

13.2 Images Formed by Mirrors

Name: _____ Class: _____ Date: _____

Total: 11 marks

Objective

Build the skills to answer exam questions on **images formed by mirrors**.

You must be able to:

- use ray diagrams to locate images from **plane** and **curved mirrors** 曲面镜
- apply the **mirror equation** 镜面公式 $\frac{1}{s_o} + \frac{1}{s_i} = \frac{1}{f}$
- describe an image as real or virtual, upright or inverted, and find its **magnification** 放大率

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ The mirror equation

$\frac{1}{s_o} + \frac{1}{s_i} = \frac{1}{f}$, where s_o is the object distance, s_i the image distance, and f the focal length.

■ Magnification

$m = -\frac{s_i}{s_o}$ —a negative m means inverted.

■ Real or virtual

A positive s_i is a **real** image (in front, inverted); a negative s_i is a **virtual** image (behind, upright), as with a plane mirror.

2 Practice

2.1 An object is 20 cm from a concave mirror of focal length 10 cm. Find the image distance. [2]

2.2 State whether a plane mirror forms a real or a virtual image. [1]

2.3 Find the magnification when $s_i = 15$ cm and $s_o = 30$ cm. [2]

3 Exam-style questions

3.1 The mirror equation is [1]

- **A** $\frac{1}{s_o} + \frac{1}{s_i} = \frac{1}{f}$
 - **B** $s_o + s_i = f$
 - **C** $s_o s_i = f^2$
 - **D** $s_i - s_o = f$
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3.2 A virtual image formed by a mirror is [1]

- **A** in front of the mirror and inverted
 - **B** behind the mirror and upright
 - **C** always at the focus
 - **D** always larger than the object
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3.3 An object is placed 24 cm from a concave mirror of focal length 8.0 cm.

(a) Find the image distance. [3]

(b) State whether the image is real or virtual. [1]

4 Go further

- work through the **13.2 Images Formed by Mirrors** lesson on the **Learn** page;

- read the **Geometric Optics** section of the AP Physics 2 handout on the **Know** page.

Solutions

2.1 $\frac{1}{s_i} = \frac{1}{10} - \frac{1}{20} = \frac{1}{20} \Rightarrow s_i = 20 \text{ cm.}$

2.2 virtual.

2.3 $m = -\frac{s_i}{s_o} = -\frac{15}{30} = -0.5.$

3.1 A.

3.2 B.

3.3 (a) $\frac{1}{s_i} = \frac{1}{8.0} - \frac{1}{24} = \frac{3-1}{24} = \frac{1}{12} \Rightarrow s_i = 12 \text{ cm.}$ (b) real ($s_i > 0$).