

GCSE Physics (9 – 1)

Lens Ray Diagrams

Name:

Group:



Instructions

- Read each question carefully before you begin to answer it.
- Use black ink or black ball-point pen for your answers.
- Fill in the boxes at the top of this page with your name and group.
- Attempt to answer every question in the booklet.
- Answer the questions in the spaces provided – there may be more space than you need in some answer spaces.
- Calculators may be used for this booklet.
- For any calculations, you **must** show all your working.
- Any and all drawings or graphs should be completed in pencil.

Information

- The maximum mark for this paper is 86 marks.
- The marks for each question are shown in brackets.
- Please be aware that good English and clear presentation are required in your answers.

For markers use	
Question	Mark
1	/4
2	/8
3	/11
4	/19
5	/12
6	/12
7	/8
8	/4
9	/4
10	/4
Total	/86
%	
Grade	



1. Lenses have many uses in modern life from phone cameras to magnifying glasses. Answer the following questions. Circle the letter of the correct answer part (a), (b) and (c).

a) A student is drawing a ray diagram to determine the image formed by a convex lens. They draw a ray parallel to the principal axis. After passing through the lens, this ray will:

- A** Continue parallel to the principal axis.
- B** Pass through the focal point on the opposite side of the lens.
- C** Appear to diverge from the focal point on the same side of the lens.
- D** Bend towards the principal axis but not necessarily pass through the focal point.

(1 mark)

b) An object is placed between the focal point (F) and a convex lens. When a ray diagram is drawn for this situation, the resulting image will be:

- A** Real, inverted, and magnified.
- B** Real, upright, and diminished.
- C** Virtual, upright, and magnified.
- D** Virtual, inverted, and diminished.

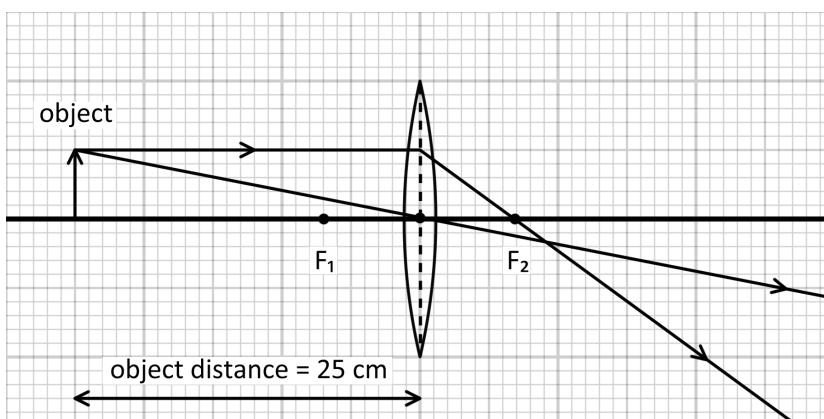
(1 mark)

c) A student sets up a concave lens. When drawing a ray diagram, they draw a ray aimed directly at the focal point on the other side of the lens (as if it would pass through it if the lens wasn't there). After passing through the diverging lens, this ray will:

- A** Continue along the same path, undeflected.
- B** Bend towards the principal axis.
- C** Bend away from the principal axis and become parallel to it.
- D** Appear to have come from the focal point on the same side of the lens.

(1 mark)

d) The figure below shows the ray diagram for convex lens.



i. Determine the focal length of the convex lens from the figure above. Each little square represents 1 cm in real life.

Focal length = ...
(1 mark)

(Total for Question 1 is 4 marks)

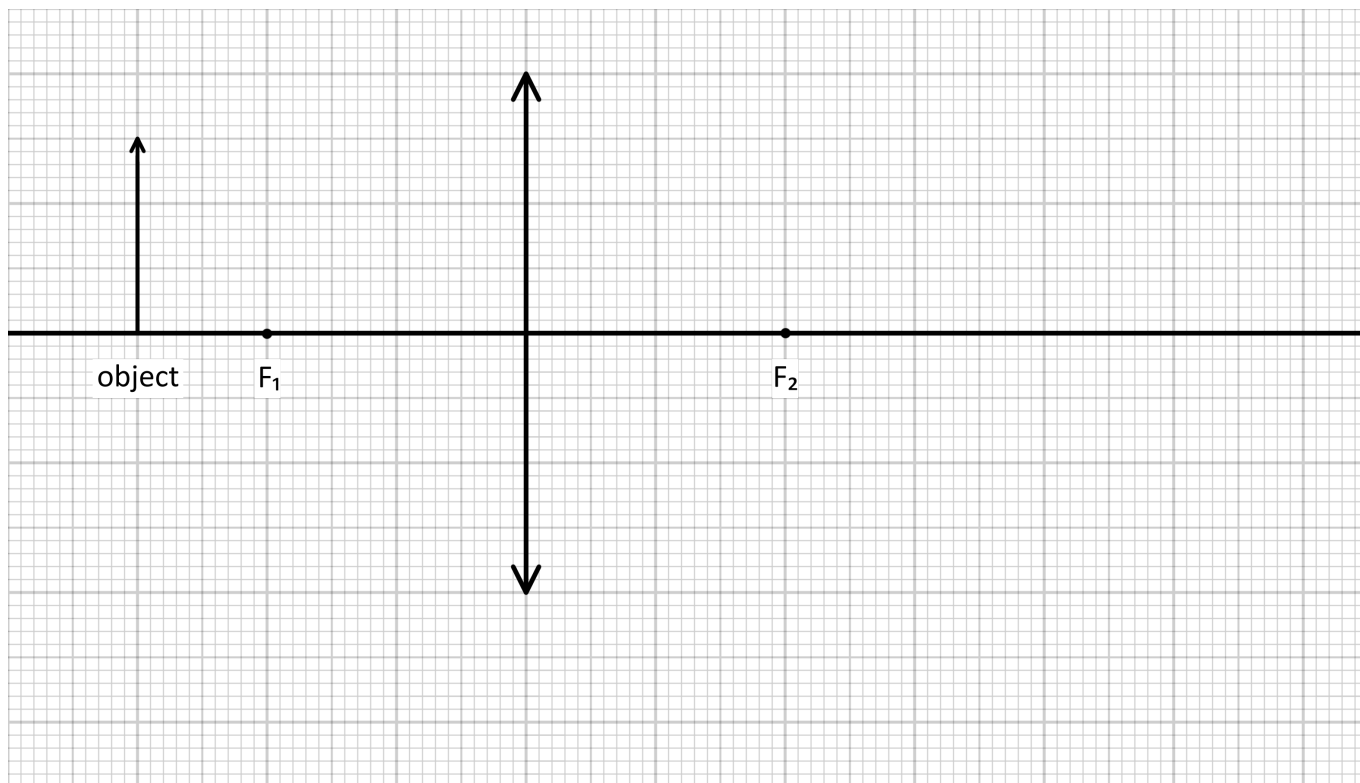
2. The figure below shows part of a ray diagram for a lens.

a) State the type of lens shown in the figure below.

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(1 mark)

b) Complete the ray diagram.



(4 marks)

c) Describe the image formed by the lens.

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(3 marks)

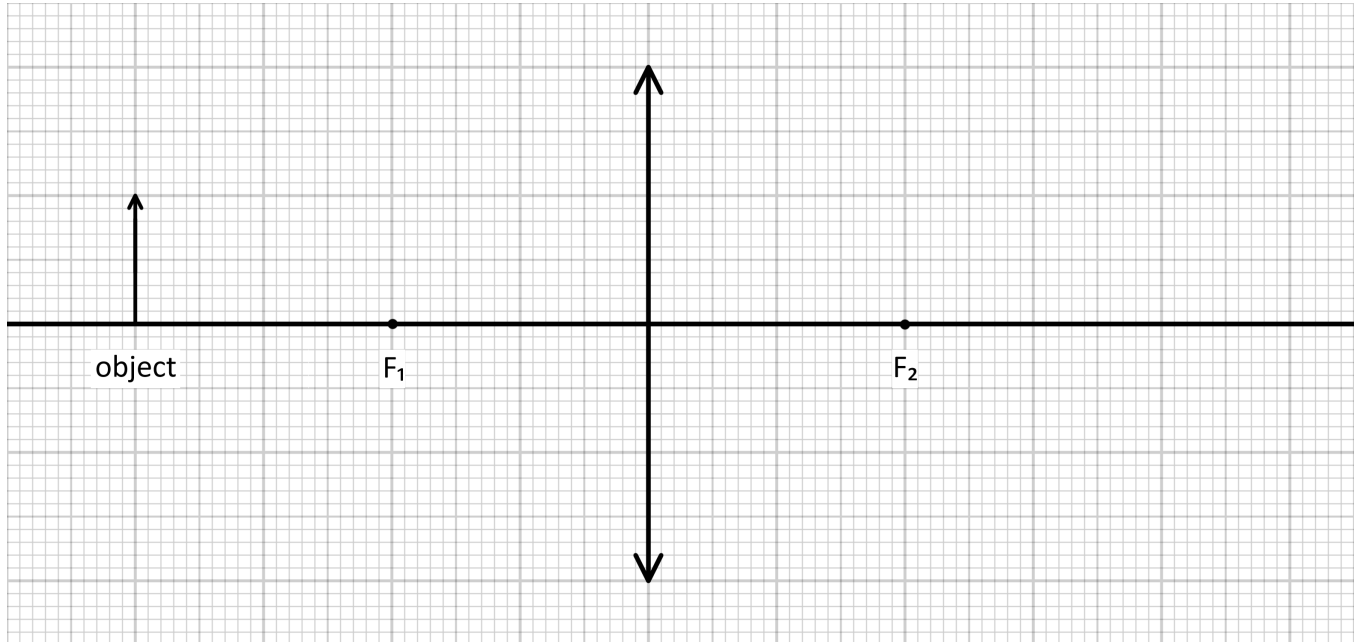
(Total for Question 2 is 8 marks)

3. The figure below shows part of a ray diagram for a lens.

a) State the type of lens shown in the figure below.

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(1 mark)

b) Complete the ray diagram.



(4 marks)

c) Describe the image formed by the lens.

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(3 marks)

A student is using a convex lens to form a clear image of a distant object on a screen. They find that the sharpest image is formed when the screen is placed 20 cm away from the lens.

d) What is the focal length of this converging lens? Give your answer in metres.

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(1 mark)

e) Calculate the power of this lens. Include the correct unit in your answer.

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Power = ...
(2 marks)

(Total for Question 3 is 11 marks)

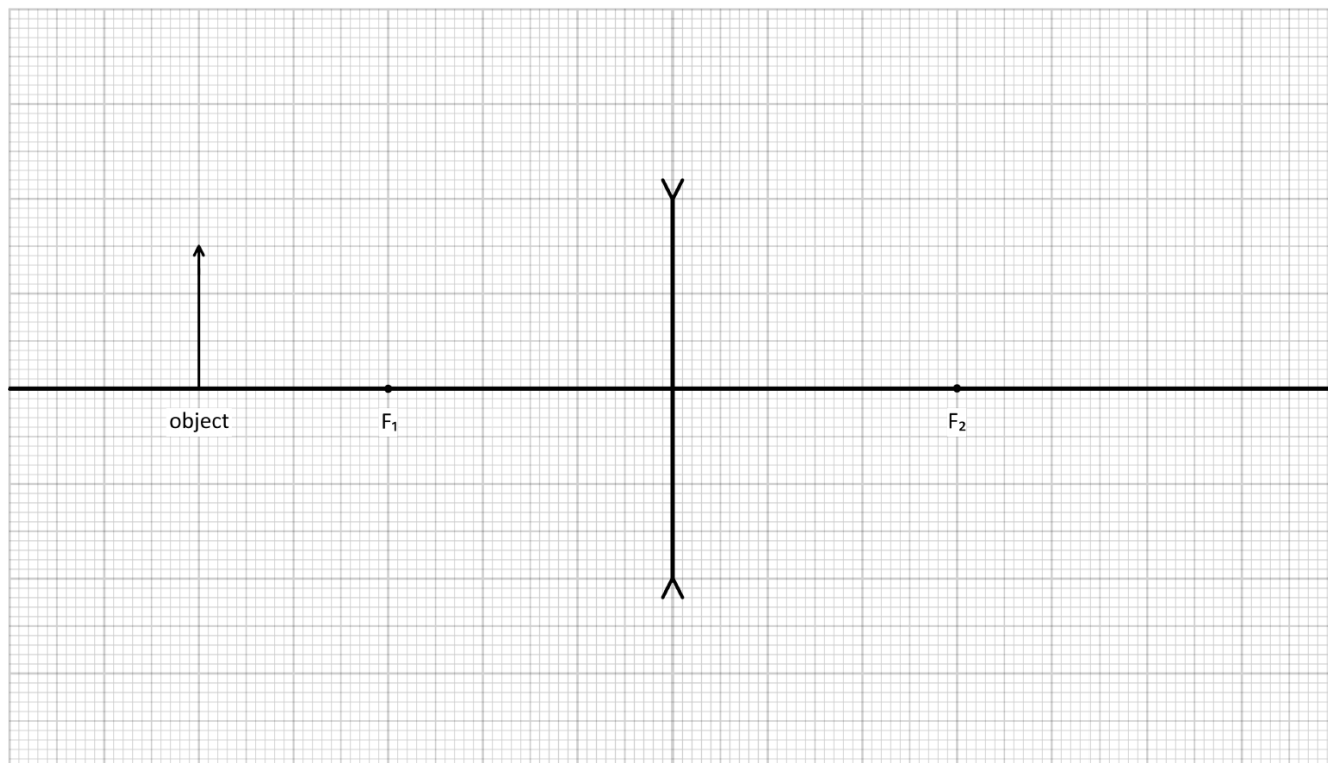
4. The figure below shows part of a ray diagram for a lens.

a) State the type of lens shown in the figure below.

.....

(1 mark)

b) Complete the ray diagram.



(4 marks)

c) Describe the image formed by the lens.

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(3 marks)

A student is using a concave lens. When parallel rays of light are incident on the lens, they appear to diverge from a virtual point located 15 cm in front of the lens.

d) What is the focal length of this concave lens?

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(1 mark)

e) Calculate the power of this concave lens. Include the correct unit and sign in your answer.

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Power = ...

(2 marks)

f) Explain why the power of a concave lens is **negative**.

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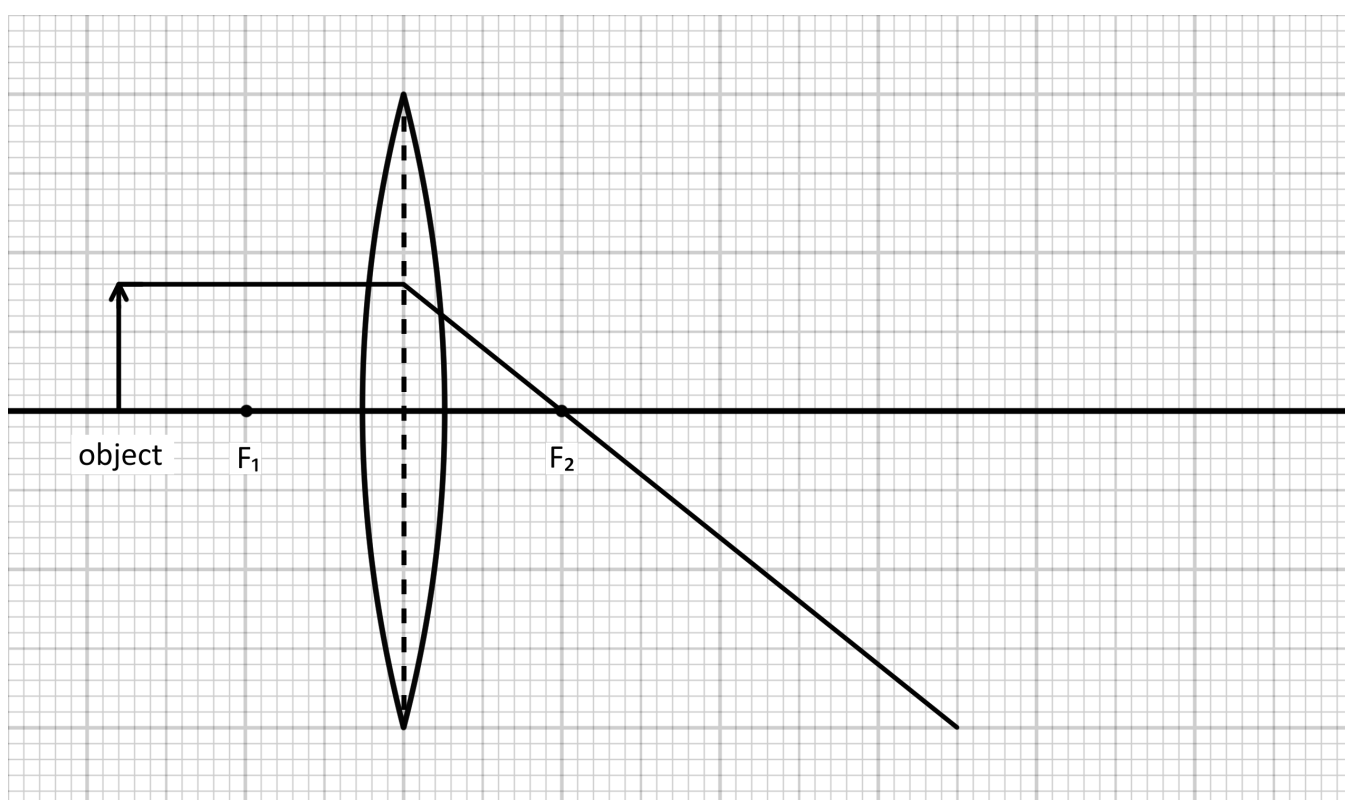
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(2 marks)

The student used another lens in a separate investigation. The figure below shows the ray diagram for the new lens.

g) Complete the ray diagram for the lens below.



(3 marks)

h) Describe the image formed by this new lens.

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(3 marks)

(Total for Question 4 is 19 marks)

5. A student conducted an experiment to demonstrate refraction using a lens.

a) Describe the process of refraction.

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(3 marks)

b) State the law of refraction.

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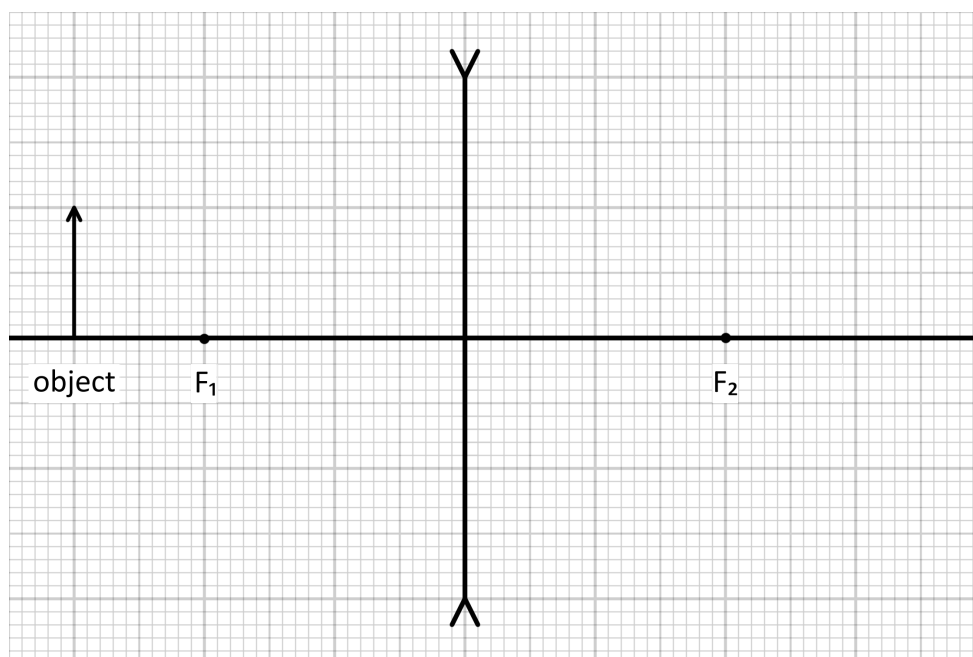
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(2 marks)

The figure below shows the uncompleted ray diagram for the lens the student used.

c) Complete the ray diagram for the lens below.



(4 marks)

i) Describe the image formed by this lens.

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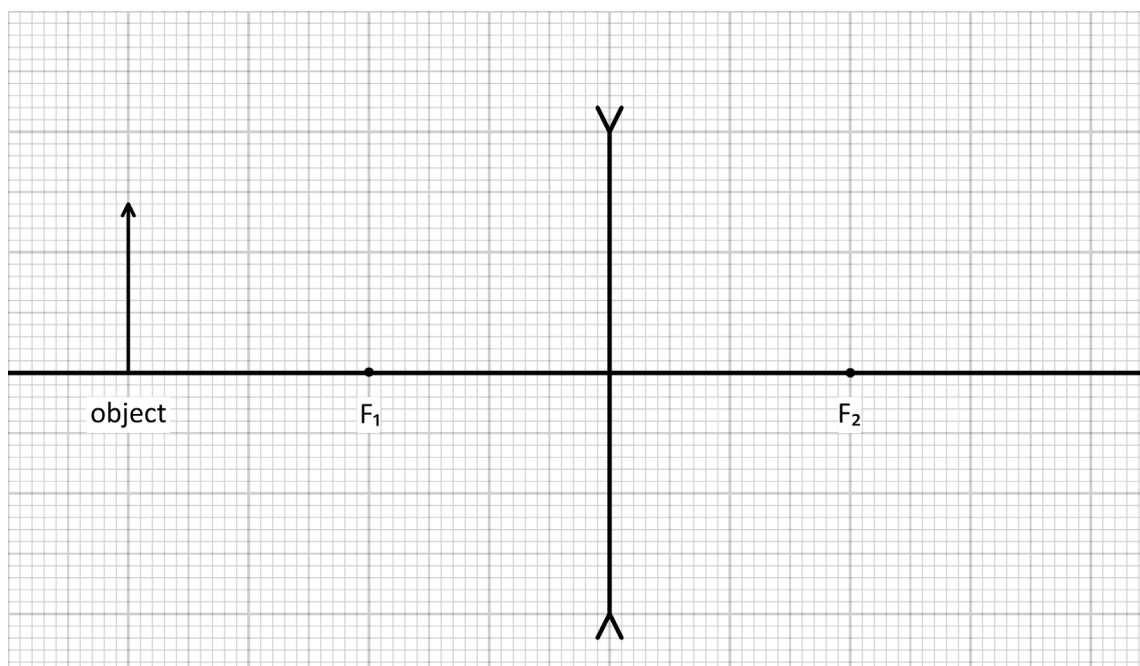
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(3 marks)

(Total for Question 5 is 11 marks)

6. A teacher has drawn an incomplete ray diagram for a concave lens.

a) Complete the ray diagram below.



b) Describe the image formed by this lens.

(4 marks)

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(3 marks)

Another student shines a parallel beam of red light through a different concave lens.

After passing through the lens, the light rays diverge. If these diverging rays are traced back, they appear to originate from a point 25 cm in front of the lens.

c) Calculate the power of this concave lens. Show your working and give your answer to two decimal places with the correct unit and sign.

Power = ...

(3 marks)

d) If the student were to use a concave lens with a power of -8.0 D, would the light rays diverge more or less compared to the lens in part (f)? Explain your reasoning.

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(2 marks)

(Total for Question 6 is 11 marks)

7. A student was doing an experiment investigating the refractive index of a lens.

a) What is a refractive index?

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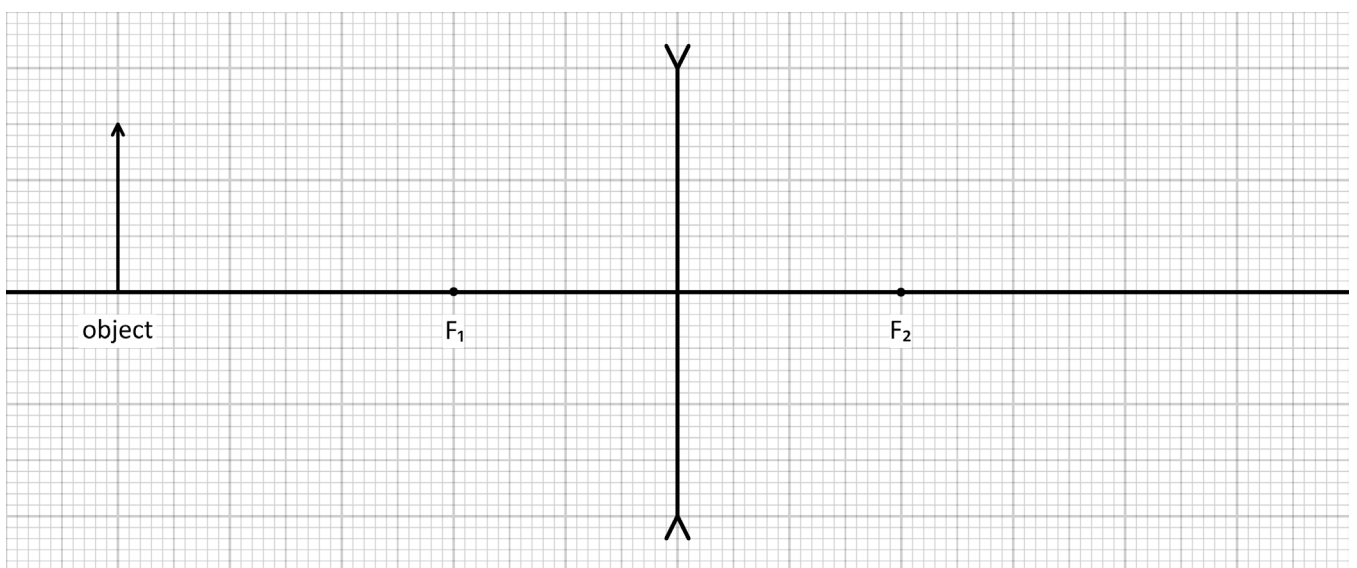
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(1 mark)

The student prepared a ray diagram for the lens they were using. The figure below shows what the student has drawn.

b) Complete the ray diagram.



(4 marks)

c) Describe the image formed by this lens.

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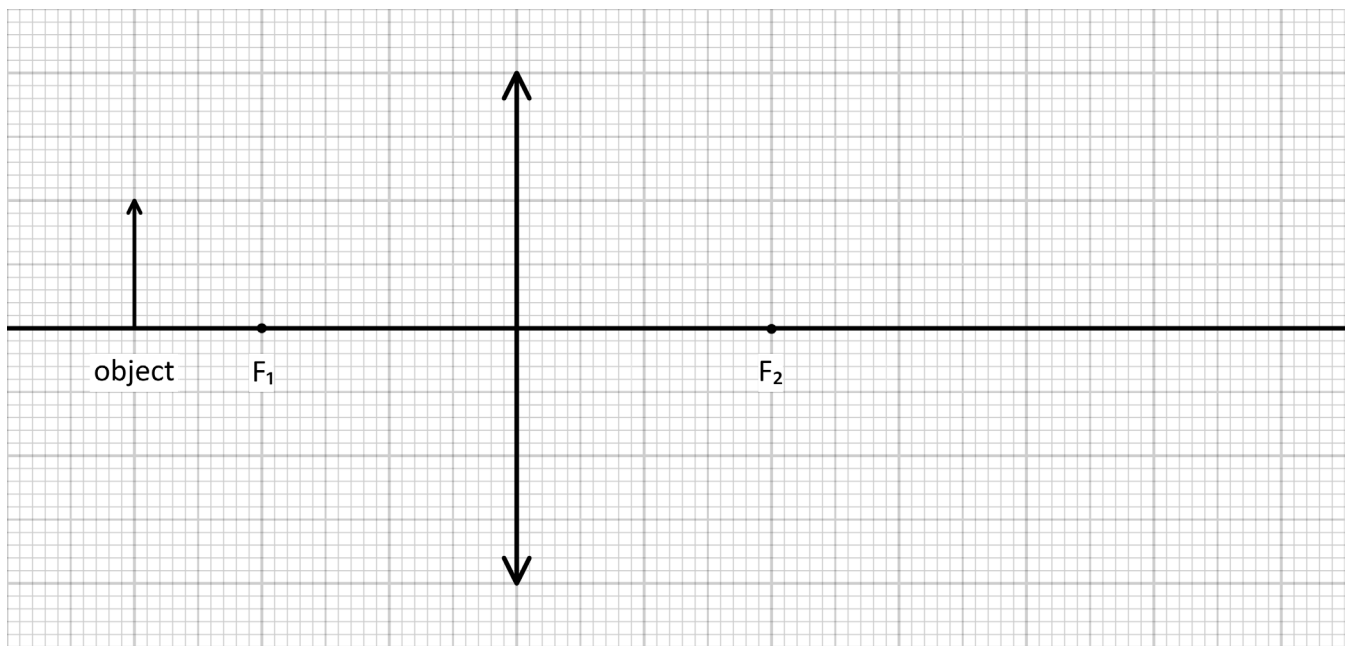
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(3 marks)

(Total for Question 7 is 8 marks)

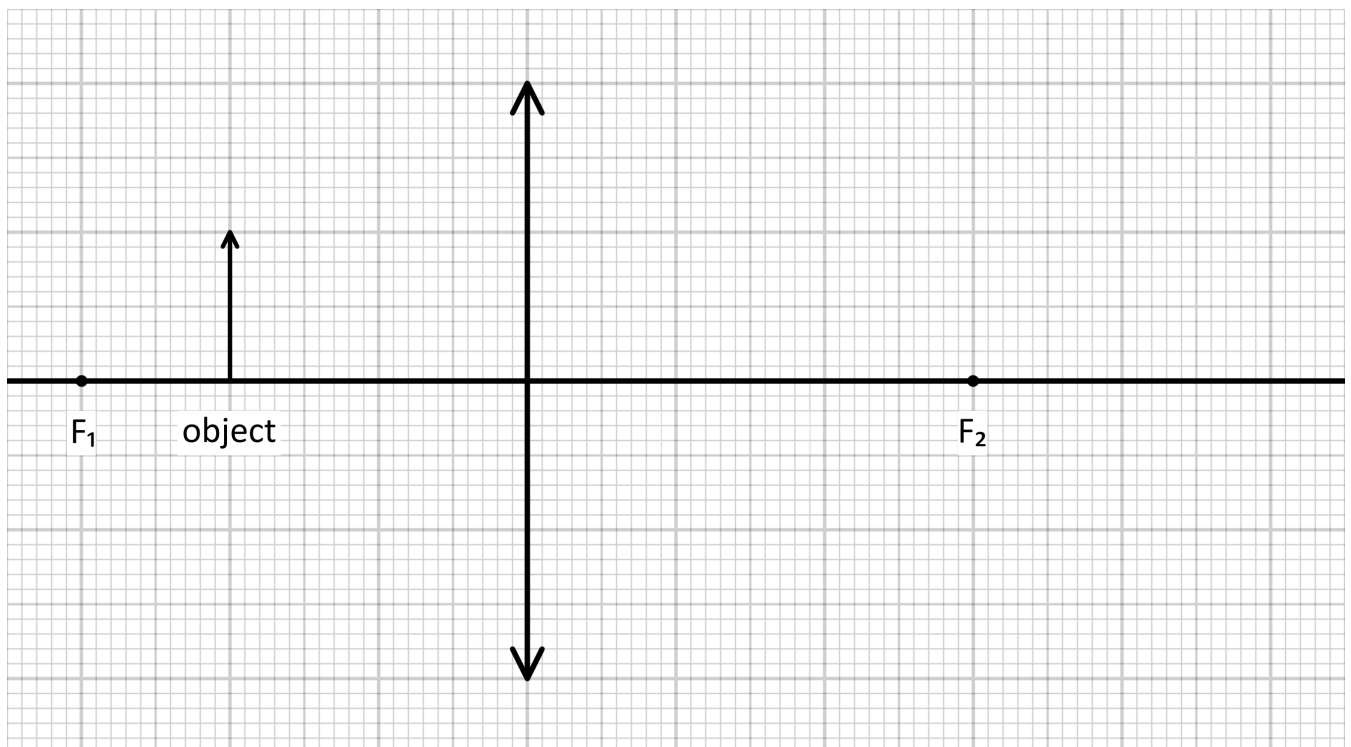
8. Complete the ray diagram for the lens in the figure below.



(4 marks)

(Total for Question 8 is 4 marks)

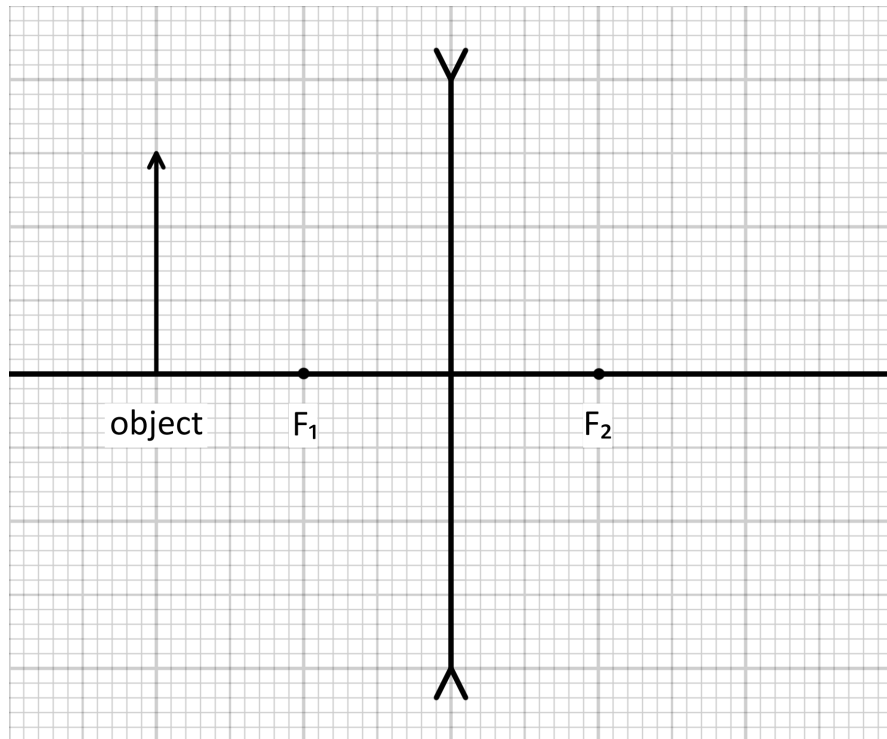
9. Complete the ray diagram for the lens in the figure below.



(4 marks)

(Total for Question 9 is 4 marks)

10. Complete the ray diagram for the lens in the figure below.



(4 marks)

(Total for Question 10 is 4 marks)