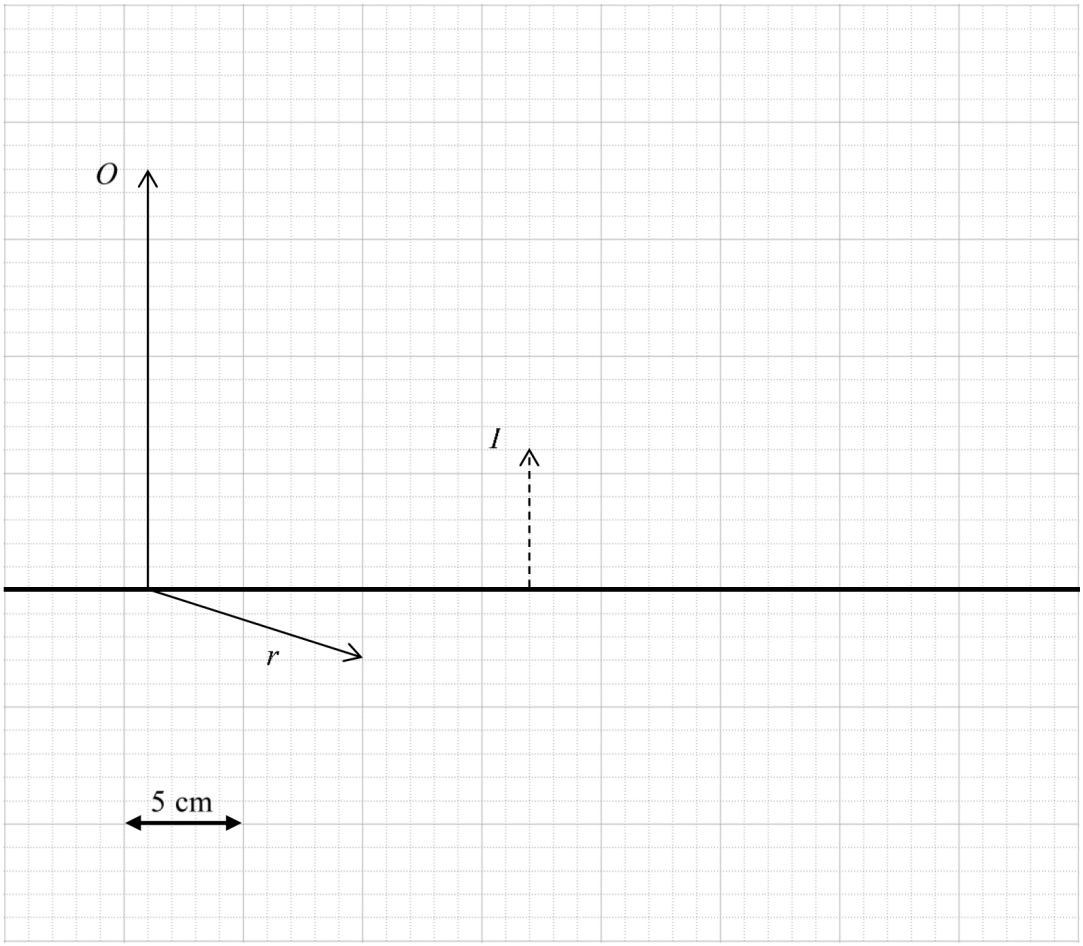
透鏡 II

Lens II

姓名: _____

學號: _____

1. 一個物件 O 放在一片透鏡 L 前，成像 I 如圖中所示。
   An object O is placed in front of lens L, the image I is shown in the figure below.



(a) L 是何種透鏡？解釋你的答案。
what kind of lens is L? Explain your answer. （2 marks）

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(b) 透過加入適當的光線，在圖中畫出透鏡的位置 (L)、主焦點的位置 (F) 並求透鏡焦距。
By adding suitable ray(s) in the figure, indicate the locations of lens (L), principal focus (F) and write down the focal length of the lens. （5 marks）

焦距 focal length: _____

(c) 完成光線 r 折射後的光路。
Complete ray r. （1 marks）

(d) 透鏡 L 和透鏡 M 的形狀、大小相同，但透鏡 M 的折射率略高。把透鏡 L 換成透鏡 M 後，成像的放大率會如何改變？扼要解釋你的答案。
Lens L and lens M have the same shape and size, but lens M has a slightly higher refractive index. How will the magnification of the image change when lens L is replaced with lens M? Briefly explain your answer. （2 marks）

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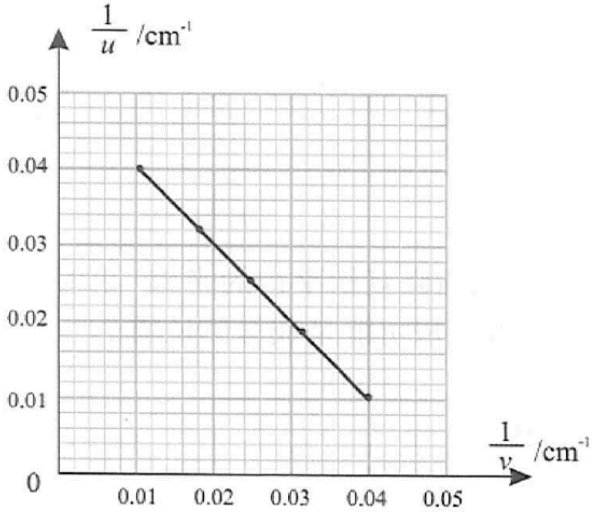
MCQs

1. 一個物件放在一片凹透鏡前 12 cm 處，產生的成像像距為 8 cm 。若把物件移至凹透鏡前 24 cm 處，產生的成像像距為
A object is placed 12 cm in front of a concave lens, and the image distance is 8 cm. If the object is moved to a position 24 cm in front of the concave lens, the resulting image distance is

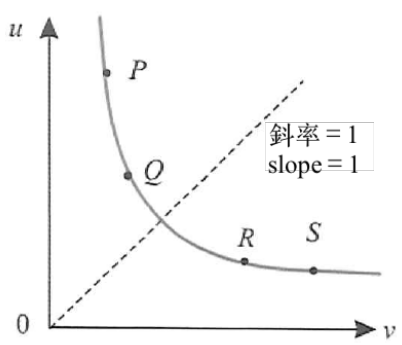
   A. 6 cm
   B. 12 cm
   C. 16 cm
   D. 18 cm

2. 

   把物體放在一個凸透鏡前，並前後移動。然後記錄物距 v 和相應的像距 v。上圖顯示 $1/u$ 和 $1/v$ 的關係線圖。透鏡的焦距是多少？
   An object is moved in front of a convex lens. The object distance u and the corresponding image distance v are recorded. A graph of $1/u$ against $1/v$ is plotted as shown above. What is the focal length of the lens?

   A. 10 cm
   B. 15 cm
   C. 20 cm
   D. 25 cm

3.



物體沿一個凸透鏡的主軸前後移動。以上的圖表顯示物距 u 和像距 v 的關係。在哪一點上，像距最接近透鏡的焦距？
An object is moved along the principal axis of a convex Lens. The graph above shows a plot of object distance u against image distance v. At which of the above points is the image distance most close to the focal length of the lens ?

4. 把一塊透鏡放在書本前，如圖。
A lens is placed above a book as shown.

下列哪項正確？
Which ones are correct?

(1) 透鏡是凹透鏡。
It is a convex lens.

(2) 成像是虛像。
The image is virtual.

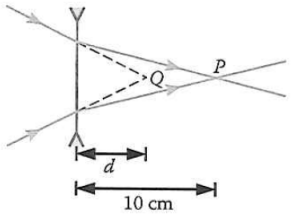
(3) 像距較透鏡的焦距短。
Object distance is shorter than focal length.

A. 只有 (1) 和 (2) (1) and (2) only
B. 只有 (1) 和 (3) (1) and (3) only
C. 只有 (2) 和 (3) (2) and (3) only
D. (1), (2) 和 (3) (1), (2) and (3)

5. 把一根蠟燭放在牆壁前一段距離外。在兩者之間放置一塊透鏡，並緩慢移動透鏡。當透鏡移至途中兩點，均有清晰的像在牆壁上形成。蠟燭在兩處的像高分別為 50 cm 和 8 cm。問蠟燭的高度是多少？
A candle is placed at a fixed distance in front of a wall. A lens is inserted and moved slowly between them. At two Particular positions, sharp images are formed on the wall. The heights of the images are 50 cm and 8 cm respectively. What is the height of the candle?

A. 6.25 cm
B. 20 cm
C. 21 cm
D. 29 cm

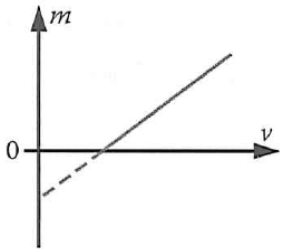
6. 一束會聚光線射向凹透鏡，並在距離透鏡 10 cm 外的 P 點會聚。已知透鏡焦距為 4 cm。若移開透鏡，光線會在 Q 點會聚。
A convergent beam is incident on a concave lens of focal length 4 cm as shown. It converges at P, which is 10 cm from the lens. If the lens is taken away, the beam will converge at Q.



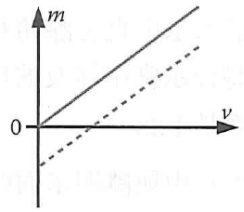
Q 點距離透鏡多遠？
How far is Q from the position of the lens?

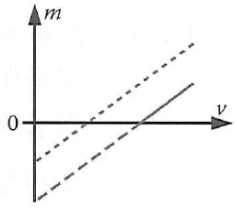
A. 2.5 cm
B. 2.9 cm
C. 4 cm
D. 6.7 cm

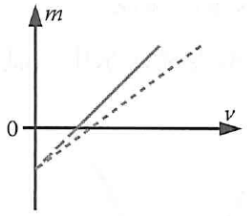
7. 下圖顯示某個像的線性放大率 m 隨像距 v 的變化。
The graph shows how the linear magnification m of an image varies with its distance from the lens v.

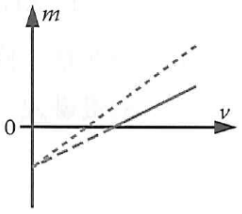


今使用另一塊焦距較長的透鏡。下列哪幅線圖正確？（原有線圖以短虛線表示。）
A lens of a longer focal length is used instead. Which of the following graphs is correct? (The original graph is shown by the dotted line.)

A.


B.


C.


D.


8. 現有一個固定的發光物件和一個固定的屏幕，物件和屏幕間的距離為 5 m。當一片焦距為 1.3 m 的透鏡放在物件前 x m 時，以下哪項是 x 的可能值？
There is a fixed luminous object and a fixed screen, with a distance of 5 m between them. When a lens with a focal length of 1.3 m is placed at a distance of x m in front of the object, which of the following is a possible value for x?

A. 1.12
B. 1.88
C. 2.60
D. 4.41