N07 HL3

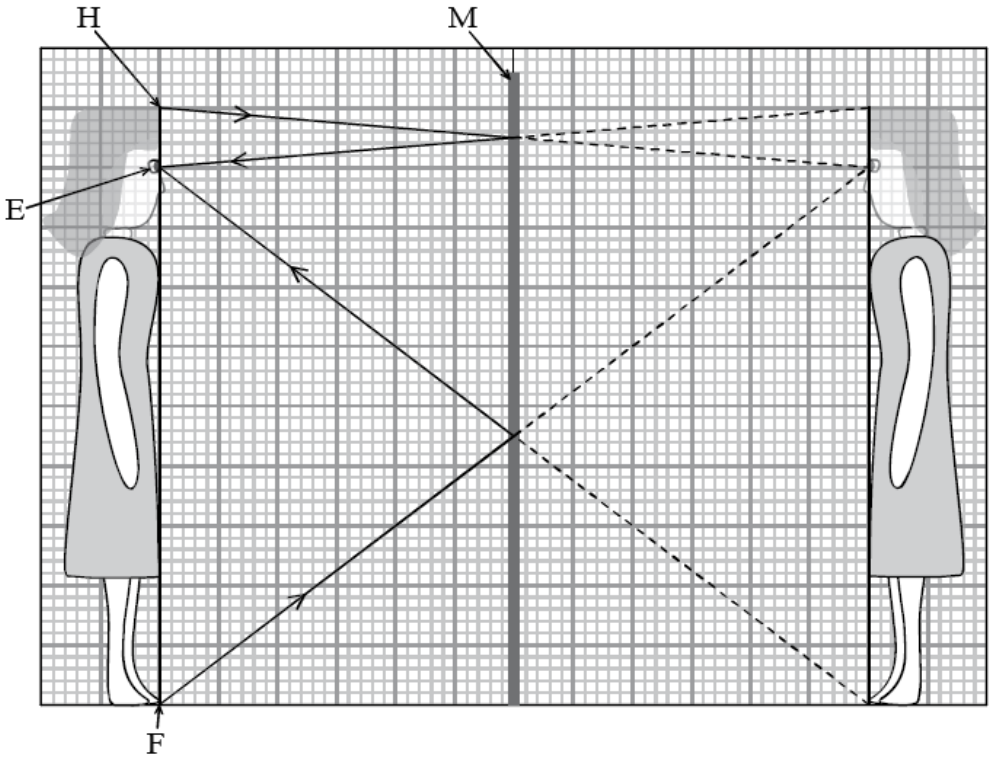
H1. (a) $\frac{\sin i}{\sin r}$ ***or*** $\frac{c}{v}$ with terms for each expression defined;

(b) $= \frac{3.0\times10^{8}}{2.1\times10^{8}}$;
$= 1.4$;

(c) speed of light in a medium depends on frequency;
the refractive index depends on frequency;
light of different frequencies refracted by different amounts / *OWTTE*;

H2. (a) 1. the angle of incidence is equal to the angle of reflection;
2. incident ray, reflected ray and normal are coplanar/in the same plane;

(b) (i)



same height;
image distance equal object distance;

(ii) correct ray construction for F;
correct ray construction for H;
The rays should be shown with equal angles at mirror judged by eye. Arrows on rays are not required.

(c) (i) $0.75\,(\pm 0.03)\,\text{m}$;

(ii) $0.68\,(\pm 0.03)\,\text{m}$;

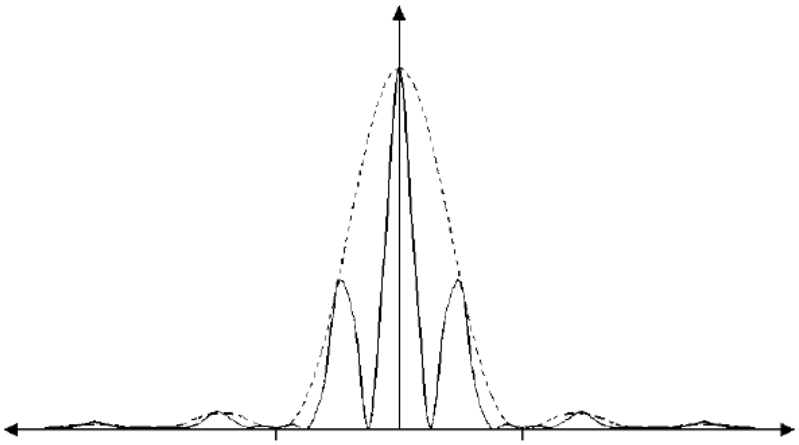
(d) no effect;

H4. (a) each element of the slit acts as a point source of light;
the light from these sources interfere;
there will be a zero of intensity (on the screen) when the sum of the path differences between the sources is an integral number of half wavelengths / a maximum when an integral number of wavelengths;

(b) $\theta = \frac{d}{D} = \frac{\lambda}{b}$;

rearrange to get $d = \frac{D\lambda}{b}$;

(c)



central maximum same intensity as single slit maximum;
two other maximum either side about half-intensity of central maximum;
*Award **[1 max]** if lines do not touch x-axis.*
There is no need to show maxima within secondary maxima. Do not penalize responses if more than two maxima are shown but they must be symmetrical and with realistic relative intensities.