# 6- Waves

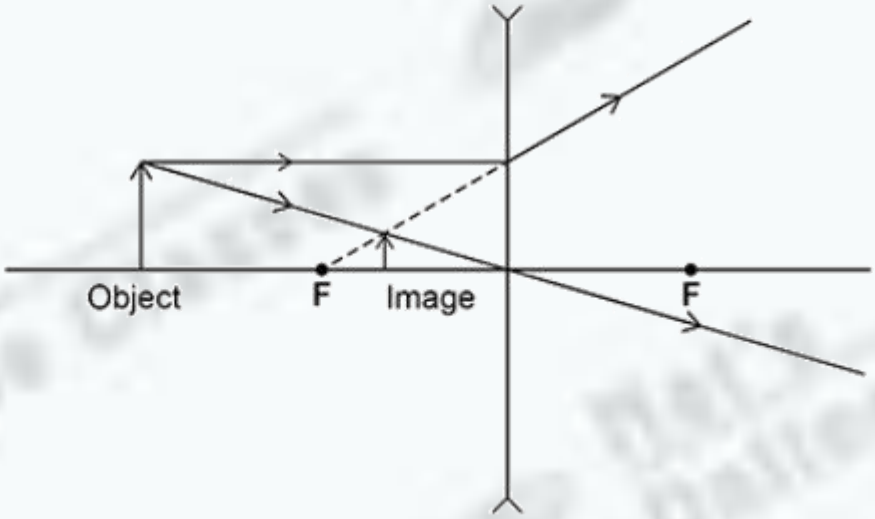
## Total mark – 18

## Question: 1

Lenses are used to form images of objects.

(a) **Figure 1** shows how a concave lens forms an image of an object.

**Figure 1**




The image of the object in **Figure 1** is upright.

Give **two** other words that describe the image.

1 _____

2 _____

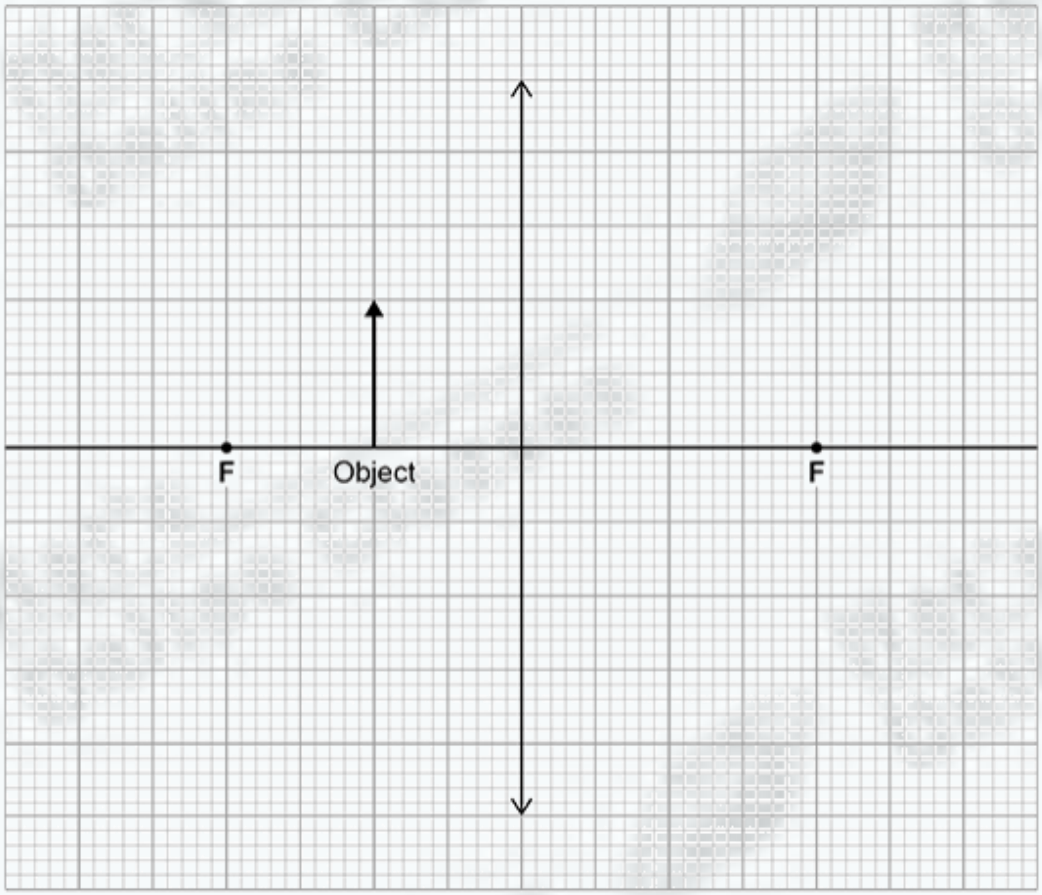
**(1)**

(b) **Figure 2** shows an object near to a **convex** lens.

Complete the ray diagram to show how the image is formed.

Use an arrow to represent the image.

**Figure 2**

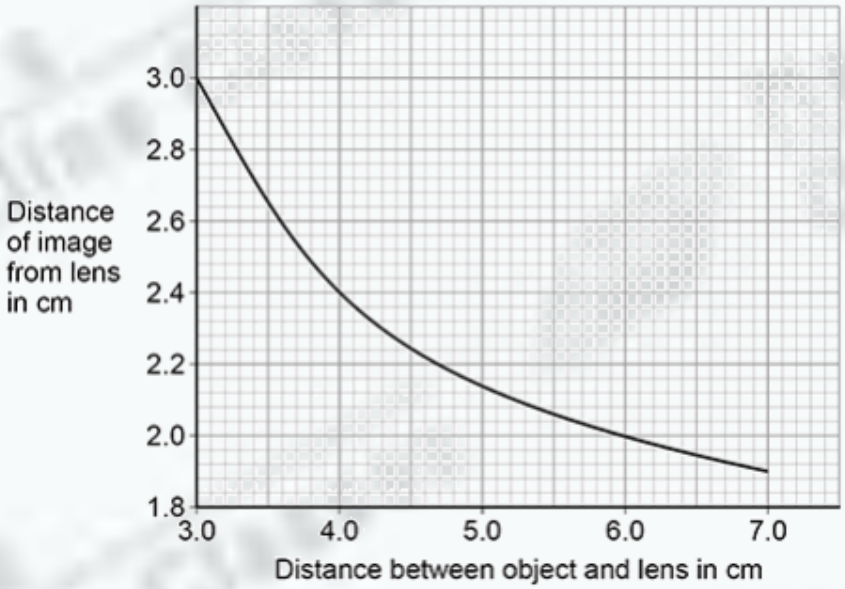



**(3)**

The position of an image formed by a convex lens varies with the distance between the object and the lens.

**Figure 3** shows the results of a student's investigation using a convex lens.

**Figure 3**




(c) Describe how the distance of the image from the lens decreases as the distance between the object and the lens increases.

**(1)**

(d) The student measured the distance from the image to the lens four times.

The distance between the object and the lens did not change.

The 4 measurements from the image to the lens were:

1.9 cm 1.7 cm 2.2 cm 1.4 cm

Calculate the uncertainty in the measurements.

_____

_____

_____

Uncertainty = ± _____ cm

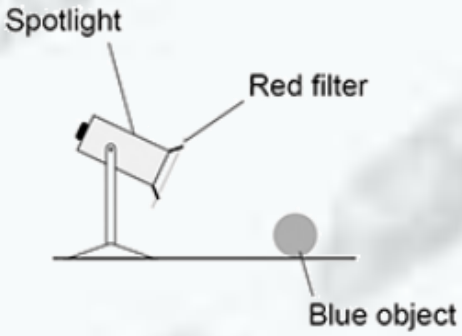
**(2)**

(e) **Figure 4** shows a spotlight containing a convex lens.

A red filter is placed in front of the spotlight.

The spotlight is directed at a blue object.

**Figure 4**




Explain why the blue object appears black.

**(3)**

# Question: 2

Ultraviolet is a type of electromagnetic wave.

(a) Give **one** use of ultraviolet.

_____

**(1)**

(b) An ultraviolet wave has a wavelength of 300 nanometres.

Which of the following is equal to 300 nanometres?

Tick (✓) **one** box.

$3 \times 10^{7}$ m ☐

$3 \times 10^{-7}$ m ☐

$3 \times 10^{9}$ m ☐

$3 \times 10^{-9}$ m ☐

**(1)**

(c) The speed of ultraviolet waves is $3 \times 10^{8}$ m/s.

Calculate the frequency of the ultraviolet wave.

Use your answer to part (b)

_____

_____

Frequency = _____ Hz

**(3)**

(d) The table below gives the wavelength of an ultraviolet wave and three other electromagnetic waves.

| | **Ultraviolet** | **Wave E** | **Wave F** | **Wave G** |
|---|---|---|---|---|
| **Wavelength in nanometres** | 300 | 0.1 | 600 | 100 000 |

Draw **one** line from each wave to the name of the wave.

| Wave | Name |
| --- | --- |
| **Wave E** | Infrared |
| **Wave F** | Visible light |
| **Wave G** | X-rays |

**(1)**

(e) Electromagnetic waves are transverse.

Some other types of wave are longitudinal.

Describe the difference between transverse and longitudinal waves.

_____

_____

**(2)**