Part I

1. Two in-phase sources produce circular waves of wavelength $\lambda$ and the interference pattern is shown to the right, with dotted lines indicating where constructive interference occurs.
   The difference in the path length from each of the sources to point P is

   (a) $\lambda/2$ (b) $\lambda$ (c) $3\lambda/2$ (d) $5\lambda/2$

2. A diffraction grating is illuminated with yellow light. The pattern seen on a screen behind the grating consists of three yellow spots, one at zero degrees (straight through) and one each at 45. You now add red light of equal intensity, coming in the same direction as the yellow light.The new pattern consists of

   (a) red spots at 0 and 45

   (b) orange spots at 0 and 45

   (c) an orange spot at 0, yellow spots at 45, and red spots slightly farther out.

   (d) an orange spot at 0, yellow spots at 45, and red spots slightly closer in.

3. An interference pattern is formed on a screen by shining a planar wave on a double- slit arrangement If we cover one slit with a glass plate (right), the phases of the two emerging waves will be different because the wavelength is shorter in glass than in air. If the phase difference is 180, how is the interference pattern

   (a) The pattern vanishes.

   (b) The bright spots lie closer together.

   (c) The bright spots are farther apart.

   (d) Bright and dark spots are interchanged.

4. Blue light of wavelength $\lambda$ passes through a a double slit with separation $d$ and forms an interference pattern on a screen. If the blue light is replaced by red light of wavelength $2\lambda$, the original interference pattern is reproduced if the slit separation is changed to

   (a) $2d$

   (b) $d/2$

   (c) No change is necessary.

   (d) There is no separation that can be used to reproduce the original pattern.

5. Suppose we cover each slit in Young's experiment with a polarizer such that the polarization transmitted by each slit is orthogonal to that transmitted through the other. On a screen behind the slits, we see:

   (a) the usual fringe pattern.

   (b) the usual fringes shifted over such that the maxima occur where the minima used to be.

   (c) nothing at all.

   (d) a fairly uniformly illuminated elongated spot.

Part II

1. In a Young's double slit experiment using yellow light of wavelength 550 nm the fringe separation is 0.275 mm.

   (a) Find the slit separation if the fringes are 2.0 m from the slit.

   The yellow lamp is replaced with a purple one whose light is made of two colours, red light of 700 nm and violet light of 400 nm.

   (b) Find the distance between the violet fringes

   (c) Find the distance between the red fringes