

物理电子学院

考生注意: 2005 年研究生复试《基础光学》试题

考生可从下列五个题中任选四题, 每题 20 分, 满分 80 分;

考生可以带英汉词典或电子词典;

考生解题时可用英文(或中文)进行解答, 证明和计算题均需写出中间(推导)过程;

1. An object 10mm high is to be imaged 50mm high on a screen that is 120mm distant. What are the radii of an equiconvex lens of index 1.5 which will produce an image of the proper size and location?

2. Light of wavelength 580nm is incident on a slit of which 0.30mm. The observing screen is placed 2m from the slit. Find the positions of the first dark fringes and the width of the central bright fringe.

3. Consider a system of two thin lenses as shown in Fig.1. The convex lens has a focal length of +20cm and the concave lens has a focal length of -10cm. The two lenses are separated by 8 cm. For an object of height 1 cm (at a distance of 40cm from the convex lens), calculate the position and size of the image.

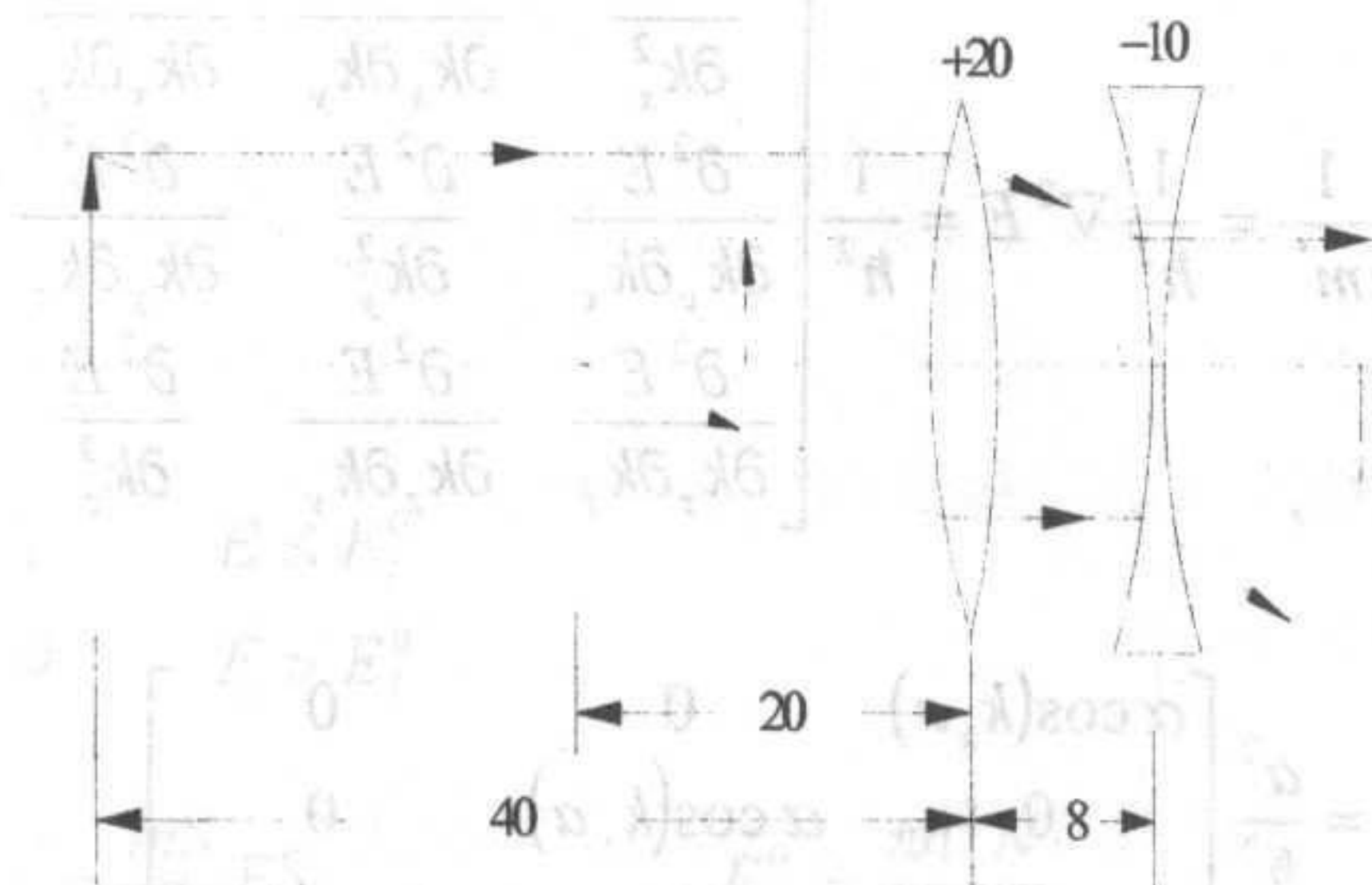


Fig.1

4. Shown as in Fig. 2, a prism is a medium formed by two plane surfaces making an angle A . We assume that the medium has an index of refraction n and that it is surrounded by a medium having unity index, such as air. An incident ray such as PQ suffers two refractions and emerges deviated an angle δ relative to the incident direction. Prove the minimum of the deviated angle δ_{\min} is satisfied with the formula:

$$\delta_{\min} = 2 \arcsin[n \sin(\frac{A}{2})] - A.$$

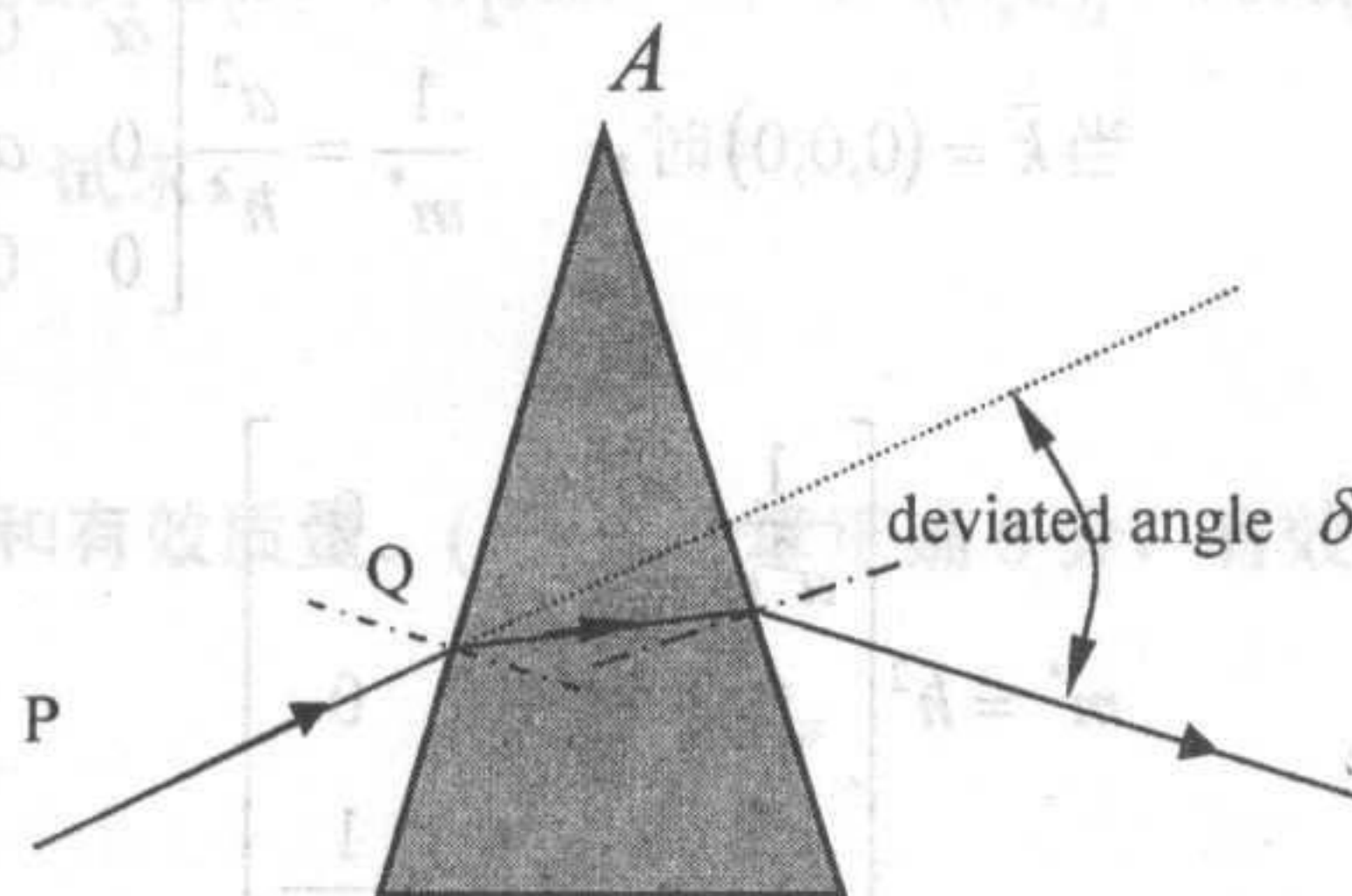


Fig.2

5. According to the Fermat's principle, prove the reflection law and refraction law.

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