

# REVISION OF P3

**Learning Objective:** Recap all of the physics content with past paper questions



**TARLETON**  
ACADEMY

FACIMUS NOSTRAE FUTURAE

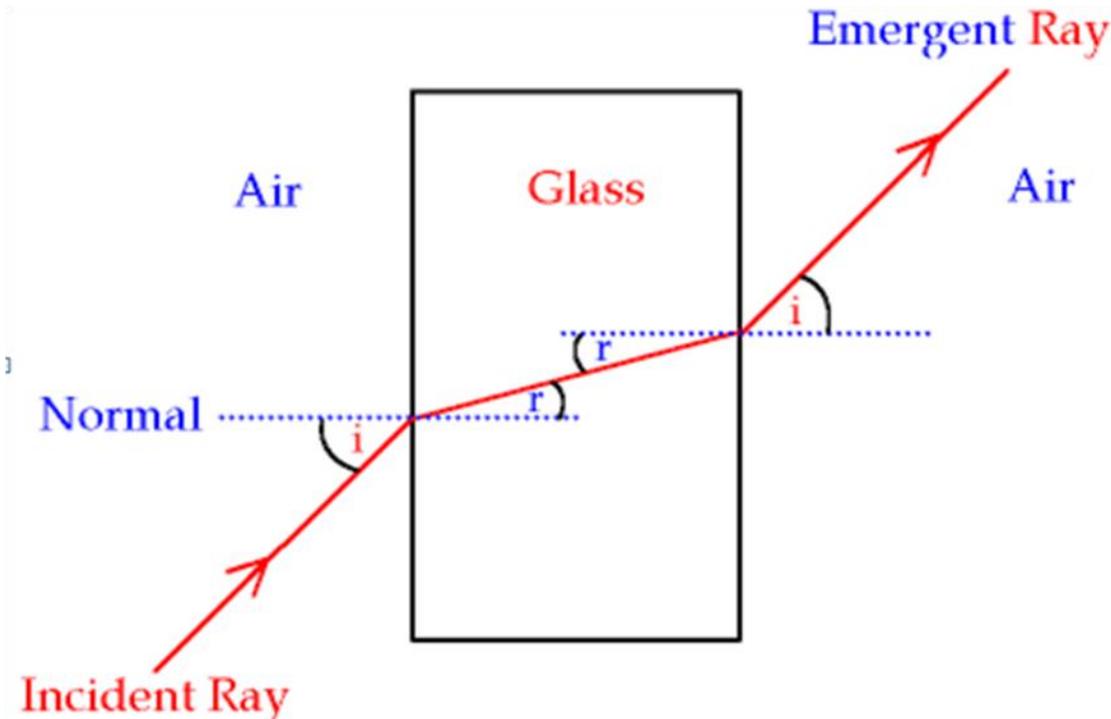
Topic	Slide numbers
Refraction	4-10
Lenses	11-33
The eye	34-52
Total internal reflection	53-71
X-rays	72-79
Ultrasound	80-90
Centre of mass	91-98
Pendulums	99-106
Moments	107-113
Hydraulics	114-123
Centripetal force	124 - 136
The motor effect	137-149
Transformers	150-162

# LEARNING OUTCOMES

- ◉ **Good-** know the key facts in the physics module
- ◉ **EBI-** You can apply what we recap to past paper questions
- ◉ **Excellent-** You can get 75% of marks in each question

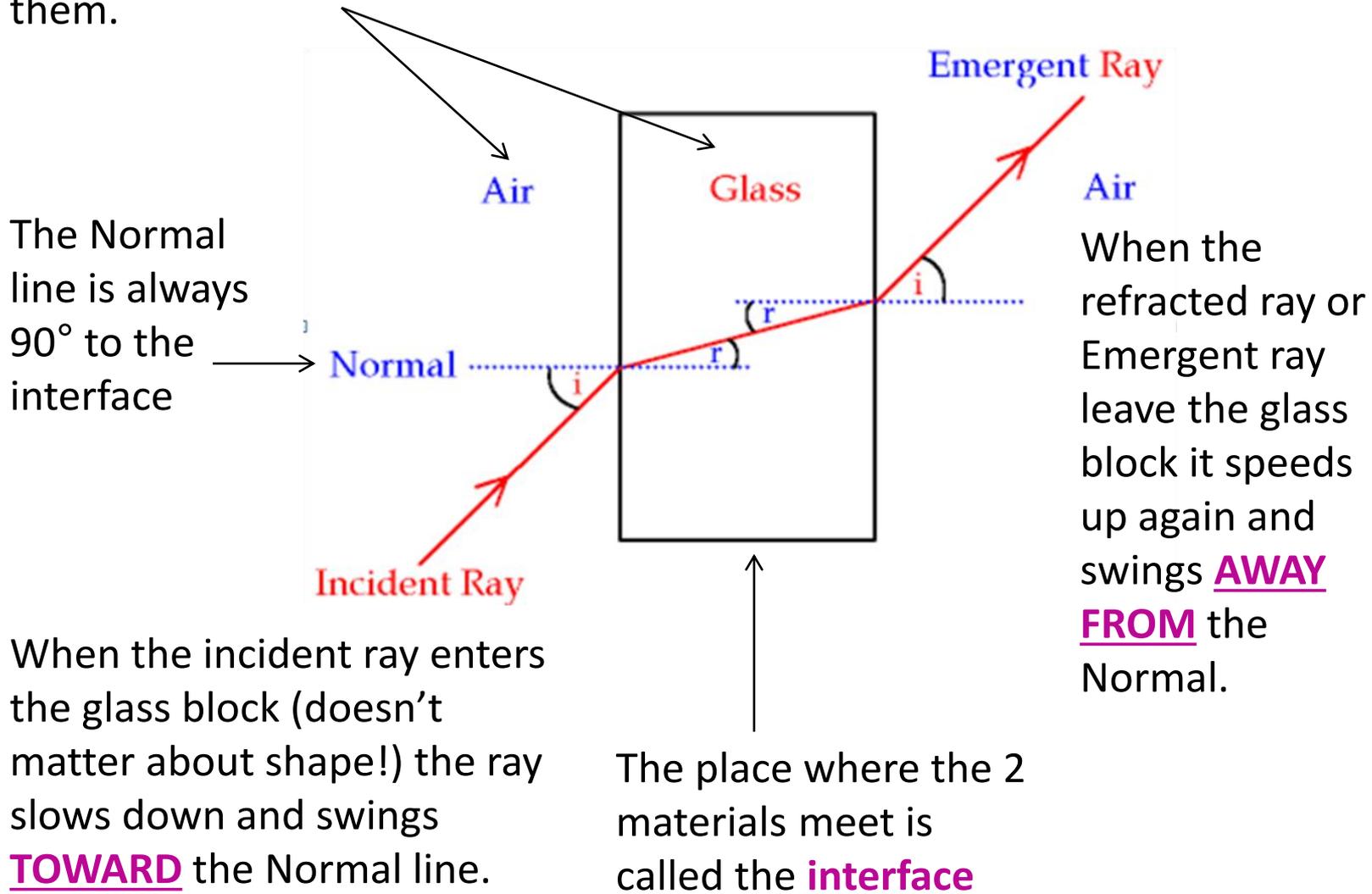
# REFRACTION

- Refraction is the change of direction of light as it passes from one medium to another. The two media must have different densities, such as air and glass.



# REFRACTION

2 different materials which have different densities. The more dense a material the more particles. Light can travel faster in air than it can in a liquid or solid so it slows down when entering them.



The Normal line is always 90° to the interface

When the incident ray enters the glass block (doesn't matter about shape!) the ray slows down and swings TOWARD the Normal line.

The place where the 2 materials meet is called the interface

When the refracted ray or Emergent ray leave the glass block it speeds up again and swings AWAY FROM the Normal.

# REFRACTION

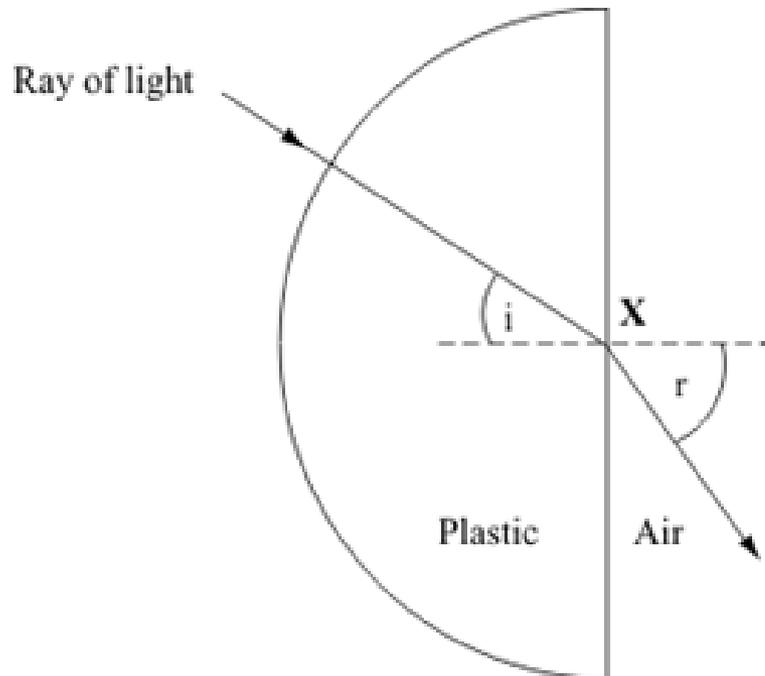
- The amount of refraction depends on the angle the light hits the boundary between the substances and the difference in relative densities, between the two media
- The degree to which a material slows the speed of light is its refractive index. This can be calculated using the equation:
  - Refractive index =  $\frac{\sin i}{\sin r}$
  - $i$  is the angle of incidence
  - $r$  is the angle of refraction

# PAST PAPER QUESTION

A student investigated the refraction of light as it passes out of a transparent plastic block.

She aimed a ray of light at point **X**. She marked the position of the ray as it passed through the transparent plastic block and into the air.

The angle  $i$  is the angle of incidence.



(i) What is the name of angle  $r$ ?

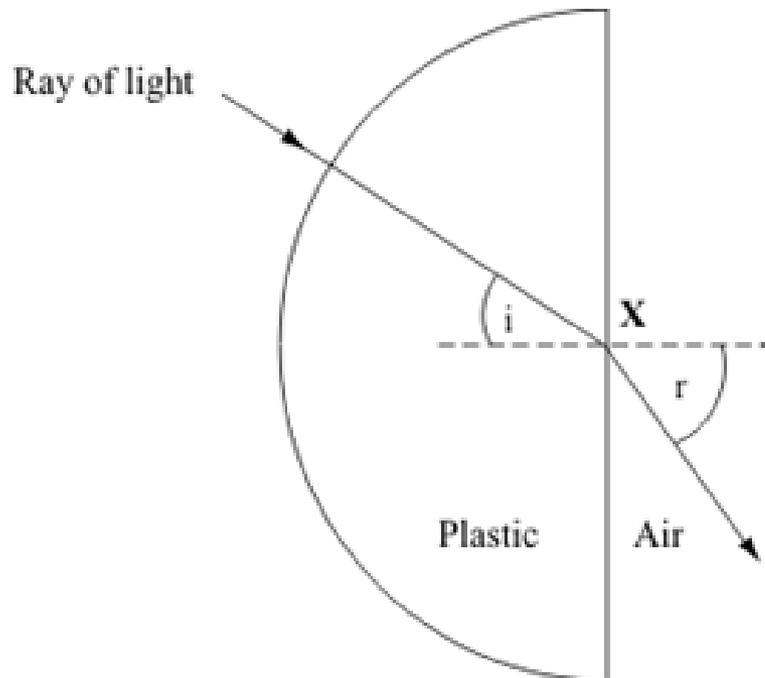
Angle of refraction

# PAST PAPER QUESTION

A student investigated the refraction of light as it passes out of a transparent plastic block.

She aimed a ray of light at point **X**. She marked the position of the ray as it passed through the transparent plastic block and into the air.

The angle  $i$  is the angle of incidence.

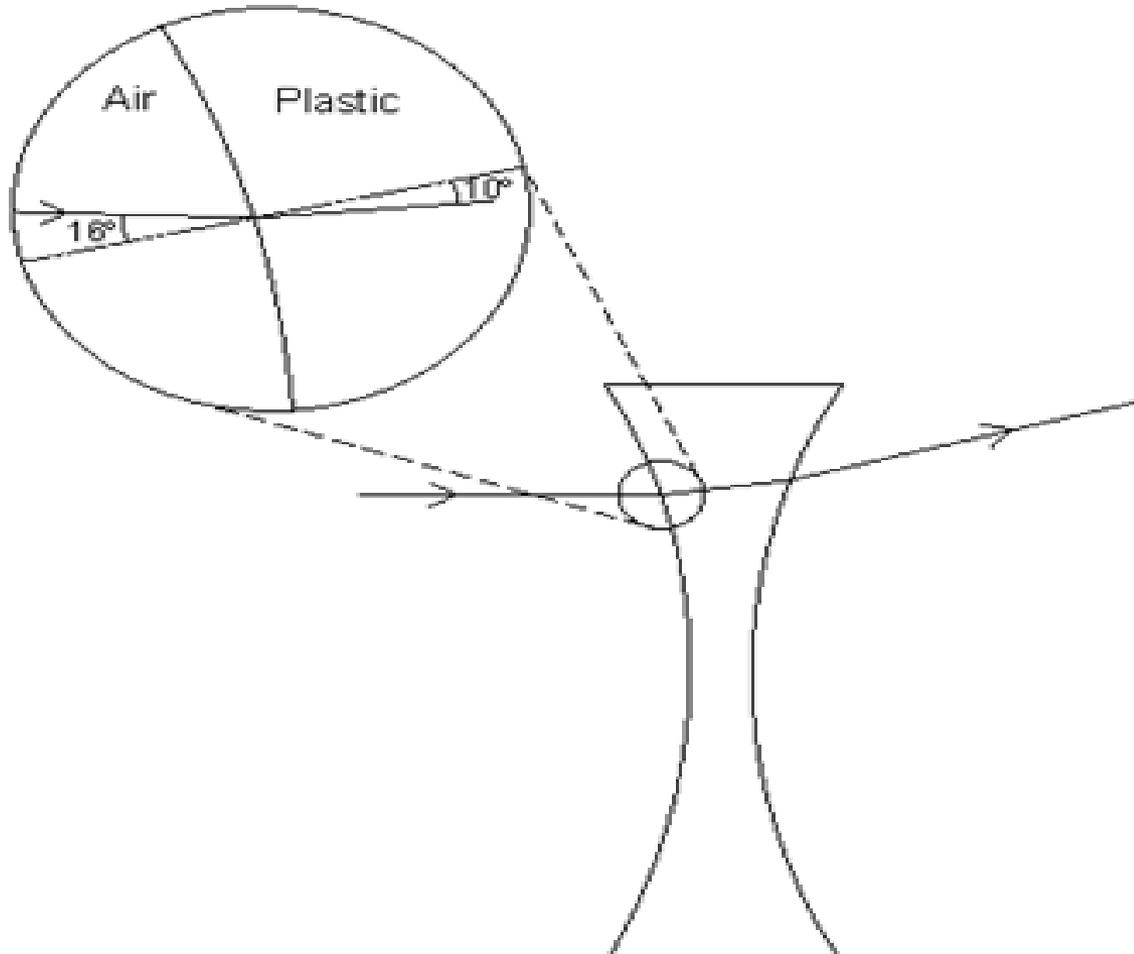


What is the name of the dashed line?

The normal

# PAST PAPER QUESTION

The diagram shows a ray of light passing through a diverging lens.



$$\text{Refractive index} = \frac{\sin 16^\circ}{\sin 10^\circ}$$
$$\text{Refractive index} = 1.59$$

## EXAMINER TIP

- ◉ Know the direction in which light is refracted in different situations.

Write a sentence that shows the examiner that you know this.

Swap books with the person next to you and write a what went well and an even better if for their statement

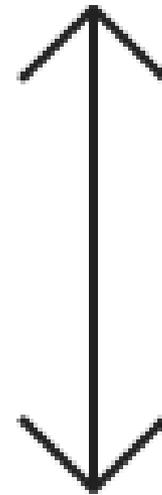
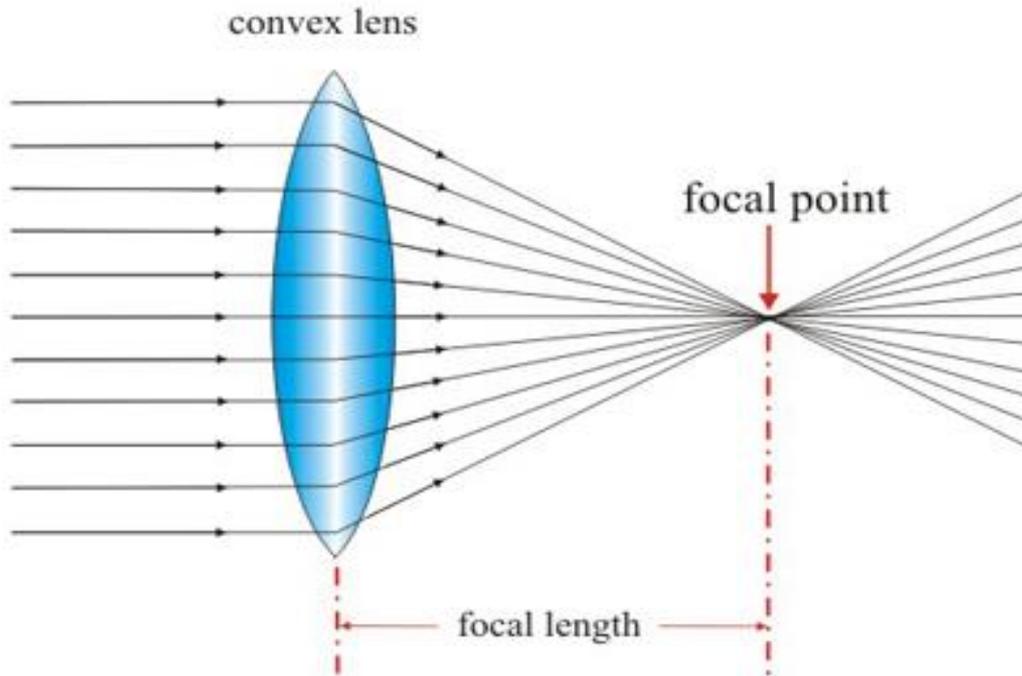


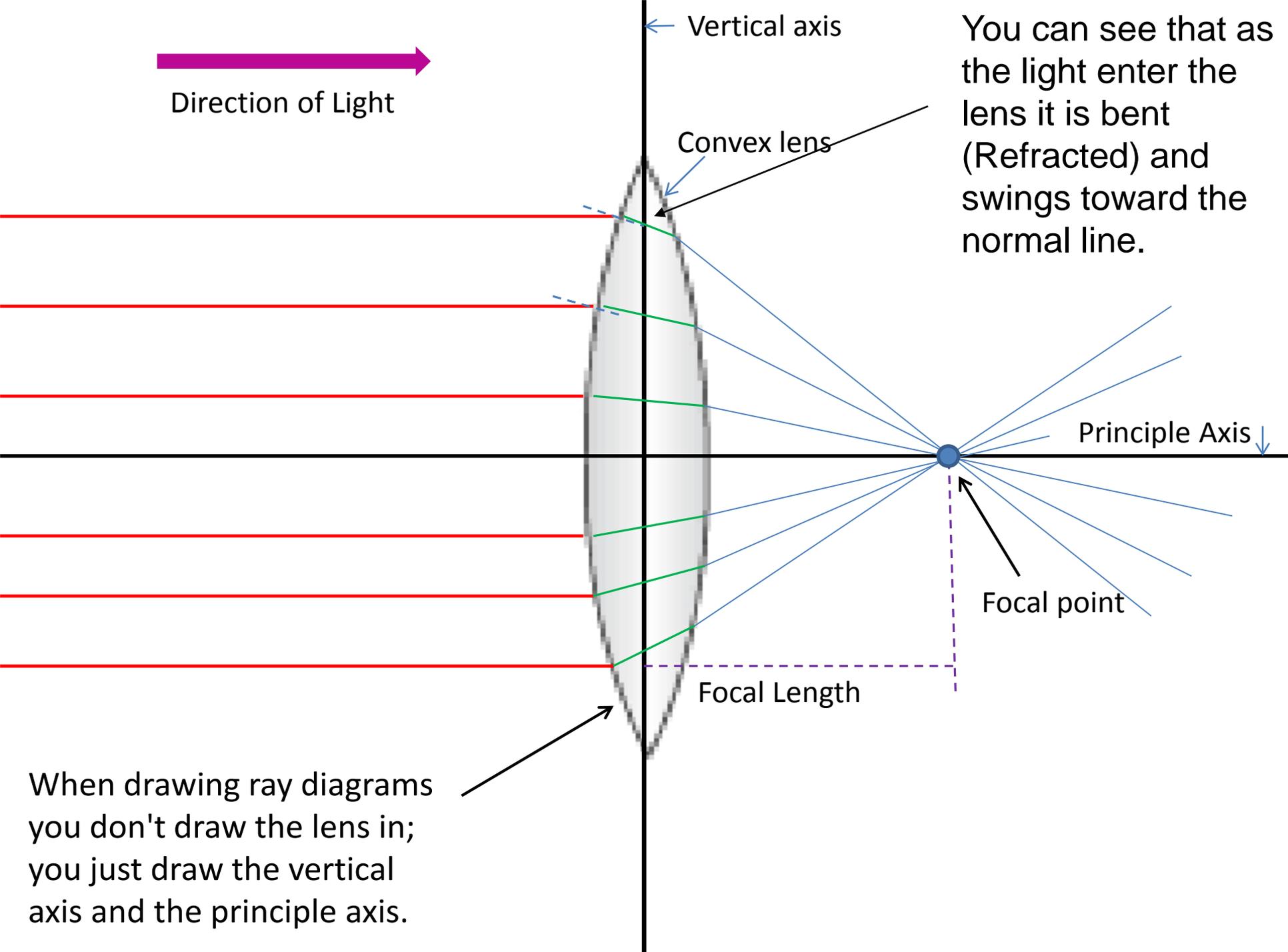
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# LIGHT THROUGH A CONVERGING LENS

- Lenses use refraction to change the direction of light to form images.
- A converging lens is a lens that makes all the light rays meet at one point.





Direction of Light

Vertical axis

Convex lens

You can see that as the light enter the lens it is bent (Refracted) and swings toward the normal line.

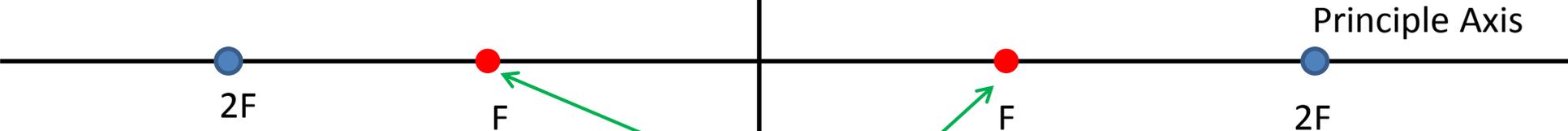
Principle Axis

Focal point

Focal Length

When drawing ray diagrams you don't draw the lens in; you just draw the vertical axis and the principle axis.

Vertical axis



Principle Axis

2F

F

F

2F

2 F points and 2 2F points. The reason for this is because light can enter in either side of the convex lens.

The 2F point is just the centre of the circle if the circles were drawn in.

Vertical axis **Formation of image when the object is beyond the 2F.**

Step 1.  
Draw a light ray from the top of the object to the vertical axis running parallel to the principle axis.

Step 3.  
Draw a ray from the top of the object running diagonally through the cross between the principle and vertical axis.

Step 2.  
From this ray draw a refracted ray running diagonally through the focal point.

Object

2F

F

F

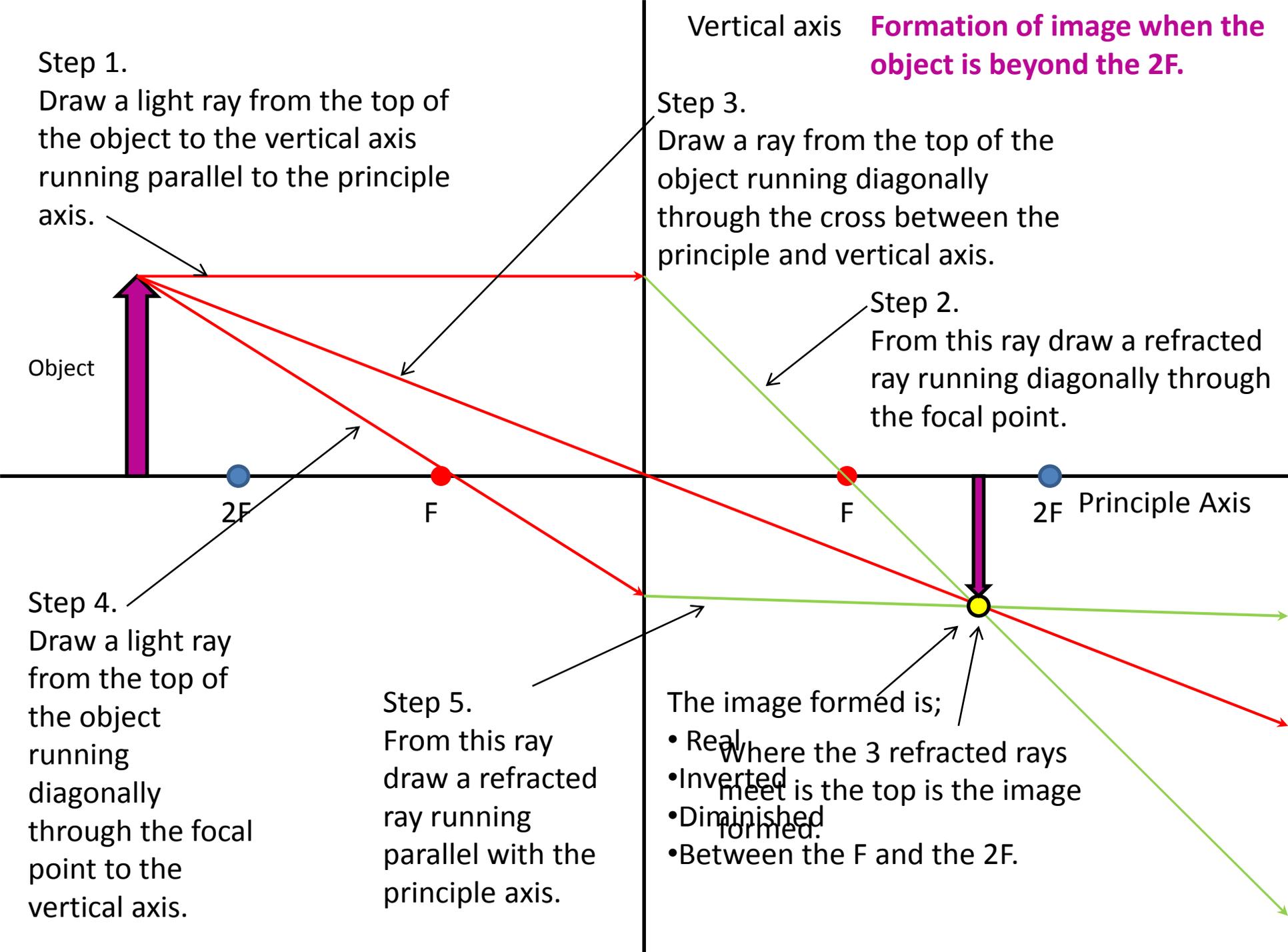
2F

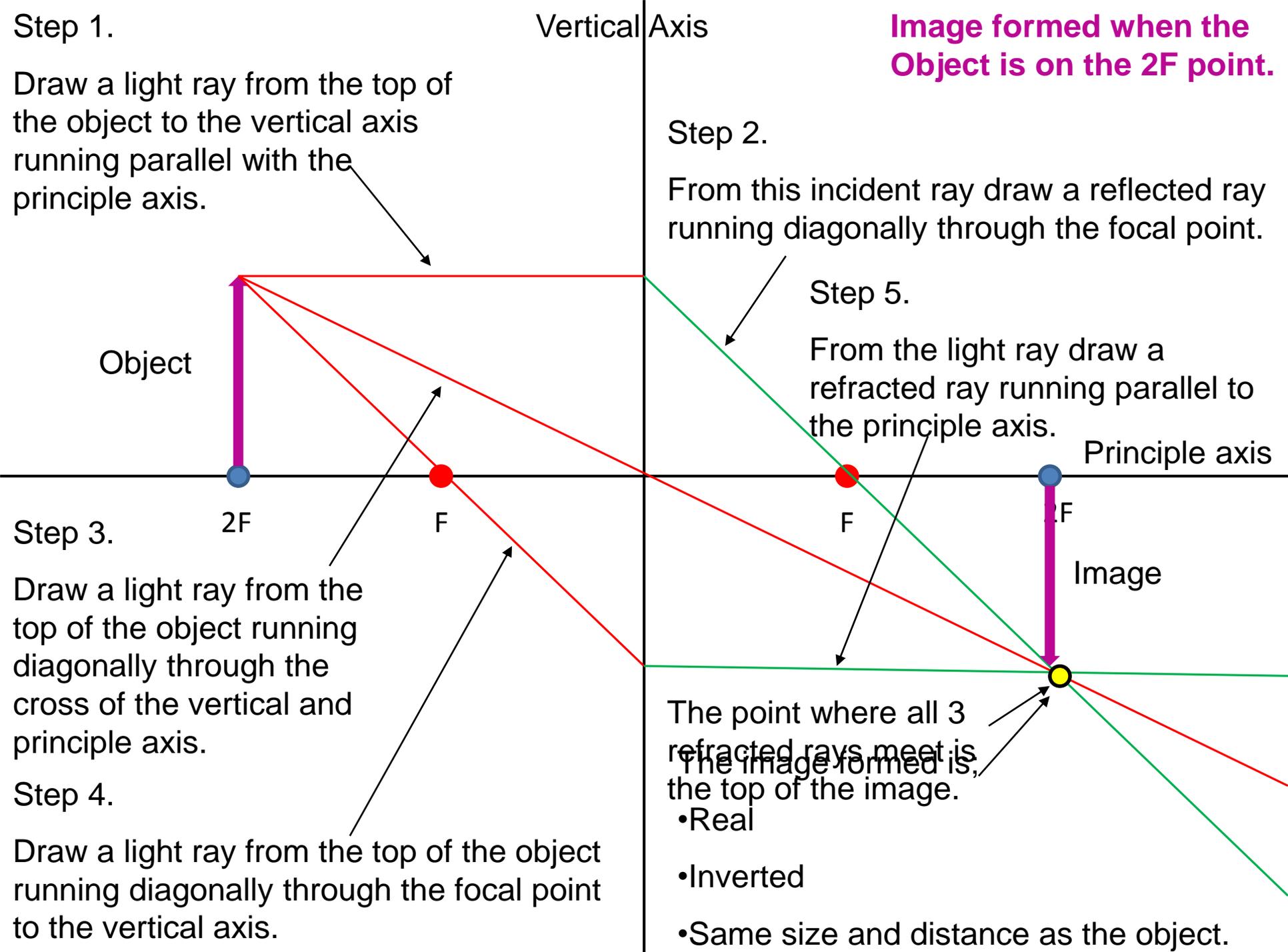
Principle Axis

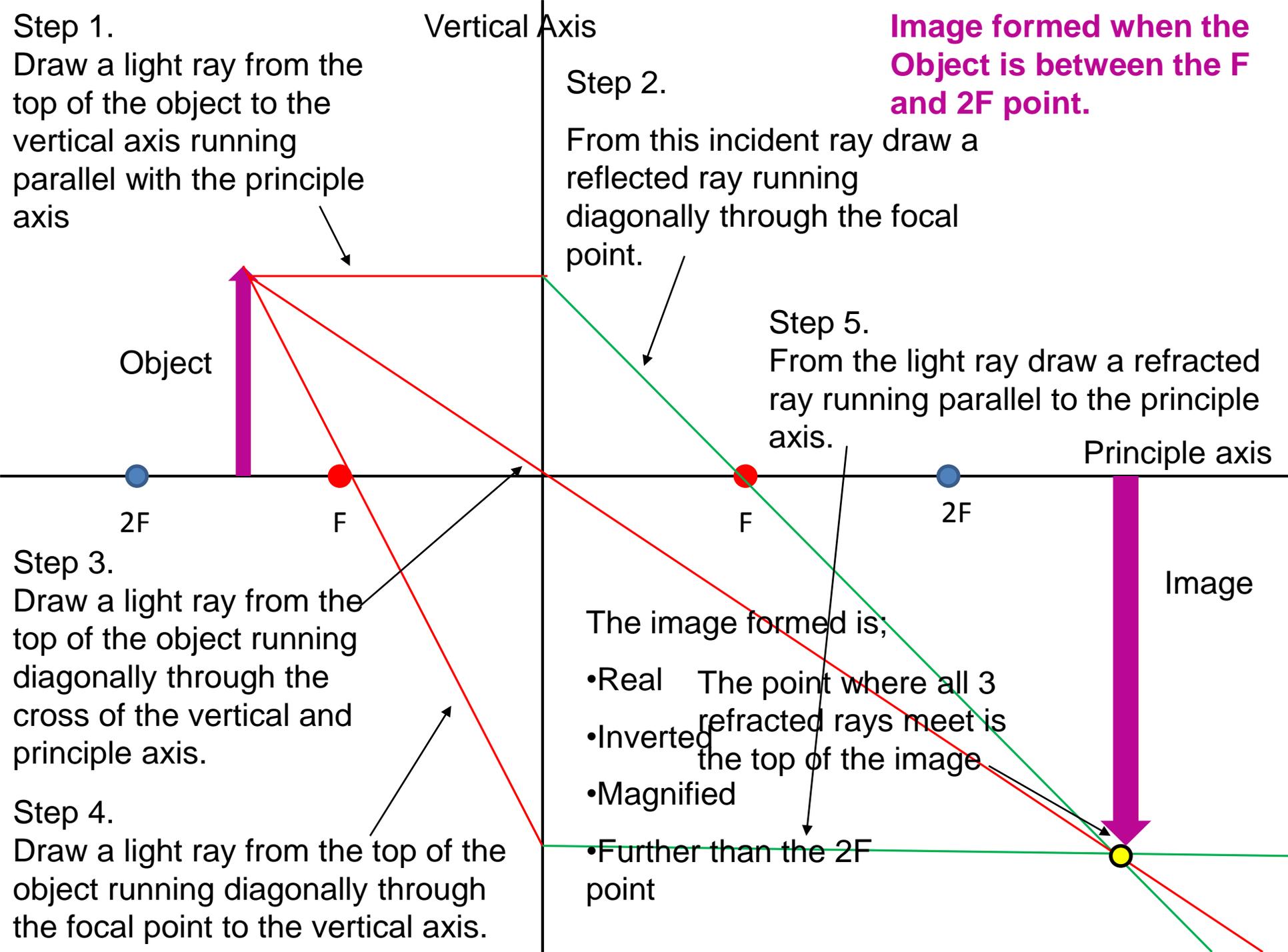
Step 4.  
Draw a light ray from the top of the object running diagonally through the focal point to the vertical axis.

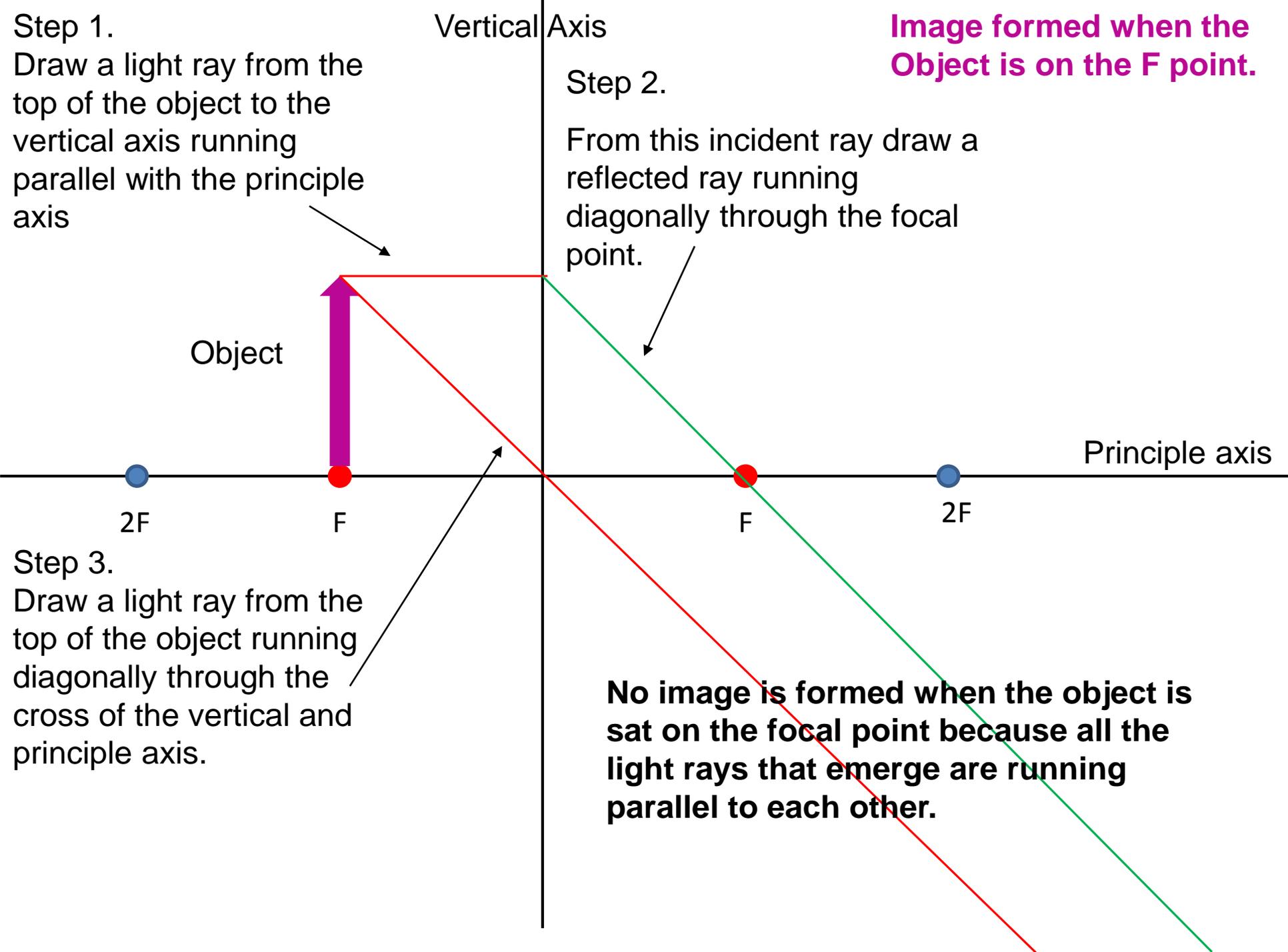
Step 5.  
From this ray draw a refracted ray running parallel with the principle axis.

The image formed is;  
• Real  
• Inverted  
• Diminished  
• Between the F and the 2F.









Step 1.

Draw a light ray from the top of the object to the vertical axis running parallel with the principle axis

Object

Vertical Axis

Step 2.

From this incident ray draw a reflected ray running diagonally through the focal point.

Image formed when the Object is on the F point.

Principle axis

2F

F

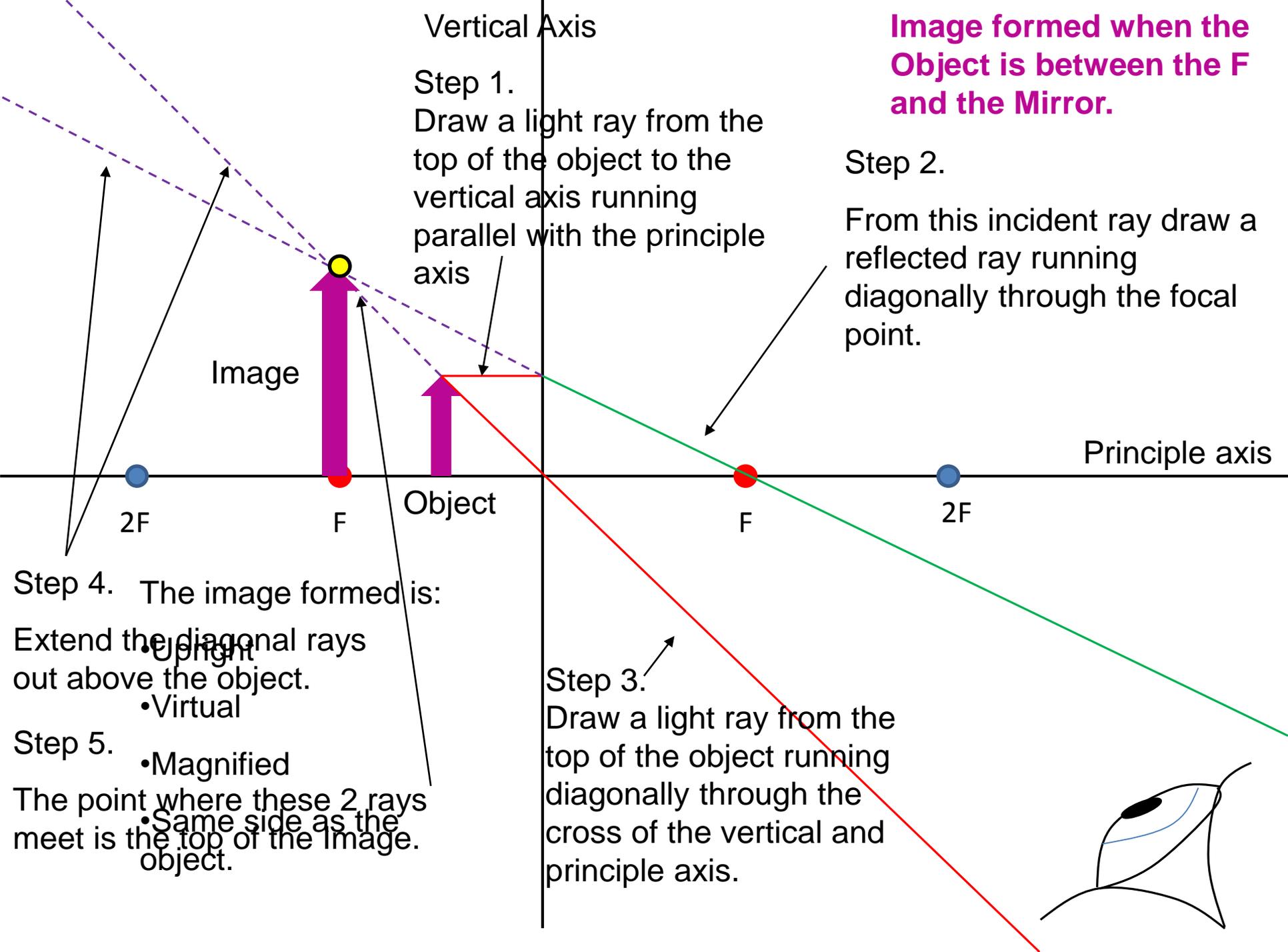
F

2F

Step 3.

Draw a light ray from the top of the object running diagonally through the cross of the vertical and principle axis.

**No image is formed when the object is sat on the focal point because all the light rays that emerge are running parallel to each other.**



Vertical Axis

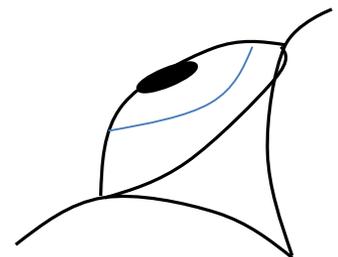
**Image formed when the Object is between the F and the Mirror.**

Step 1.  
Draw a light ray from the top of the object to the vertical axis running parallel with the principle axis

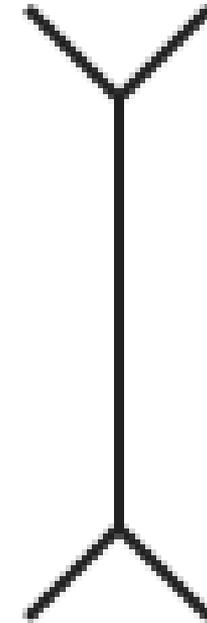
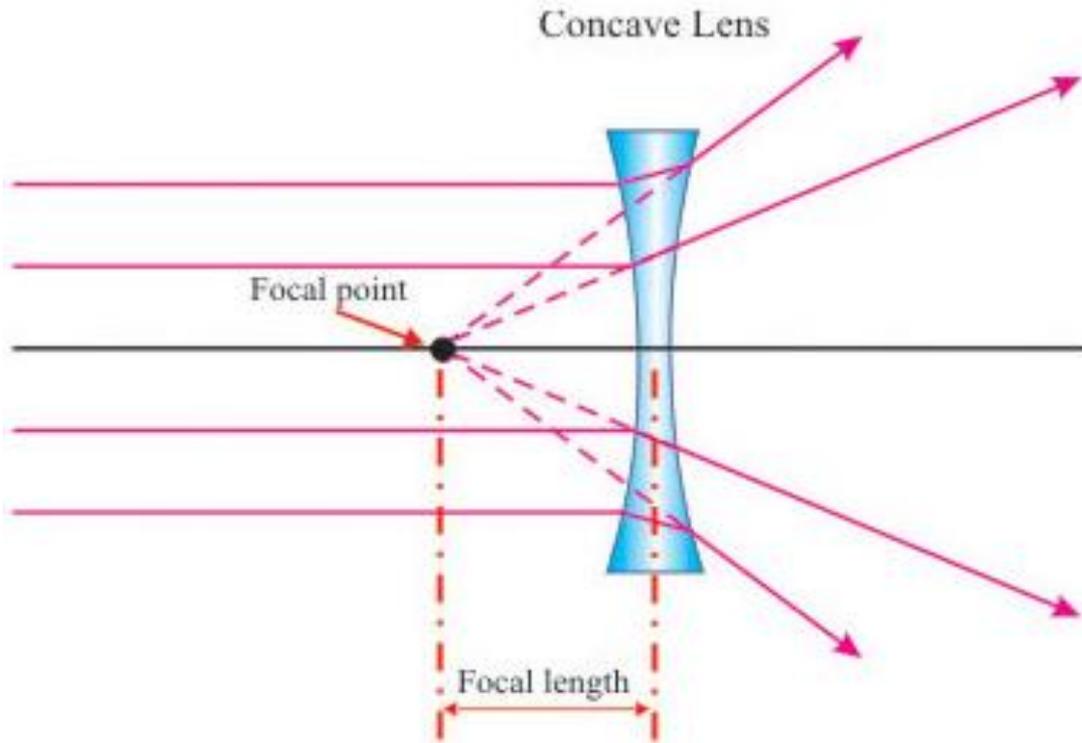
Step 2.  
From this incident ray draw a reflected ray running diagonally through the focal point.

Step 3.  
Draw a light ray from the top of the object running diagonally through the cross of the vertical and principle axis.

Step 4. The image formed is:  
 • Upright  
 • Virtual  
 Step 5.  
 • Magnified  
 The point where these 2 rays meet is the top of the Image.  
 • Same side as the object.



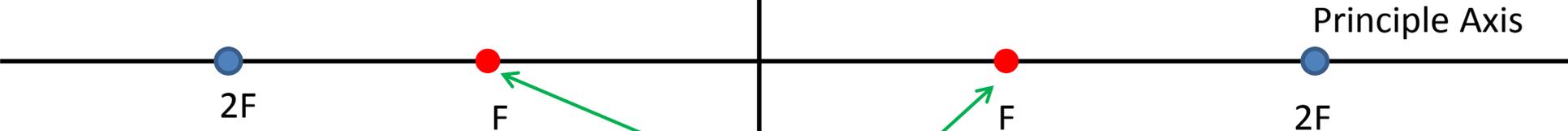
# DIVERGING LENS



- When light passes through a diverging lens, the light rays disperse outwards.

Like with the converging lenses you don't draw in the lens itself, you just draw the vertical and principle axis.

Vertical axis



Principle Axis

2F

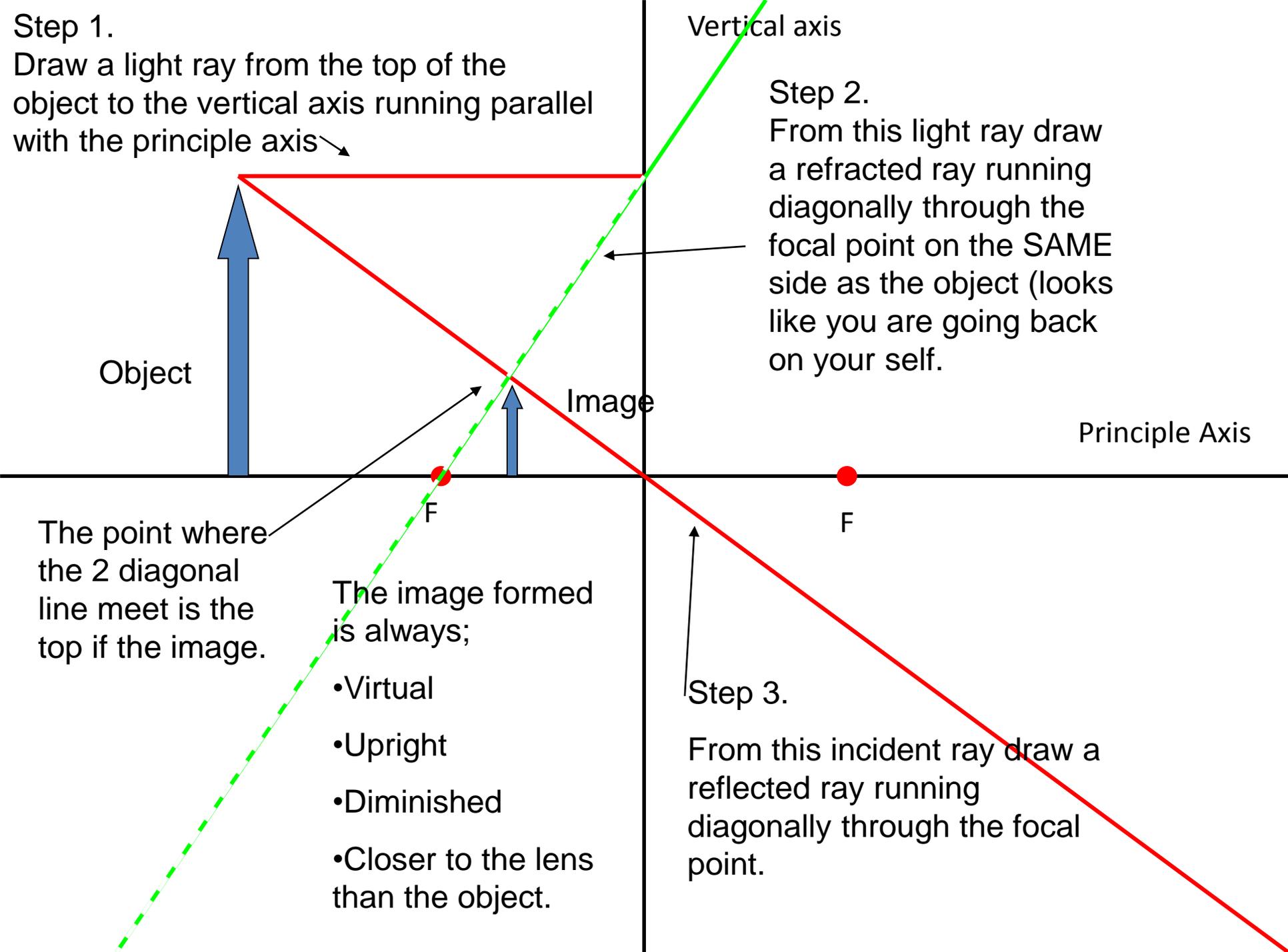
F

F

2F

2 F points and 2 2F points. The reason for this is because light can enter in either side of the convex lens.

The 2F point is just the centre of the circle if the circles were drawn in.



Step 1.  
Draw a light ray from the top of the object to the vertical axis running parallel with the principle axis

Step 2.  
From this light ray draw a refracted ray running diagonally through the focal point on the SAME side as the object (looks like you are going back on your self).

Step 3.  
From this incident ray draw a reflected ray running diagonally through the focal point.

The point where the 2 diagonal line meet is the top if the image.

The image formed is always;

- Virtual
- Upright
- Diminished
- Closer to the lens than the object.

# POWER OF LENSES

$$\text{Power} = \frac{1}{\text{Focal length}}$$

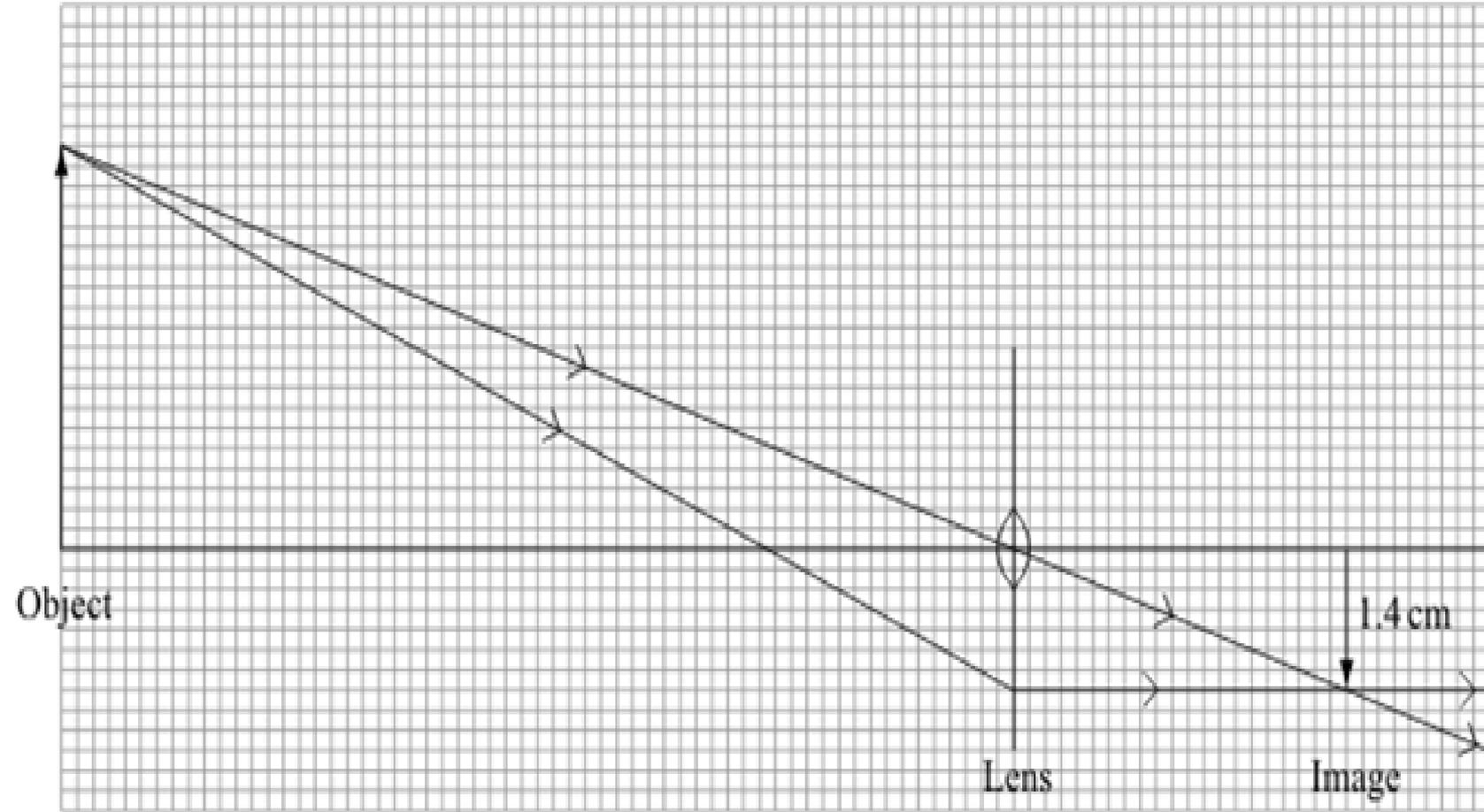
$$\begin{aligned} \text{Power} &= \text{Diopetre (D)} \\ \text{Focal length} &= \text{m} \end{aligned}$$

1. A converging lens has a focal length of 2cm. Calculate the power of the lens
2. A diverging lens has a focal length of 0.3m. Calculate the power of the lens

For a given focal length, the greater the refractive index, the flatter the lens. This means that the lens can be manufactured thinner.

# PAST PAPER QUESTION

The diagram shows the position of an image formed in a camera.

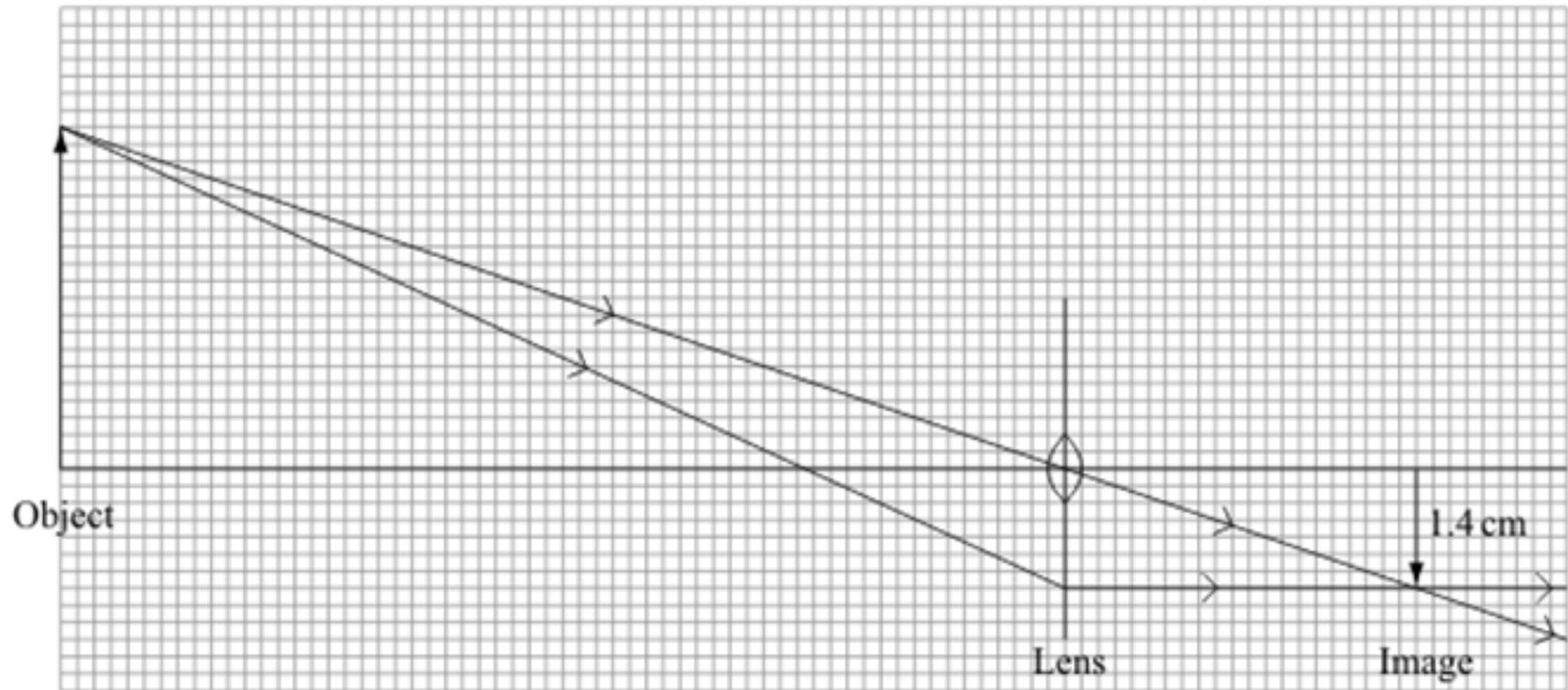


What type of lens is shown in the diagram?

**Converging**

# PAST PAPER QUESTION

The diagram shows the position of an image formed in a camera.



Use the equation in the box to calculate the magnification.

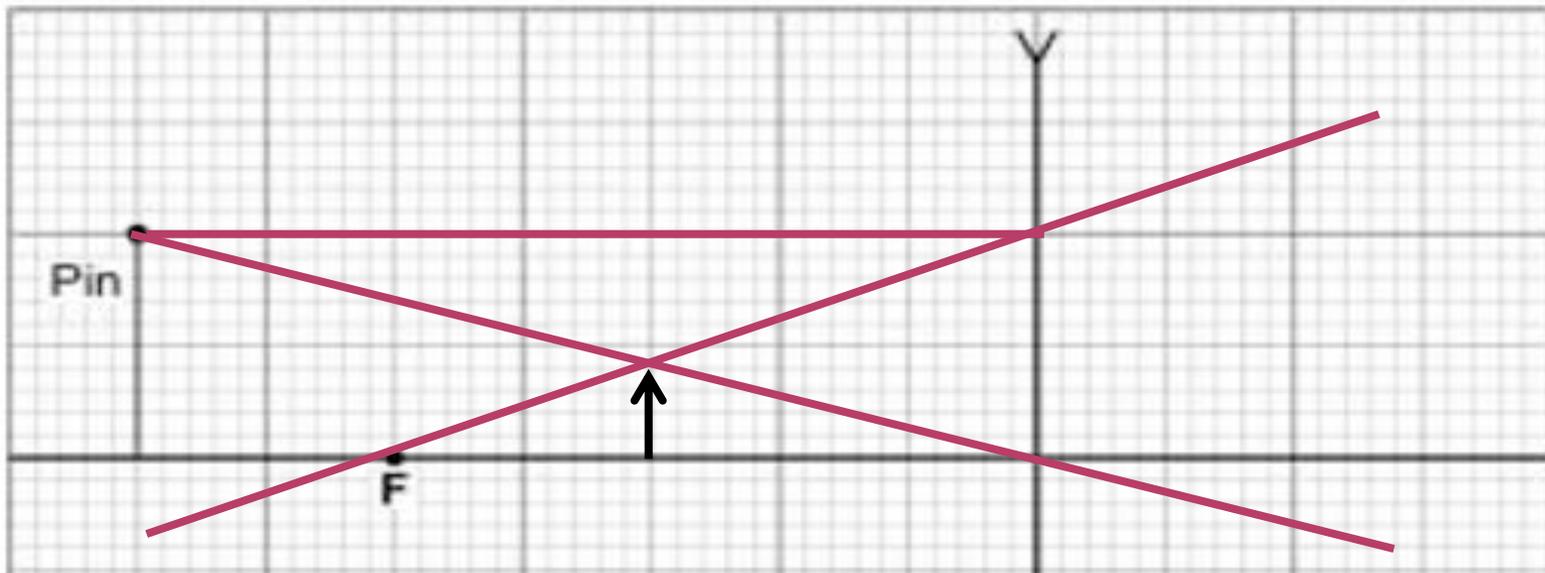
$$\text{magnification} = \frac{\text{image height}}{\text{object height}}$$

$$1.4\text{cm} / 4\text{cm} = 0.35$$

# PAST PAPER QUESTION

The focal length of the lens is 5 cm. A student looking through the lens sees the image of a pin.

Complete the ray diagram below to show how the image of the pin is formed.



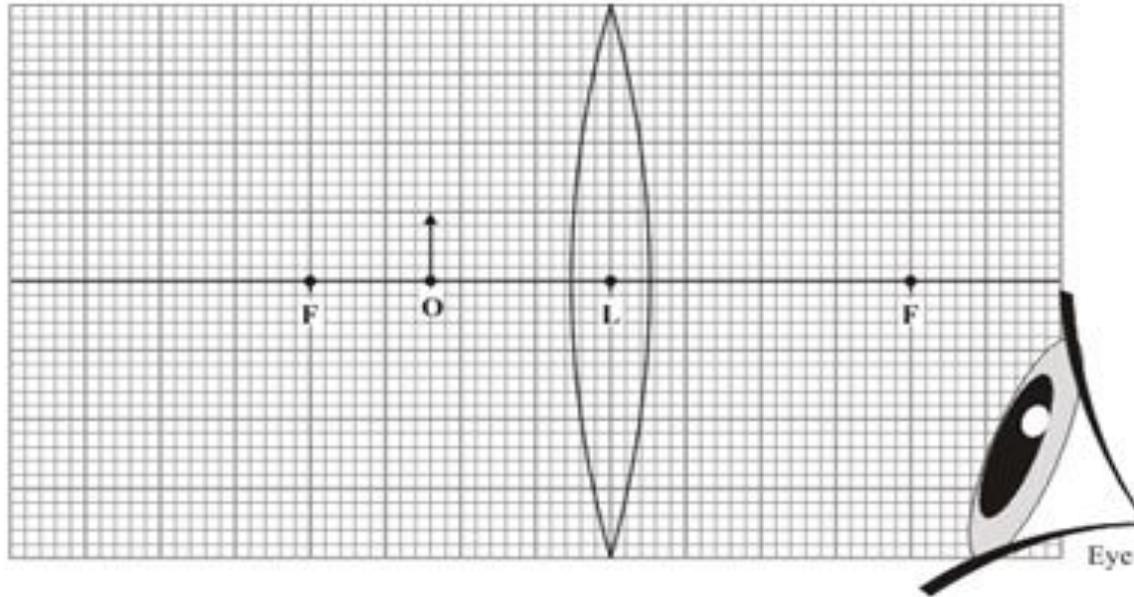
Diverging / concave lens

2 lines correctly drawn from the top of the pin through the lens

position of image correct - *image must be upright*

Concave lens

# PAST PAPER QUESTION



The diagram shows a lens used as a magnifying glass. The position of the eye is shown and the size and position of an object standing at point **O**.

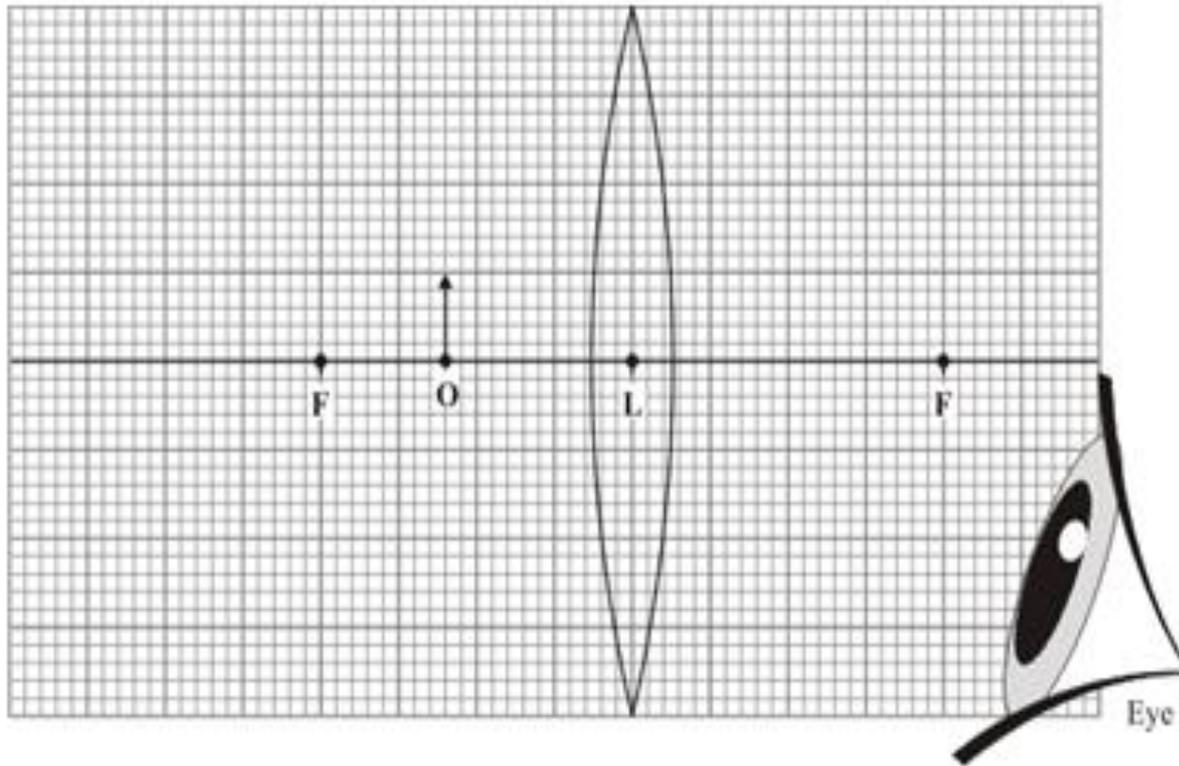
What type of lens is shown in the diagram?

Converging / convex

Two points are marked as **F**. What are these points?

Focal point

# PAST PAPER QUESTION

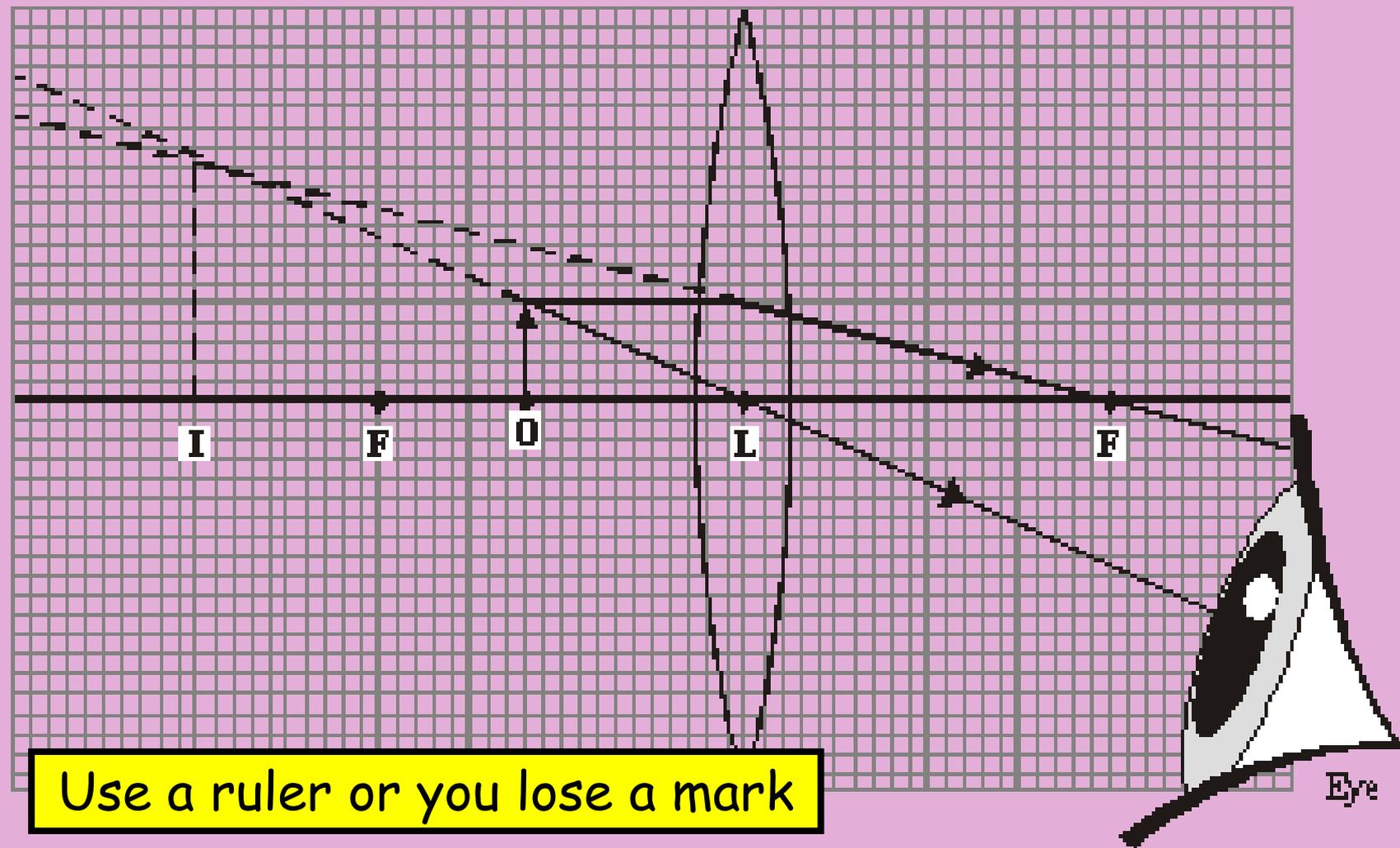


What is the name of the straight line which goes through the point **F**, through the point **L** at the centre of the lens, and through the point **F** on the other side?

Principal axis

# PAST PAPER QUESTION

On the diagram, use a ruler to construct accurately the position of the image. You should show how you construct your ray diagram and how light appears to come from this image to enter the eye.

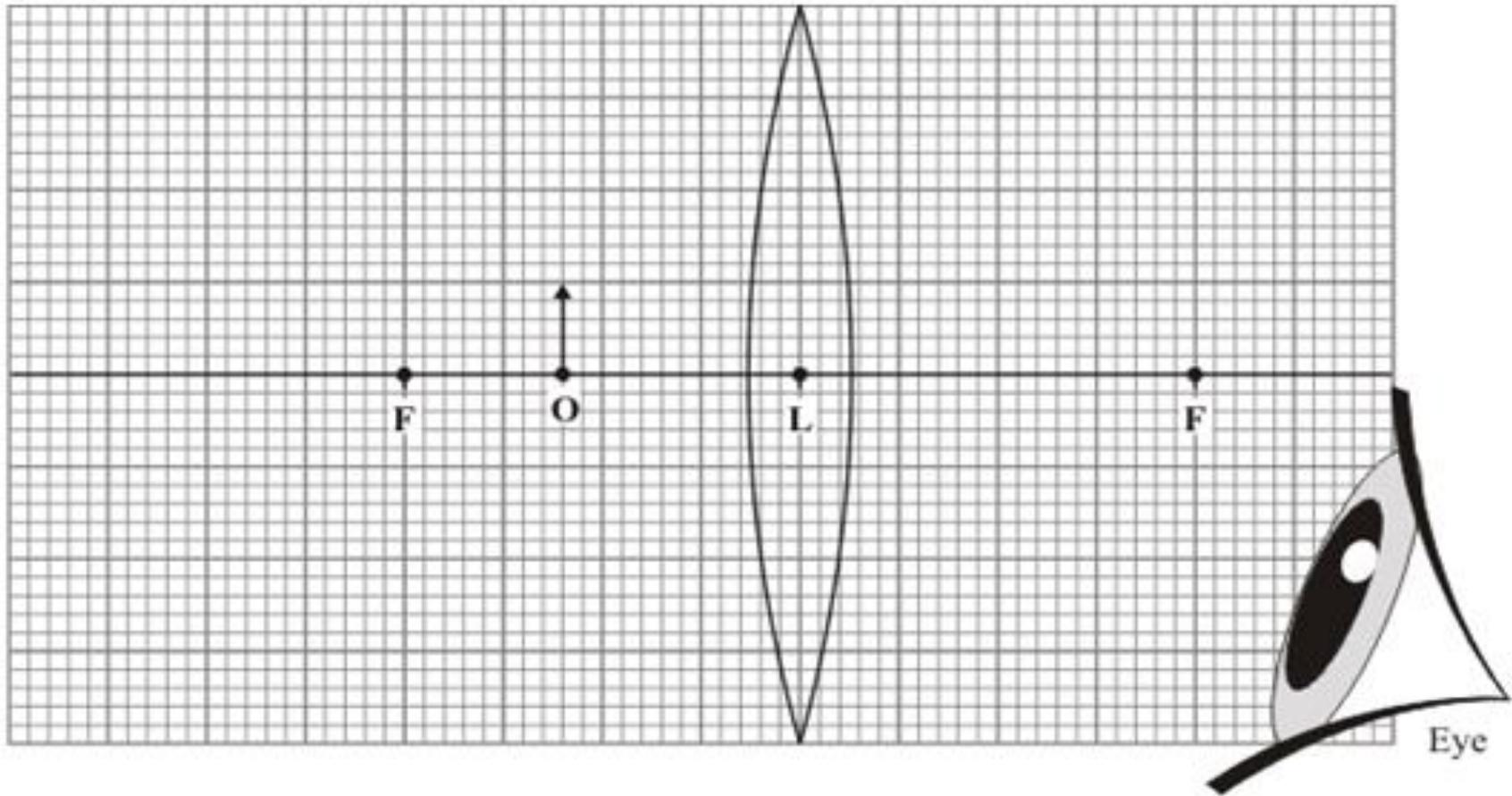


Use a ruler or you lose a mark

Eye

# PAST PAPER QUESTION

## LENSES



The image is *virtual*. What is a *virtual* image?

Formed where imaginary rays intersect / cross

# PAST PAPER QUESTION

A camera uses a lens to produce an image which falls on a light detector.



Name a light detecting device which may be used in a camera.

Photographic film or CCDs

# PAST PAPER QUESTION

A camera uses a lens to produce an image which falls on a light detector.



Why does the image formed in a camera have to be a real image?

Otherwise no real light will fall on the light detector

# PAST PAPER QUESTION

The lens can be used in a camera to produce a *real* image. Explain why a *real* image must be produced in a camera and how the object and the lens are positioned to produce a *real* image which is **smaller** than the object.

Do **not** draw a ray diagram as part of your answer.

1. The image needs to fall on film / sensors / LDRs / CCDs
2. either to cause a (chemical) reaction or to be digitalised.
3. Object should be on the far side of the focus from the lens.

## EXAMINER TIP

- ◉ Be able to construct ray diagrams to show the formation of images by lenses. Know what is meant by the focus and focal length of lenses and know the terms 'real' and 'virtual' as applied to images.

Write a sentence that shows the examiner that you know this.



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The optic nerve

The optic nerve carries impulses from the retina to the brain.

to colour.  
Contains the light receptors, which trigger electrical impulses to be sent to the brain when light is detected.

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# THE EYE

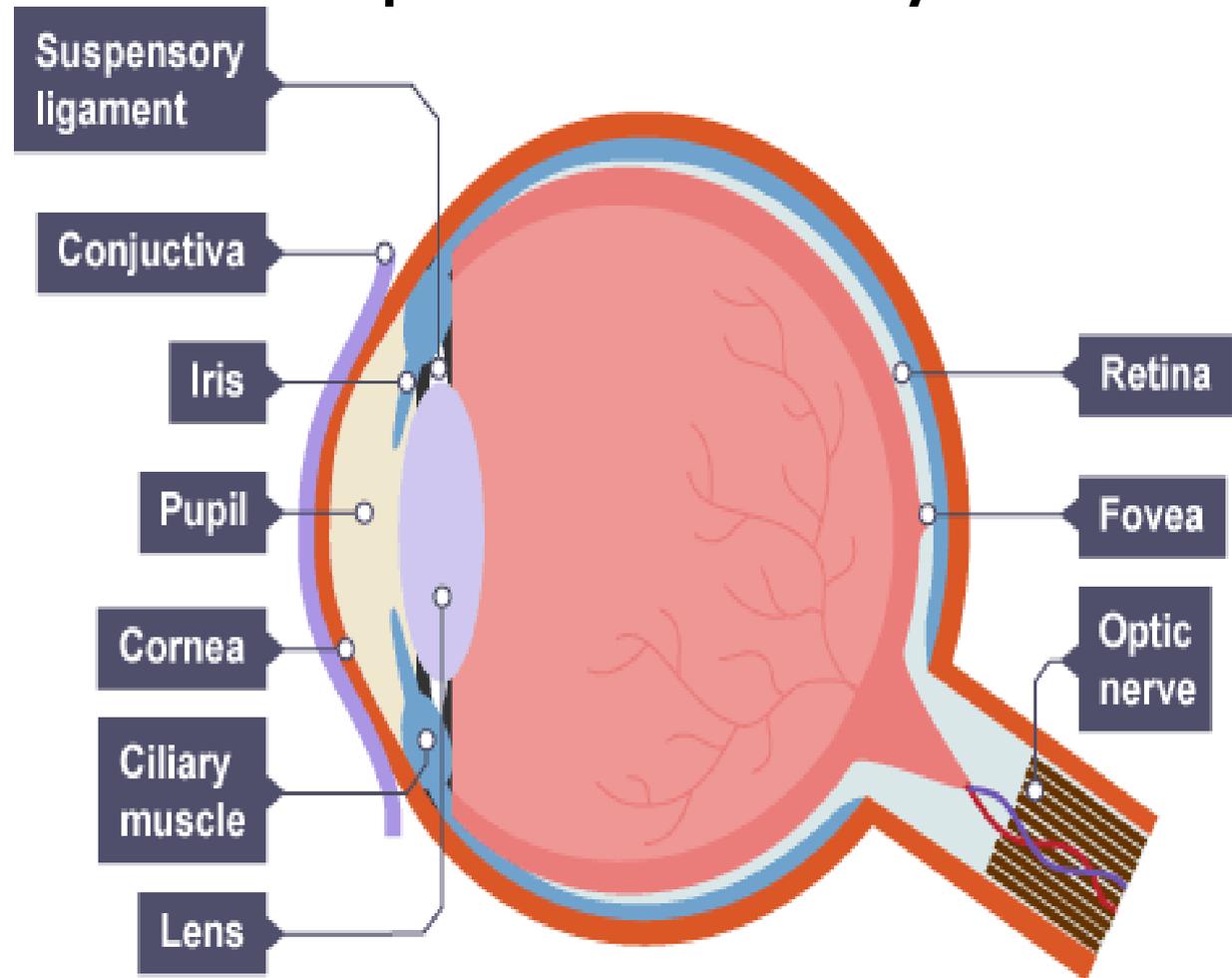
## Learning Outcomes:

1. Describe the uses of each part of the eye

**Good-** know the key facts in the physics module

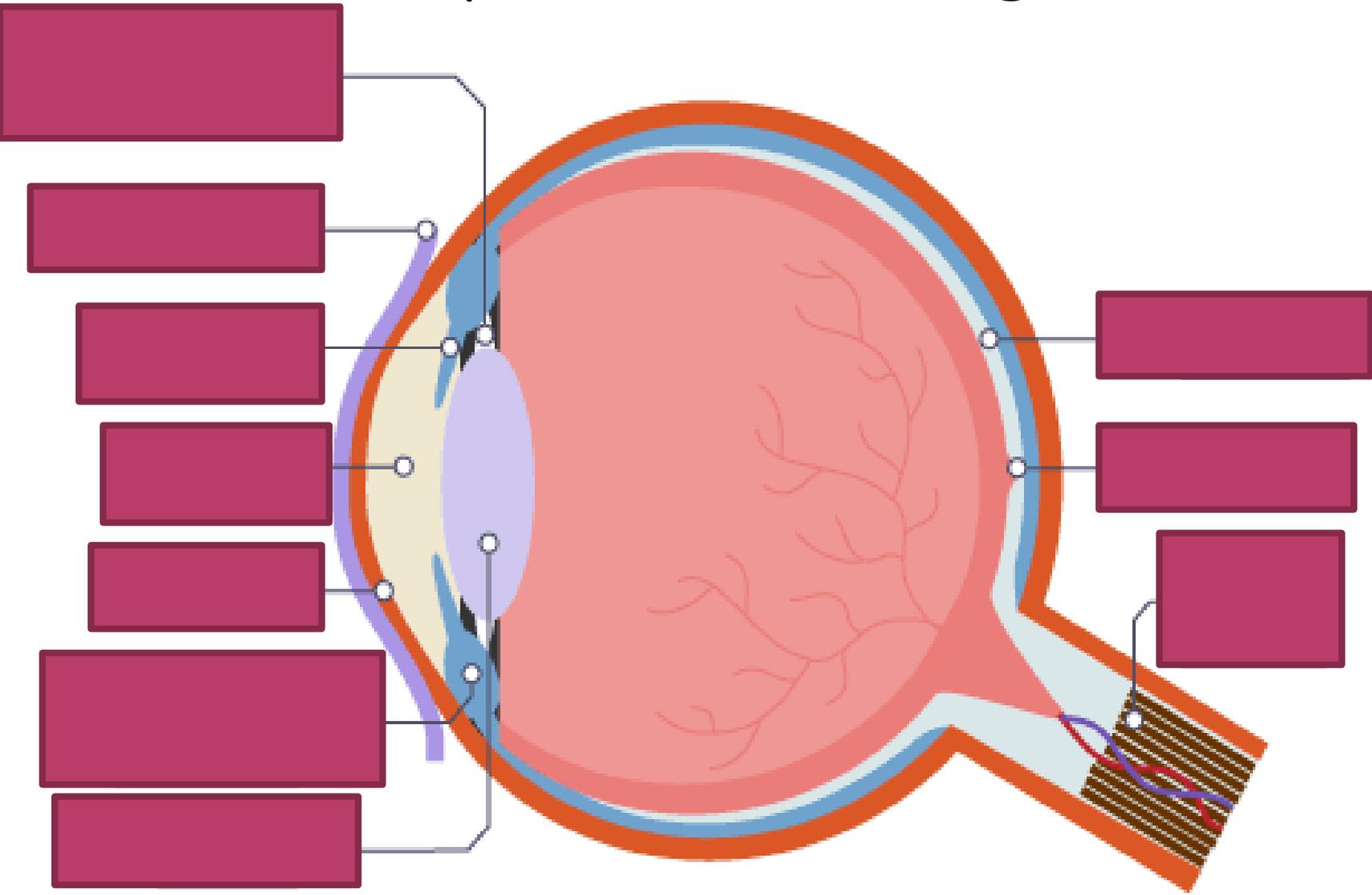
**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question



# THE EYE

Can you label this diagram?



# THE EYE

1. Watch this video and complete the following table

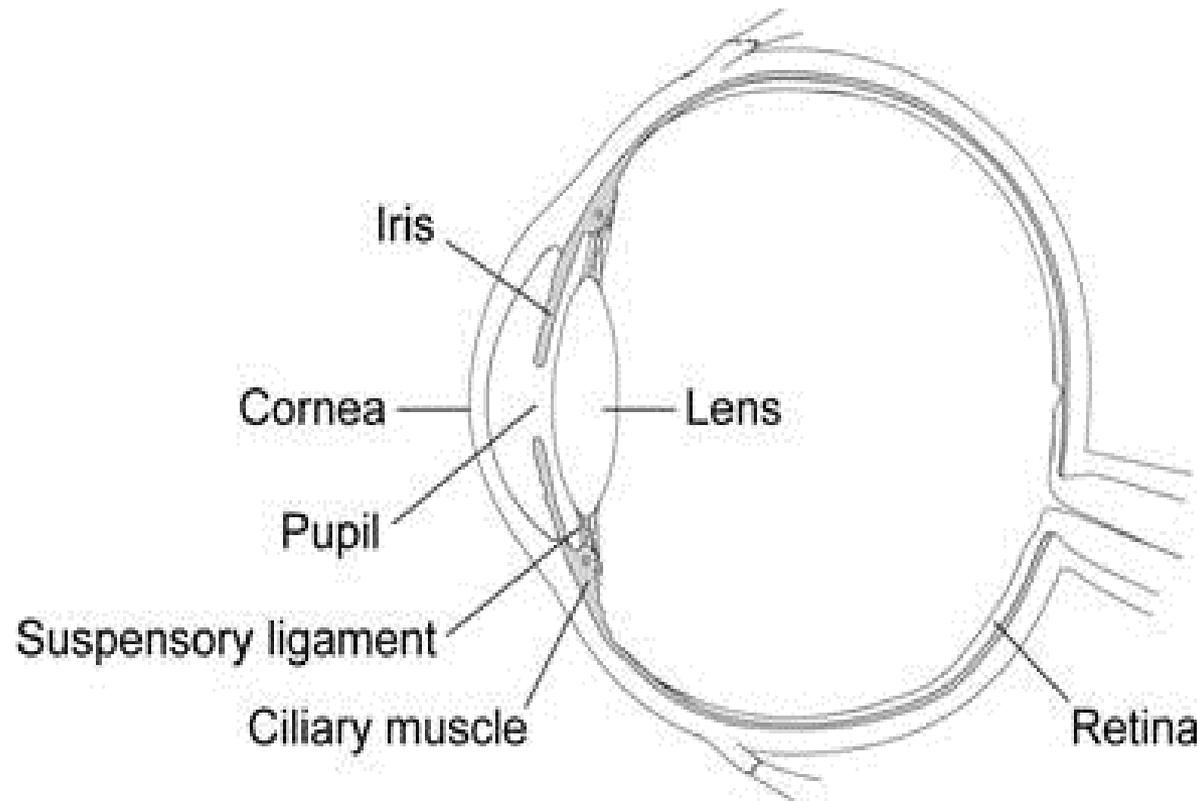
[http://www.bbc.co.uk/schools/gcsebitesize/science/triple\\_aqa/medical\\_applications\\_physics/the\\_eye/revision/2/](http://www.bbc.co.uk/schools/gcsebitesize/science/triple_aqa/medical_applications_physics/the_eye/revision/2/)

Object	Ciliary muscles	Suspensory ligaments	Muscle tension on the lens	Lens shape
Near	Contracted	Slackened	Low	Fat, more curved
Distant	Relaxed	Stretched	High	Thin, less curved

# COMPARING THE EYE AND A CAMERA

Camera part	Function in the camera	Structure in the eye performing a similar role
Lens	To focus light onto the photosensitive surface at the back of the camera. This can either be photographic film or a <b>CCD</b> (charge-coupled device).	Lens - which focuses light onto the retina.
Focusing screw	Allows the user to adjust the focus for nearer or more distant objects.	Ciliary muscles - which stretch or slacken the suspensory ligaments to adjust the shape of the lens
Aperture	Allows the user to adjust the amount of light entering the camera in different light conditions.	Iris - which adjusts the amount of light entering the eye through the pupil.
Shutter	Allows the user to adjust the length of time that light enters the camera, which controls the amount of light to which the photosensitive surface is exposed.	Not applicable (although we do have eyelids).
Photosensitive surface	Detects and records the light which is focused onto it. This can be on <b>photographic film</b> , but digital cameras use <b>CCDs</b> which convert light into electrical signals which can be stored.	Retina - which detects light and converts it into electrical impulses which are sent to the brain.

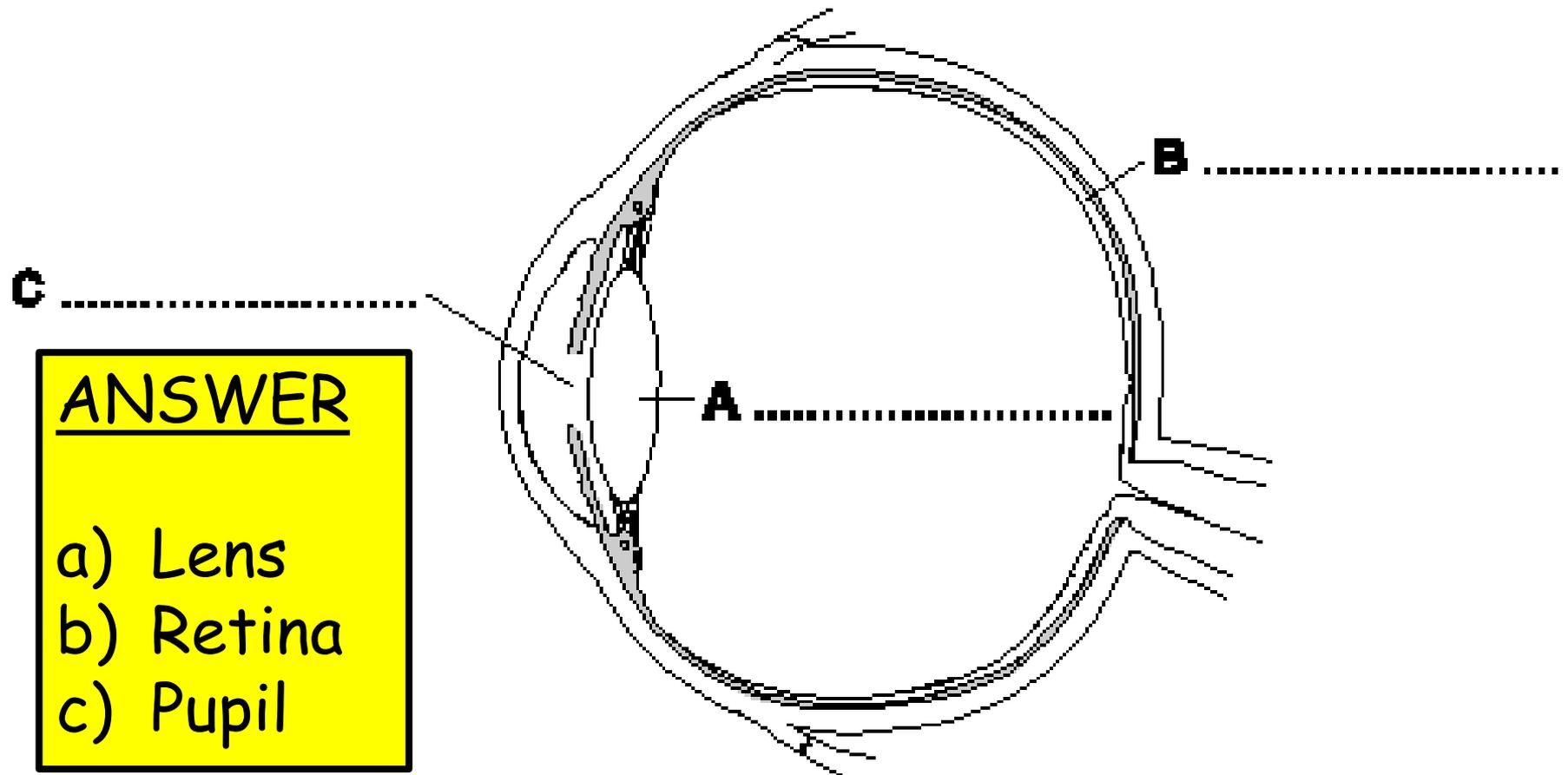
The diagram shows the cross-section of an eye. Use words from the box to complete each sentence.



**ciliary muscle**      **cornea**      **iris**      **pupil**

The shape of the lens is changed by the **Ciliary muscle**, this allows the lens together with the **Cornea** to focus light onto the retina.

Q1. (a) The diagram shows the cross-section of an eye.



Use words from the box to label the parts, **A**, **B** and **C**.

cornea

iris

lens

pupil

retina

# HOW THE EYE WORKS

## **Learning Outcomes:**

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question

1. When light enters the eye, the ciliary muscles change the thickness of the lens
2. The light is focused by your lens onto the retina
3. The light sensitive cells in the retina send electrical impulses through the optic nerve to your brain
4. Your brain processes these impulses and shows you what the object looks like

# RANGE OF VISION

## **Learning Outcomes:**

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Near point is the closest an object can be from the eye without the object appearing blurred.

If an object is brought closer to the eye than the near point, the lens cannot become sufficiently curved to refract the diverging rays to focus them onto the retina.

Normal vision - Near point is 25 cm.

Long sight - Near point is further away than 25 cm. This means they cannot focus properly on objects.

# RANGE OF VISION

## **Learning Outcomes:**

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**Excellent-** You can get 75% of marks in each question

The far point is the furthest an object can be from the eye without it appearing blurred.

Eyes without defects focus on distant objects at infinity because the light rays arrive parallel to each other.

Short sightedness - can see near objects clearly but their far point is closer than infinity so they can't focus properly on distant objects.

The distance between the near point and the far point is called the range of vision.

# HOW THE EYE WORKS



## **Learning Outcomes:**

**Good-** know the key facts in the physics module

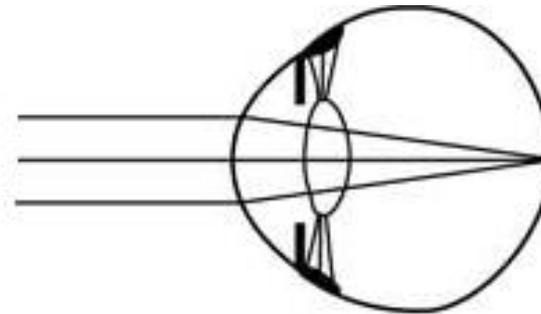
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By using our understanding of how the eye works and how lenses work, we can design glasses to correct for sight problems

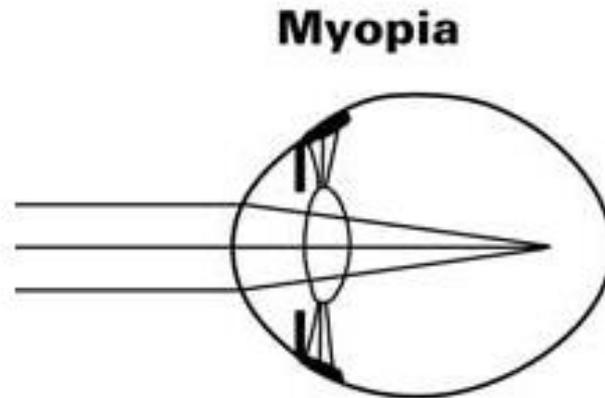
# SHORT SIGHTEDNESS

In a normal eye, the lens focuses the image exactly on the retina.



Normal eye

However, in the eye of a person with Myopia (short sighted), the image is formed before the retina. This leads to a blurred image.



Light focused in front of retina

# CORRECTING SHORT SIGHTEDNESS

## **Learning Outcomes:**

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question

Short sight can be corrected by glasses that have a concave (diverging) lens.

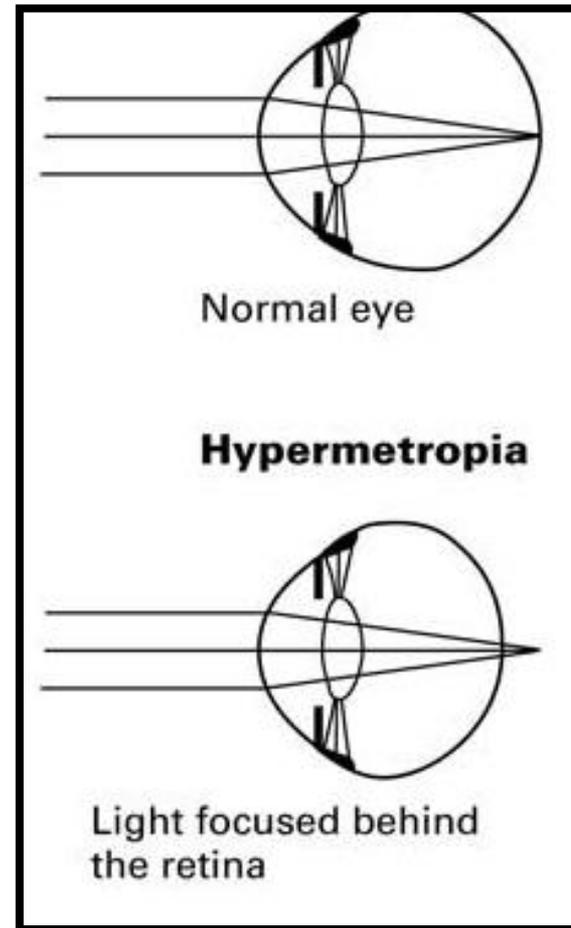
This causes the light rays to diffract outwards slightly as they pass the lens so that they are focused exactly on the retina by the lens in the eye.

The power of the lenses used to correct short sightedness is negative.

# LONG SIGHTEDNESS

In a person with 'hyperopia' (long sight), the image is not correctly focused onto the retina by the eye lens. The image is focused behind the retina, leading to a blurry image.

**How can we correct this?**



# CORRECTING LONG SIGHTEDNESS

## **Learning Outcomes:**

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

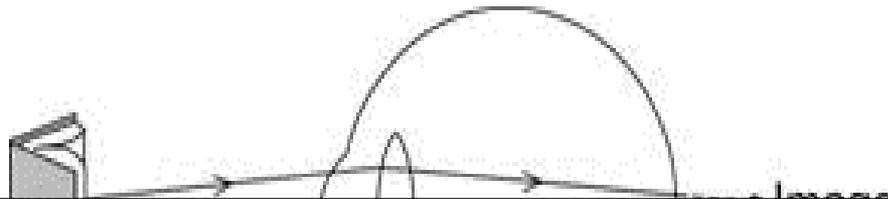
**Excellent-** You can get 75% of marks in each question

Long sight can be corrected by using a **convex (converging) lens**.

This causes the light rays to converge slightly before they hit the lens so that they are refracted perfectly onto the retina.

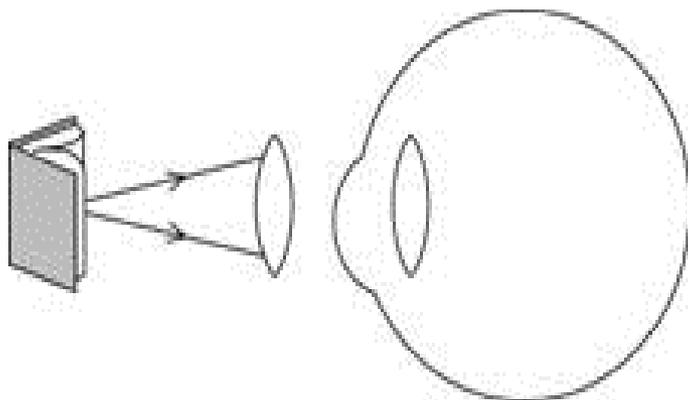
The power of the lenses used to correct long sightedness is positive.

A man, as he gets older, needs to hold a book further from his eyes in order to be able to see the writing clearly. The diagram shows that his eye lens is not able to focus light on the retina.

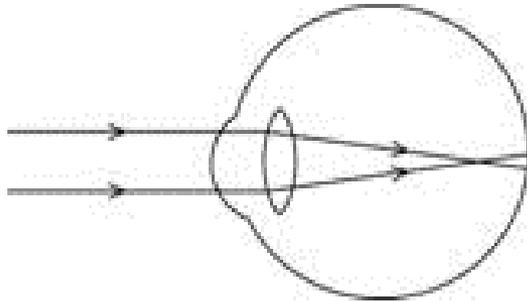


## ANSWER

1. Moved further (from his eyes)
2. (ii) Rays between lens and eye and converging rays inside eye focus on the retina



(b) The diagram shows one of the eyes of a person who is short-sighted.



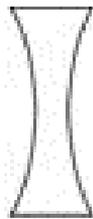
Which **one** of the following lenses, **J**, **K** or **L**, could be used to correct the person's eyesight?



**J**



**K**



**L**

Lens ..... **L** .....

Give a reason for your choice.

It diverges (spreads) the light or it will make the light focus on the retina

Give **two** similarities between an eye and a camera.

1 .....

2 .....

ANSWER - any two from:

- Both use a converging lens
- Image formed is real
- Image is inverted
- Image in eye formed on retina, image in camera formed on film / CCDs
- Amount of light entering eye and camera can be controlled

## EXAMINER TIP

- ◉ Know the function of the parts of the eye and know the similarities and differences between a camera and the eye.

Write a sentence that shows the examiner that you know this.

Swap books with the person next to you and write a what went well and an even better if for their statement

# YOU SHOULD ALREADY KNOW..

## **Learning Outcomes:**

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question

Light going from a dense medium, such as glass, into a less dense medium, such as air, speeds up at the boundary.

This causes light rays to bend when they pass from glass to air at an angle other than  $90^\circ$ .

This is refraction.

# TOTAL INTERNAL REFLECTION

## TOTAL INTERNAL REFLECTION

### **Learning Outcomes:**

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question

Not all of the light refracts - and a small amount reflects back into the glass.

As the angle of incidence increases, so does the angle of refraction.

Beyond a certain angle, called the critical angle, all the waves reflect back into the glass and no refraction occurs.

This is total internal reflection

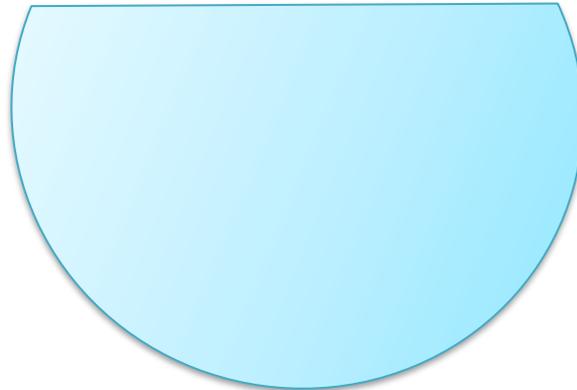
***Learning  
Outcomes:***

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# Total internal reflection Critical angle



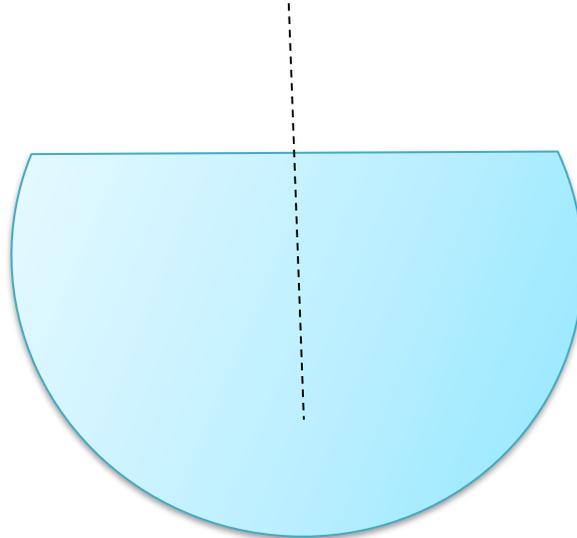
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Outcomes:**

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# Total internal reflection Critical angle



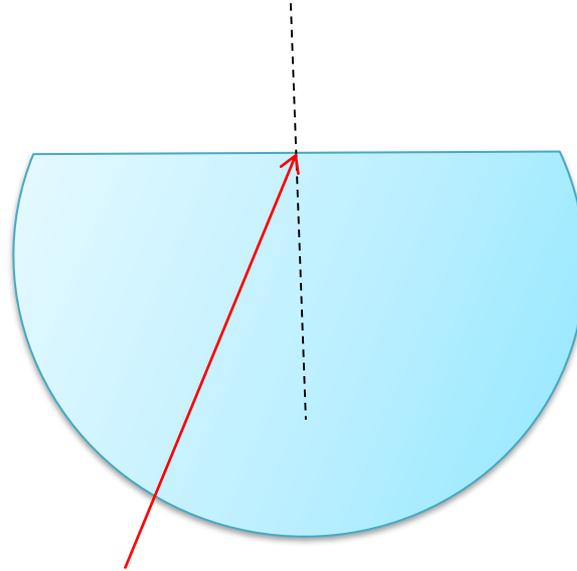
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# Total internal reflection Critical angle



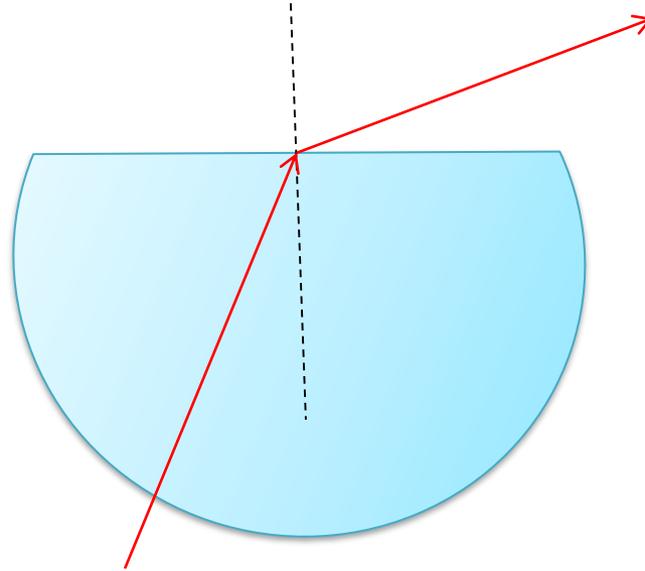
**Learning  
Outcomes:**

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# Total internal reflection Critical angle



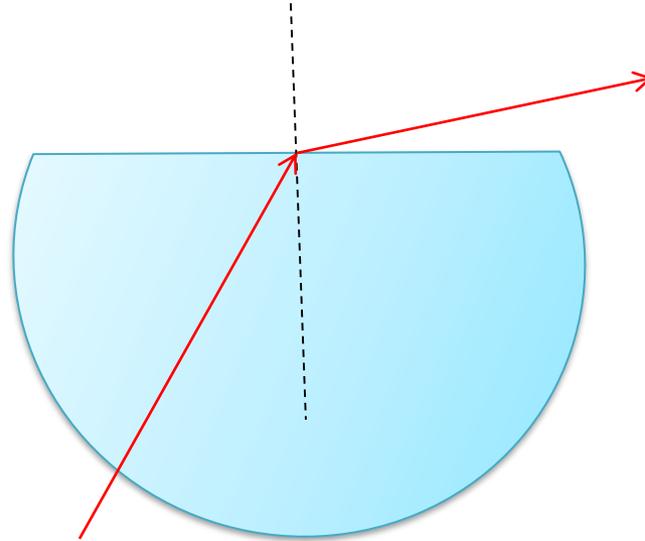
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Outcomes:**

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# Total internal reflection Critical angle



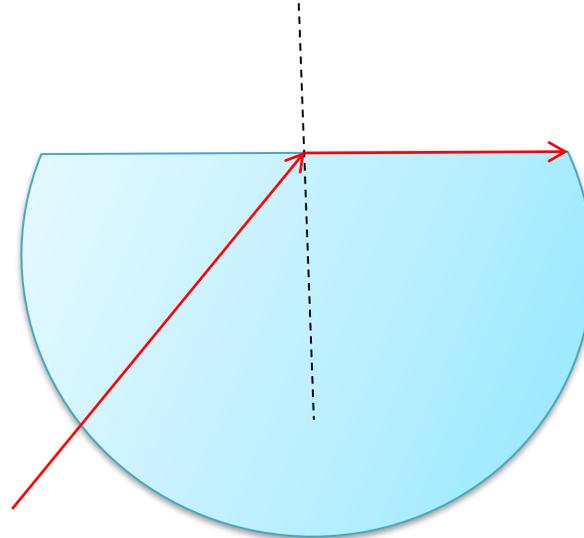
**Learning  
Outcomes:**

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# Total internal reflection Critical angle



Ray skims surface  
of Perspex block

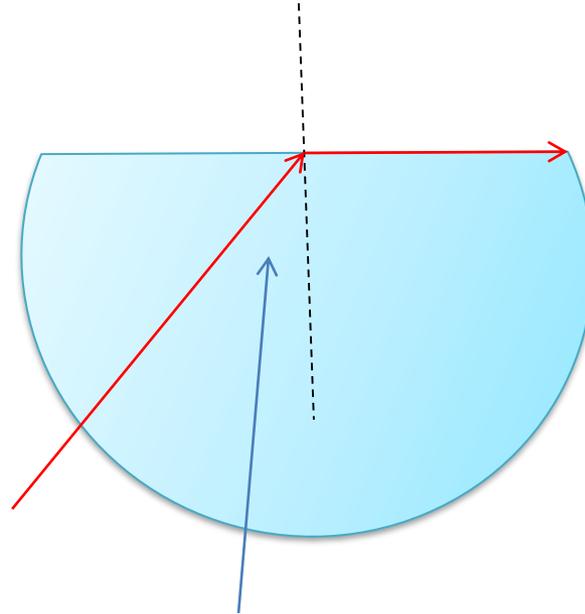
**Learning  
Outcomes:**

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question

# Total internal reflection Critical angle



Measure this angle  
This is the **critical angle**

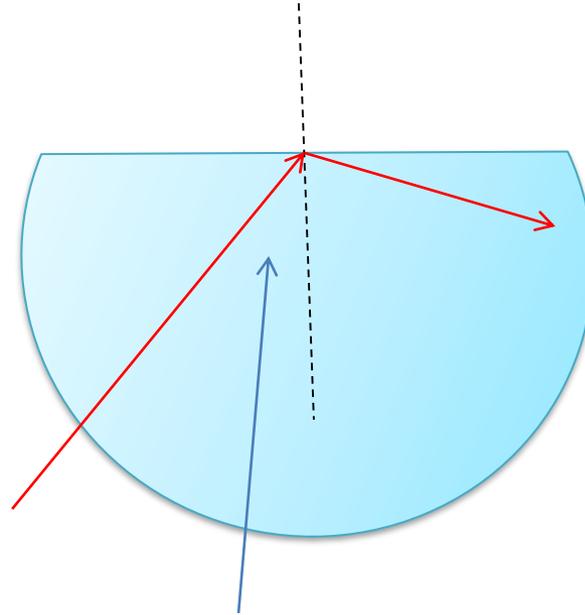
**Learning  
Outcomes:**

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question

# Total internal reflection Critical angle



At angles greater than the critical angle the light is totally internally reflected.

**Learning  
Outcomes:**

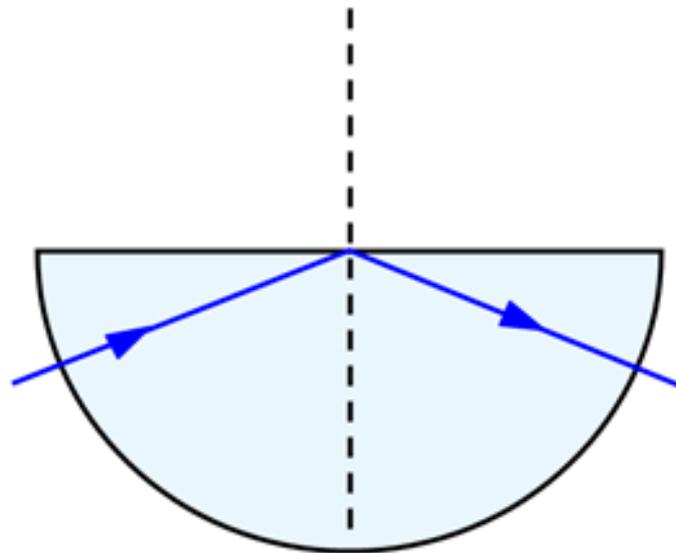
**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question

Total internal reflection only occurs when;

1. Light is passing from a less dense to a more dense medium
2. Angle of incidence is greater than the critical angle



(resourcefulphysics.org)

<http://www.freezeray.com/flashFiles/Refraction1.htm>

**Learning  
Outcomes:**

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question

Refractive index and critical angle are linked by the following formula

$$\text{Refractive index} = \frac{1}{\sin C}$$

**Step 1:** Change the subject of the equation to find  $c$

$$\sin c = 1 \div \text{refractive index}$$

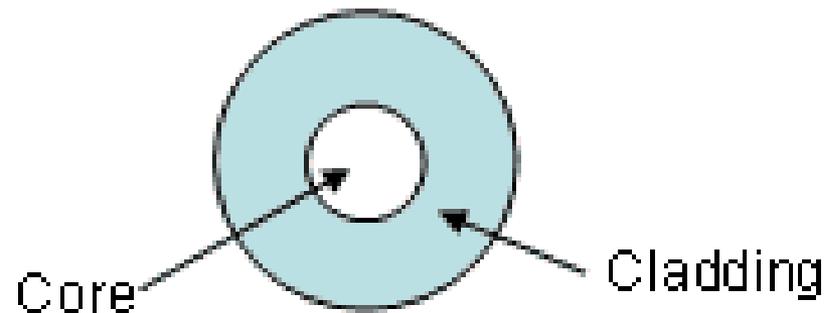
**Step 2:** Put in the number from the question

$$\sin c = 1 \div 1.5 = 0.67$$

**Step 3:** Work out the inverse sine ( $\sin^{-1}$ )

$$c = 42^\circ$$

# TOTAL INTERNAL REFLECTION

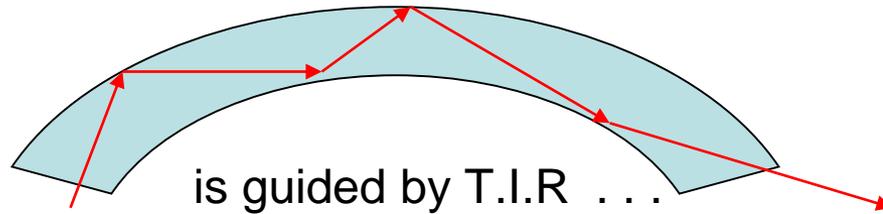


Optical Glass Index of Refraction

Core = 1.458

Cladding = 1.440

# TOTAL INTERNAL REFLECTION



*Light in at this end . . .*

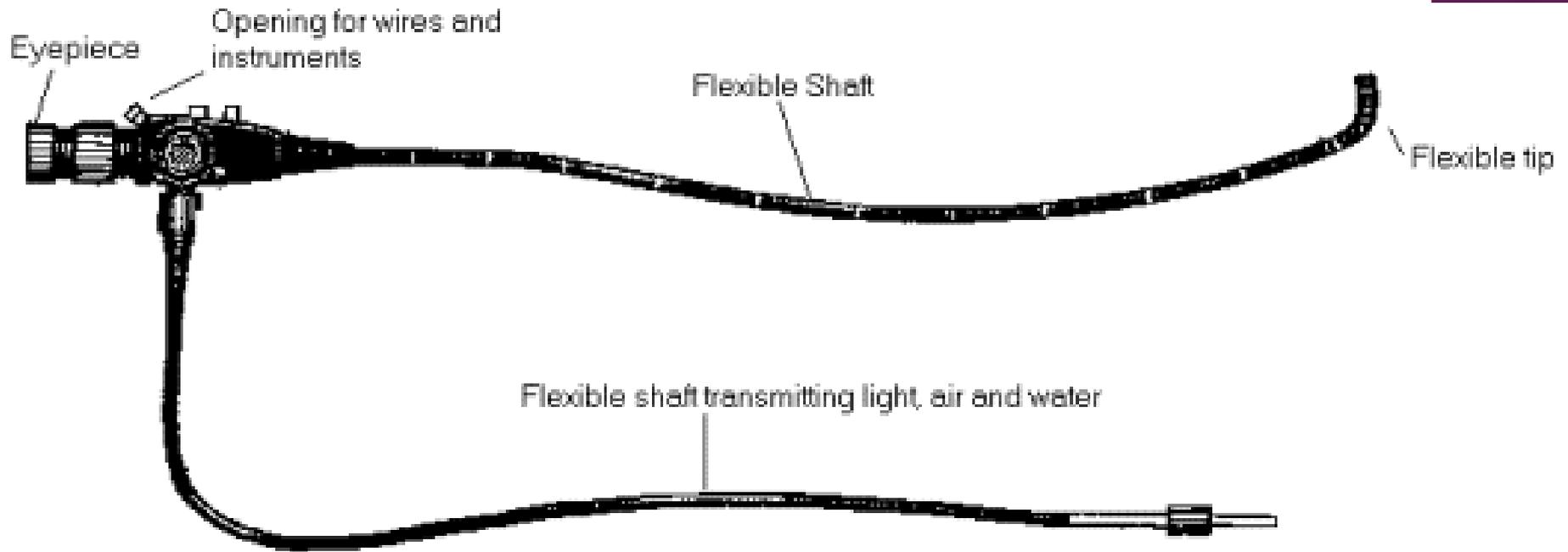
is guided by T.I.R . . .

and comes out here.

Optical fibres are used in communications to carry signals. (The signals are pulses of laser light)

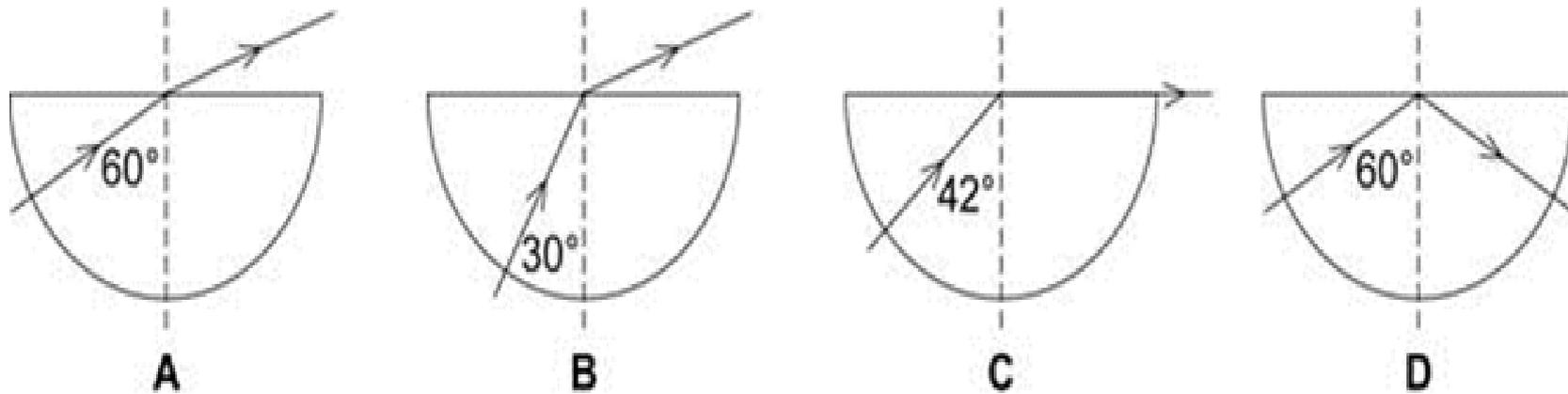
Optical fibres are used in medicine to look inside the body. An endoscope is made of a bunch of optical fibres to carry light into and out of the body.

# ENDOSCOPE



# PAST PAPER QUESTION

Each diagram shows a light ray incident on a glass-air boundary. The critical angle for glass is  $42^\circ$ .



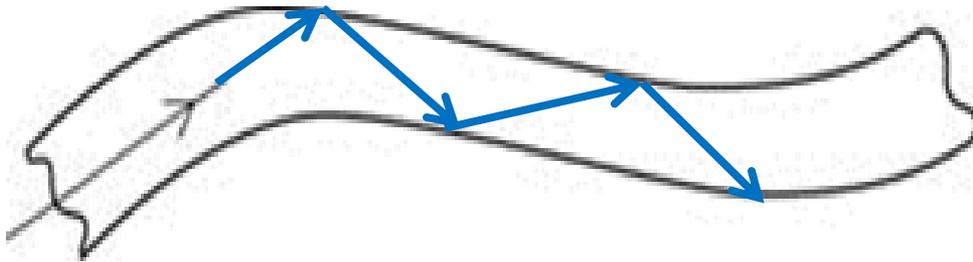
Which **one** of the diagrams, **A**, **B**, **C** or **D**, shows total internal reflection?

Write the correct letter in the box.

**D**

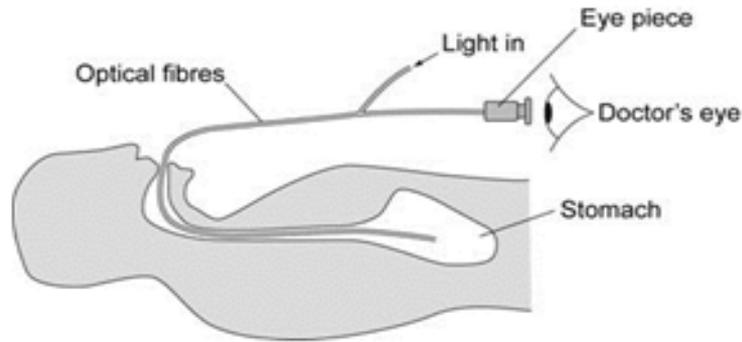
# PAST PAPER QUESTION

Complete the diagram to show the path taken by the light ray as it travels through the optical fibre.



# PAST PAPER QUESTION

The diagram shows an endoscope being used by a doctor to look inside a patient's stomach. Light travels into the stomach through a bundle of optical fibres.



The following sentences describe how the endoscope allows the doctor to see inside the patient's stomach. The sentences are in the wrong order.

- Q** Light passes through a bundle of optical fibres into the patient's stomach.
- R** The inside of the stomach reflects some of the light.
- S** The optical fibres take the light to an eyepiece.
- T** The doctor looks through the eyepiece to see inside the patient's stomach.
- U** The reflected light passes through a second bundle of optical fibres.

Arrange these sentences in the correct order. Start with letter **Q**.



# EXAMINER TIP

- ◉ Know that total internal reflection only occurs when the light is passing from a less dense to a more dense medium and the angle of incidence is greater than the critical angle.

Write a sentence that shows the examiner that you know this.

Swap books with the person next to you and write a what went well and an even better if for their statement



# X-RAYS

- ◉ X-rays form part of the EM spectrum
- ◉ They are transverse waves and can help diagnose disease
- ◉ High energy X-rays used to treat cancer
- ◉ They have a very short wavelength
- ◉ They cause **ionisation** (add or removing *electrons* in atoms and *molecules*)
- ◉ Turn photographic paper black
- ◉ Absorbed by metal and bone
- ◉ Pass through healthy body tissue
- ◉ Medical staff need to take precautions

# X-RAYS

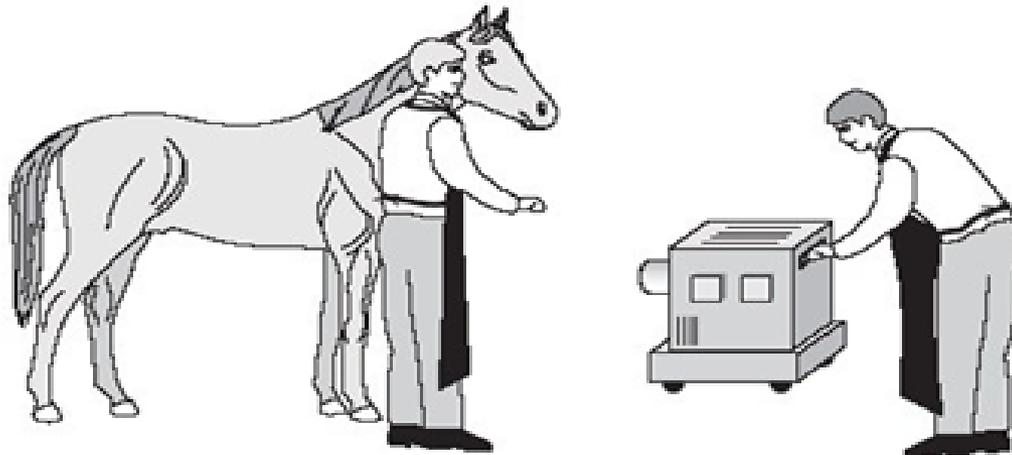
- ⦿ Charged-coupled device (CCDs) are now used instead of photographic film. This makes them easier to be recorded and stored.
- ⦿ Computerised tomography scans (CT scans) take lots of images in order to build up 3D images of the structures in the body rather than the 2D images that X-rays can provide.
- ⦿ CT scans give doctors a much deeper insight into what is wrong with the patient.

# PRECAUTIONS OF X-RAYS

- Patients limited to the number of X-rays they can have .
- X-rays machines produce relatively low energy X-rays which reduce the risk of damage to human tissue.
- X-ray rooms have shielded walls containing lead to reduce the risk to hospital staff.
- Warning signs are outside of the rooms so people don't walk in when the X-ray machine is in use.
- Only trained, specialist staff (radiographers) can use X-ray machines.
- They leave the room frequently or stand behind a lead screen when the X-ray machine is in use.
- If they can't do either of these, they wear a lead apron.

# PAST PAPER QUESTION

The picture shows a horse being prepared for an X-ray.



The person who will take the X-ray and the person holding the horse are wearing special aprons. These aprons have a lead lining.

Explain why the lead lining is important.

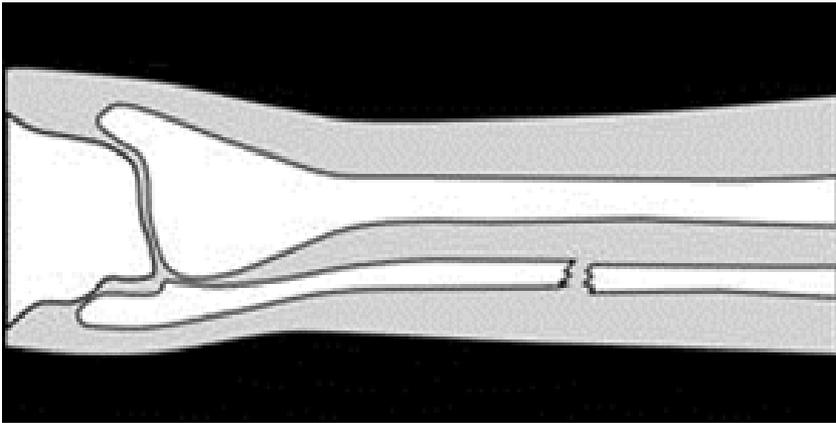
*To gain full marks in this question you should write your ideas in good English.*

1. As X-rays are unable to go through lead
2. The apron reduces the risk of the person's cells being damaged

# PAST PAPER QUESTION

Both X-ray machines and CT scanners are used to produce images of the body.

The diagram shows an X-ray photograph of a broken leg.



Before switching on the X-ray machine, the radiographer goes behind a screen.

1. X-rays are ionising OR cause cancer OR damage cells
2. Any stray X-rays are absorbed by screen
3. Which reduces the radiation dose to the radiographer

# PAST PAPER QUESTION

The following is an extract from a newspaper article.

## **X-rays cause 700 new cancers each year in the U.K.**

Each year there are about 125 000 new cancer cases in the UK, of which, about 700 may be due to the use of X-rays to diagnose illness.

The article was reporting on a scientific research project first published in a medical journal.

What evidence would the scientists have collected to come to the conclusion that X-rays can cause cancer?

1. medical records / X-ray records
2. of people with cancer

# PAST PAPER QUESTION

Explain the advantage of a CT scan compared to an X-ray.

1. A CT scan gives a 3D image
2. Therefore the image can be observed from different directions

## EXAMINER TIP

- ⦿ Know the uses and dangers of medical X-rays.

Write a sentence that shows the examiner that you know this.

Swap books with the person next to you and write a what went well and an even better if for their statement



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# ULTRASOUND

- Ultrasounds are high frequency sound waves (above 20kHz).
- Some animals can produce ultrasounds; bats and dolphins.
- Used to diagnose disease, pre-natal scans to check the development of an unborn baby, the medical treatment of kidney stones and in cleaning.

# ULTRASOUND

- ◉ When ultrasounds reach a boundary between two substances with different densities, they are partly reflected back.
- ◉ The remainder of the ultrasound waves continue to pass through.
- ◉ A detector is able to detect the reflected waves. It measures the time between an ultrasound wave leaving the source and it reaching the detector. The further away the boundary, the longer the time taken.

# ULTRASOUND

- ◉ We can calculate this distance travelled using this equation
- ◉  $s = v \times t$
- ◉  $s$  = distance (m)
- ◉  $v$  = speed (m/s)
- ◉  $t$  = time (s)

# X-RAYS AND ULTRASOUND

- ◉ X-rays have a shorter wavelength and higher frequency so X-rays produce higher quality images. This is vital when looking at small fractures
- ◉ CT scans are even higher quality than normal X-ray photographs
- ◉ X-rays are ionising so they can cause damage to the DNA in cells. This damage happens much easier in rapidly dividing cells (like that of a foetus). Ultrasound waves are not ionising so it is safe to use on a foetal scan.

## PAST PAPER QUESTION

Sound travels through air, water and glass at different speeds. Through which of these materials does sound travel

The fastest; ..... **Glass** .....

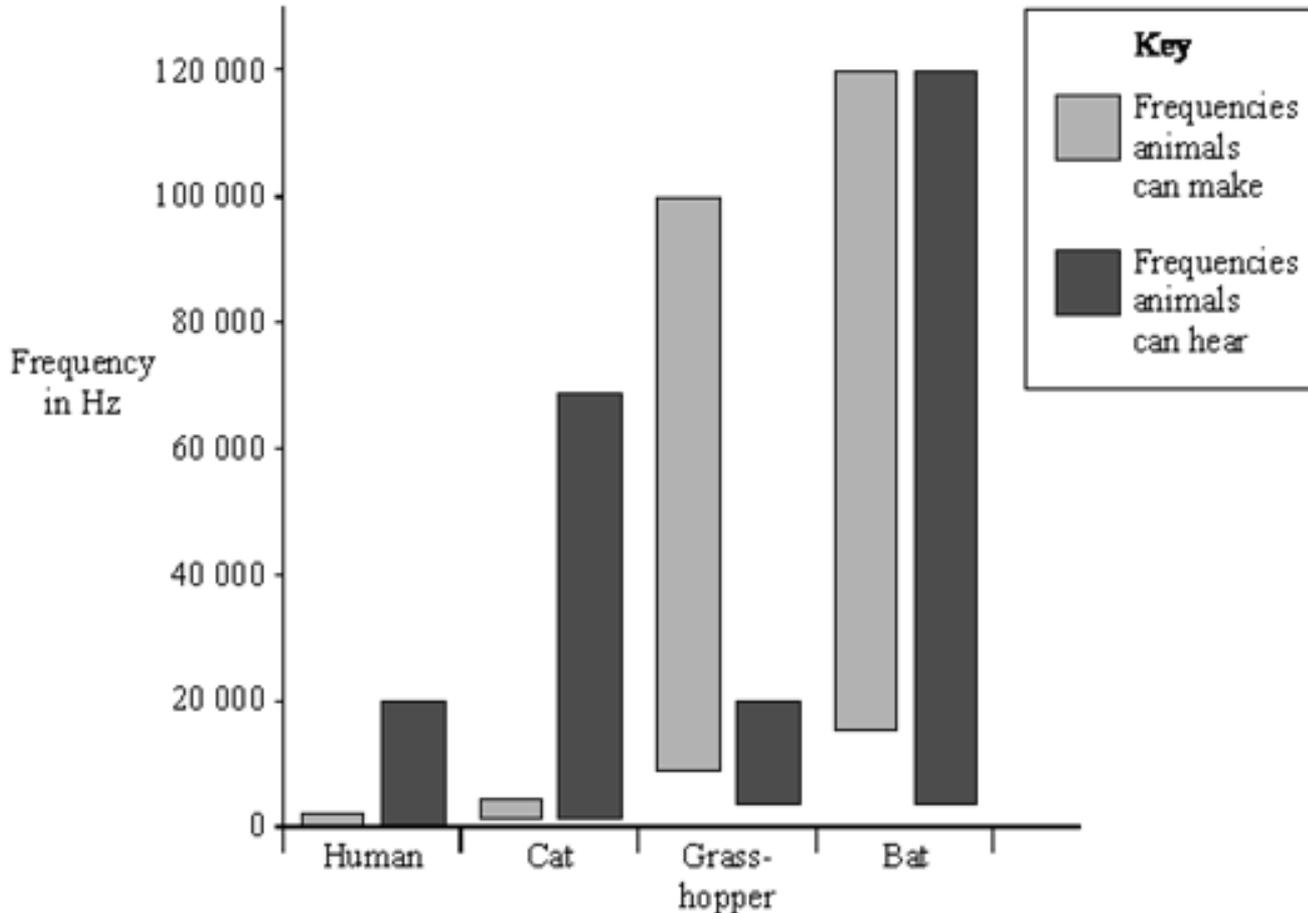
The slowest? ..... **Air** .....

Give a reason for your choice of answers.

**Sound travels faster in solids than gases**

# PAST PAPER QUESTION

The bar chart shows the frequencies of sound which different animals can make and can hear.



Which of the animals can make sounds which are beyond their own hearing range?

Grasshopper

# PAST PAPER QUESTION

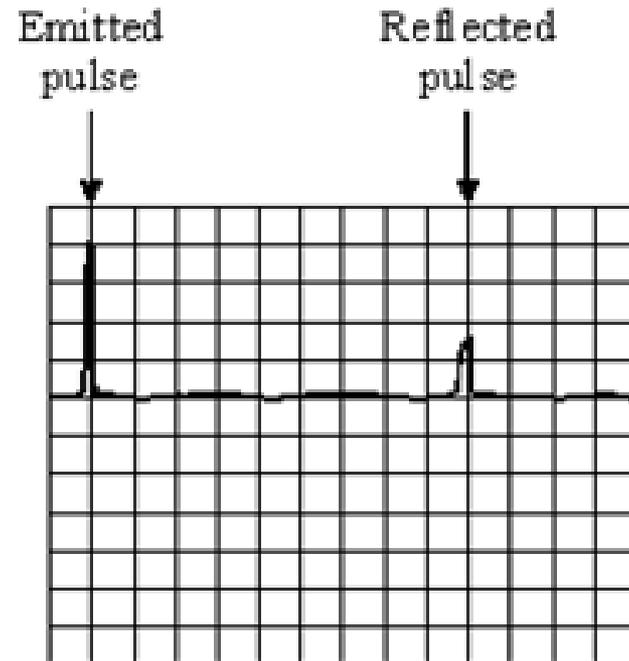
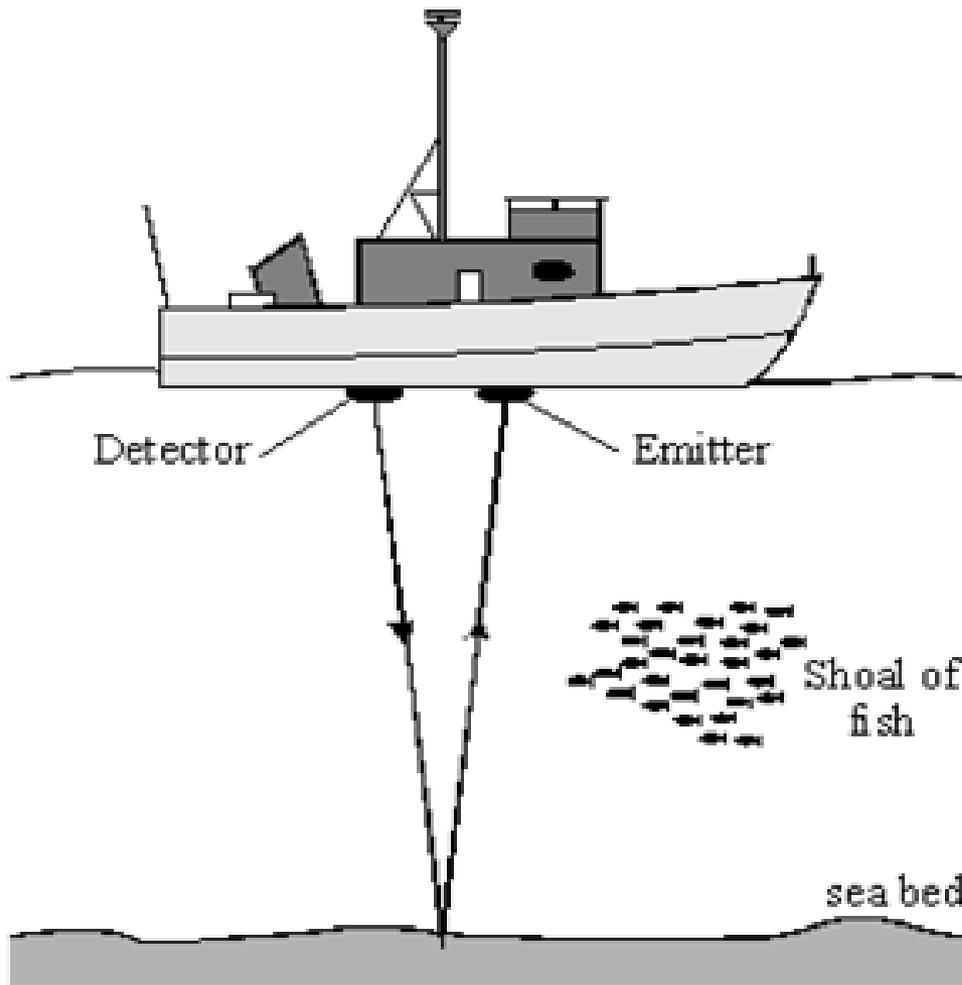
What name is given to the sounds which a cat can hear but a human cannot?

Ultrasound

---

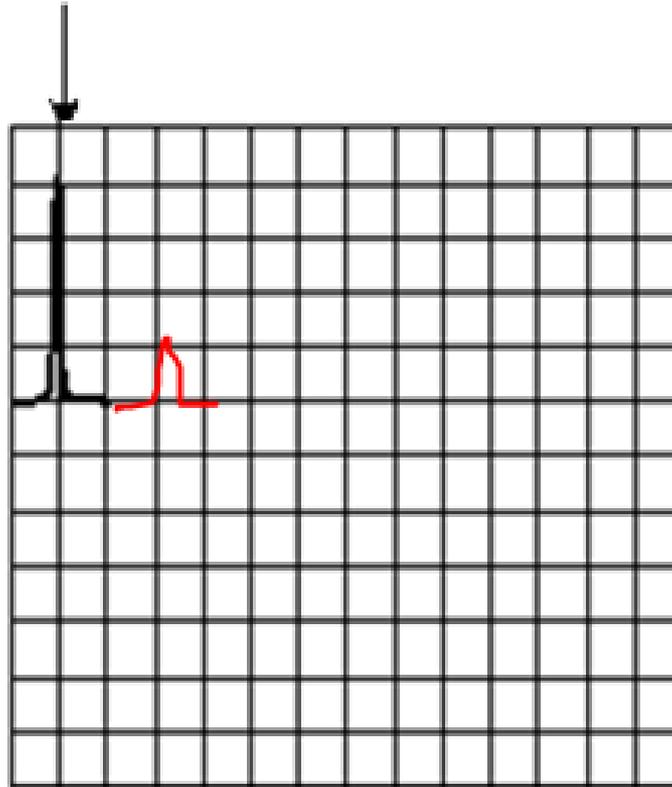
# PAST PAPER QUESTION

The diagram shows a trawler searching for a shoal of fish. Pulses of high frequency sound emitted from the trawler are reflected back to the trawler. The pulses are displayed on a cathode ray oscilloscope.



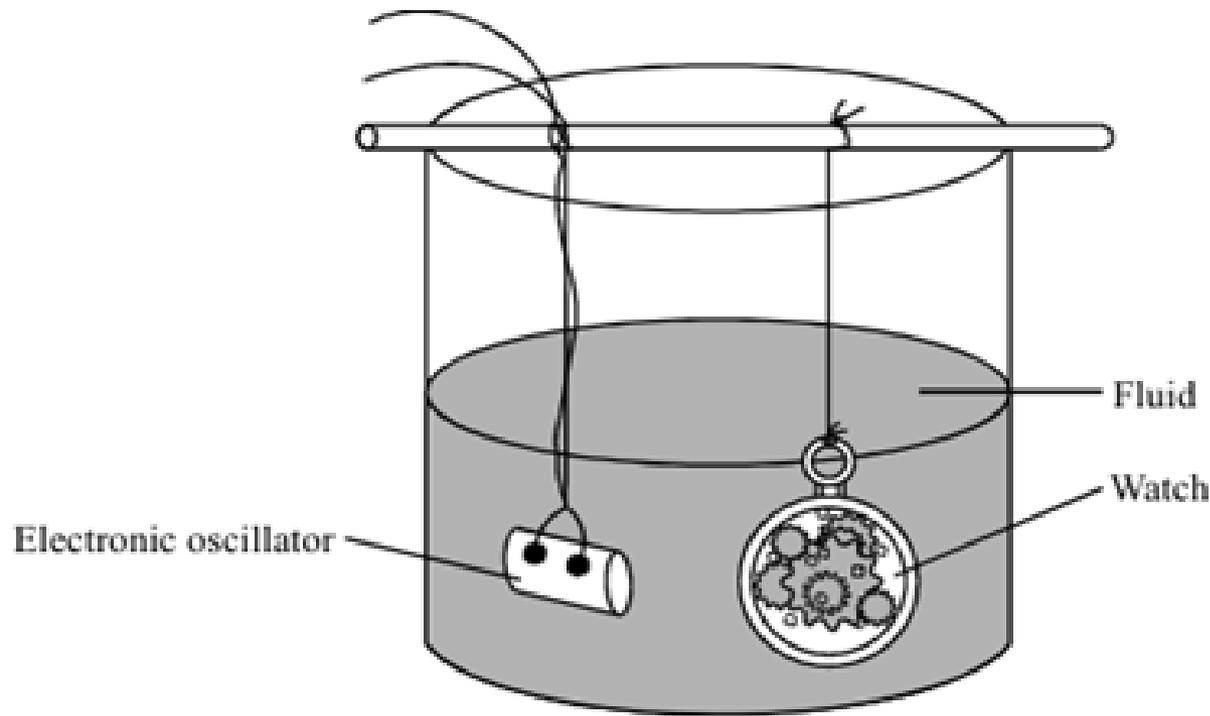
# PAST PAPER QUESTION

1. All of the reflected pulse closer than given in original diagram
2. Reflected pulse smaller than emitted but greater than 1 square high



# PAST PAPER QUESTION

The diagram shows how ultrasonic waves can be used to clean a watch.



Suggest how this method cleans the watch.

1. Vibrations in the water
2. Shake the dirt particles off the watch

## EXAMINER TIP

- ◉ Know the definition of 'ultrasound' and the medical uses of ultrasound.

Write a sentence that shows the examiner that you know this.

Swap books with the person next to you and write a what went well and an even better if for their statement



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# CENTRE OF MASS

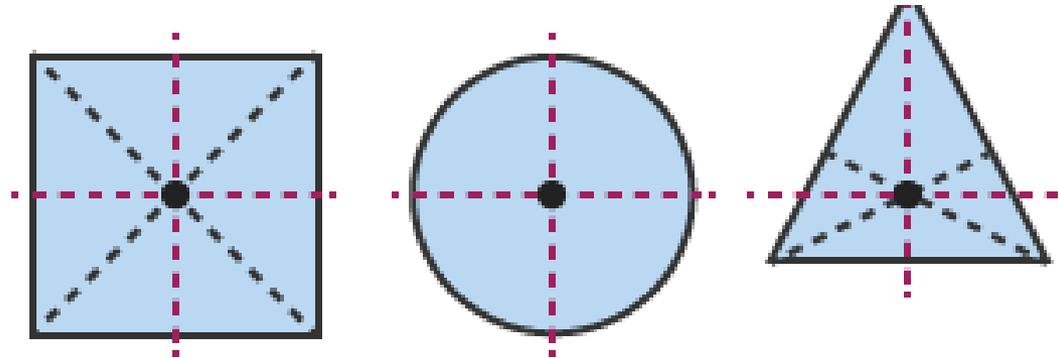
## Learning Outcomes:

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question

- The mass of an object being concentrated at a point is known as the centre of mass.
- Finding the centre of mass in symmetrical objects



# CENTRE OF MASS

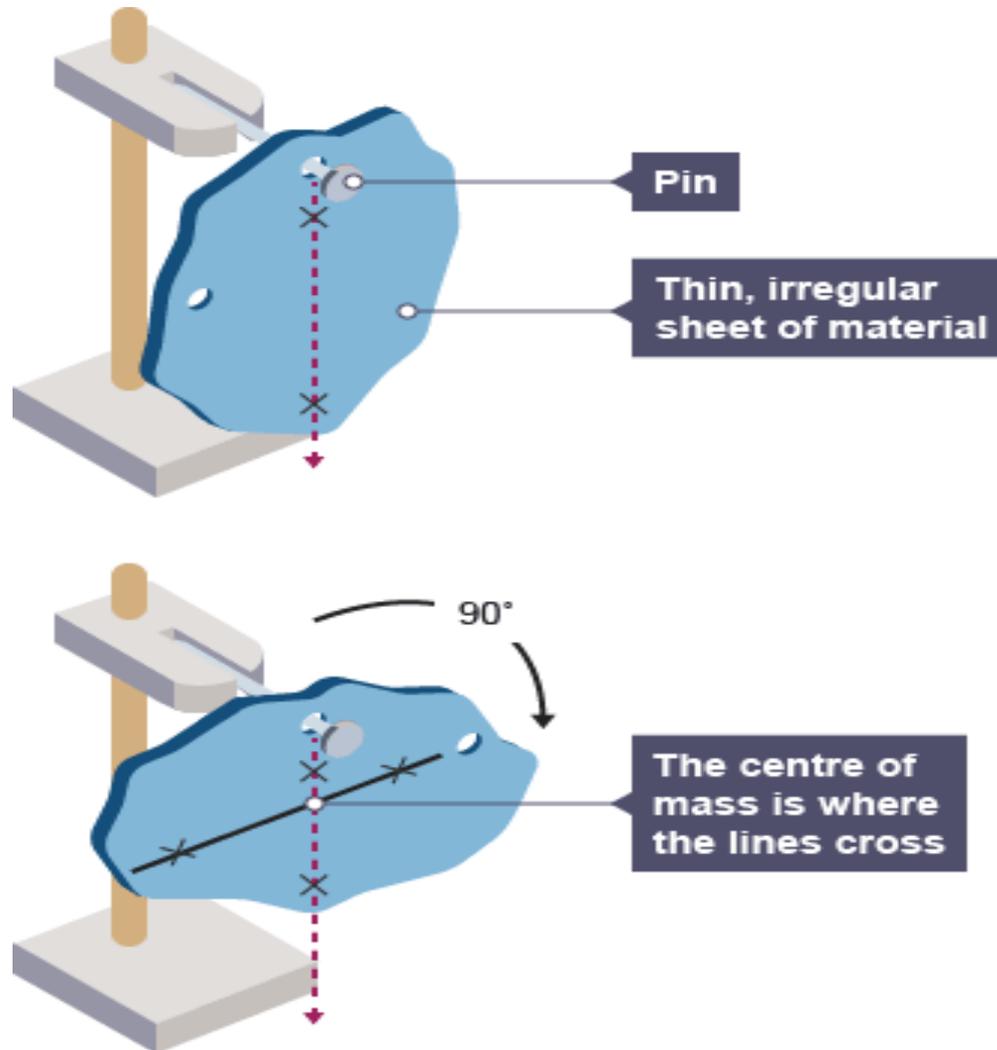
## Learning Outcomes:

- Finding the centre of mass in irregular objects

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question



# STABILITY

## **Learning Outcomes:**

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question

- Stability is a measure of how likely it is for an object to topple over when pushed or moved.
- Stable objects are very difficult to topple over, while unstable objects topple over very easily.
- The stability of an object is affected by two factors:
  - The width of the base of the object
  - The height of its centre of mass

# STABILITY

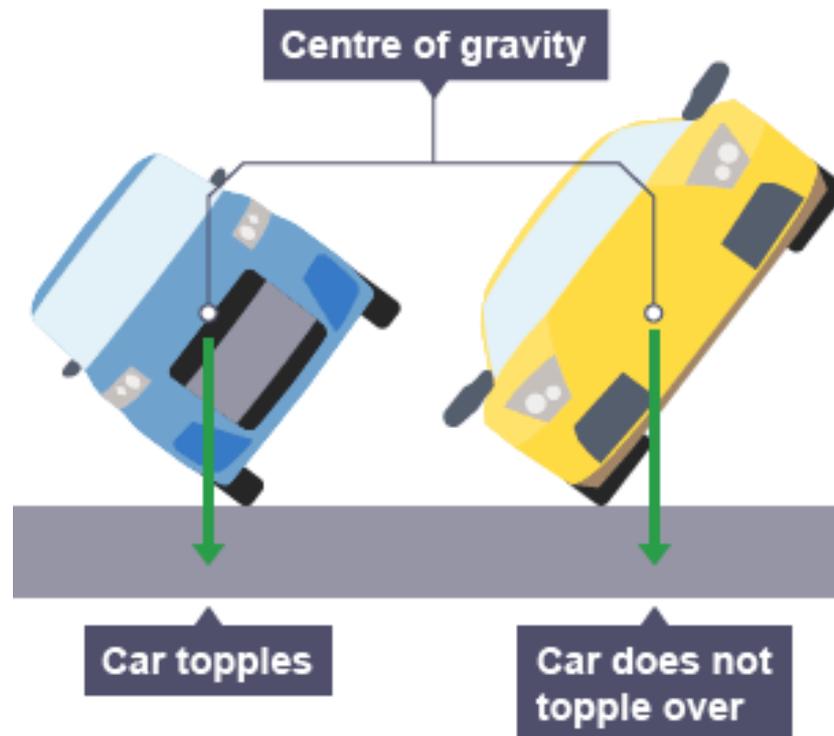
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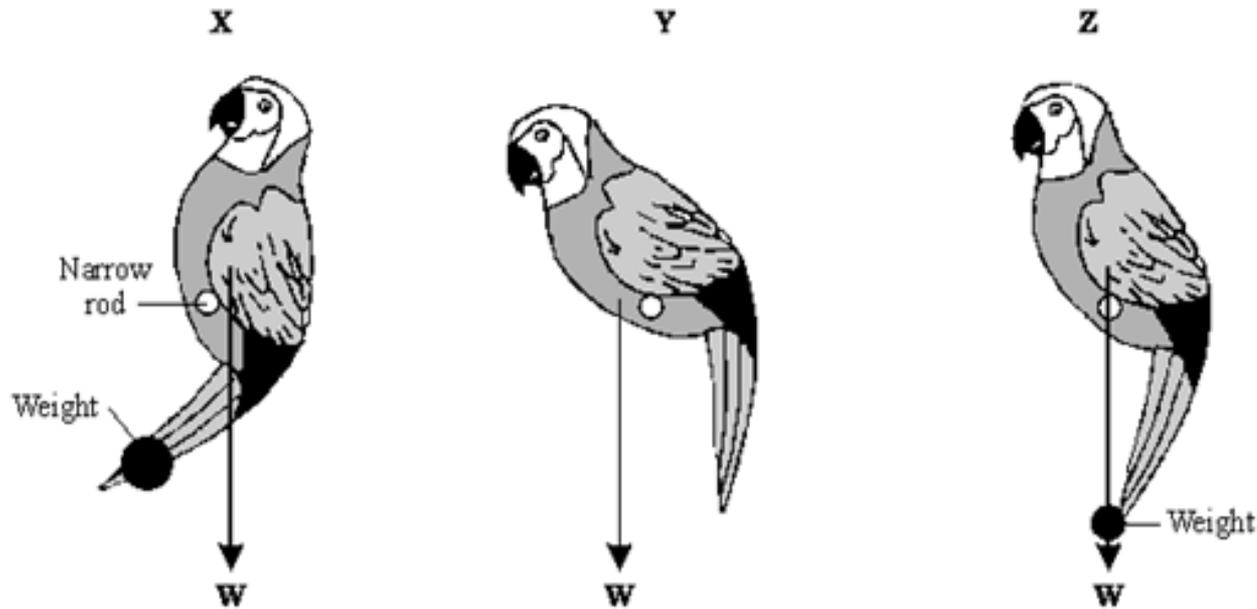
**Excellent-** You can get 75% of marks in each question

- Objects with a wide base, and a low centre of mass, are more stable than those with a narrow based and a high centre of mass.



# PAST PAPER QUESTION

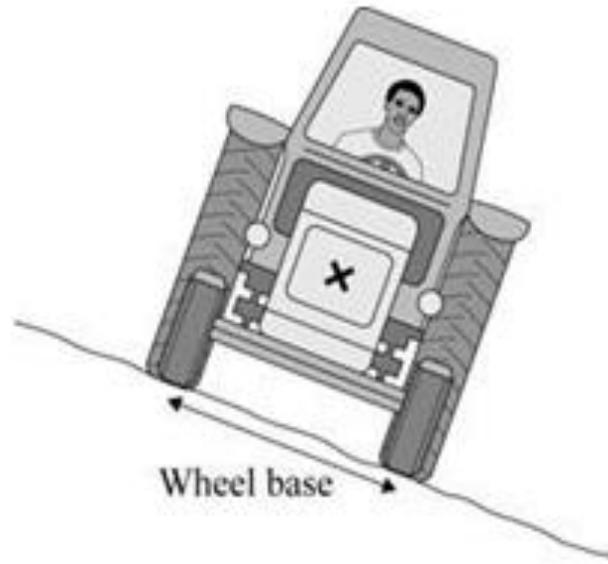
The diagram shows three similar toys. Each toy should be able to balance on a narrow rod. The arrows show the direction in which the weight of the toy acts.



Only one of the toys balances on the rod, the other two fall over. Which **one** of the toys is balanced? Explain the reason for your choice.

1. Z
2. Weight acts through pivot
3. So there is no moment

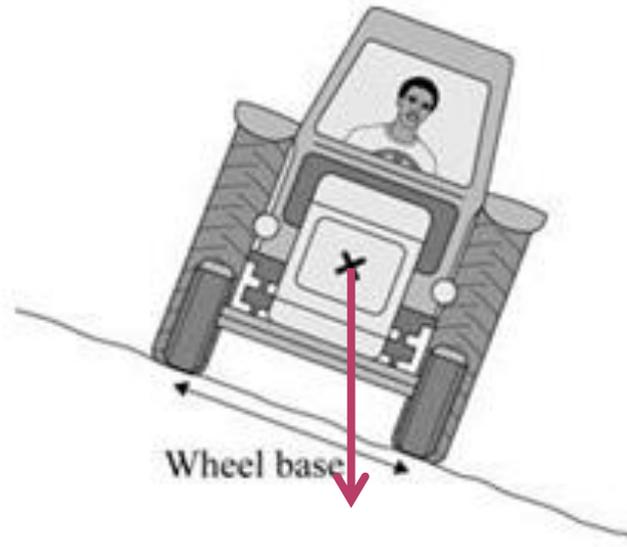
## PAST PAPER QUESTION



Explain how the design of the tractor could be changed in order to increase the tractor's stability.

1. Lower the centre of mass
2. Make the wheelbase wider

## PAST PAPER QUESTION



Explain why the tractor does not topple over. You may add to the diagram to help your explanation.

The line of action of its weight (draw on the diagram) falls inside its wheel base therefore there is no resultant / clockwise moment

## EXAMINER TIP

- ◉ Be able to analyse the stability of objects by evaluating their tendency to topple.

Write a sentence that shows the examiner that you know this.

Swap books with the person next to you and write a what went well and an even better if for their statement



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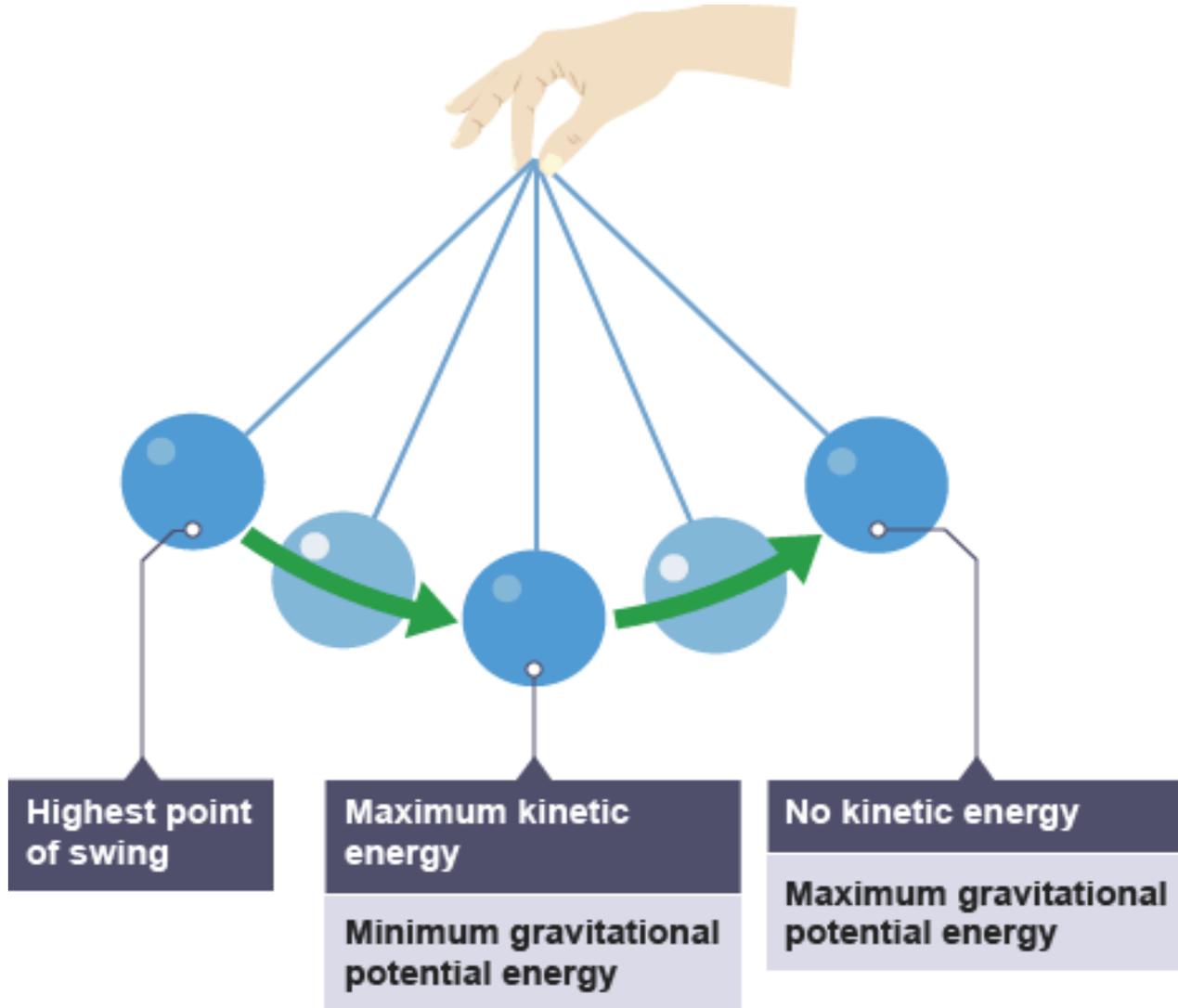
# PENDULUMS

## Learning Outcomes:

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question



# PENDULUMS

## **Learning Outcomes:**

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**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question

- Common examples of pendulums include swings at playgrounds, some fairground rides - e.g. pirate ship rides and the inside mechanisms of some clocks - e.g. grandfather clocks

# PENDULUMS

The number of complete swings (from one side to the other and back again) made by a pendulum per second is its **frequency, f**.

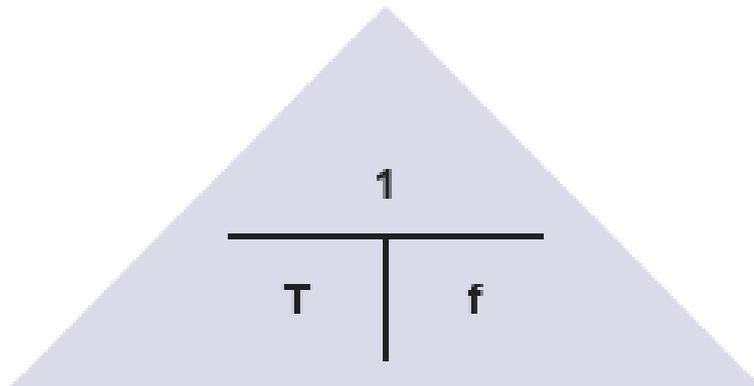
Time period and frequency are related by the equation:

$$T = 1/f$$

where:

T = time period in seconds, s

f = frequency in Hertz, Hz

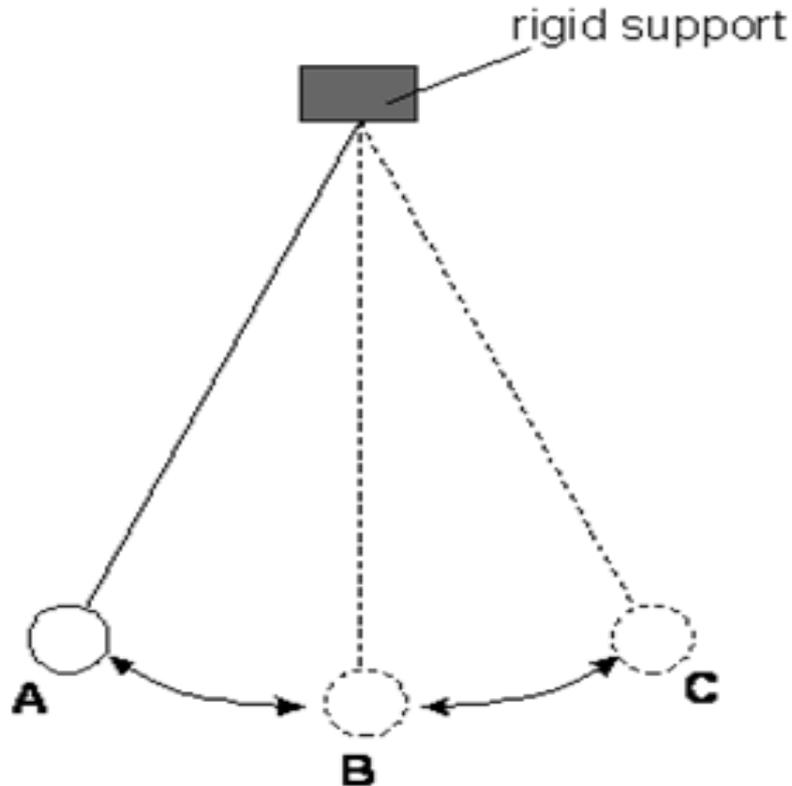


The time period of one swing of a pendulum is dependent only upon the length of the pendulum and not upon the mass of the bob, or how high it swings. Longer pendulums have greater time periods than shorter pendulums.

# PAST PAPER QUESTION

The diagram below shows an experiment where a pendulum swings backwards and forwards.

A pendulum is a small heavy weight suspended by a light string.



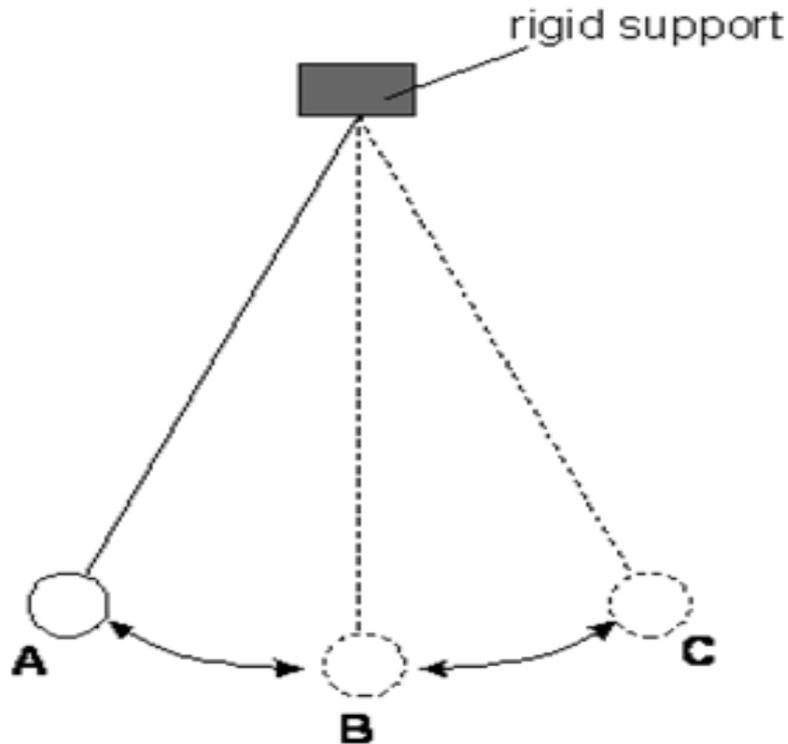
In which position, A, B or C, does the pendulum have least potential energy?  
Explain your answer.

B because it has the maximum kinetic energy

# PAST PAPER QUESTION

The diagram below shows an experiment where a pendulum swings backwards and forwards.

A pendulum is a small heavy weight suspended by a light string.



In which position, A, B or C, does the pendulum have greatest kinetic energy?

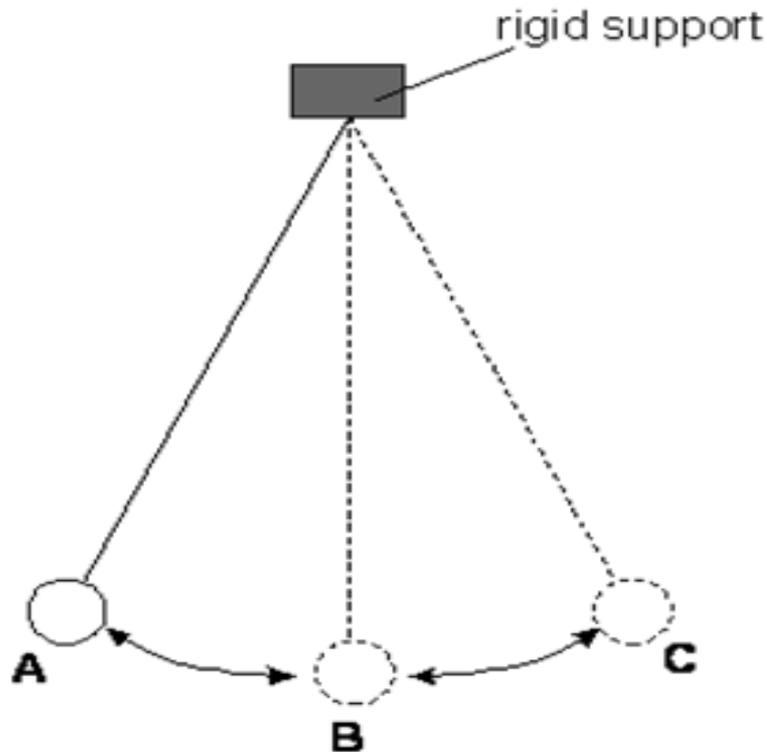
Explain your answer.

**B because it has the minimum of GPE**

# PAST PAPER QUESTION

The diagram below shows an experiment where a pendulum swings backwards and forwards.

A pendulum is a small heavy weight suspended by a light string.

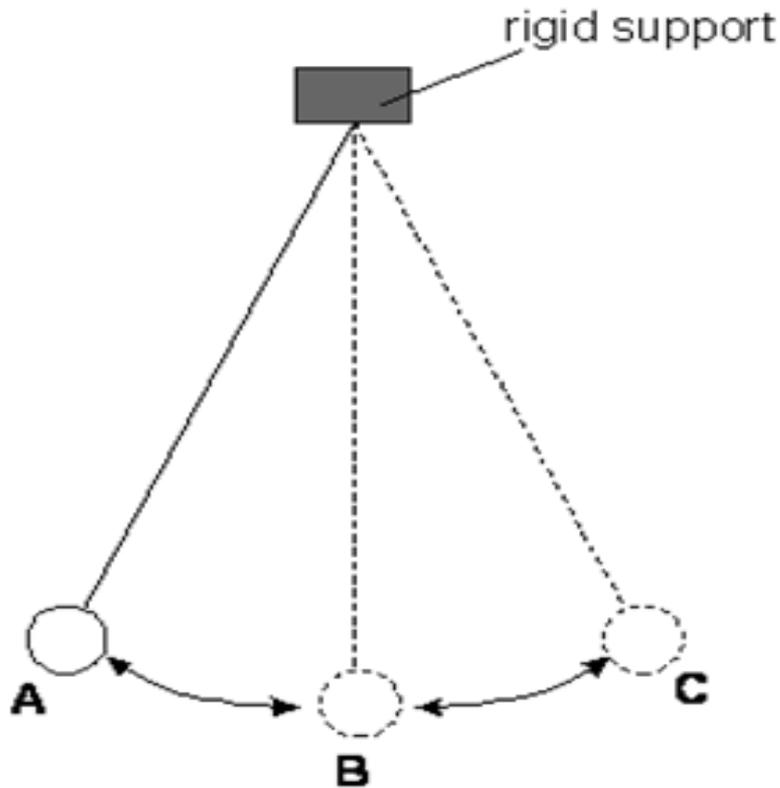


After a few minutes the size of the swings becomes smaller. Explain why this happens.

Energy lost from doing work against friction

The diagram below shows an experiment where a pendulum swings backwards and forwards.

A pendulum is a small heavy weight suspended by a light string.



If the experiment were repeated on the Moon the pendulum would swing more slowly. Suggest a reason for this.

1. Intensity of gravity less (not zero)
2. The energies/restoring forces less

## EXAMINER TIP

- ◉ Know the terms in the equation and their units.

Write a sentence that shows the examiner that you know this.

Swap books with the person next to you and write a what went well and an even better if for their statement

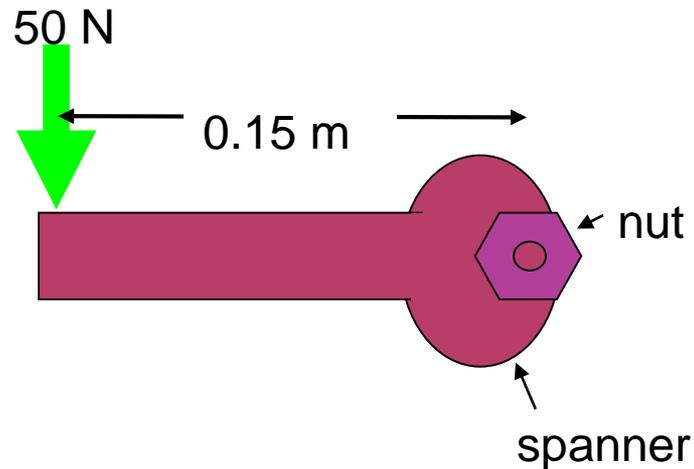


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# MOMENTS

- ⦿ A moment is a turning force
- ⦿ The size of a moment depends on the size of the applied force and its perpendicular distance from a pivot



$$\text{Moment (Nm)} = \text{Force (N)} \times \text{Distance (m)}$$

$$= 50\text{N} \times 0.15\text{m}$$

$$= 7.5\text{Nm}$$

# MOMENTS

## Balancing moments

When an object is not turning around a pivot, the total clockwise moment must be exactly balanced by the total anti-clockwise moment.

We say that the opposing moments are balanced:

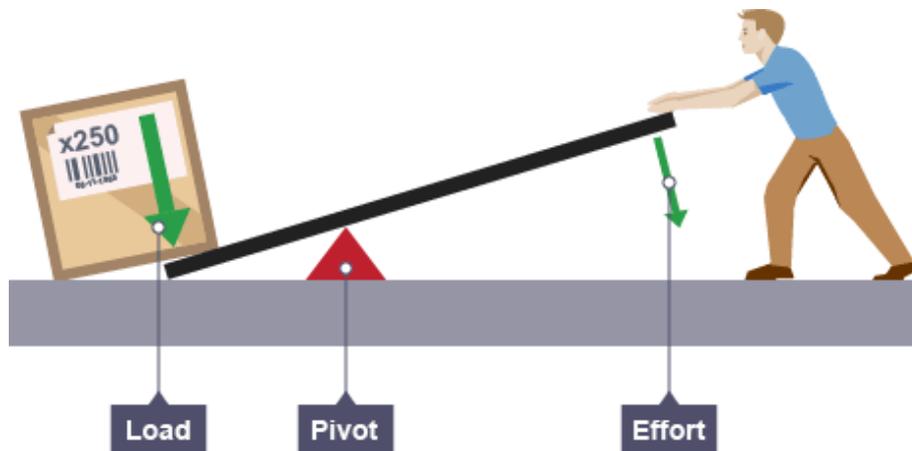
sum of the clockwise moments = sum of the anti-clockwise moments

# MOMENTS - LEVERS

A lever is a simple machine that makes work easier to do. E.g. scissors, or lifting the lid on a tin of paint with a screwdriver.

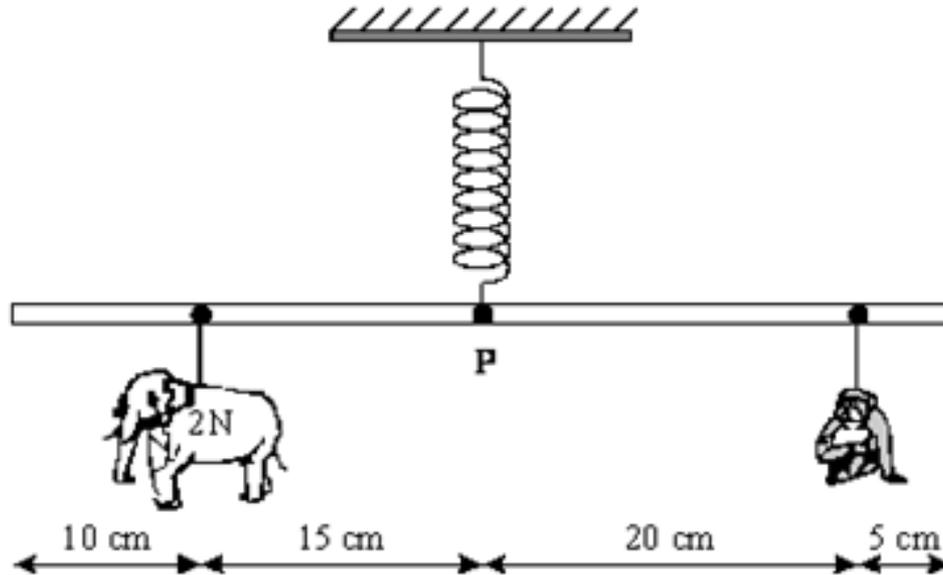
Levers act as force multipliers which means they reduce the force needed to perform tasks.

When someone uses a lever, they exert a force (the effort) around a pivot to move an object (the load).



# PAST PAPER QUESTION

The diagram shows a simple toy. Different animal shapes can be positioned so that the 50 cm rod balances horizontally.



Use the following equation to calculate the moment exerted by the elephant shape of weight 2N about the pivot P. Show clearly how you work out your answer and give the unit.

Moment = force

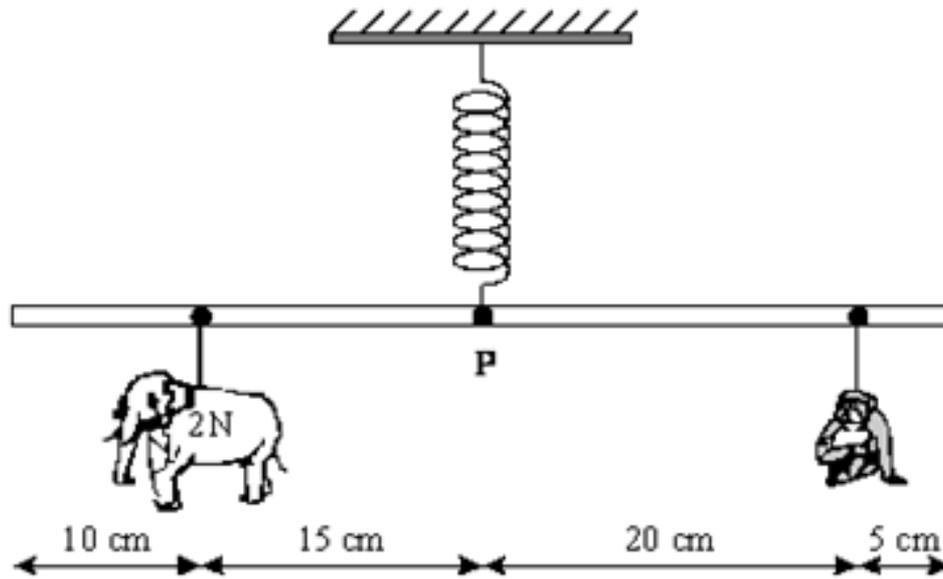
$$1. \quad M = F \times d$$

$$2. \quad M = 2\text{N} \times 0.15\text{m}$$

$$3. \quad 2 = 0.3\text{Nm}$$

ot

# PAST PAPER QUESTION



Use the following relationship to calculate the weight of the monkey shape.

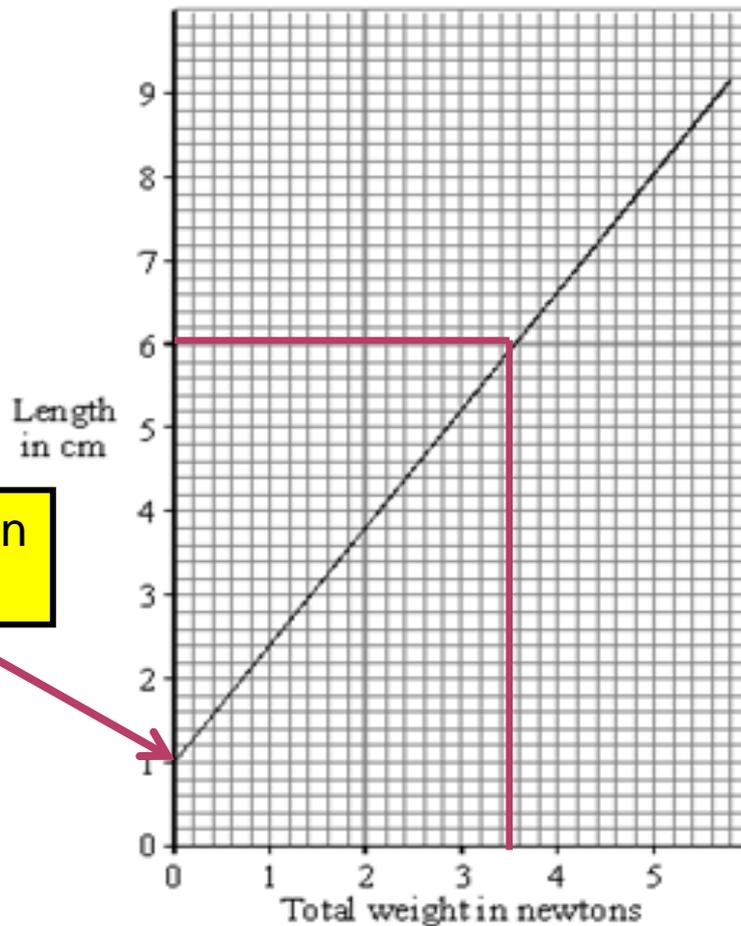
Total clockwise moment = total anticlockwise moment

1.  $M = F \times d$
2.  $0.3 \text{ Nm} = F \times 0.20 \text{ m}$
3.  $F = 0.3 / 0.20 \text{ m}$
4.  $F = 1.5 \text{ N}$

N

# PAST PAPER QUESTION

The graph shows how the length of the spring changes as the total weight of the different animal shapes change.



Hint – extension starts at 1cm

$$6\text{cm} - 1\text{cm} = 5\text{cm}$$

Use the graph to find how much the spring extends when the elephant shape and the monkey shape are hung from the rod. Show how you get your answer.

## EXAMINER TIP

- ◉ Know how to calculate the moment of a force.  
Know how to use the law of moments to calculate a force or distance needed for balance.

Write a sentence that shows the examiner that you know this.

Swap books with the person next to you and write a what went well and an even better if for their statement



**TARLETON**  
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# HYDRAULICS

## **Learning Outcomes:**

**Good-** know the key facts in the physics module

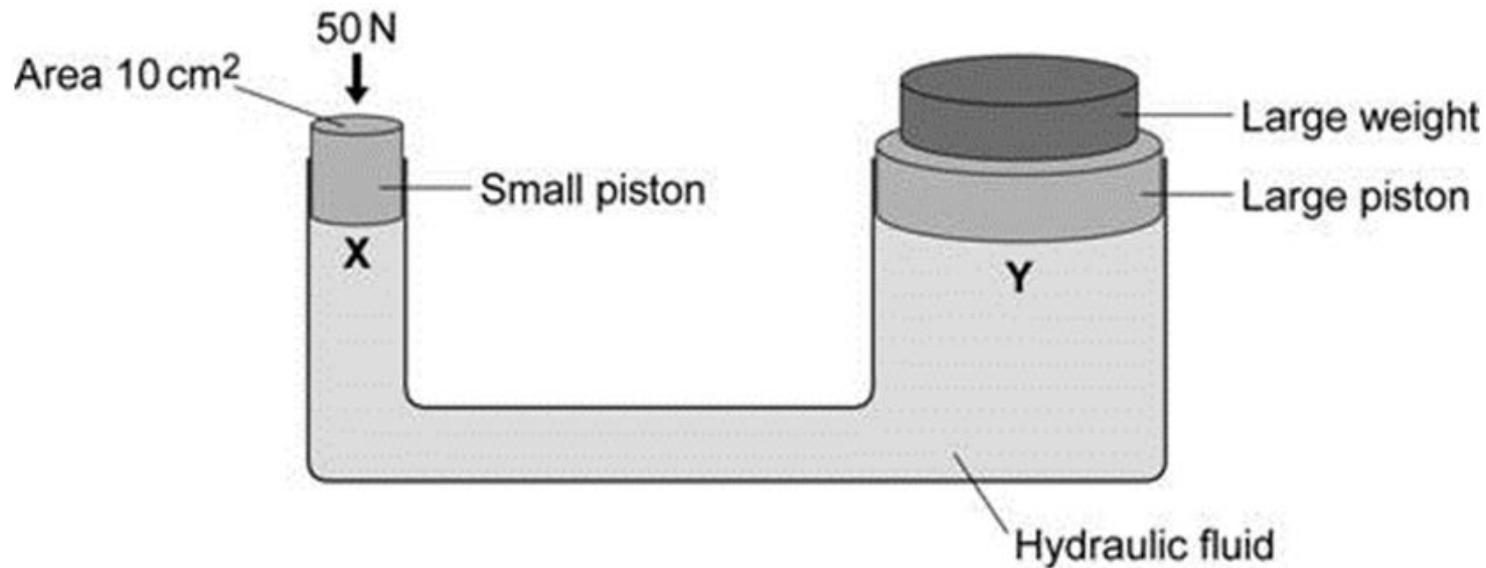
**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question

1. Pressure is transmitted equally through liquids.
2. In hydraulic machines, a small amount of force can be multiplied into a large amount of force.

# SIMPLIFY THIS STATEMENT

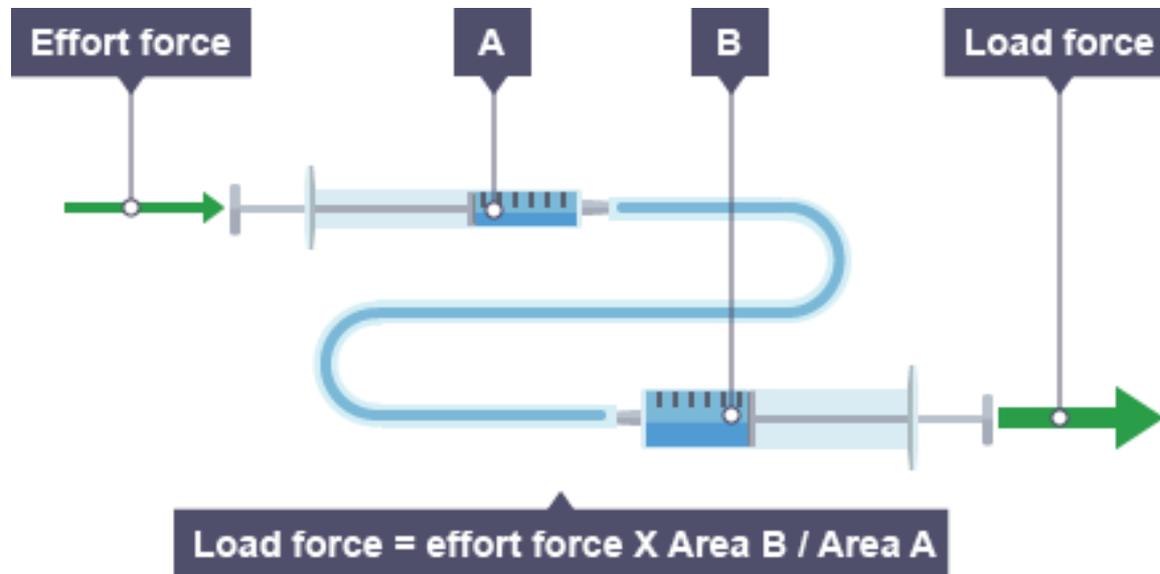
1. **Particles in liquids are close together - liquids virtually incompressible.**
2. **As the particles move around, they collide with other particles and with the walls of the container. The pressure in a liquid is transmitted equally in all directions, so a force exerted at one point on a liquid will be transmitted to other points in the liquid.**



Complete the following sentence.

The pressure at Y will be ..... **The same as** ..... the pressure at X.

# WHAT HAPPENS NEXT AND WHY?



Tube B has a plunger with a bigger cross-sectional area than tube A so the load force exerted is larger than the effort force exerted. This is known as a force multiplier. (The bigger syringe moves a shorter distance than the smaller syringe).

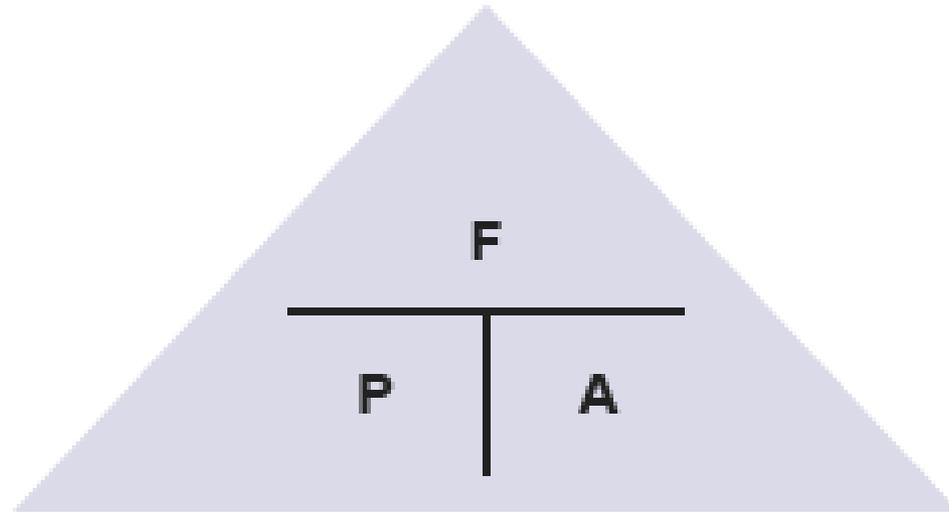
## HYDRAULICS

**Learning Outcomes:**

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question



- $P = \text{pressure (Pa)}$
- $F = \text{force (N)}$
- $A = \text{cross-sectional area (m}^2\text{)}$

1. Force / Area
2.  $250 / 10 = 25 \text{ Pa}$

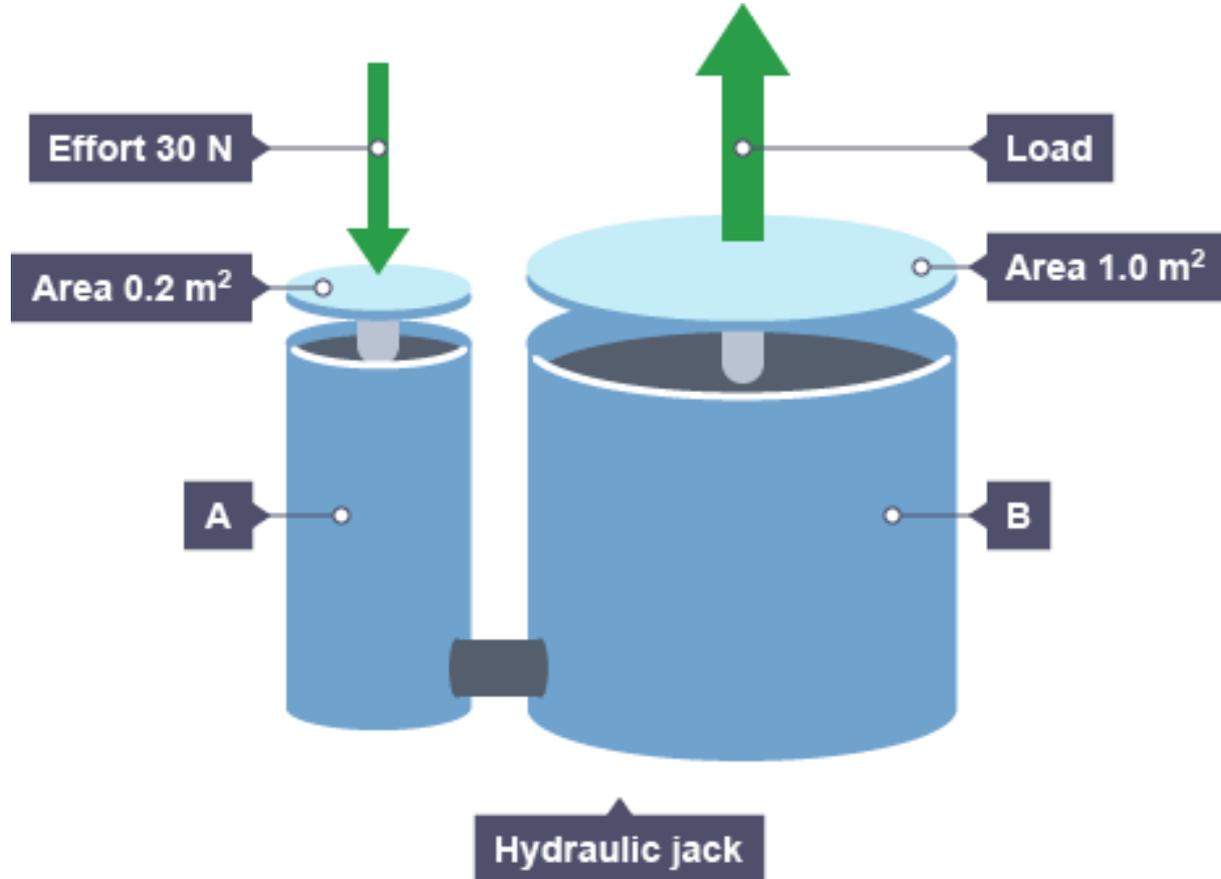
# CALCULATE THE FORCE ON PISTON B

## Learning Outcomes:

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

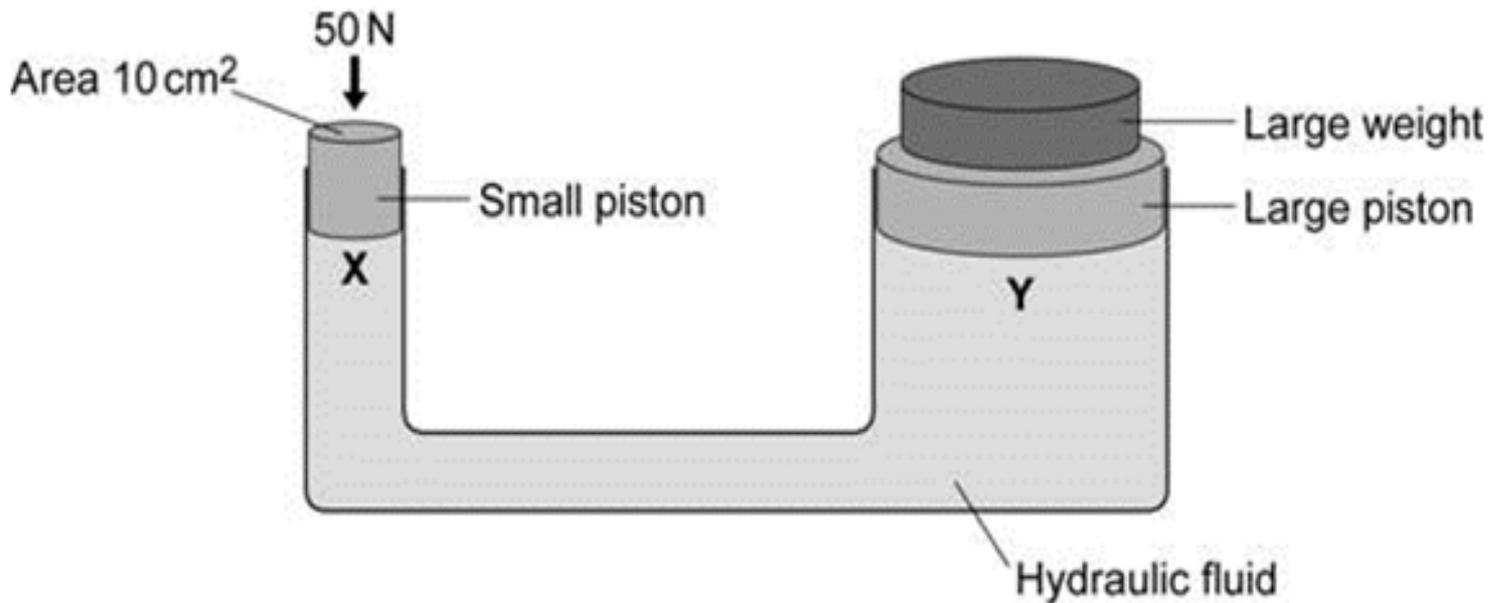
**Excellent-** You can get 75% of marks in each question



**Hint - 2 step process where you need to calculate the pressure in A and change the subject to find the force of B**

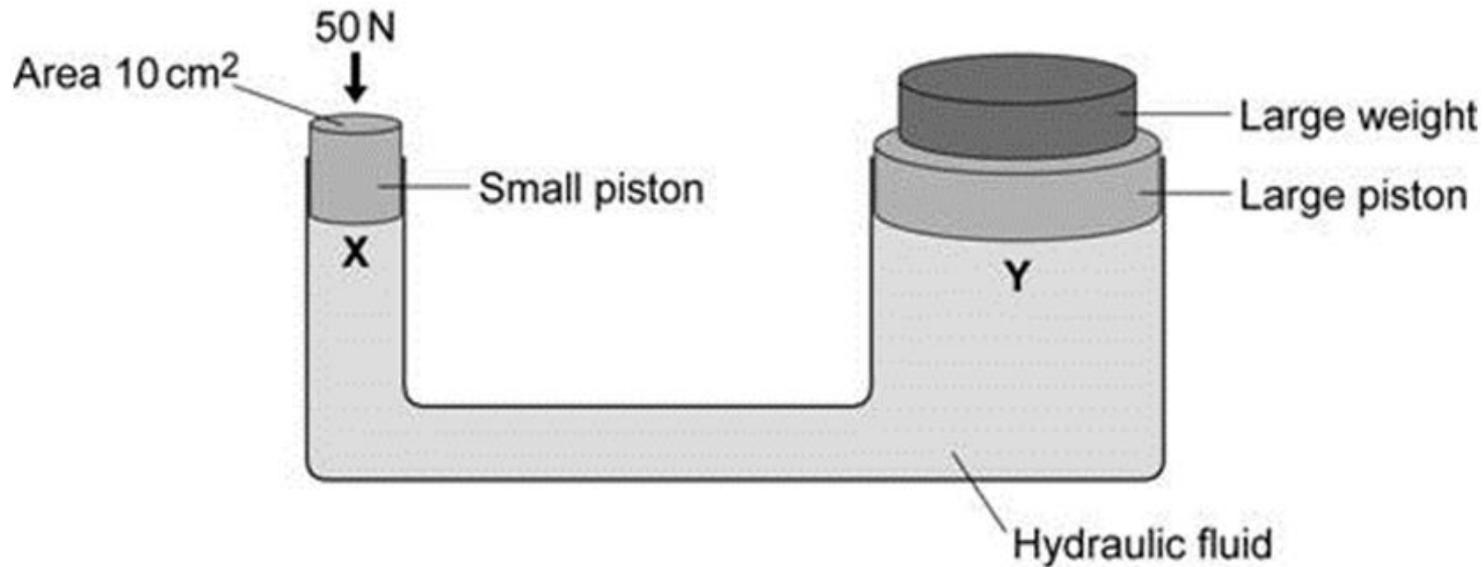
# EXAM QUESTION

**Q1.** The diagram shows a simple hydraulic jack. The jack is designed to lift a large weight using a much smaller force.



Complete the following sentence.

A hydraulic jack is an example of a ..... **Force** ..... multiplier



Calculate the pressure, in N/cm<sup>2</sup>, created on the small piston by the force of 50 N pushing downwards.

Write down the equation you use, and then show clearly how you work out your answer.

.....  
.....

Pressure = ..... **5** ..... N/cm<sup>2</sup> (2)

## GIVE ME 5

**Learning  
Outcomes:**

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question

1. Braking system of a car
2. Lifting equipment - e.g. hydraulic jacks and wheelchair lifts
3. Lifting and excavating arms on machinery such as diggers
4. Hydraulic presses - which are used during the forging of metal parts
5. Wing flaps and some rudders on aircraft and boats

## EXAMINER TIP

- ◉ Know the terms in the equation and their units.

Write a sentence that shows the examiner that you know this.

Swap books with the person next to you and write a what went well and an even better if for their statement



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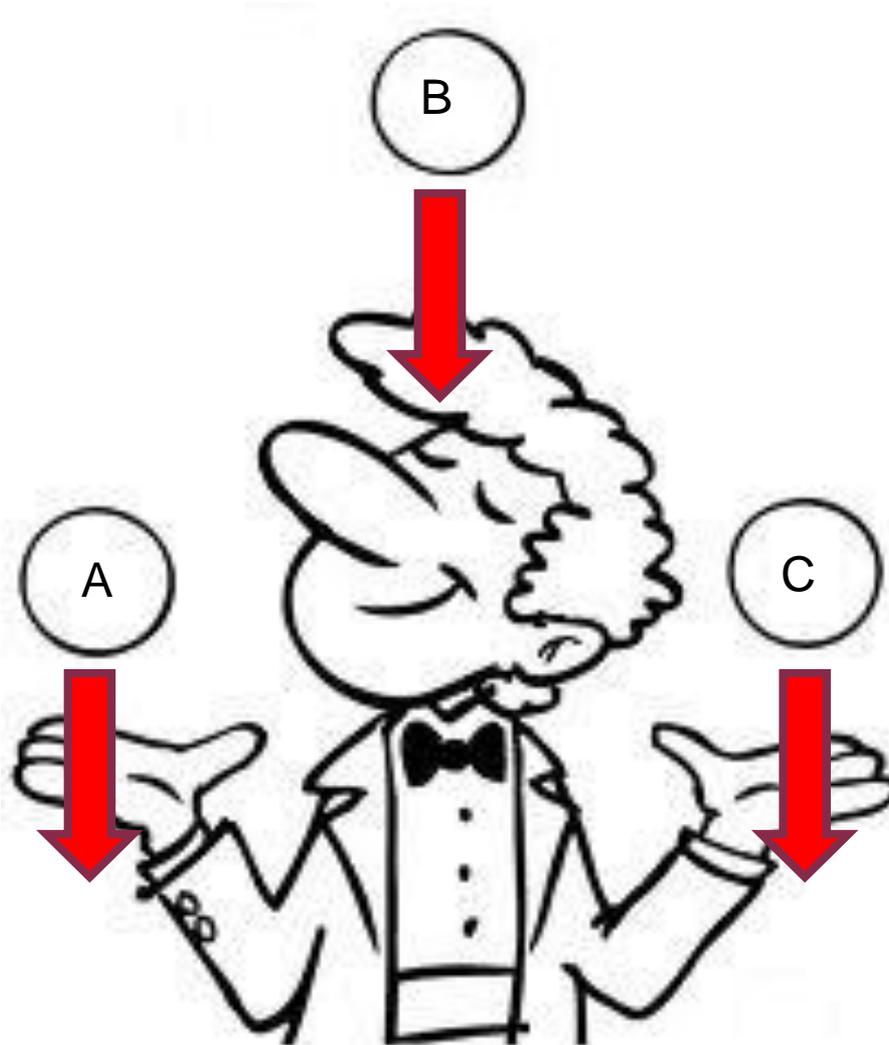
**Learning  
Outcomes:**

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question

# WHERE ARE THE FORCES?

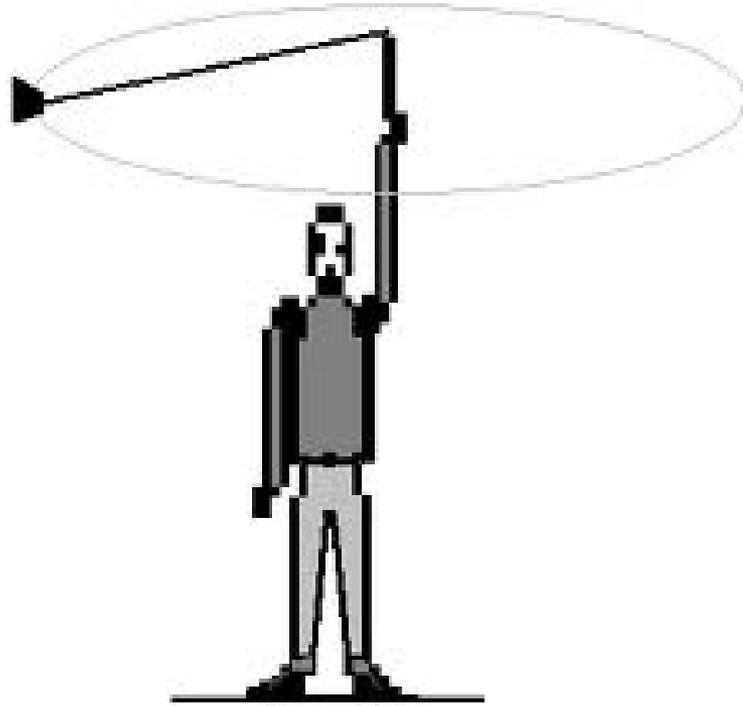


What is the force on the *bung*?

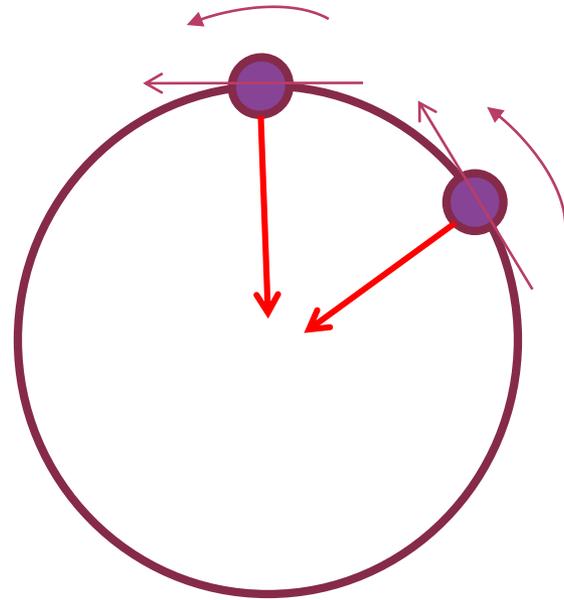
What would happen to the path of the bung if you let go?

What would happen if the bung was really heavy?

What happens if you make the string long or short?



- ◉ An object moving in a circle changes direction all the time
- ◉ When an object changes direction, it is due to a resultant force (Newton's 2<sup>nd</sup> Law)
- ◉ This force acts towards the centre of the circle - centripetal force
- ◉ The object is said to accelerate towards the centre of the circle (change in direction NOT speed)



The London Eye is the largest observation wheel in the world.



The passengers ride in capsules. Each capsule moves in a circular path and accelerates.

Explain how the wheel can move at a steady speed and the capsules accelerate at the same time. (2)

1. Acceleration is (rate of) change of velocity
2. Velocity has direction

# FACTORS AFFECTING CENTRIPETAL FORCE

- ◉ The faster an object's moving, the Larger the centripetal force has to be to keep it moving in a circle.
- ◉ The heavier an object, the Larger the centripetal force has to be to keep it moving in a circle.
- ◉ The smaller the radius of a circle, the Larger the centripetal force to keep an object moving in a circle.

The designers of the London Eye had to consider **three** factors which affect the resultant force described in part (c).

Two factors that increase the resultant force

1. An increase in the speed of rotation
2. An increase in the total mass of the wheel, the capsules and the passengers.

Name the other factor that affects the resultant force and state what effect it has on the resultant force.

The greater the radius / diameter / circumference (of the wheel)  
the smaller the (resultant) force  
(required)

# What is the centripetal force?

- Electrostatic force...

- Friction...

- Gravity...

- Tension...

- A car travelling around a bend

- A stone whirled around on the end of a string

- A planet moving around the sun

- An electron orbiting the nucleus

(b) In which direction does each capsule accelerate?

..... **Towards the centre of the wheel** .....

(c) What is the name of the resultant force that causes the capsules to accelerate?

..... **Centripetal force** .....

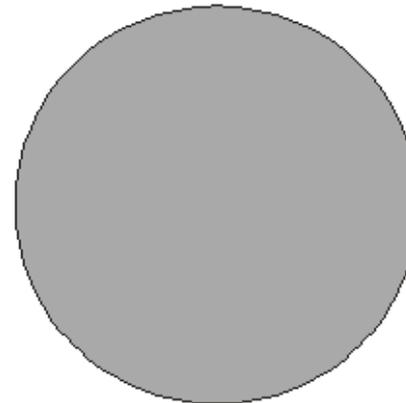
# The Red Planet

The two natural satellites, or moons, of Mars are Phobos (fear) and Deimos (terror). They are named after the horses which pulled the chariot of Mars, the god of war in the mythology of Ancient Greece.

Phobos takes less than eight hours to orbit Mars and gets slightly closer every time it does so. Scientists predict that in about 100 million years time it will either be ripped apart by the gravitational force or will crash onto the surface of Mars.

● Deimos

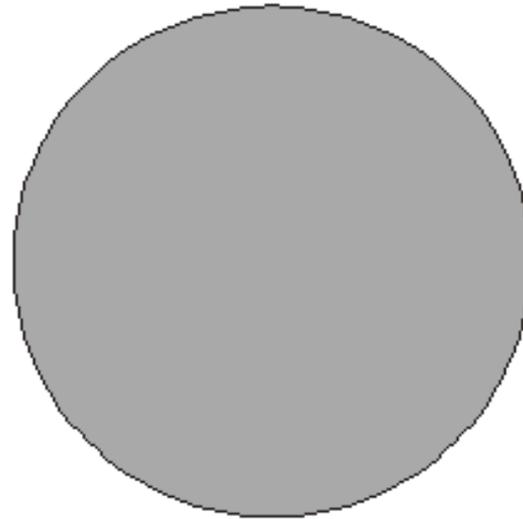
● Phobos



Not to scale

● Deimos

● Phobos



Not to scale

Suggest how scientists have arrived at their prediction of about 100 million years.

From observations of the rate of change in the moon's orbit (1), scientists have continued the pattern/trend for the next 100 million years (1)

The centripetal force on Phobos is gradually changing as it orbits Mars.

Is the force increasing or decreasing?

Increasing (1)

Explain your answer.

The circumference of the orbit of the moon will decrease (1)

Scientists expect that the mass of Mars and the mass of Phobos will not increase.

Explain what will happen to the gravitational force on Phobos as it orbits Mars.

.....

.....

.....

.....

It will increase/be more (1) because Phobos will get closer to Mars (1)

## EXAMINER TIP

- ◉ Be able to identify which force(s) provide(s) the centripetal force in a given situation.

Write a sentence that shows the examiner that you know this.

Swap books with the person next to you and write a what went well and an even better if for their statement



# ELECTROMAGNETS

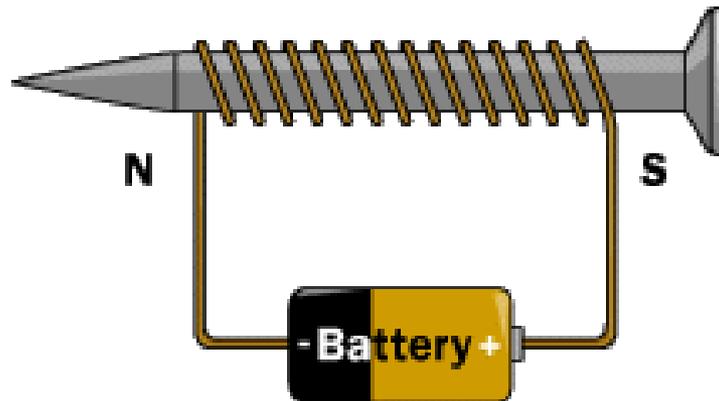
## Learning Outcomes:

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question

- ◉ Electromagnets are made by passing an electric current through a wire that has been wrapped around iron.
- ◉ The current creates a magnetic field and magnetises the iron core. When the current is turned off the iron loses its magnetism



# ELECTROMAGNETS

## Learning Outcomes:

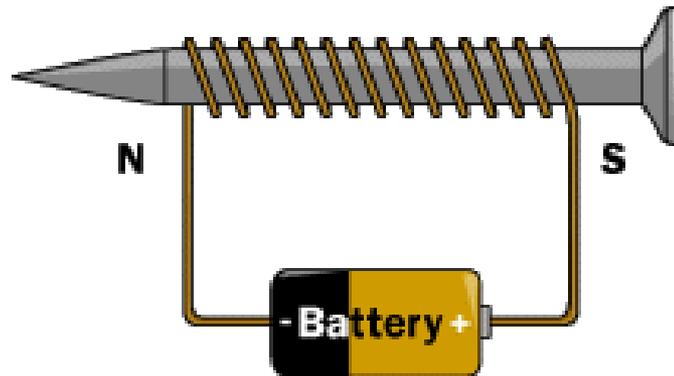
**Good-** know the key facts in the physics module

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**Excellent-** You can get 75% of marks in each question

- For the exam, you need to know how the electric bell, loud speaker, circuit breaker and scrap yard crane work.
- Use the link below to read more about how these work.

[http://www.bbc.co.uk/schools/gcsebitesize/science/triple\\_aqa/keeping\\_things\\_moving/the\\_motor\\_effect/revision/2/](http://www.bbc.co.uk/schools/gcsebitesize/science/triple_aqa/keeping_things_moving/the_motor_effect/revision/2/)



# PAST PAPER QUESTION

Name a material that could be used to make the outside case of the plug.

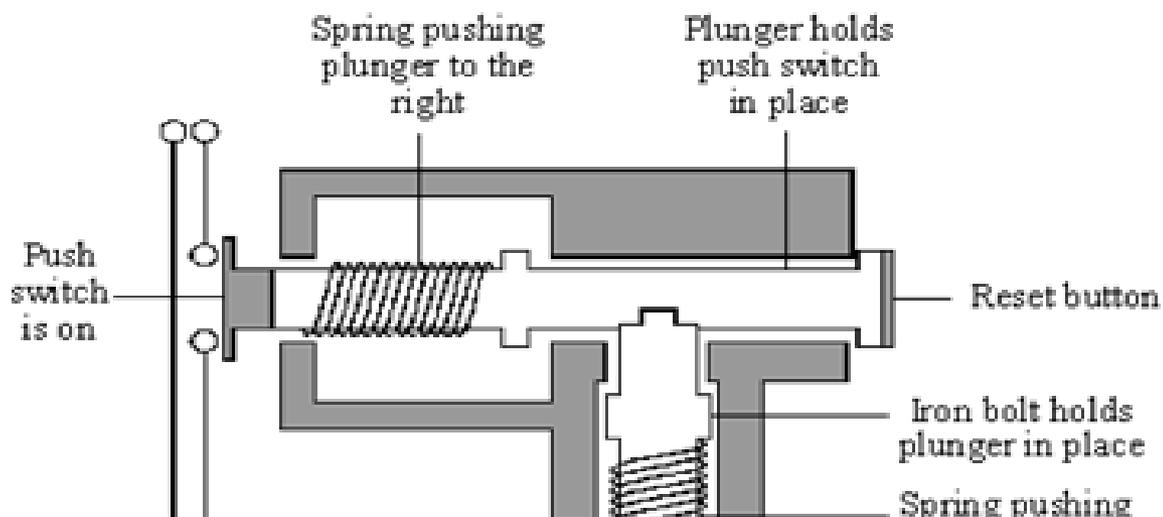
Plastic

Give a reason for your choice.

Because it is a good insulator

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

Some electrical circuits are protected by a circuit breaker. These switch the circuit off if a fault causes a larger than normal current to flow. The diagram shows one type of circuit breaker. A normal current (15 A) is flowing.



Write sentences in good English that include these facts

1. attracts the iron bolt
2. plunger pushed / moved to the right
3. push switch opens / goes to off / goes to right

When the current goes above 15 A, the electromagnet becomes stronger and

# THE MOTOR EFFECT

## **Learning Outcomes:**

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question

- You can make an electric motor by using a coil of wire inside 2 opposite magnetic poles
- If the wire is at  $90^\circ$  to the field, the force is greatest.

# THE MOTOR EFFECT

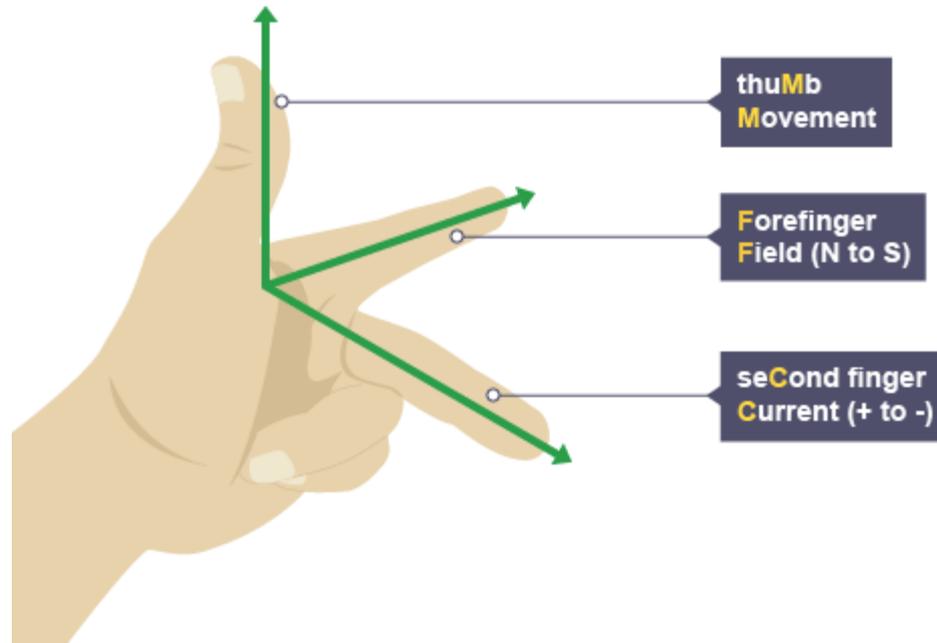
## Learning Outcomes:

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question

- The direction of the force and the movement of the wire can be determined using Fleming's left hand rule.



# THE MOTOR EFFECT

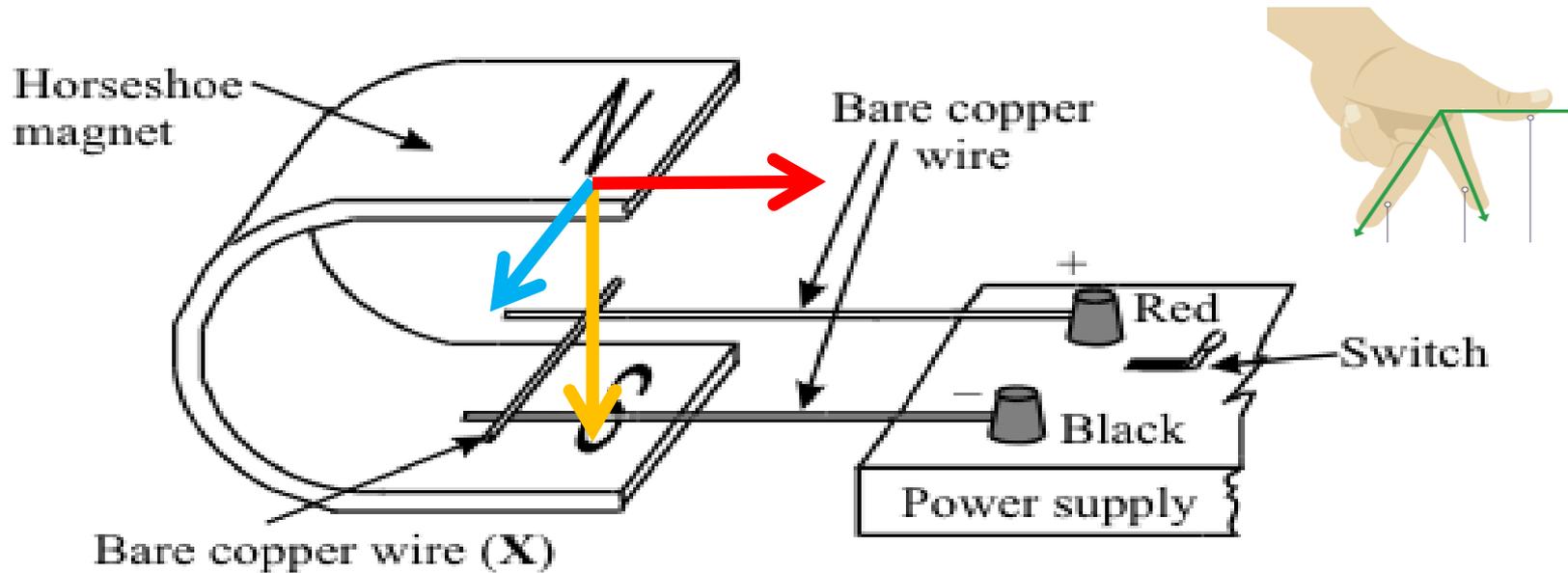
- The direction of the current must be reversed every half turn, otherwise the coil stops. A commutator (split ring) is used.
- The size of the force on a wire carrying a current in a magnetic field can be increased by:
  1. increasing the size of the current
  2. increasing the strength of the magnetic field
- The speed of a motor can be increased by increasing the size of the current or by increasing the strength of the magnetic field.

# THE MOTOR EFFECT

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# PAST PAPER QUESTION

The diagram shows apparatus used to demonstrate the motor effect. **X** is a short length of bare copper wire resting on two other wires.



Describe what happens to wire **X** when the current is switched on.

It moves horizontally to the right

**Movement**  
**Current**  
**Field**

## PAST PAPER QUESTION

What difference do you notice if the following changes are made?

A. The magnetic field is reversed.

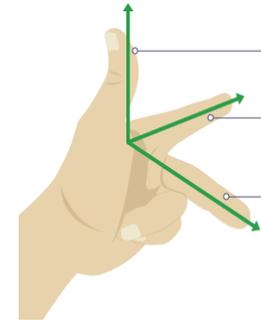
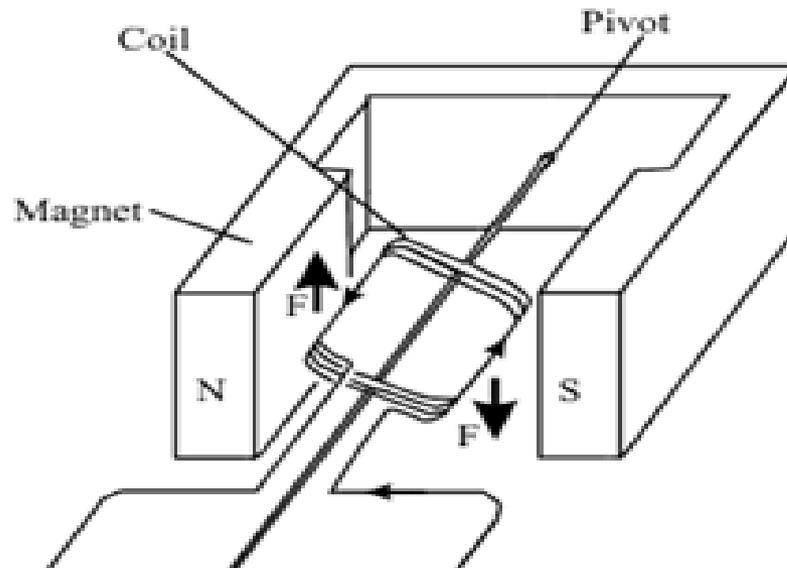
Moves in the opposite direction

B. The current is increased.

Faster movement or larger force

# PAST PAPER QUESTION

The diagram shows a coil placed between the poles of a magnet. The arrows on the sides of the coil itself show the direction of the conventional current.



1. Turns clockwise
2. Oscillates
3. Comes to rest facing field/at  $90^\circ$  to field/vertically

# PAST PAPER QUESTION

Most electric motors use electromagnets instead of permanent magnets. State three of the features of an electromagnet which control the strength of the magnetic field obtained.

- 1 ..... **Number of turns** .....
- 2 ..... **Density of turns** .....
- 3 ..... **Current** .....

## EXAMINER TIP

- ◉ Be able to use Fleming's Left-hand Rule to identify the direction of the force on a current carrying conductor.

Write a sentence that shows the examiner that you know this.

Swap books with the person next to you and write a what went well and an even better if for their statement



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# ELECTROMAGNETIC INDUCTION

## **Learning Outcomes:**

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question

- ◉ If an electrical conductor cuts through a magnetic field, a potential difference is induced across the ends of the conductor.
- ◉ If the conductor is part of a complete circuit, an electric current will flow in the circuit.
- ◉ A conductor can either be moved inside a magnetic field or a magnet can be moved in a coil of wire

# ELECTROMAGNETIC INDUCTION

## **Learning Outcomes:**

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question

- The induced potential difference can be increased by:
  1. Moving the magnet or wire faster
  2. Using a stronger magnet
  3. Increasing the number of turns, or loops, on the coil
  4. Increasing the area of the coil

# TRANSFORMERS

- ◉ An alternating current passes through the primary coil and produces a magnetic field that continuously changes direction. The soft iron core increases the strength of the magnetic field.
- ◉ The secondary coil cuts through the changing magnetic field, inducing an alternating potential difference across the ends of the coil.
- ◉ An alternating current flows if a circuit is connected to the secondary coil
- ◉ There is no electrical connection between the primary and the secondary coils.

# SWITCH MODE TRANSFORMERS

## **Learning Outcomes:**

**Good-** know the key facts in the physics module

**EBI-** You can apply what we recap to past paper questions

**Excellent-** You can get 75% of marks in each question

- Switch mode transformers operate at a high frequency (often between 50 and 200 kHz).
- Switch mode transformers are much lighter and smaller than traditional transformers working from a 50Hz mains supply.
- Switch mode transformers use very little power when they are switched on but no load is applied.

# SWITCH MODE TRANSFORMERS

	Switch mode transformers	Iron core transformers
<b>Frequency</b>	Operate at a high frequency, often between 50 Hz and 200 Hz	Operate at 50 Hz (UK mains frequency)
<b>Size</b>	Relatively small and light	Relatively large and heavy due to the iron core)
<b>Power usage when no load is applied</b>	Very little	Same as if a load was being applied because a current continues to flow through the primary coil

# PAST PAPER QUESTION

A transformer is used to reduce the 230 V a.c. mains to the 12 V supply required for the lighting system. The transformer has 1150 turns on its primary coil.

- (i) Write down the equation which links the number of turns of each transformer coil to the voltage across each transformer coil.

$$\frac{\text{voltage across primary}}{\text{voltage across secondary}} = \frac{\text{number of turns on primary}}{\text{number of turns on secondary}}$$

Calculate the number of turns on the secondary coil of the transformer. Show clearly how you work out your answer.

$$(230\text{V} / 12\text{V}) = (1150 / ?)$$

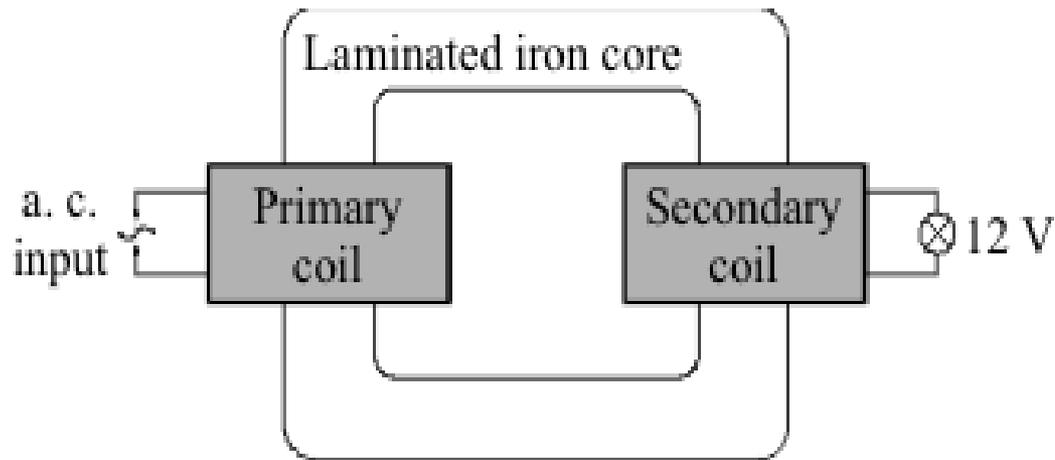
$$19.16\text{V} = 1150 / ?$$

$$\text{Turns on secondary} = 1150 / 19.16$$

$$\text{Turns on secondary} = 60$$

# PAST PAPER QUESTION

The diagram represents a simple transformer used to light a 12 V lamp. When the power supply is switched on the lamp is very dim.



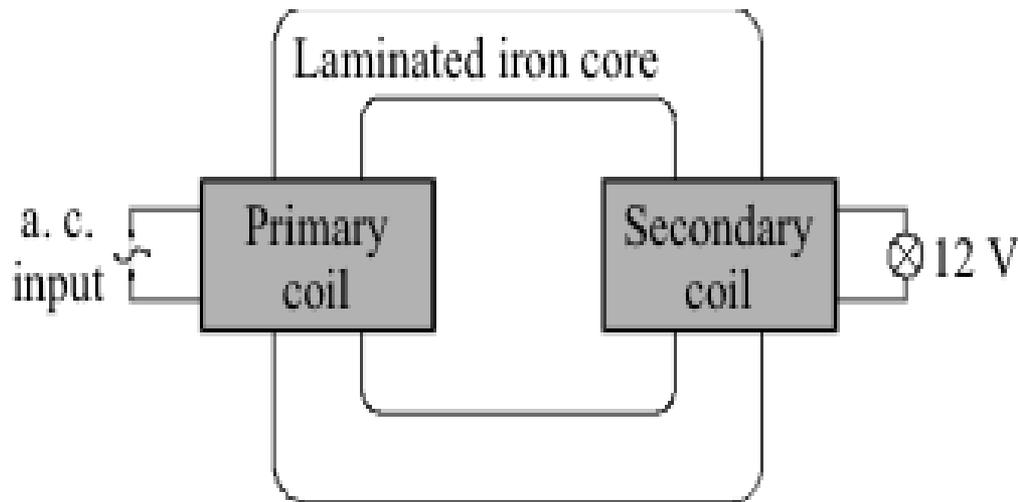
Give **one** way to increase the voltage at the lamp without changing the power supply.

Either of the following

1. Increase the turns on the secondary coil
2. Decrease the number of turns on the primary coil

# PAST PAPER QUESTION

The diagram represents a simple transformer used to light a 12 V lamp. When the power supply is switched on the lamp is very dim.

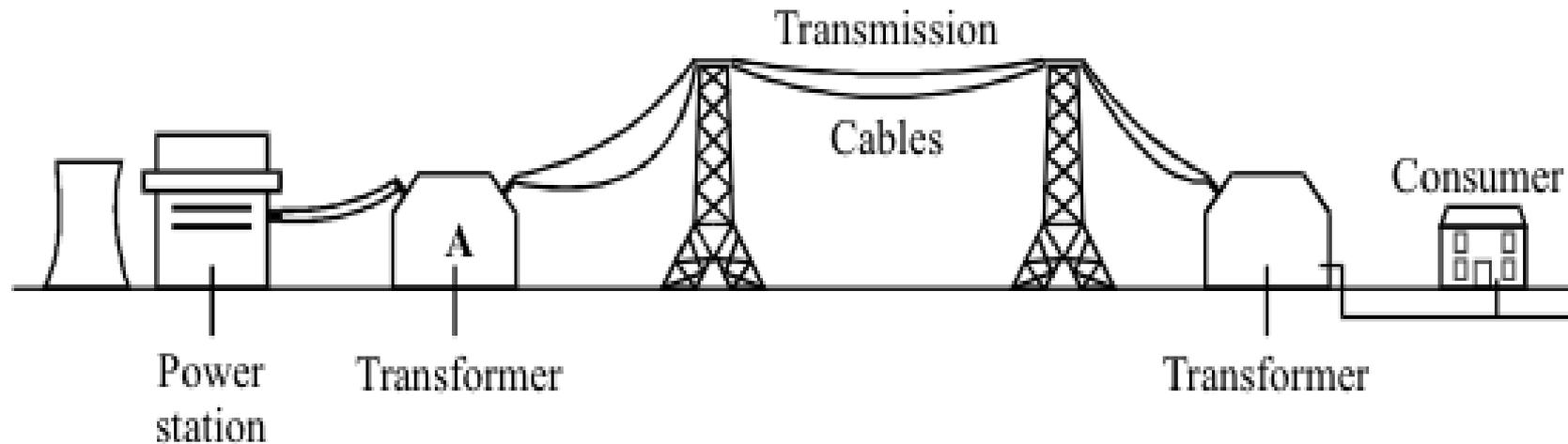


What is meant by the iron core being *laminated*?

Constructed in thin layers

# PAST PAPER QUESTION

Electrical energy is distributed around the country by a network of high voltage cables.



For the system to work the power is generated and distributed using alternating current rather than direct current. Why?

Transformers only work with alternating current

## PAST PAPER QUESTION

Transformers are an essential part of the distribution system. Explain why.

Used to increase voltage to reduce energy loss along the cables

The transmission cables are suspended high above the ground. Why?

To avoid people touching them

## PAST PAPER QUESTION

The power station generates 100 MW of power at a voltage of 25 kV. Transformer A, which links the power station to the transmission cables, has 44 000 turns in its 275 kV secondary coil.

Calculate the number of turns in the primary coil of transformer A. Show clearly how you work out your answer.

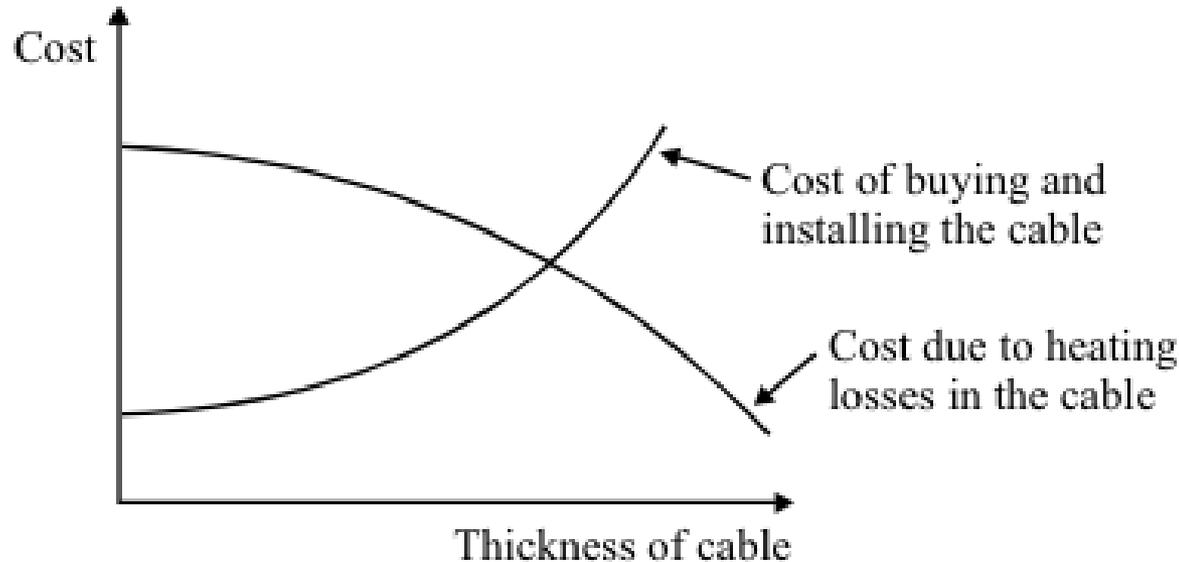
$$\frac{\text{voltage across primary}}{\text{voltage across secondary}} = \frac{\text{number of turns on primary}}{\text{number of turns on secondary}}$$

$$\text{Turns on primary} = 4000$$

Number of turns = .....

# PAST PAPER QUESTION

The diagram shows how the cost of transmitting the electricity along the cables depends upon the thickness of the cable.



Why does the cost due to the heating losses go down as the cable is made thicker?

Resistance of cables decrease

By what process is most heat energy lost from the cables?

Convection and conduction to the air

## EXAMINER TIP

- ◉ Know the components of a transformer and be able to describe how it works. Know the advantages of a switch mode transformer.

Write a sentence that shows the examiner that you know this.

Swap books with the person next to you and write a what went well and an even better if for their statement



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