

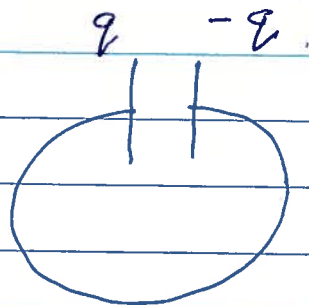
Exam III TEST QUESTIONS [PART II]

1. What is displacement current? Why did Maxwell postulate it?

2. Show that $\epsilon_0 \frac{\Delta \phi_E}{\Delta t}$ has the dimensions

$$Q T^{-1}$$

3. At $t=0$, a capacitor is charged to $\pm q$ and a wire is connected as shown.



Show that the displacement current between the plates is equal to the conduction current ~~between the plates~~ in the wire.

4. Light and sound are both waves, list 5 differences between them.

5. What is light?

6. If you are sitting 1m away from a 60 watt bulb (taken to be a point source) what is the amplitude of the \vec{E} field entering your eye?

7 Show that the average intensity of an E-M wave can be written as $\frac{c B_m^2}{2\mu_0}$, $\frac{1}{2} c \epsilon_0 E_m^2$ or $\frac{E_m B_m}{2\mu_0}$ where E_m

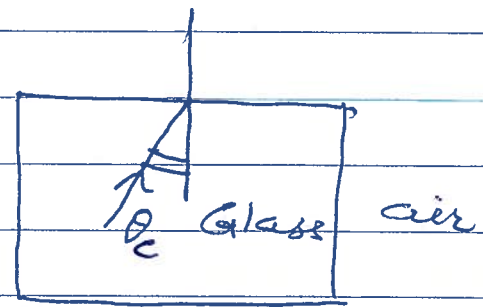
and B_m are the amplitudes of the \vec{E} and \vec{B} fields.

8. You "see" a lightning flash and 10 secs later "hear" the thunder. If the speed of sound is 340m/s how far away was the flash? why?

9. What is radiation. How do you distinguish between heat, radio waves and x-rays?

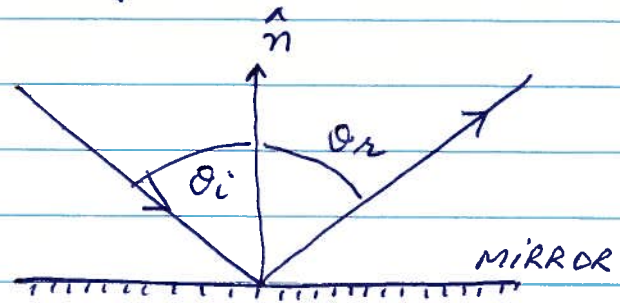
10. Show that $\frac{1}{\sqrt{\mu_0 \epsilon_0}}$ has the dimensions $L T^{-1}$.

11 As shown, a ray of light is incident at the glass-air interface. ($n_{\text{glass}} = 1.5$). If the angle of incidence is the critical angle, where is the refracted ray? Why? Calculate θ_c .



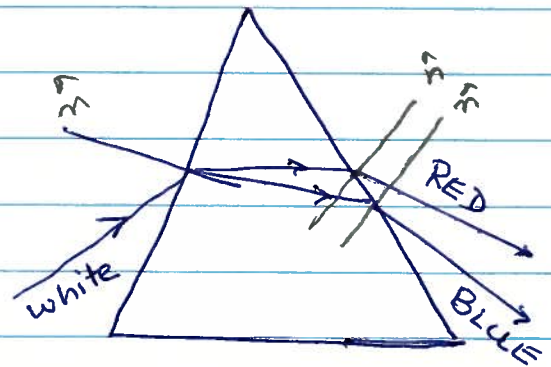
12. If in ~~Prob 11~~ Prob 11, $\theta_{inc} > \theta_c$ what happens to the light after it hits the surface? Why?
13. Write down Maxwell's Equations and explain their significance.

14. In the picture shown if you rotate the mirror by an angle θ by what angle will



the reflected ray be rotated? Why?

15. Newton's Expts showed that when white light goes through a prism the emerging beam is split into several colors. If he observed



what is shown in the picture what did he learn about the properties of light? Why?

16. All mirrors form images given by the Equations

$$\frac{1}{p} + \frac{1}{q} = \frac{2}{r}, \quad m = -\frac{q}{p}$$

where p = object-mirror distance, q = image-mirror dist.
 r = radius of mirror. How do you distinguish among a plane, a concave and a convex mirror?

17. Use the Equations of prob 16 to locate images for $p \rightarrow \infty$, $p > r$, $p = r$, $p < r$, $p < \frac{r}{2}$. In each case, calculate magnification and specify if image is real or virtual. Draw ray Diagrams to support your answers.

18. Why is there a "minus" sign on the right of the Equation

$$m = -\frac{q}{p}$$

19. Describe the method used to locate the image of a point object produced by any optical system.

20. How would you experimentally distinguish between a real image and a virtual image.

21. The right rear view mirror of your car has a warning "objects are nearer than they appear". What kind of mirror is this? Draw a ^{ray} diagram to support your answer.