透鏡 I
Lens I
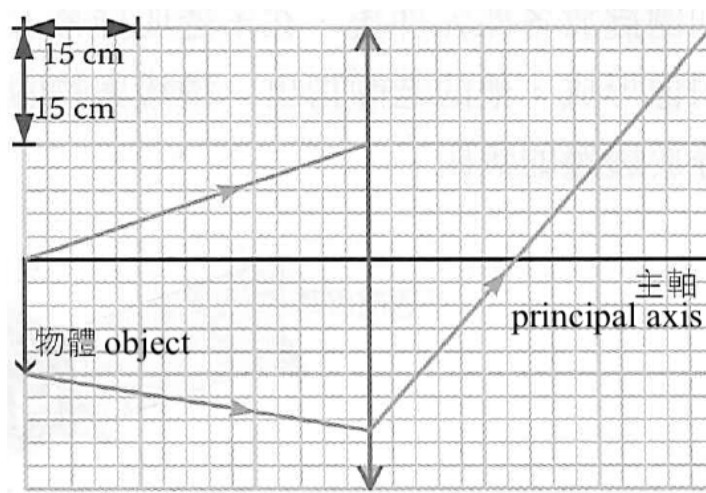
姓名: _____

學號: _____

1. 把一件高 15 cm 的物體，放在凸透鏡前 45 cm 的位置。下圖顯示兩條從物體發出的光線，及其中一條折射線。
   An object of height 15 cm is placed 45 cm in front of a convex lens. The figure shows two light rays emitted from that object. One of the paths is as depicted.

(a) 試畫上餘下的折射線。
   Complete the path of the remaining light ray. （2 marks）

(b) 由此或以其他方法，求透鏡的焦距。
   Hence, or otherwise, find the focal length of the lens. （1 marks）

   焦距 focal length: _____

(c) 試指出像的本質，解釋你的答案。
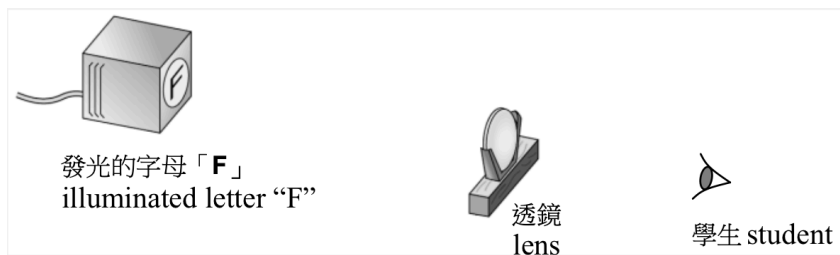   State the nature of the image, explain your answer. （2 marks）

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2. 如圖所示，一位學生用透鏡觀看發光的字母「F」。
   An illuminated letter 'F' is viewed through a lens as follow.

發光的字母「**F**」
illuminated letter "F"

透鏡
lens

學生 student

(a) 不論透鏡和字母「F」之間的距離怎樣改變，透鏡都不能產生實像。這是哪一種透鏡？
    The lens cannot form a real image of the letter no matter how the distance between them is varied.
    State the type of lens used. （1 marks）

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(b) 草繪學生看到的像。
    Sketch the image as seen by the observer. （1 marks）

(c) 透鏡的焦距是 15 cm，形成的像與透鏡相距 10 cm。在下面的方格紙中繪畫光線圖，顯示像怎樣形成。

The focal length of the lens is 15 cm and the image formed is 10 cm away from the lens. In the following graph paper, draw a ray diagram to show how the image is formed. （3 marks）

L

5 cm

principal
axis
主軸
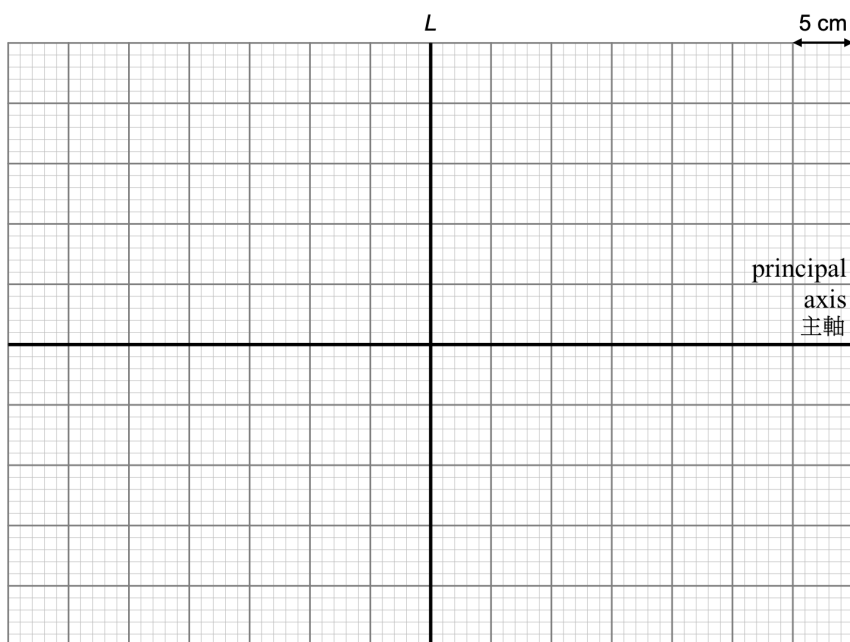
(d) 如果學生把透鏡移近字母「F」，像距、像的方向會怎樣改變？

If the lens is moved closer to the letter 'F', how will the image distance, the orientation and of the image change? （2 marks）
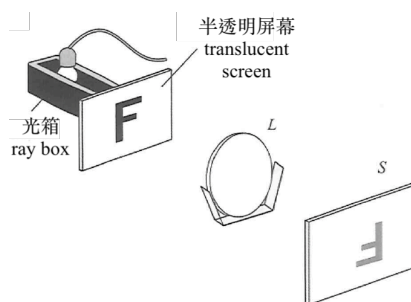
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MCQs

1. 利用光線箱照亮印有字母 "F" 的半透明屏幕。把凸透鏡 L 和屏幕 S 放在適當的距離，以便在 S 上形成清晰、倒立及等大的成像。下列哪些陳述是正確的？

   A translucent screen printed with a letter "F" is illuminated by a ray box. A convex lens L and a screen S are placed so that an inverted sharp image of the same size as the object is produced. Which of the following statements is/are true?


   (1)   若把 L 略為向右移，成像將向左移。
          If L is moved to the right through a short distance, the image will move to the left.

   (2)   若把 L 略為向上提，成像將向上移。
          If L is raised through a short distance, the image will move upward.

   (3)   若把 L 略為向光線箱移動，S 須移離光線箱，以便再次捕捉成像。
          If L is raised through a short distance, the image will move upward.

   A.   只有 (1)   (1) 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)

2. 如圖顯示，物體藉凸透鏡形成一個倒置的像。圖中亦繪畫了四條來自這物體的光線。哪條光線是不正確的？
   An object is placed in front of a convex lens and an inverted image is formed as shown. Four rays from the object are drawn. Which of them is/are incorrectly drawn?
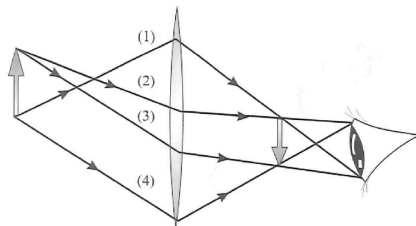

A.	只有 (1)	(1) only
B.	只有 (4)	(4) only
C.	只有 (2) 和 (4)	(2) and (4) only
D.	(2), (3) 和 (4)	(2), (3) and (4)

3. 如圖顯示，兩條會聚的光線投射在一個主焦點為 F 的透鏡上。哪字母代表折射線所會聚的一點？
   A pair of converging light rays strike a lens with focus F as shown. Which of the letters represents the point where the rays will be converged?
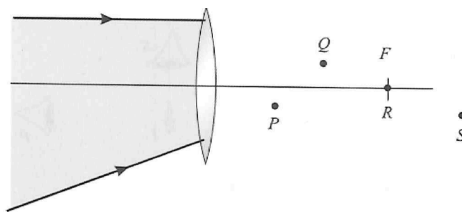
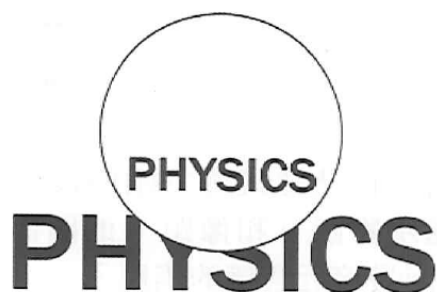| A.	P
B.	Q
C.	R
D.	S

4. 如圖顯示一條光線，穿過凹透鏡 L 後發生的折射。哪字母可能是 L 的主焦點？
   A ray of light is refracted by a concave lens L as shown. Which of the letters can be the focus of L?
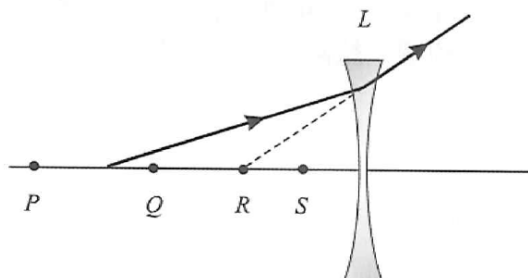
   A.　　 P
   B.　　 Q
   C.　　 R
   D.　　 S

5.

   如圖顯示，一個透鏡放在印有 "PHYSICS" 字樣的紙板上的情況。以下哪些改變可增加成像的尺寸？
   The diagram shows the result when a lens is held above a paper printed with the word "PHYSICS". Which of the following may increase the size of the image?

   (1)　　 增加透鏡的焦距
   　　　　 increase the focal length

   (2)　　 把透鏡的位置略為提高
   　　　　 raise the lens higher

   (3)　　 使用較大折射率的透鏡
   　　　　 use a lens of larger refractive index

6. 一條光線通過兩塊透鏡，並入射線與出射線皆與主軸平行，如圖。下列哪項正確？A light ray passes two lenses as shown. Both the incident and emergent rays are parallel to the principal axis. Which of the following statements is/are correct?
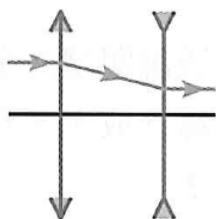
(1)　　凸透鏡的焦距較凹透鏡長。
　　　　The focal length of the convex lens is longer than that of the concave lens.

(2)　　兩塊透鏡各自一個主焦點在凹透鏡右方重疊。
　　　　One of the foci of the convex lens and one of the foci of the concave lens overlap on the right of the concave lens.

(3)　　即使入射線並非平行於主軸，它與出射線仍然互相平行。
　　　　The incident and the emergent rays are still parallel if the incident ray is not parallel to the principal axis.

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

7. 一個物體通過透鏡成像，如圖。
   An object and its image formed by a lens are as shown.
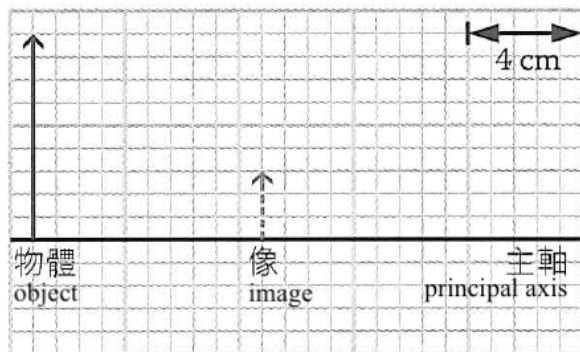
透鏡的焦距是多少？
What is the focal length of the lens?

A. 1 cm
B. 1.5 cm
C. 4 cm
D. 6 cm