Exemplar Problems

Question 4. In a Young's double-slit experiment, the source is white light. One of the holes is covered by a red filter and another by a blue filter. In this case,
(a) there shall be alternate interference patterns of red and blue
(b) there shall be an interference pattern for red distinct from that for blue
(c) there shall be no interference fringes
(d) there shall be an interference pattern for red mixing with one for blue
Solution: (c)
Key concept:
Condition for Observing Interference
The initial phase difference between the interfering waves must remain constant. Otherwise the interference will not be sustained.
The frequency and wavelengths of two waves should be equal. If not the phase difference will not remain constant and so the interference will not be sustained.
The light must be monochromatic. This eliminates overlapping of patterns as each wavelength corresponds to one interference pattern.
Here in this problem of Young's double-slit experiment, when one of the holes is covered by a red filter and another by a blue filter. In this case due to filtration only red and blue lights are present. In YDSE monochromatic light is used for the formation of fringes on the screen. Hence, in this case there shall be no interference fringes.
The wave front emitted by a narrow source is divided in two parts by reflection, refraction or diffraction. The coherent sources so obtained are imaginary.