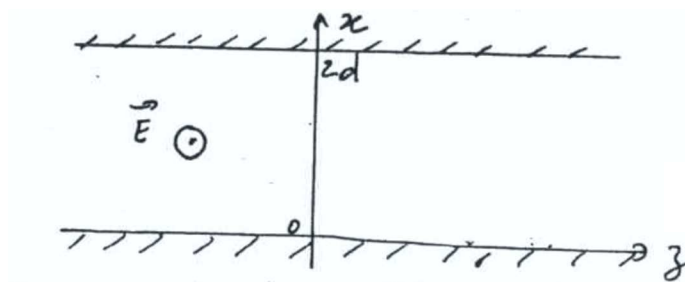
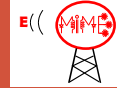


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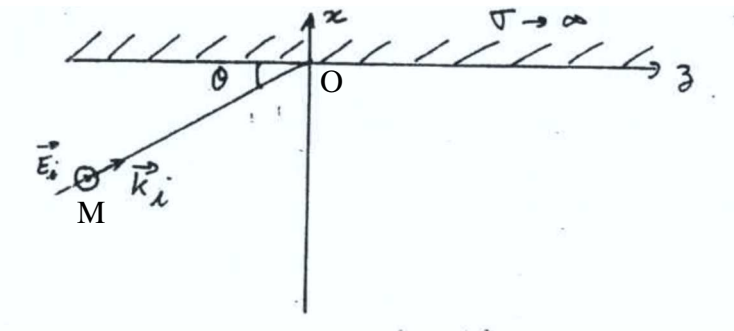


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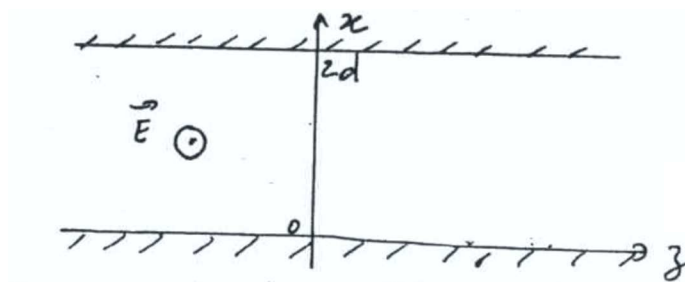


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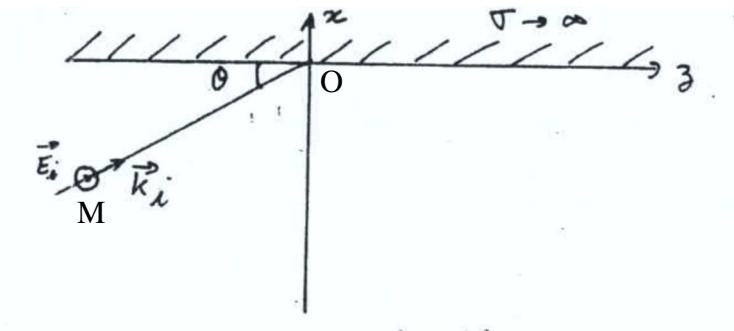


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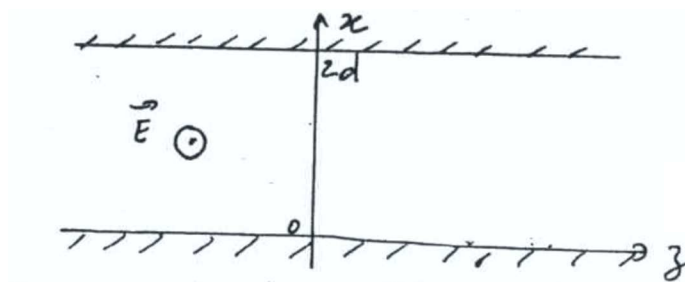


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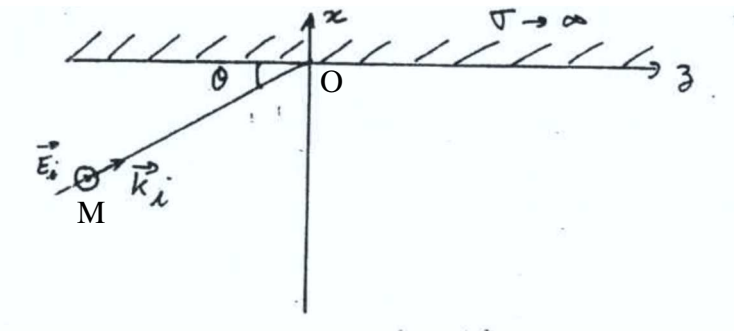


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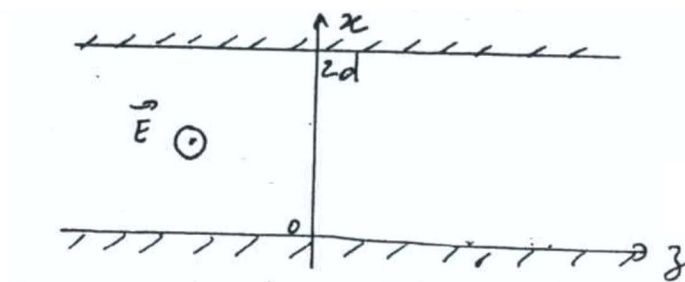


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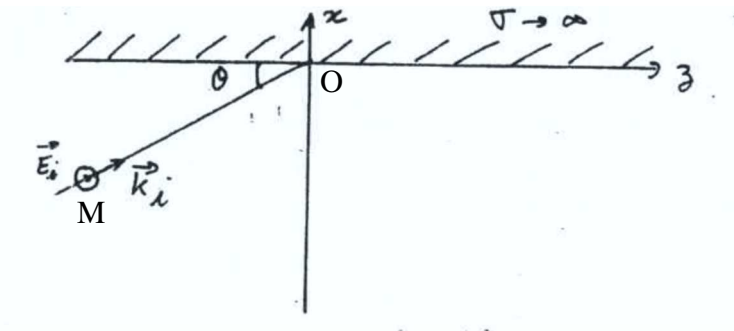


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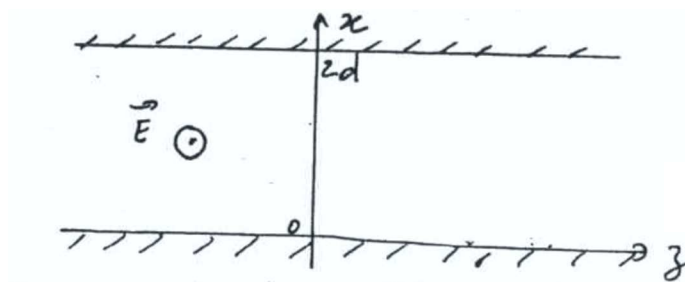
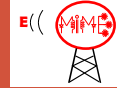


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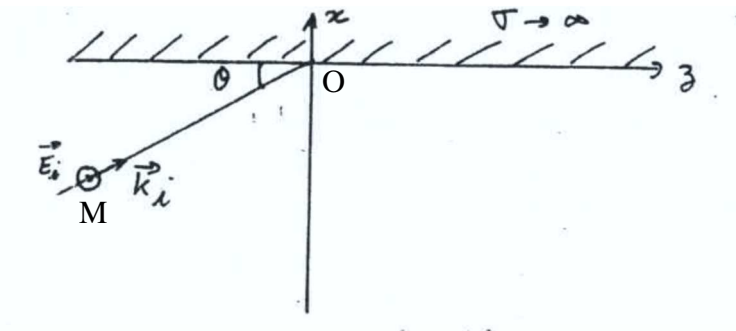


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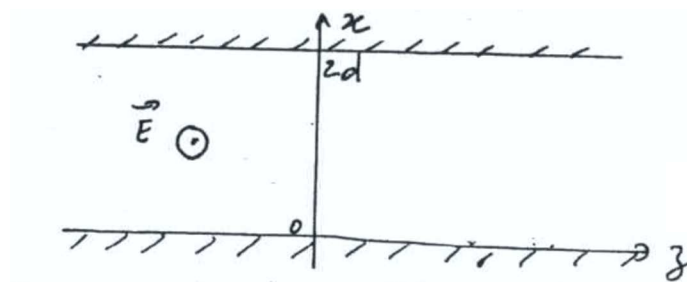


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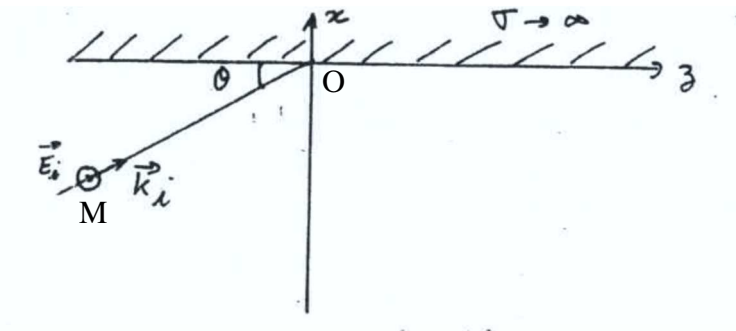


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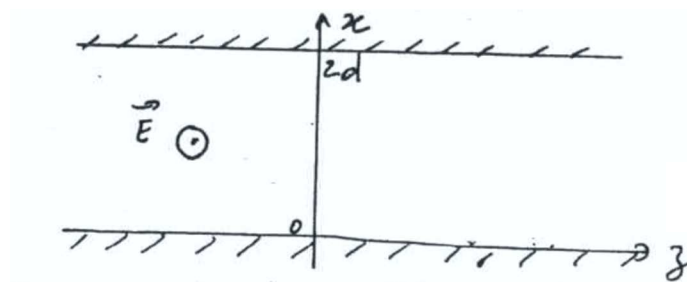


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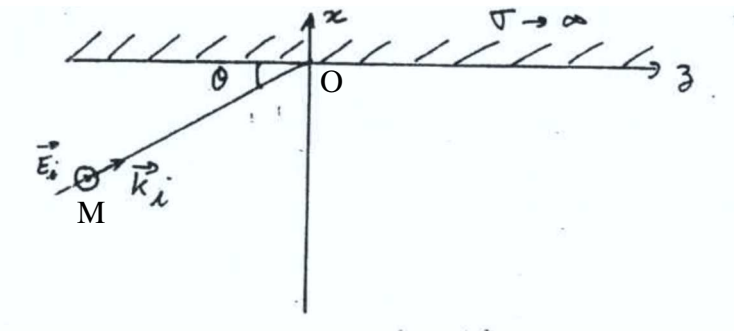


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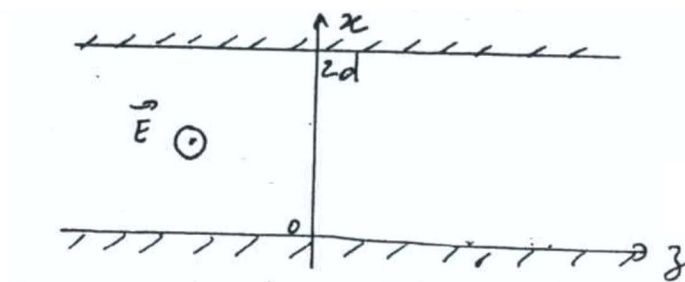


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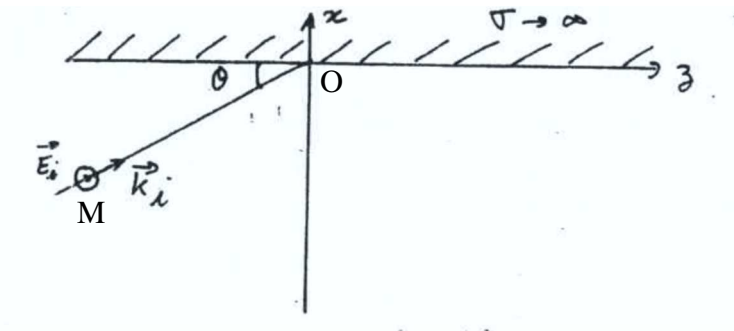


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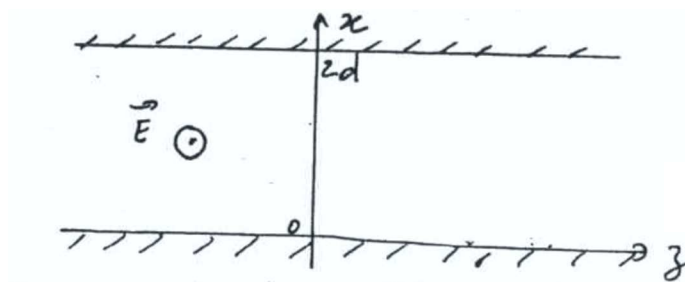
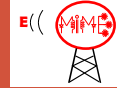


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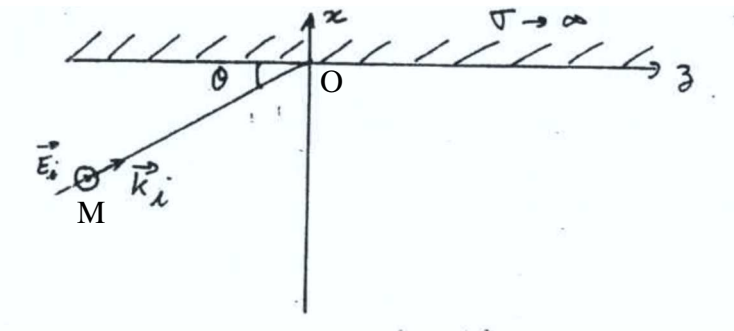


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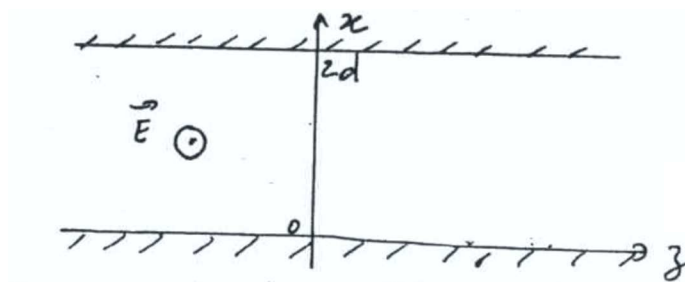


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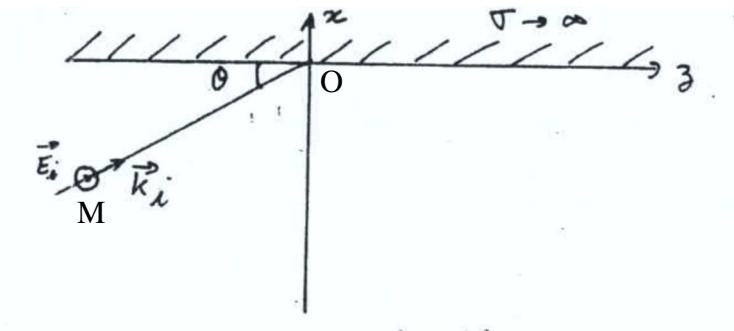


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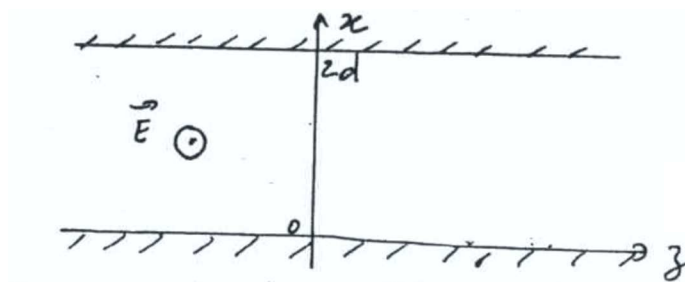


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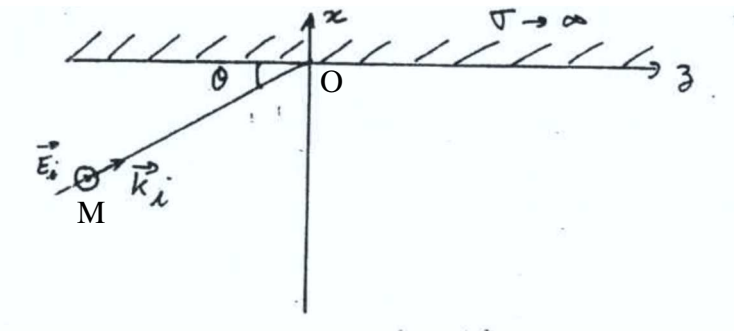


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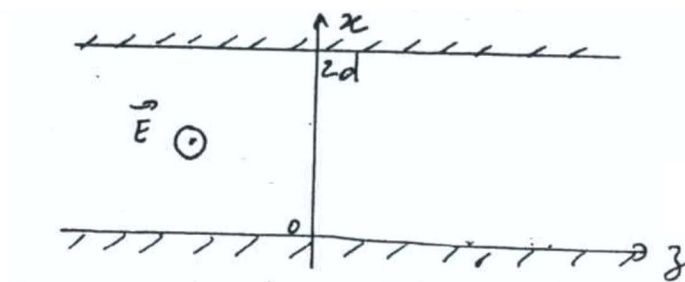


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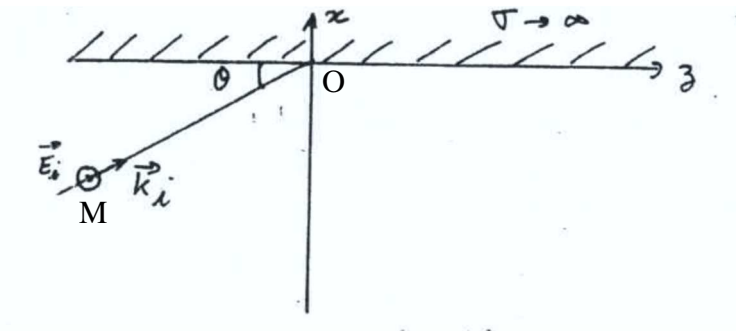


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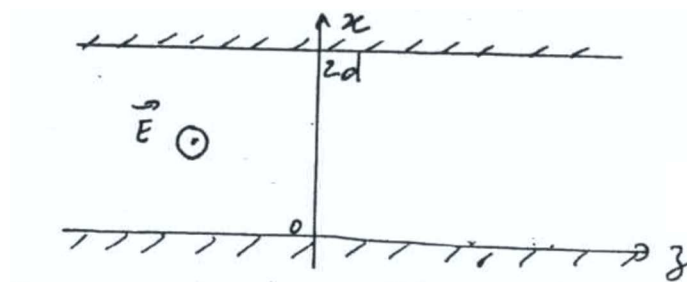
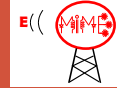


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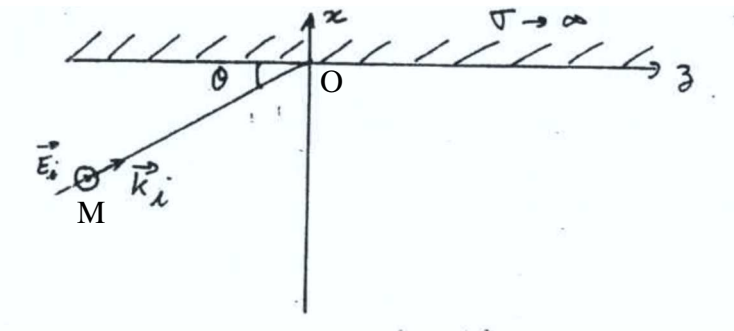


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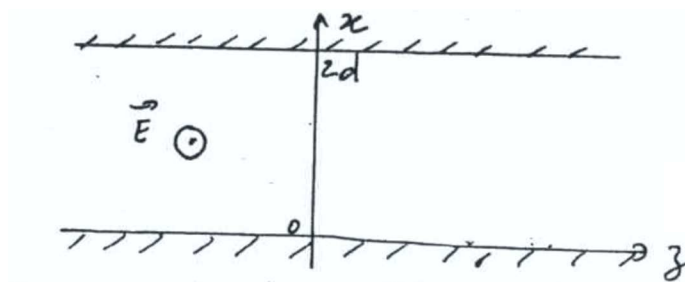


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