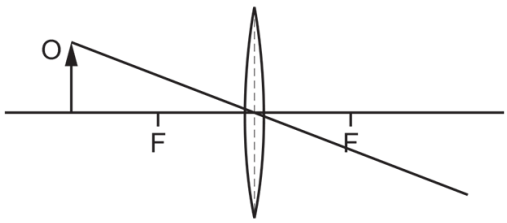
3.2 Light

01. 0625_m22_qp_22 Q: 23

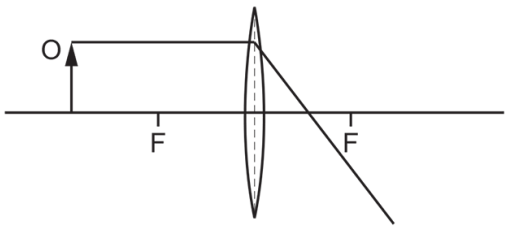
The diagrams each show a ray of light from an object O passing through a thin converging lens.

The principal focuses in each diagram are labelled F.

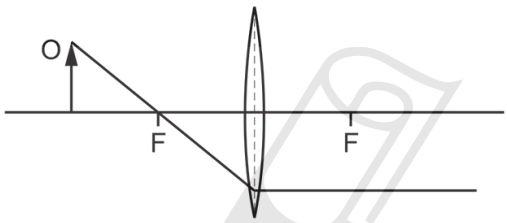
1



2



3



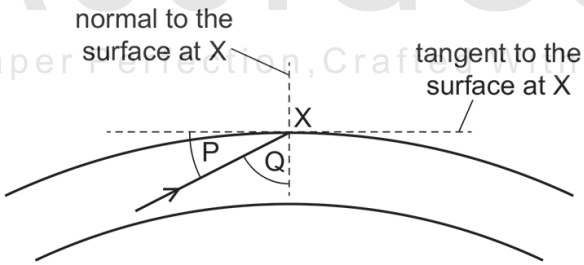
Which diagrams are correct?

A 1 and 2 **B** 2 only **C** 1 and 3 **D** 3 only

---

02. 0625_m22_qp_22 Q: 24

The diagram shows a ray of light inside an optical fibre approaching point X.



The light is totally reflected within the fibre.

The refractive index of the material of the optical fibre is 1.39.

Which condition ensures that total internal reflection occurs?

A Q < 45° **B** Q > 47° **C** P > 47° **D** P = Q

---

03. 0625_m22_qp_22 Q: 25

An eclipse of the Sun happens when the Moon comes between the Earth and the Sun.

Which statement is correct?

A Infrared radiation from the Sun disappears before visible light and ultraviolet radiation.

B Ultraviolet radiation from the Sun disappears before visible light and infrared radiation.

C Visible light from the Sun disappears before ultraviolet radiation and infrared radiation.

D Infrared radiation, ultraviolet radiation and visible light from the Sun all disappear at the same moment.

---

04. 0625_m21_qp_22 Q: 21

What causes the change in direction when light travels from air into glass?

A The amplitude of the light changes.

B The colour of the light changes.

C The frequency of the light changes.

D The speed of the light changes.

---

05. 0625_m21_qp_22 Q: 22

Light from a torch is incident on a plane mirror. The angle of incidence is 38°.

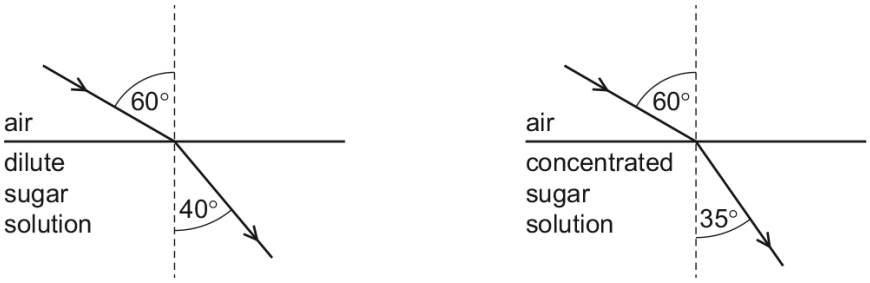
What is the angle of reflection?

A 38° **B** 52° **C** 76° **D** 142°

---

06. 0625_m21_qp_22 Q: 23

Two rays with an angle of incidence of 60° pass into dilute and concentrated sugar-water solutions. The refractions are shown.



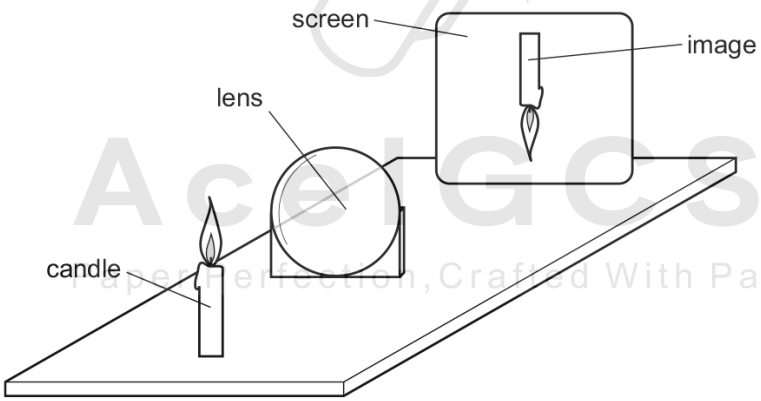
Which row is correct?

	refractive index as concentration increases	speed through solution as concentration increases
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

---

07. 0625_m21_qp_22 Q: 24

A thin converging lens is used to produce a sharp image of a candle.



Various sharp images are produced on the screen by moving the lens and the screen backwards and forwards.

Which statement is **always** correct?

A The image is at the principal focus (focal point) of the lens.

B The image is bigger than the object.

C The image is closer to the lens than the object.

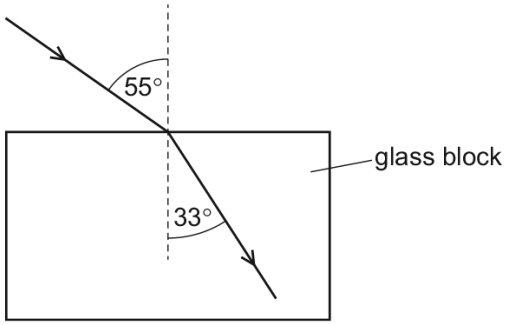
D The image is inverted.

---

08. 0625_s21_qp_21 Q: 22

Light travelling at a speed of 3.0×10^8 m/s strikes the surface of a glass block and undergoes refraction as it enters the block.

The diagram shows a ray of this light before and after it enters the block.



What is the speed of light in the glass?

A 1.8×10^8 m/s

B 2.0×10^8 m/s

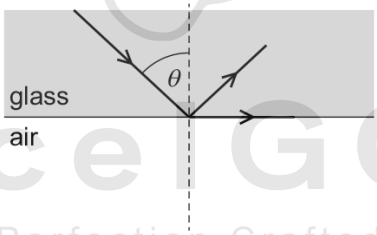
C 4.5×10^8 m/s

D 5.0×10^8 m/s

---

09. 0625_s21_qp_21 Q: 23

The diagram shows a narrow beam of light incident on a glass-air boundary. Some of the light emerges along the surface of the glass and some is reflected back into the glass.



Which row is correct?

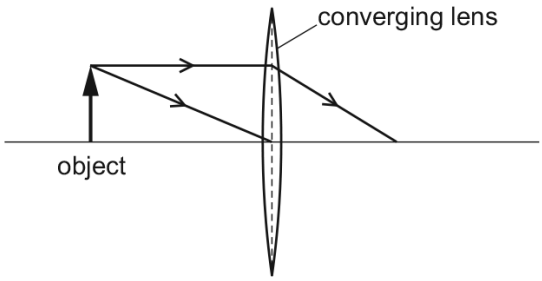
	this is an example of total internal reflection	angle θ is the critical angle
A	no	yes
B	no	no
C	yes	no
D	yes	yes

---

10. 0625_s21_qp_21 Q: 24

An object is placed in front of a thin converging lens.

The diagram shows the paths of two rays from the top of the object.



An image of the object is formed on a screen to the right of the lens.

How does this image compare with the object?

A It is larger and inverted.

B It is larger and the same way up.

C It is smaller and inverted.

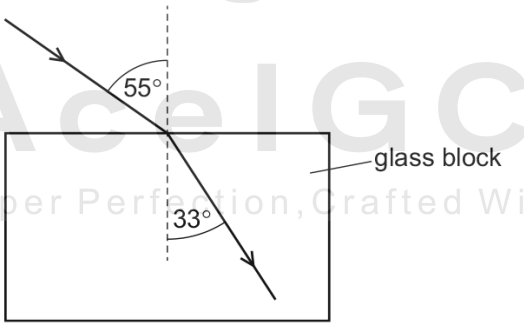
D It is smaller and the same way up.

---

11. 0625_s21_qp_22 Q: 22

Light travelling at a speed of 3.0×10^8 m/s strikes the surface of a glass block and undergoes refraction as it enters the block.

The diagram shows a ray of this light before and after it enters the block.



What is the speed of light in the glass?

A 1.8×10^8 m/s

B 2.0×10^8 m/s

C 4.5×10^8 m/s

D 5.0×10^8 m/s

---

12. 0625_s21_qp_22 Q: 23

Which statement about the image of an object formed in a plane mirror is correct?

A It is smaller than the object.

B It is the same size as the object.

C It is larger than the object.

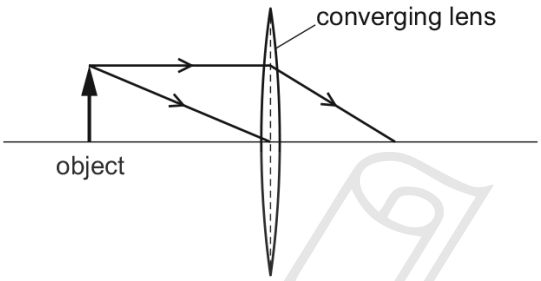
D It is inverted.

---

13. 0625_s21_qp_22 Q: 24

An object is placed in front of a thin converging lens.

The diagram shows the paths of two rays from the top of the object.



An image of the object is formed on a screen to the right of the lens.

How does this image compare with the object?

A It is larger and inverted.

B It is larger and the same way up.

C It is smaller and inverted.

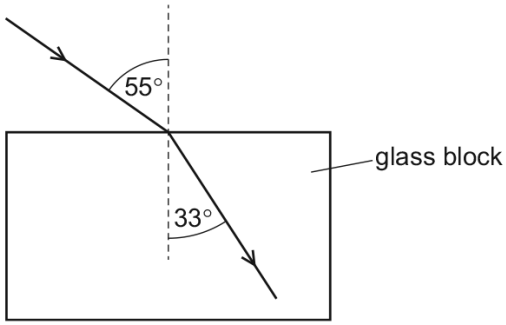
D It is smaller and the same way up.

---

14. 0625_s21_qp_23 Q: 22

Light travelling at a speed of 3.0×10^8 m/s strikes the surface of a glass block and undergoes refraction as it enters the block.

The diagram shows a ray of this light before and after it enters the block.



What is the speed of light in the glass?

A 1.8×10^8 m/s

B 2.0×10^8 m/s

C 4.5×10^8 m/s

D 5.0×10^8 m/s

---

15. 0625_s21_qp_23 Q: 23

A beam of light is monochromatic.

What does monochromatic mean?

A All the waves in the beam must have the same frequency only.

B All the waves in the beam must have the same amplitude only.

C All the waves in the beam must have the same speed only.

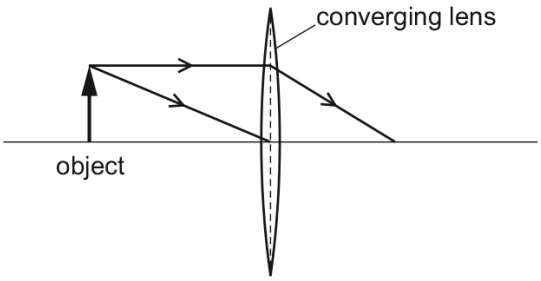
D All the waves in the beam must have the same amplitude, frequency and speed.

---

16. 0625_s21_qp_23 Q: 24

An object is placed in front of a thin converging lens.

The diagram shows the paths of two rays from the top of the object.



An image of the object is formed on a screen to the right of the lens.

How does this image compare with the object?

A It is larger and inverted.

B It is larger and the same way up.

C It is smaller and inverted.

D It is smaller and the same way up.

---

17. 0625_w21_qp_21 Q: 19

Two beams of light are both the same colour of red. One beam is travelling through air. The other beam is travelling through water. Each beam has a different brightness.

Which quantity is the same for both sets of waves?

A amplitude

B frequency

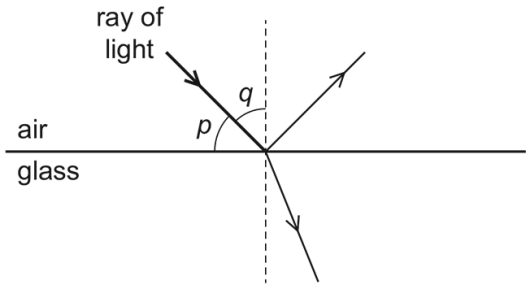
C speed

D wavelength

---

18. 0625_w21_qp_21 Q: 20

The diagram shows a ray of light in air incident on a glass block. Some of the light is refracted and some of the light is reflected. Two angles, *p* and *q*, are marked on the diagram.



Which row gives the angle of incidence and states whether total internal reflection occurs?

	angle of incidence	total internal reflection
A	*p*	no
B	*p*	yes
C	*q*	no
D	*q*	yes

---

19. 0625_w21_qp_21 Q: 21

The diagram shows a ray of light in glass incident on the surface between the glass and air.

What happens if the angle of incidence is made larger than the critical angle for the glass?

A The angle of refraction becomes equal to 90°.

B There is a refracted ray and a ray reflected inside the glass.

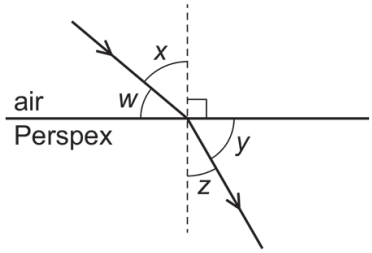
C There is a refracted ray only.

D There is only a ray reflected inside the glass.

---

20. 0625_w21_qp_22 Q: 19

The diagram shows how a ray of light refracts when going from air to Perspex.



The critical angle of Perspex is *c*.

Which expression is correct?

A $\frac{\sin x}{\sin z} = \sin c$

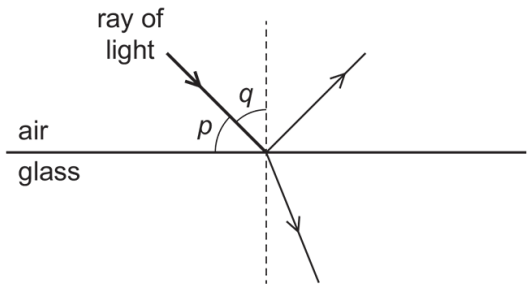
B $\frac{\sin z}{\sin x} = \sin c$

C $\frac{\sin w}{\sin y} = \sin c$

D $\frac{\sin y}{\sin w} = \sin c$

21. 0625_w21_qp_22 Q: 20

The diagram shows a ray of light in air incident on a glass block. Some of the light is refracted and some of the light is reflected. Two angles, *p* and *q*, are marked on the diagram.



Which row gives the angle of incidence and states whether total internal reflection occurs?

	angle of incidence	total internal reflection
A	*p*	no
B	*p*	yes
C	*q*	no
D	*q*	yes

---

22. 0625_w21_qp_22 Q: 21

The letter F is reflected in a mirror.

What does the optical image look like?

A **B** **C** **D**

---

23. 0625_w21_qp_23 Q: 19

A ray of light travels from air into a glass block.

	in air	in glass
speed of ray	v_a	v_g
wavelength of ray	λ_a	λ_g
frequency of ray	f_a	f_g

Three suggestions as to how the refractive index of glass n may be calculated are listed.

1 $n = \frac{v_a}{v_g}$

2 $n = \frac{\lambda_a}{\lambda_g}$

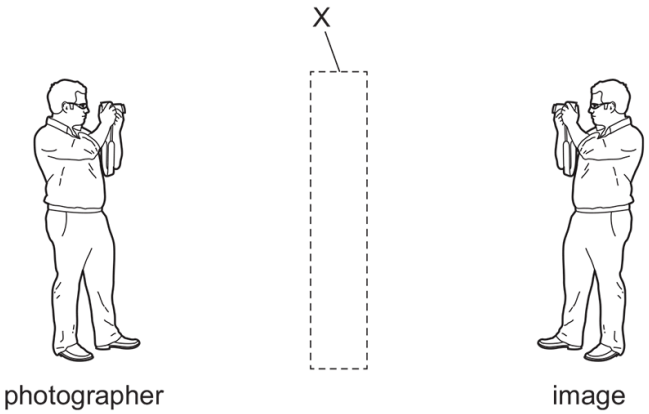
3 $n = \frac{f_a}{f_g}$

Which suggestions are correct?

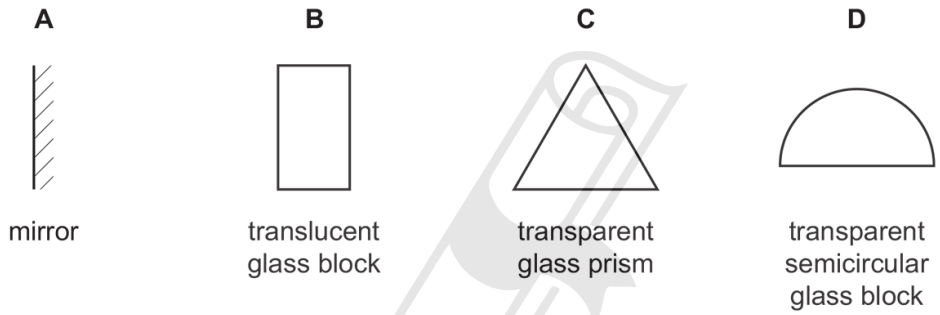
A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

24. 0625_w21_qp_23 Q: 21

A photographer sees his image as shown.

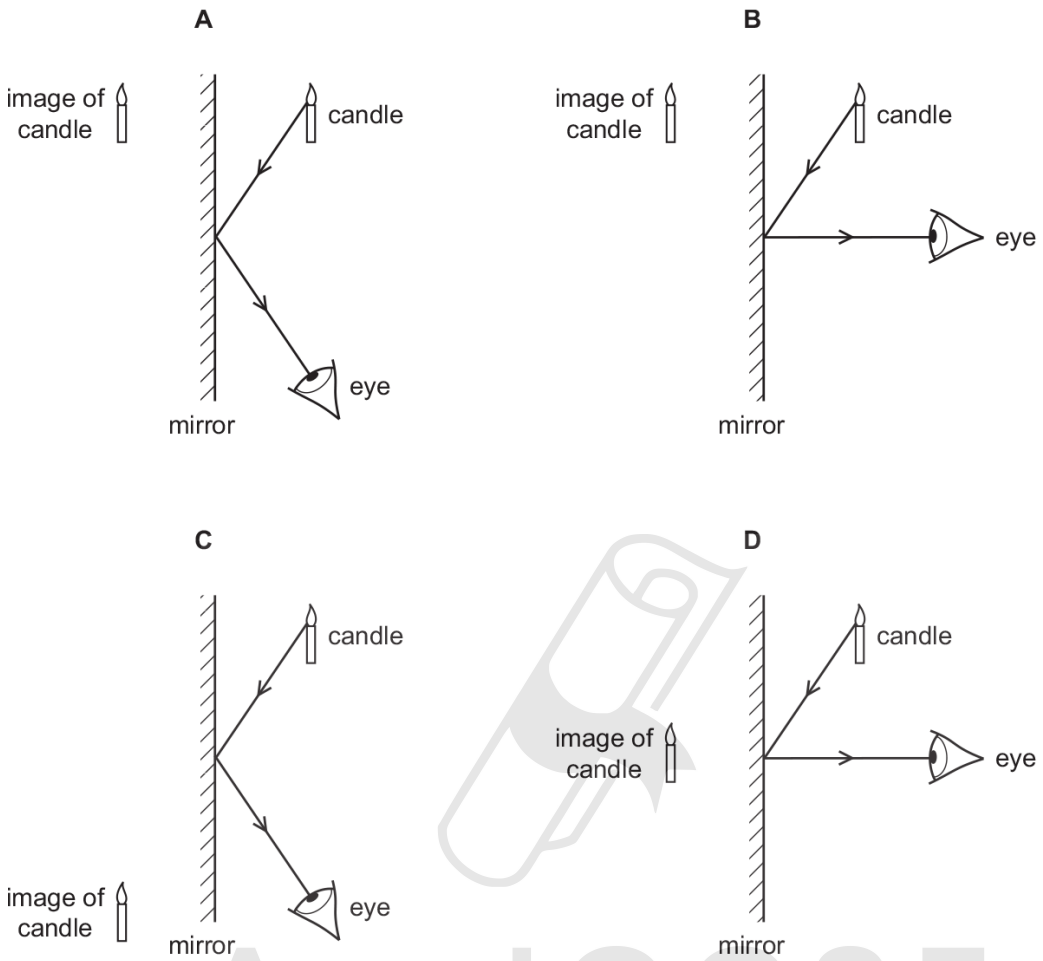


What could X be?



25. 0625_m20_qp_22 Q: 25

Which diagram shows how the light from a candle is reflected by a mirror, and shows the position of the image formed?



26. 0625_m20_qp_22 Q: 26

A converging lens can be used as a magnifying glass.

What will be the nature of the image?

A real, inverted, diminished

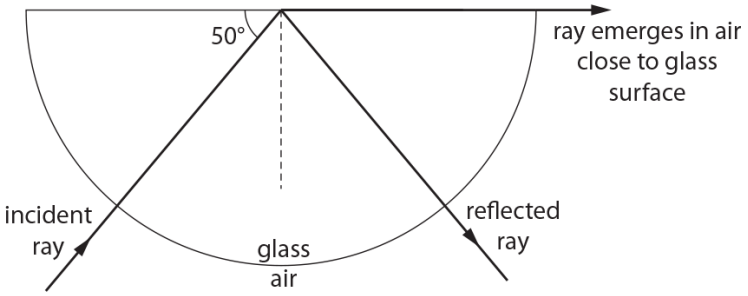
B real, upright, enlarged

C virtual, inverted, enlarged

D virtual, upright, enlarged

27. 0625_p20_qp_20 Q: 25

The diagram shows a ray of monochromatic light passing through a semi-circular glass block.



What is the refractive index of the glass?

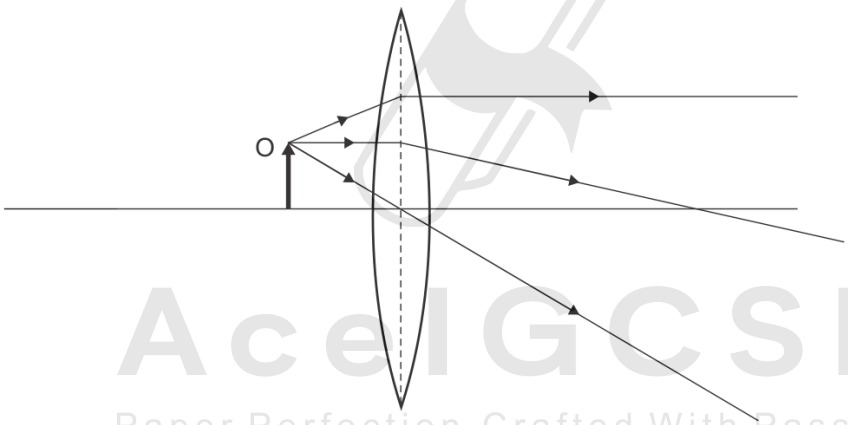
A 0.64 **B** 0.77 **C** 1.31 **D** 1.56

---

28. 0625_p20_qp_20 Q: 26

An object O is placed close to a thin converging lens.

The diagram represents three rays from the top of O passing through the lens.



Which type of image is produced by the lens when the object O is in this position?

A real and diminished

B real and enlarged

C virtual and diminished

D virtual and enlarged

---

29. 0625_s20_qp_21 Q: 22

Which statement is correct?

A The speed of light in glass is equal to the speed of light in a vacuum multiplied by the refractive index of glass.

B The incident angle of a light ray at an air-glass surface is the angle between the ray and the glass surface.

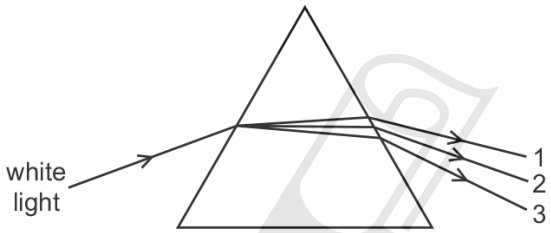
C The sine of the critical angle at an air-glass surface is equal to $\frac{1}{\text{refractive index of glass}}$.

D The angle of refraction for light passing through an air-glass surface is proportional to the angle of incidence at that surface.

---

30. 0625_s20_qp_21 Q: 23

A narrow beam of white light passes through a prism and is dispersed into a spectrum.



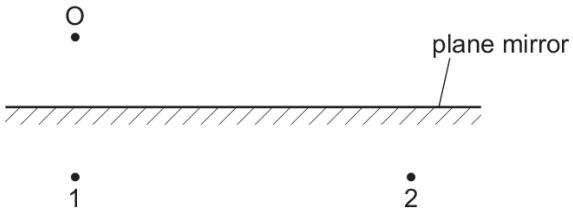
Which row is correct?

	colour 1	colour 2	colour 3
A	blue	yellow	red
B	red	blue	yellow
C	red	yellow	blue
D	yellow	blue	red

---

31. 0625_s20_qp_22 Q: 22

An object O is placed in front of a plane mirror as shown.



Which row is correct?

	position of the image	nature of the image
A	1	real
B	1	virtual
C	2	real
D	2	virtual

---

32. 0625_s20_qp_22 Q: 23

Which statement is correct?

A The speed of light in glass is equal to the speed of light in a vacuum multiplied by the refractive index of glass.

B The incident angle of a light ray at an air-glass surface is the angle between the ray and the glass surface.

C The sine of the critical angle at an air-glass surface is equal to $\frac{1}{\text{refractive index of glass}}$.

D The angle of refraction for light passing through an air-glass surface is proportional to the angle of incidence at that surface.

---

33. 0625_s20_qp_23 Q: 23

Which statement about converging lenses is correct?

A A real image of an object projected onto a screen by a converging lens is always inverted.

B The image formed by a converging lens is always upright.

C The image formed by a converging lens when used as a magnifying glass is a real image.

D Parallel rays entering a converging lens are focused at a distance greater than the focal length from the lens.

---

34. 0625_w20_qp_21 Q: 21

Which row correctly describes light waves?

	wave type	direction of vibrations
A	longitudinal	parallel to direction of wave travel
B	longitudinal	perpendicular to direction of wave travel
C	transverse	parallel to direction of wave travel
D	transverse	perpendicular to direction of wave travel

---

35. 0625_w20_qp_21 Q: 23

Which statement about a thin converging lens is correct?

A All rays of light refracted by the lens pass through the principal focus.

B All rays initially parallel to the principal axis of the lens are refracted through the principal focus.

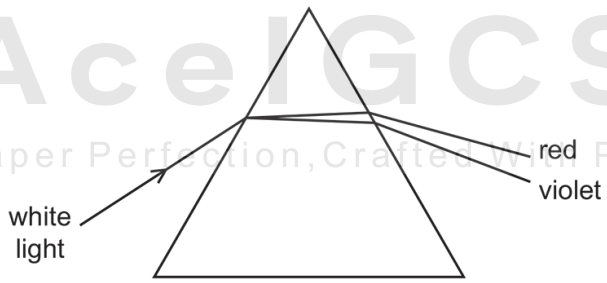
C The focal length of the lens is the distance between the image and the principal focus.

D The focal length of the lens is the distance between the object and the image.

---

36. 0625_w20_qp_21 Q: 24

The diagram shows white light passing through a prism.



Which description of what happens as the light passes into the prism is correct?

A The speed of the red light is less than the speed of the violet light and the red light is the least refracted.

B The speed of the red light is greater than the speed of the violet light and the red light is the least refracted.

C The speed of the violet light is less than the speed of the red light and the violet light is the least refracted.

D The speed of the violet light is greater than the speed of the red light and the violet light is the least refracted.

---

37. 0625_w20_qp_22 Q: 21

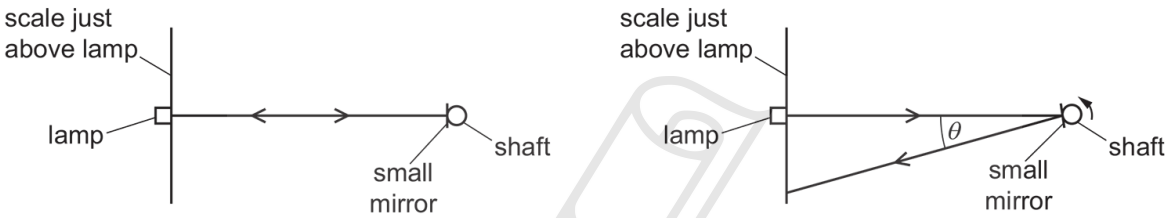
Which row correctly describes light waves?

	wave type	direction of vibrations
A	longitudinal	parallel to direction of wave travel
B	longitudinal	perpendicular to direction of wave travel
C	transverse	parallel to direction of wave travel
D	transverse	perpendicular to direction of wave travel

---

38. 0625_w20_qp_22 Q: 23

An optical lever is a very sensitive device for detecting small rotations. A lamp sends a narrow beam of light on to a small plane mirror attached to a shaft whose rotation is to be measured. The operation of the device is shown in plan view.



The beam from the lamp reflects from the mirror to give a small spot of light on a scale placed just above the lamp. The shaft and mirror rotate through 1°. The spot of light moves along the scale.

The table shows the angle θ through which the reflected beam rotates and the conditions required for high sensitivity.

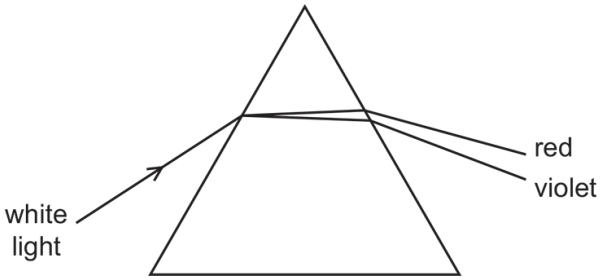
Which row is correct?

	angle θ	to achieve high sensitivity
A	1°	the lamp and scale need to be as close to the mirror as possible
B	1°	the lamp and scale need to be as far from the mirror as possible
C	2°	the lamp and scale need to be as close to the mirror as possible
D	2°	the lamp and scale need to be as far from the mirror as possible

---

39. 0625_w20_qp_22 Q: 25

The diagram shows white light passing through a prism.



Which description of what happens as the light passes into the prism is correct?

A The speed of the red light is less than the speed of the violet light and the red light is the least refracted.

B The speed of the red light is greater than the speed of the violet light and the red light is the least refracted.

C The speed of the violet light is less than the speed of the red light and the violet light is the least refracted.

D The speed of the violet light is greater than the speed of the red light and the violet light is the least refracted.

---

40. 0625_w20_qp_23 Q: 21

Which row correctly describes light waves?

	wave type	direction of vibrations
A	longitudinal	parallel to direction of wave travel
B	longitudinal	perpendicular to direction of wave travel
C	transverse	parallel to direction of wave travel
D	transverse	perpendicular to direction of wave travel

A water wave has a speed of 2.0 m/s.

4.0 complete waves pass a point every 10 seconds.

What is the wavelength of the wave?

A 0.50 m **B** 0.80 m **C** 5.0 m **D** 8.0 m

---

41. 0625_w20_qp_23 Q: 23

A driver sits in a car. She has a rear-view plane mirror 0.5 m in front of her. A bus is 7.5 m behind the driver.

The driver looks at the image of the bus in her mirror.

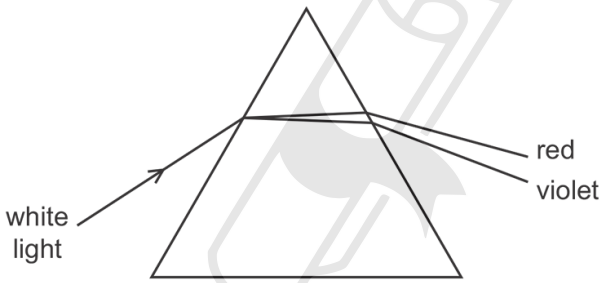
How far is the image away from her?

A 1.0 m **B** 7.5 m **C** 8.0 m **D** 8.5 m

---

42. 0625_w20_qp_23 Q: 24

The diagram shows white light passing through a prism.



Which description of what happens as the light passes into the prism is correct?

A The speed of the red light is less than the speed of the violet light and the red light is the least refracted.

B The speed of the red light is greater than the speed of the violet light and the red light is the least refracted.

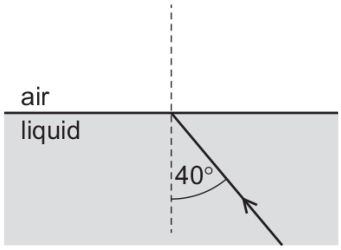
C The speed of the violet light is less than the speed of the red light and the violet light is the least refracted.

D The speed of the violet light is greater than the speed of the red light and the violet light is the least refracted.

---

43. 0625_m19_qp_22 Q: 23

A narrow beam of light is travelling through a transparent liquid. It meets the surface as shown, at an angle of incidence of 40°. The refractive index of the liquid is 1.5.



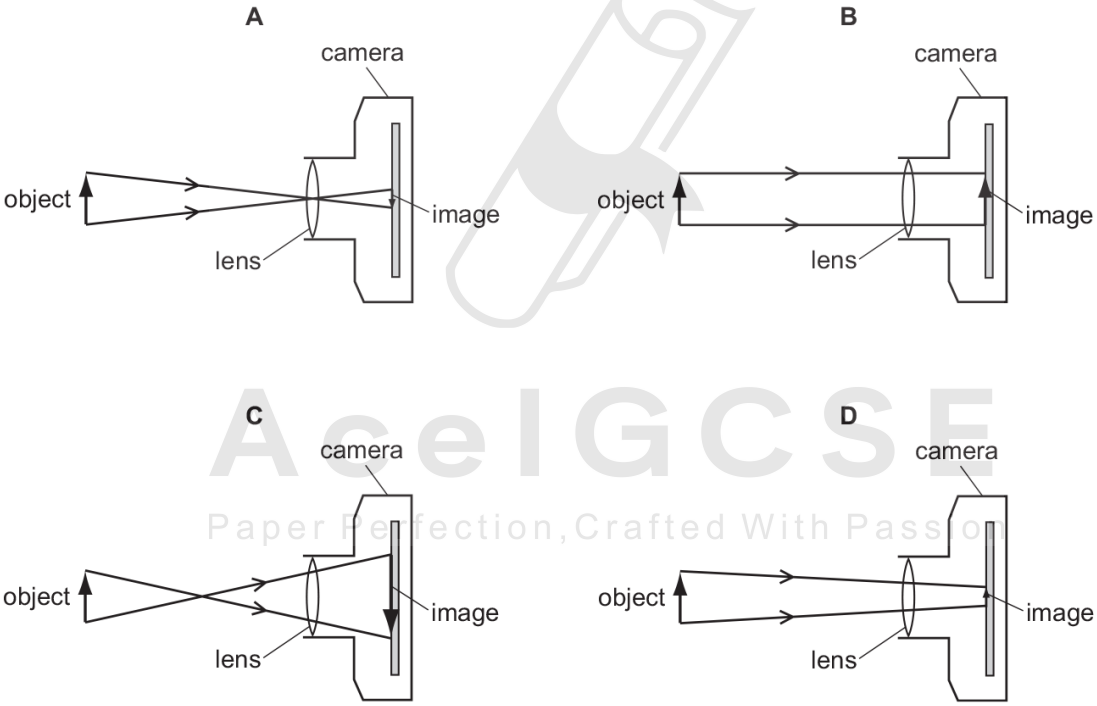
What is the angle of refraction as the light enters the air?

A 25° **B** 27° **C** 60° **D** 75°

---

44. 0625_m19_qp_22 Q: 24

Which diagram correctly represents rays of light passing through a converging lens in a camera?



---

45. 0625_s19_qp_21 Q: 21

An object is placed 30 cm in front of a plane mirror.

Which statement describes the image of the object?

A The image is the same size and 30 cm from the object.

B The image is the same size and 60 cm from the object.

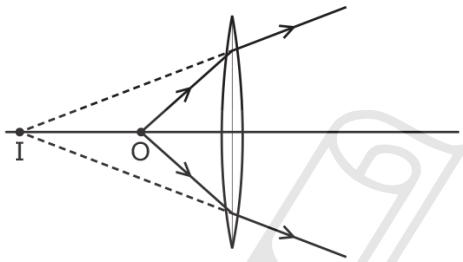
C The image is smaller and 30 cm from the object.

D The image is smaller and 60 cm from the object.

---

46. 0625_s19_qp_21 Q: 22

A small object O is placed near a converging lens, as shown. The lens forms an image I.



Which statement is correct?

A The image I is diminished.

B The image I is inverted.

C The image I is real.

D The object O is closer to the lens than its principal focus.

---

47. 0625_s19_qp_22 Q: 21

Which conditions are necessary for light to be totally internally reflected?

	the incident light is in	angle of incidence
A	the less dense medium	less than the critical angle
B	the less dense medium	greater than the critical angle
C	the more dense medium	less than the critical angle
D	the more dense medium	greater than the critical angle

---

48. 0625_s19_qp_22 Q: 22

Light is travelling through air. The light strikes a glass block at an angle of incidence of 45°. The glass has a refractive index of 1.4.

What is the angle of refraction of the light as it enters the glass?

A 29° **B** 30° **C** 32° **D** 82°

---

49. 0625_s19_qp_23 Q: 21

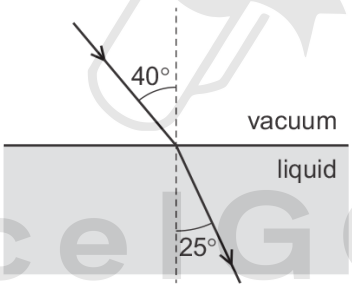
Which conditions are necessary for light to be totally internally reflected?

	the incident light is in	angle of incidence
A	the less dense medium	less than the critical angle
B	the less dense medium	greater than the critical angle
C	the more dense medium	less than the critical angle
D	the more dense medium	greater than the critical angle

---

50. 0625_s19_qp_23 Q: 22

A beam of light passes through a vacuum and then enters a liquid. The diagram shows the path it takes.



The light travels through the vacuum at a speed of 3.0×10^8 m/s.

What is the speed of light in the liquid?

A 1.9×10^8 m/s

B 2.0×10^8 m/s

C 4.6×10^8 m/s

D 4.8×10^8 m/s

---

51. 0625_w19_qp_21 Q: 22

The diagram shows the image of a clock in a plane mirror.

Which is the actual time?

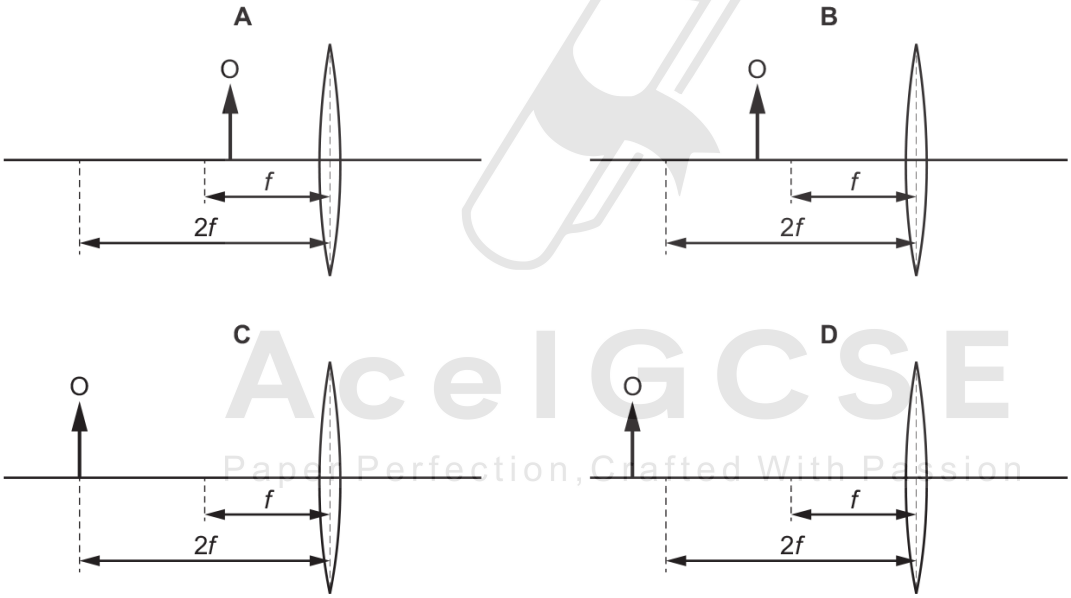
A 04:15 **B** 04:45 **C** 07:15 **D** 07:45

---

52. 0625_w19_qp_21 Q: 23

A converging lens produces an image of an object O. The focal length of the lens is *f*.

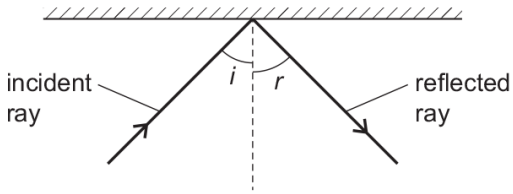
Which position of the object produces a virtual image?



---

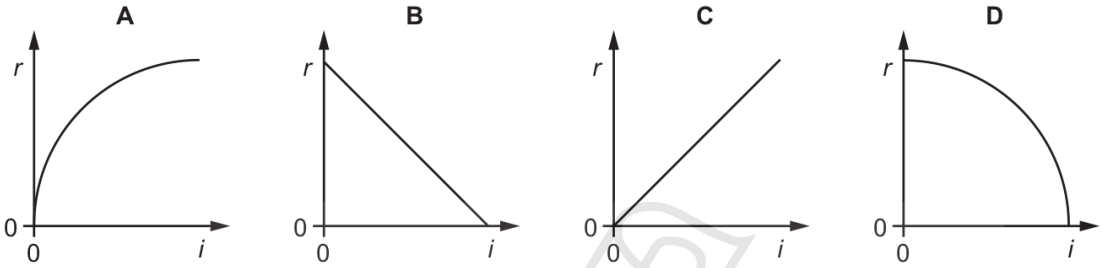
53. 0625_w19_qp_22 Q: 23

A ray of light is incident on a plane mirror. A student measures the angle of incidence *i* and the angle of reflection *r*.



The student varies the angle of incidence and then plots a graph of *r* against *i*.

What does the graph look like?



---

54. 0625_w19_qp_22 Q: 24

What is monochromatic light?

A light of a single amplitude

B light of a single frequency

C light of more than one colour

D light which travels with constant velocity

---

55. 0625_w19_qp_23 Q: 22

A person stands 1.0 m in front of a plane mirror. The mirror is moved away from the person at a speed of 1.0 m/s.

Which statement is correct?

A The image moves away from the person at a speed of 1.0 m/s.

B The image moves away from the person at a speed of 2.0 m/s.

C The image moves towards the person at a speed of 1.0 m/s.

D The image moves towards the person at a speed of 2.0 m/s.

---

56. 0625_w19_qp_23 Q: 23

White light is refracted and dispersed when it enters a glass prism from air.

Which colour has the lowest speed as it moves through the glass prism?

A blue light

B orange light

C red light

D violet light

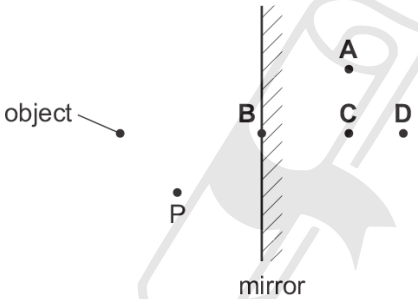
---

57. 0625_m18_qp_22 Q: 24

An object is placed before a plane mirror as shown.

A student views the image of the object in the mirror from point P.

Where does she see the image?



---

58. 0625_m18_qp_22 Q: 25

Light has a speed of 1.24×10^8 m/s in diamond.

What is the refractive index of diamond?

A 0.41 **B** 1.54 **C** 2.42 **D** 3.72

---

59. 0625_m18_qp_22 Q: 26

Which statement describes monochromatic light?

A light that does not diffract

B light that has a single frequency

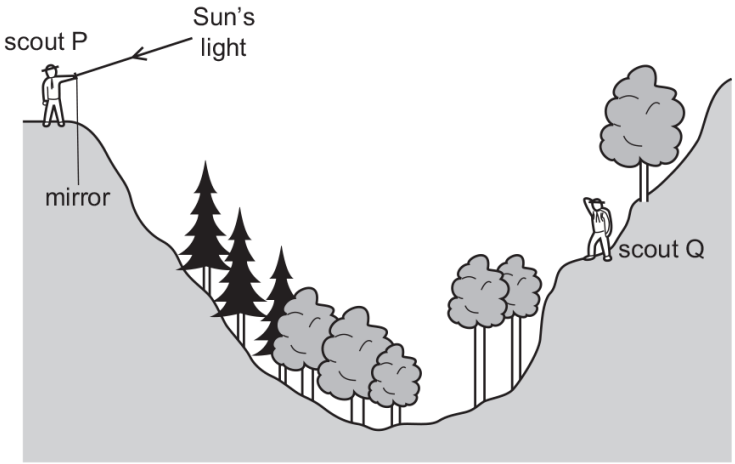
C light that spreads out when shone through a glass prism

D light that travels at the same speed in all materials

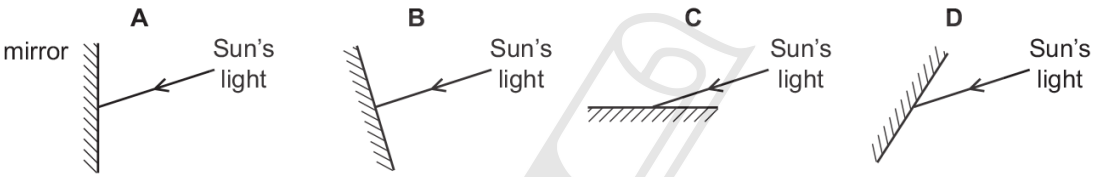
---

60. 0625_s18_qp_21 Q: 21

Scout P signals to scout Q on the other side of a valley by using a mirror to reflect the Sun's light.



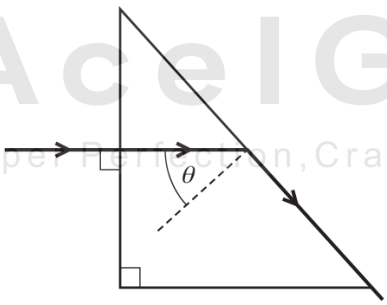
Which mirror position allows the Sun's light to be reflected to scout Q?



---

61. 0625_s18_qp_21 Q: 22

A prism is made from transparent plastic. In this plastic, light travels at 0.80 c, where c is its speed in air. Light enters one face of the prism at right-angles as shown.



The light just escapes from the sloping face of the prism.

What is angle θ?

A 37° **B** 39° **C** 51° **D** 53°

---

62. 0625_s18_qp_22 Q: 22

A scientist describes light as being monochromatic.

What does this tell you about the light?

A It has a single frequency.

B It has more than one wavelength.

C It travels at a single speed in a single direction.

D It travels at different speeds in different directions.

---

63. 0625_s18_qp_23 Q: 22

Images formed by lenses and mirrors can either be described as real or as virtual.

Which row describes real and virtual images of a point object?

	real images	virtual images
A	formed where light rays meet	an image in a plane mirror is an example of a virtual image
B	formed where light rays meet	can be projected onto a screen
C	formed from where light rays appear to diverge	an image in a plane mirror is an example of a virtual image
D	formed from where light rays appear to diverge	can be projected onto a screen

---

64. 0625_w18_qp_21 Q: 22

Which statement about the image formed by a plane mirror is correct?

A The image is larger than the object.

B The image is smaller than the object.

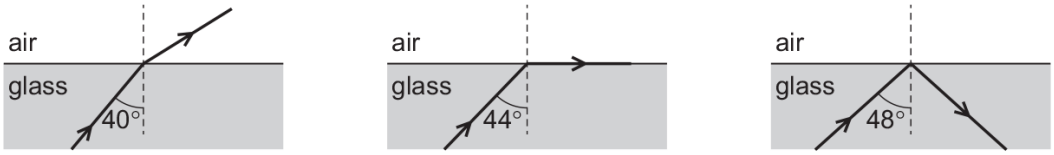
C The image is twice as far from the mirror as the object.

D The image is virtual.

---

65. 0625_w18_qp_21 Q: 23

A ray of light is incident on a glass-air surface. The diagrams show the ray of light at different angles of incidence in the glass.



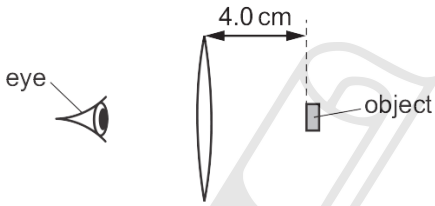
What is the refractive index of the glass?

A 1.35 **B** 1.44 **C** 1.50 **D** 1.55

---

66. 0625_w18_qp_22 Q: 22

A thin converging lens has a focal length of 6.0 cm. An observer looks through the lens at an object which is placed 4.0 cm from the lens.



Which description of the image that is observed is correct?

A diminished and inverted

B diminished and virtual

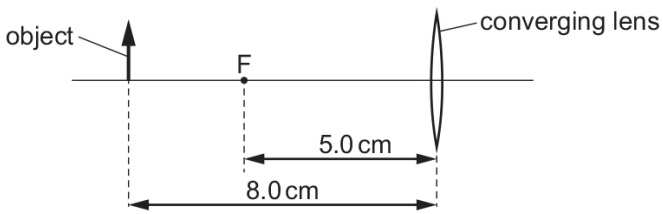
C enlarged and inverted

D enlarged and virtual

---

67. 0625_w18_qp_23 Q: 22

An object is placed 8.0 cm from a thin converging lens of focal length 5.0 cm.



Which statement about the image formed by the lens is correct?

A The image is real and inverted.

B The image is real and upright.

C The image is virtual and inverted.

D The image is virtual and upright.

---

68. 0625_w18_qp_23 Q: 23

Light travels through air and then enters and travels through a parallel-sided glass block.

Which statement is correct?

A The angle of incidence is greater than the angle of refraction as the light leaves the block.

B The light emerging from the block is parallel to the light entering the block.

C The speed of the light decreases as it leaves the block.

D The wavelength of the light does not change as it enters the block.

---

69. 0625_m17_qp_22 Q: 21

Light passes along an optical fibre.

What happens to the light within the fibre?

A diffraction

B dispersion

C refraction

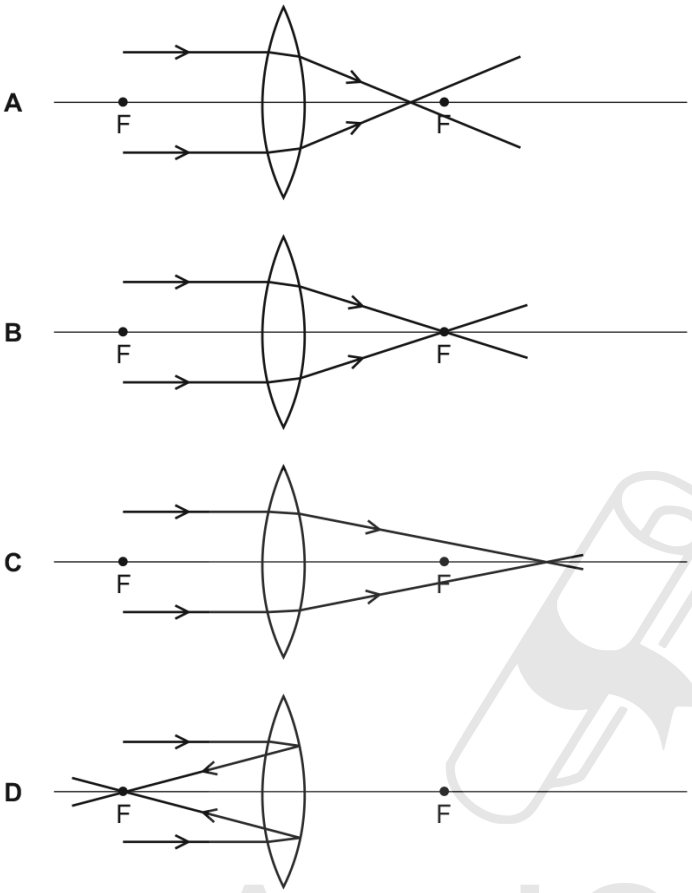
D total internal reflection

---

70. 0625_m17_qp_22 Q: 22

The points labelled F are the principal foci of a lens. A beam of parallel light is incident on the lens.

Which diagram shows the path of the light after it passes through the lens?



71. 0625_s17_qp_21 Q: 20

A converging lens is used as a magnifying glass to view an object.

Which statement is correct?

A The image is inverted.

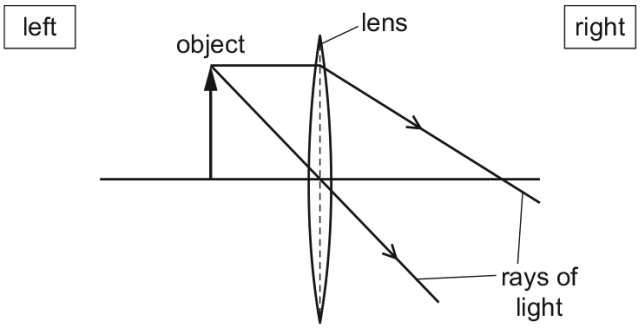
B The image is nearer the lens than the object.

C The image is the same size.

D The image is virtual.

72. 0625_s17_qp_22 Q: 20

The incomplete ray diagram shows two rays of light that have passed from one point on an object through a thin converging lens.



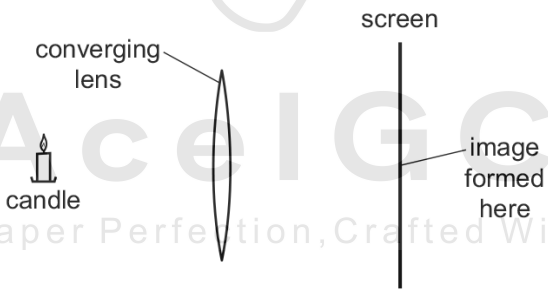
Which type of image is formed, and on which side of the lens is it formed?

	type of image	which side of lens
A	real	on the left
B	real	on the right
C	virtual	on the left
D	virtual	on the right

---

73. 0625_s17_qp_23 Q: 20

A converging lens is used to make an image on a screen.



What type of image is formed on the screen?

A real and inverted

B real and upright

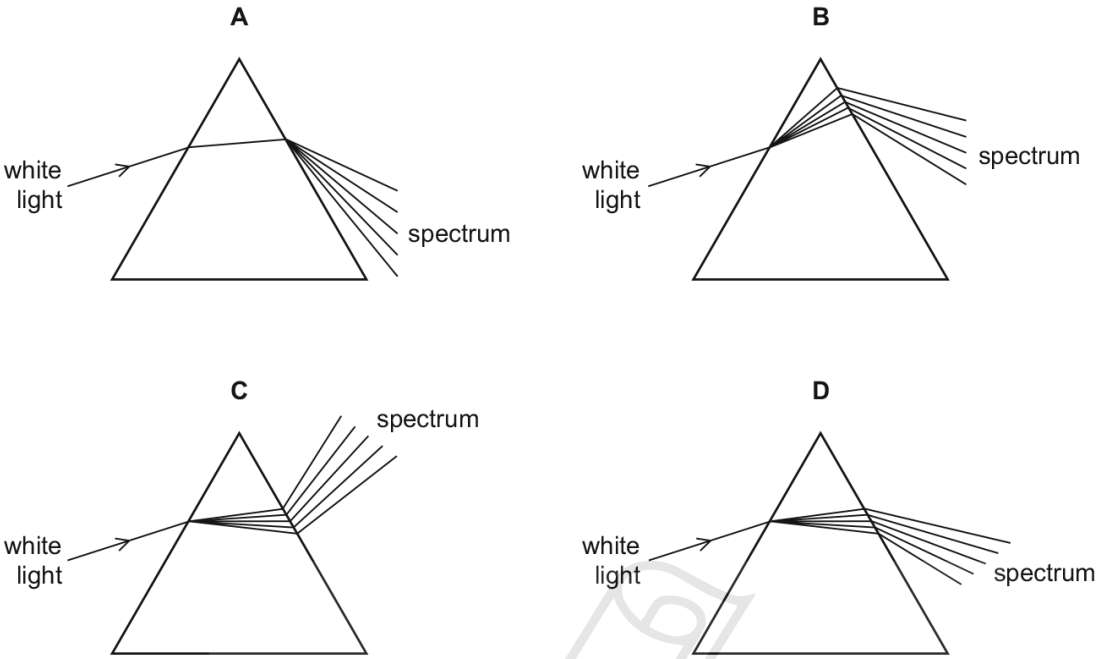
C virtual and inverted

D virtual and upright

---

74. 0625_s17_qp_23 Q: 21

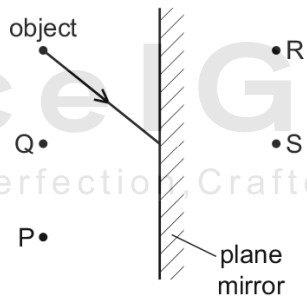
Which diagram shows what happens when a ray of white light passes through a prism?



---

75. 0625_w17_qp_21 Q: 21

The diagram shows an object in front of a plane mirror. A ray of light from the object is incident on the mirror.



Through which point does the reflected ray pass, and at which point is the image of the object formed?

	point through which reflected ray passes	point at which image is formed
A	P	R
B	P	S
C	Q	R
D	Q	S

---

76. 0625_w17_qp_21 Q: 22

A laser is a source of light with a single frequency.

Which description of this type of light is correct?

A dispersed

B focused

C monochromatic

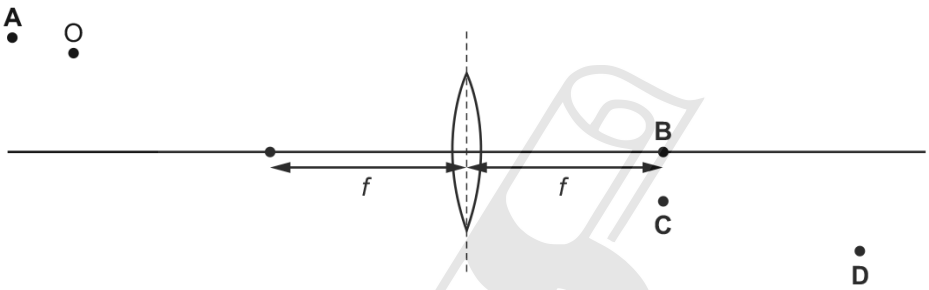
D refracted

---

77. 0625_w17_qp_22 Q: 21

The diagram shows an object O in front of a thin converging lens of focal length *f*.

At which point will the lens form a sharp image of the object?



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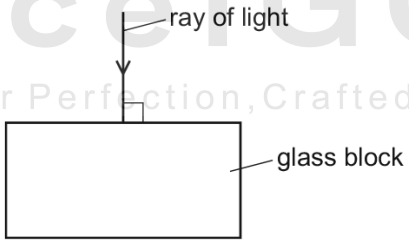
78. 0625_w17_qp_22 Q: 22

The diagram shows a ray of light incident on the surface of a rectangular glass block at 90° to the surface.



Which quantities remain unchanged as the light enters the glass block?

A direction and frequency

B direction and speed

C frequency and speed

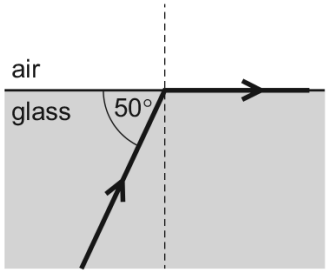
D speed and wavelength

---

79. 0625_w17_qp_23 Q: 21

The diagram shows a ray of light in glass. The ray reaches a boundary with air.

One weak ray of light is missing from the diagram.



Which statement is correct?

A At the boundary, the speed of the light will become less.

B The critical angle for light at this boundary is 50°.

C The diagram shows an example of diffraction of light.

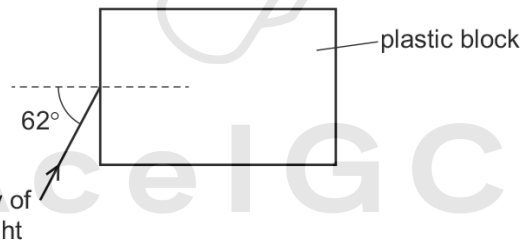
D The missing ray is a weak reflected ray.

---

80. 0625_w17_qp_23 Q: 22

Light travelling in air enters a plastic block at an angle of incidence of 62°.

The plastic has a refractive index of 1.48.



What is the angle of refraction?

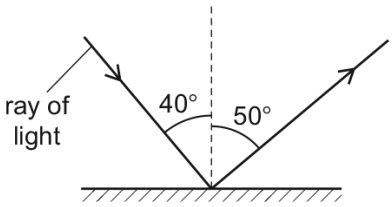
A 18° **B** 28° **C** 37° **D** 42°

---

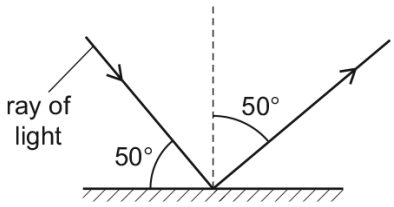
81. 0625_m16_qp_22 Q: 22

Which diagram correctly shows a ray of light reflected by a plane mirror?

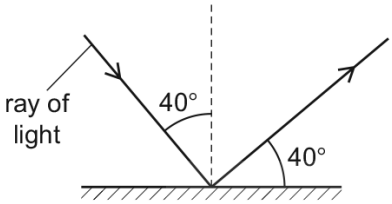
A



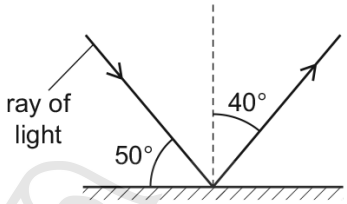
B



C



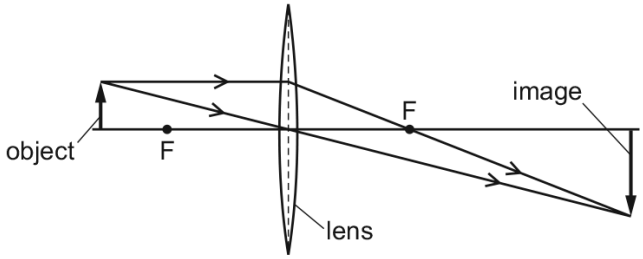
D



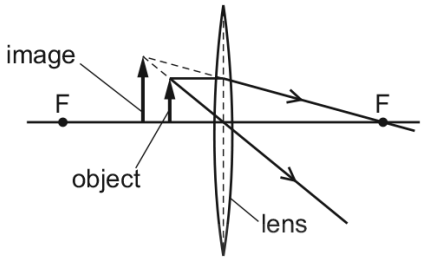
82. 0625_m16_qp_22 Q: 23

Which diagram shows how a converging lens is used as a magnifying glass?

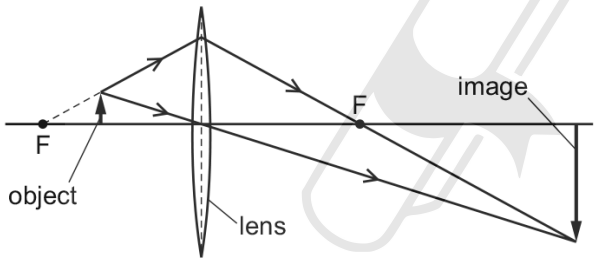
A



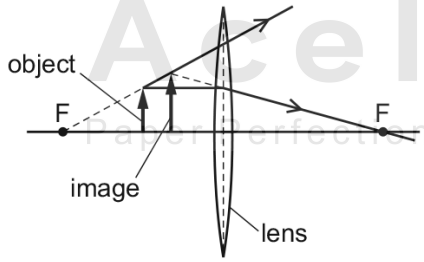
B



C

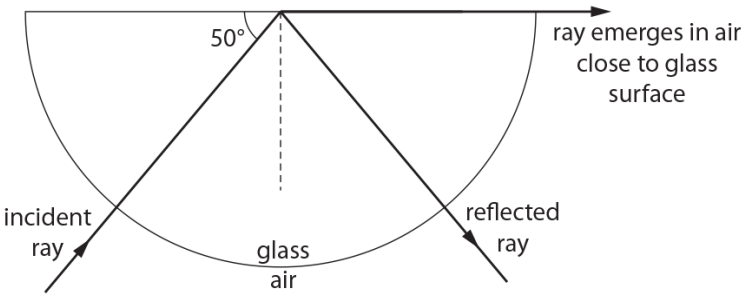


D



83. 0625_p16_qp_20 Q: 25

The diagram shows a ray of monochromatic light passing through a semi-circular glass block.



What is the refractive index of the glass?

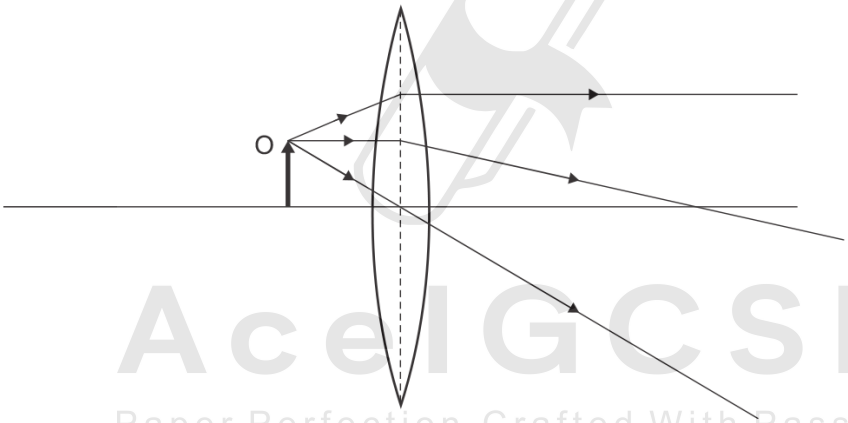
A 0.64 **B** 0.77 **C** 1.31 **D** 1.56

---

84. 0625_p16_qp_20 Q: 26

An object O is placed close to a thin converging lens.

The diagram represents three rays from the top of O passing through the lens.



Which type of image is produced by the lens when the object O is in this position?

A real and diminished

B real and enlarged

C virtual and diminished

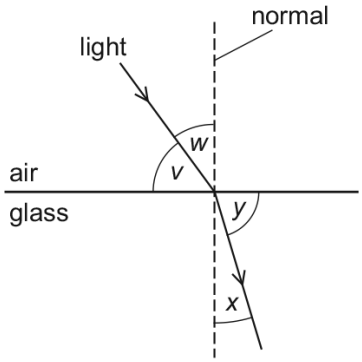
D virtual and enlarged

---

85. 0625_s16_qp_21 Q: 22

The diagram shows light travelling from air into glass.

Four angles *v*, *w*, *x* and *y* are shown.



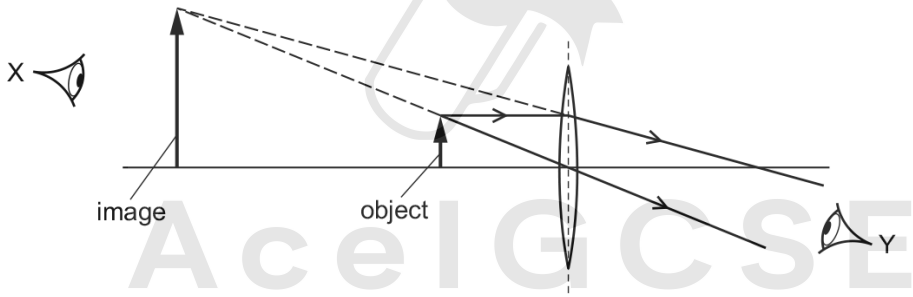
Which formula is used to calculate the refractive index *n* of the glass?

A $n = \frac{\sin v}{\sin y}$ **B** $n = \frac{\sin v}{\sin x}$ **C** $n = \frac{\sin w}{\sin y}$ **D** $n = \frac{\sin w}{\sin x}$

---

86. 0625_s16_qp_21 Q: 23

The diagram shows a converging lens forming an image of an object.



Which statement about the image is correct?

A It is real and can be seen by an eye at X.

B It is real and can be seen by an eye at Y.

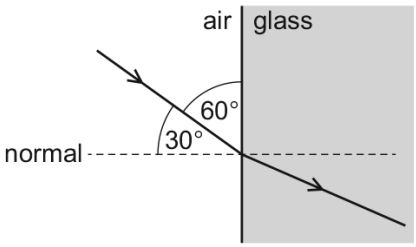
C It is virtual and can be seen by an eye at X.

D It is virtual and can be seen by an eye at Y.

---

87. 0625_s16_qp_22 Q: 23

The diagram shows light passing from air into glass.



NOT TO SCALE

The glass has a refractive index of 1.5.

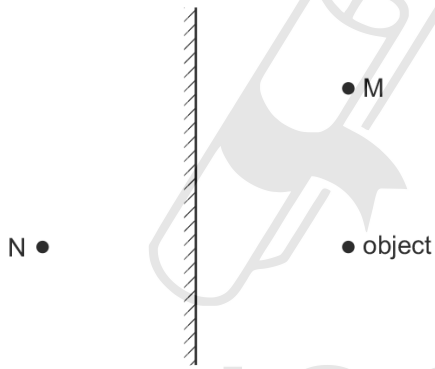
What is the angle of refraction in the glass?

A 19° **B** 22° **C** 35° **D** 49°

---

88. 0625_s16_qp_23 Q: 22

The diagram shows an object in front of a plane mirror. The mirror forms an image of the object.



At which labelled point is the image formed, and which type of image is formed?

	where the image is formed	type of image
A	at M	real
B	at M	virtual
C	at N	real
D	at N	virtual

---

89. 0625_s16_qp_23 Q: 23

Light enters a glass block at an angle of incidence of 46°.

The light refracts at an angle of refraction of 26°.

What is the refractive index of the glass?

A 0.57 **B** 0.61 **C** 1.64 **D** 1.77

---

90. 0625_w16_qp_21 Q: 22

An image is formed by a plane mirror. A second image is formed by a lens used as a magnifying glass.

Which row states the nature of each of these images?

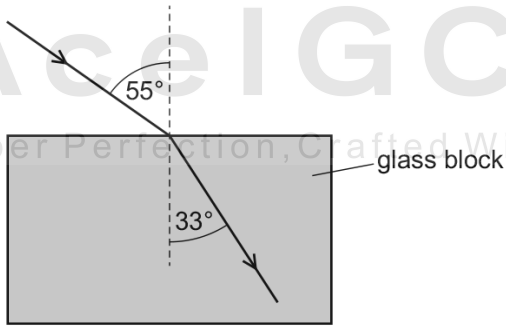
	plane mirror	magnifying glass
A	real	real
B	real	virtual
C	virtual	real
D	virtual	virtual

---

91. 0625_w16_qp_21 Q: 23

Light travelling at a speed of 3.0×10^8 m/s strikes the surface of a glass block and undergoes refraction as it enters the block.

The diagram shows a ray of this light before and after it enters the block.



What is the speed of light in the glass?

A 1.8×10^8 m/s

B 2.0×10^8 m/s

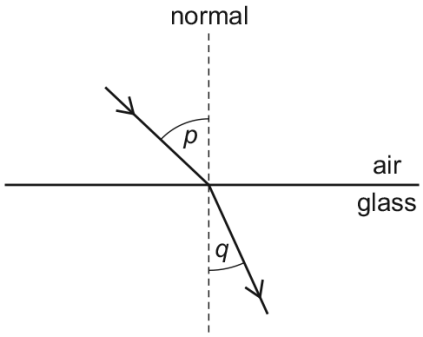
C 4.5×10^8 m/s

D 5.0×10^8 m/s

---

92. 0625_w16_qp_22 Q: 23

The diagram shows light passing from air into glass. Two angles *p* and *q* are marked.



Which pair of equations can both be used to calculate the refractive index *n* of the glass?

A $n = \frac{\text{speed of light in air}}{\text{speed of light in glass}}$, $n = \frac{\sin p}{\sin q}$

B $n = \frac{\text{speed of light in glass}}{\text{speed of light in air}}$, $n = \frac{\sin p}{\sin q}$

C $n = \frac{\text{speed of light in air}}{\text{speed of light in glass}}$, $n = \frac{\sin q}{\sin p}$

D $n = \frac{\text{speed of light in glass}}{\text{speed of light in air}}$, $n = \frac{\sin q}{\sin p}$

---

93. 0625_w16_qp_23 Q: 21

An image is formed by a plane mirror. A second image is formed by a lens used as a magnifying glass.

Which row states the nature of each of these images?

	plane mirror	magnifying glass
A	real	real
B	real	virtual
C	virtual	real
D	virtual	virtual

---

94. 0625_w16_qp_23 Q: 22

The speed of light in air is 3.0×10^8 m/s.

The critical angle for light in a transparent plastic material placed in air is 37°.

What is the speed of light in the plastic material?

A 1.8×10^8 m/s

B 2.4×10^8 m/s

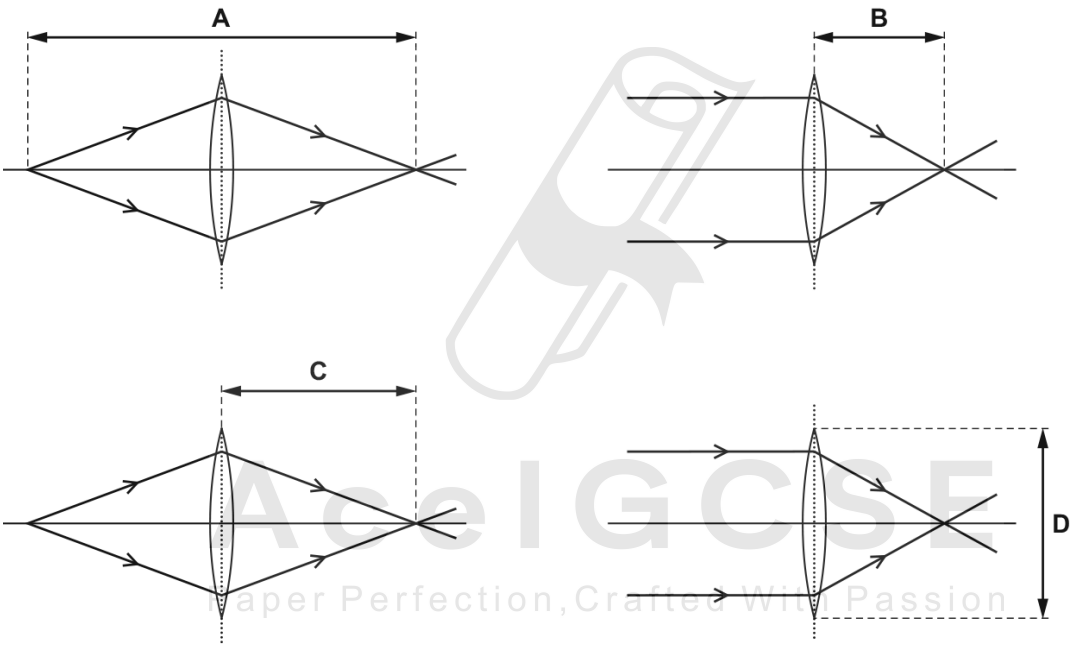
C 3.8×10^8 m/s

D 5.0×10^8 m/s

---

95. 0625_m15_qp_12 Q: 20

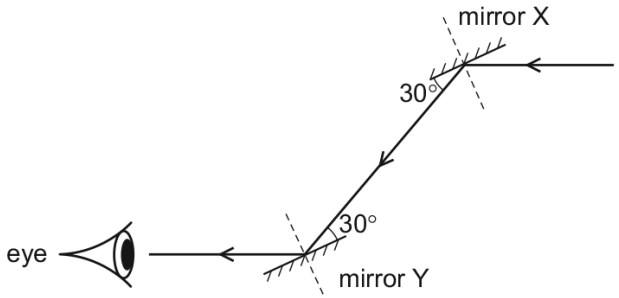
Which labelled distance is the focal length of the lens?



---

96. 0625_m15_qp_12 Q: 21

A ray of light is reflected by two parallel plane mirrors X and Y.



Which statement is correct?

A The angle of incidence at mirror X is 30°.

B The angle of incidence at mirror Y is 60°.

C The angle of reflection at mirror X is 120°.

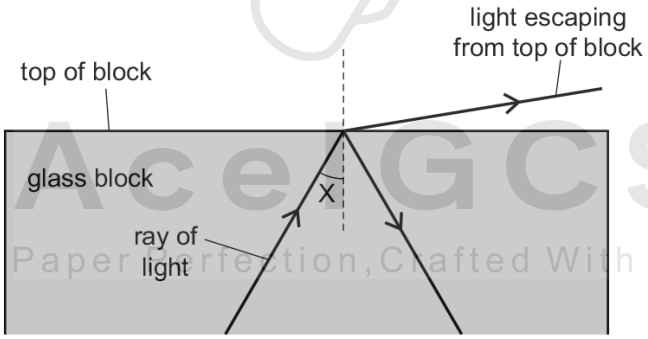
D The angle of reflection at mirror Y is 0°.

---

97. 0625_s15_qp_11 Q: 22

A scientist tries to direct a ray of light in a glass block so that no light escapes from the top of the block.

However, some light does escape.



The scientist changes angle X and stops the light escaping from the top.

Which row in the table describes the change to angle X and the name of the effect produced?

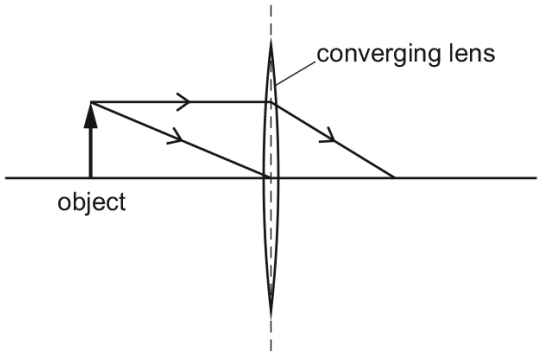
	change to angle X	name of effect produced
A	decrease	total internal reflection
B	decrease	total internal refraction
C	increase	total internal reflection
D	increase	total internal refraction

---

98. 0625_s15_qp_12 Q: 20

An object is placed in front of a thin converging lens.

The diagram shows the paths of two rays from the top of the object.



An image of the object is formed on a screen to the right of the lens.

How does this image compare with the object?

A It is larger and inverted.

B It is larger and the same way up.

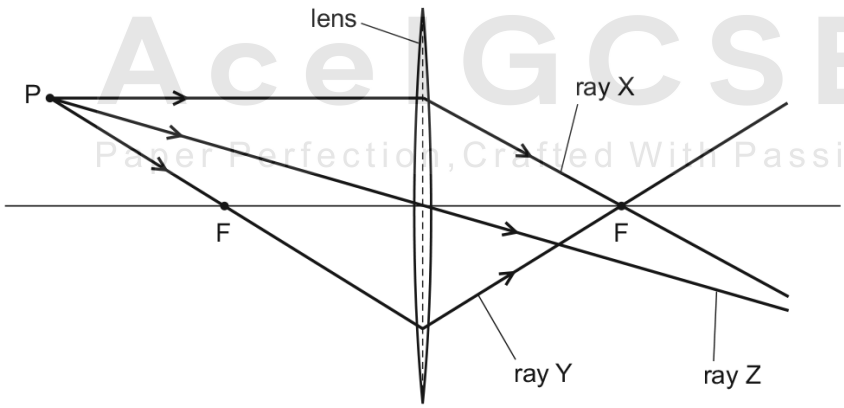
C It is smaller and inverted.

D It is smaller and the same way up.

---

99. 0625_w15_qp_11 Q: 21

A student draws a diagram representing three rays of light from point P passing through a converging lens. Each point labelled F is a principal focus of the lens.



Which of the rays has the student drawn correctly?

A ray X and ray Y

B ray X and ray Z

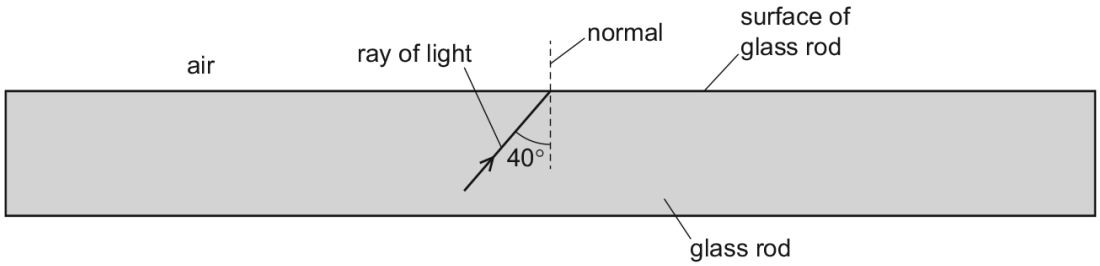
C ray Y only

D ray Z only

---

100. 0625_w15_qp_11 Q: 22

The diagram shows a ray of light inside a glass rod. The critical angle for the light in the glass is 42°.



Which row shows what happens to the light when it reaches the surface of the glass rod?

	any light reflected?	any light refracted?
A	no	no
B	no	yes
C	yes	no
D	yes	yes

---

101. 0625_w15_qp_12 Q: 20

A plane mirror is fitted to a wall.

Which statement about the image formed by the mirror is correct?

A The image is real.

B The image is left to right (laterally inverted).

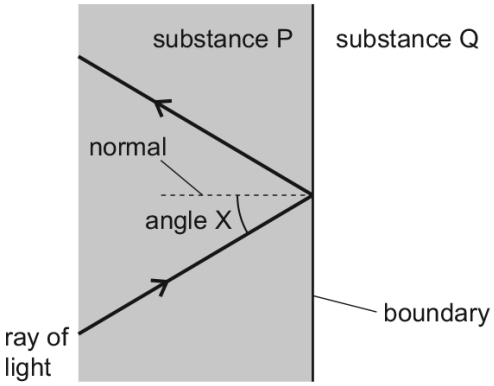
C The image is smaller than the object.

D The image is upside down.

---

102. 0625_w15_qp_13 Q: 22

The diagram shows a ray of light travelling in a substance P. The ray reaches a boundary with a substance Q. Total internal reflection occurs at the boundary.



Which row contains correct statements about angle X and about the optical density of substance Q?

	angle X	substance Q
A	smaller than the critical angle	less dense than substance P
B	smaller than the critical angle	more dense than substance P
C	greater than the critical angle	less dense than substance P
D	greater than the critical angle	more dense than substance P

---

103. 0625_s14_qp_11 Q: 21

Which statement about a converging lens is **not** correct?

A A ray parallel to the principal axis of the lens is refracted through the principal focus.

B All rays of light refracted by the lens pass through the principal focus.

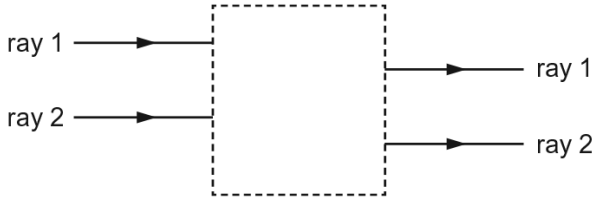
C The distance between the centre of the lens and the principal focus is the focal length.

D The principal focus of the lens is a point on the principal axis.

---

104. 0625_s14_qp_11 Q: 22

Rays of light enter and leave a box.



What could be inside the box to make the rays behave as shown?

A a converging lens

B a parallel-sided glass block

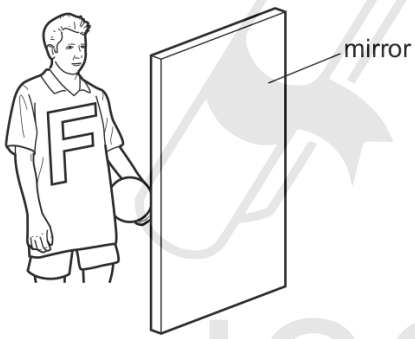
C a plane mirror

D a triangular prism

---

105. 0625_s14_qp_12 Q: 22

A boy wears a shirt with a letter F on the front. He stands in front of a plane mirror.



What does he see in the mirror?

A

B

C

D

---

106. 0625_w14_qp_11 Q: 20

Light waves pass from air into glass and are refracted.

What always remains constant when this happens?

A direction

B frequency

C speed

D wavelength

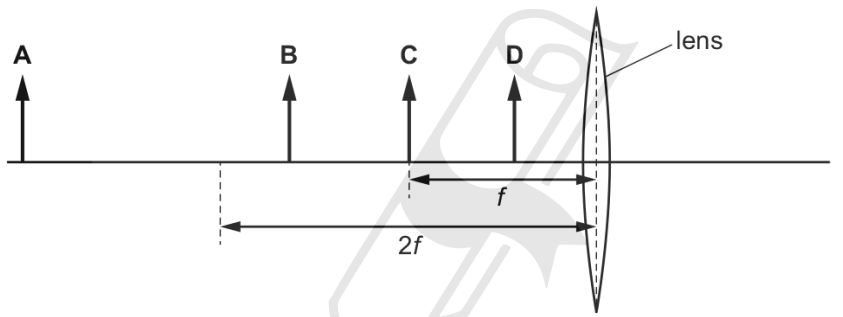
---

107. 0625_w14_qp_11 Q: 23

An object is placed in front of a converging lens. The lens has a focal length *f*.

The lens produces a real, enlarged image of the object.

In which labelled position is the object placed?

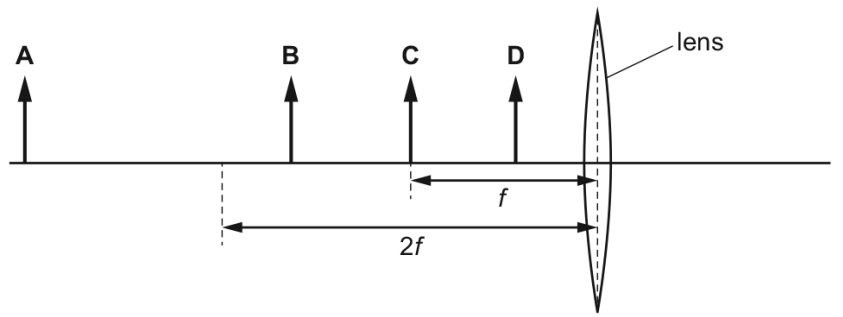


---

108. 0625_w14_qp_13 Q: 23

An object is placed in front of a converging lens. The lens has a focal length *f*.

In which labelled position should the object be placed in order to produce a real image of the object that is smaller than the object?



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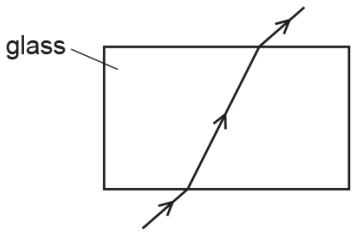
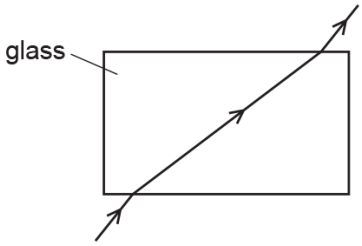
109. 0625_s13_qp_11 Q: 22

Which diagram shows how a ray of light could pass through a glass block in air?

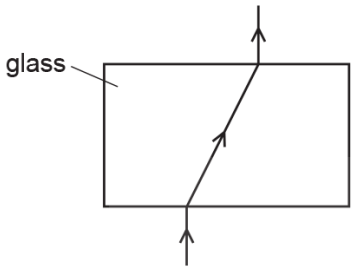
A



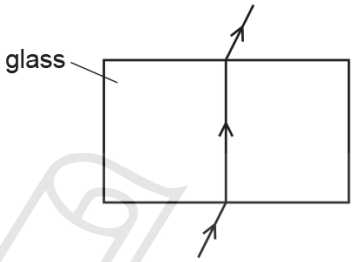
B



C

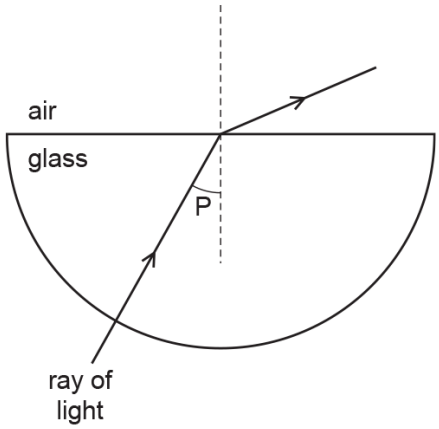


D



110. 0625_w13_qp_11 Q: 22

The diagram shows a ray of light passing through a semicircular glass block into air.



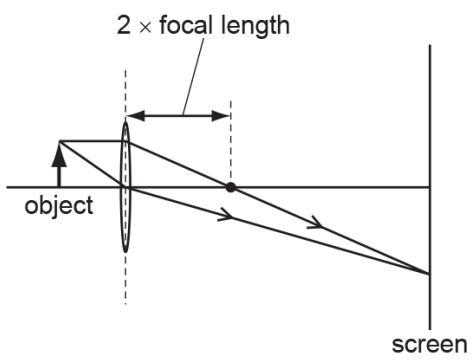
Which row gives the correct name for angle P and states how angle P compares with the critical angle?

	name of angle P	angle P compared with the critical angle
A	angle of incidence	larger than the critical angle
B	angle of incidence	smaller than the critical angle
C	angle of refraction	larger than the critical angle
D	angle of refraction	smaller than the critical angle

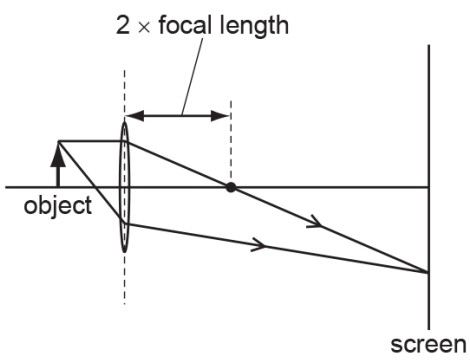
111. 0625_w13_qp_11 Q: 23

Which diagram shows how an image of an object is formed on a screen by a converging lens?

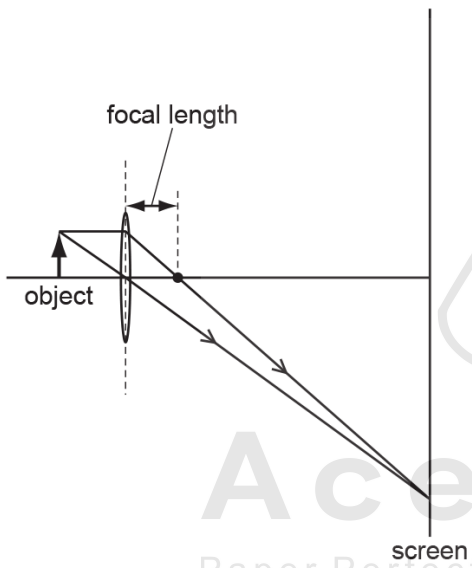
A



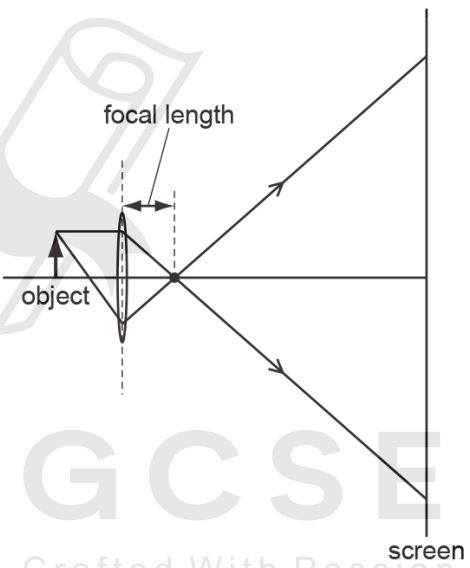
B



C

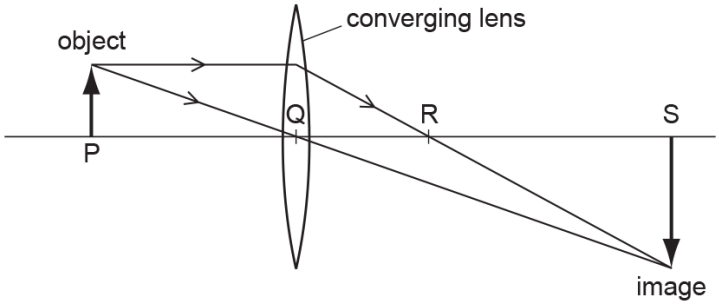


D



112. 0625_w13_qp_13 Q: 22

The diagram represents a converging lens forming an image of an object.



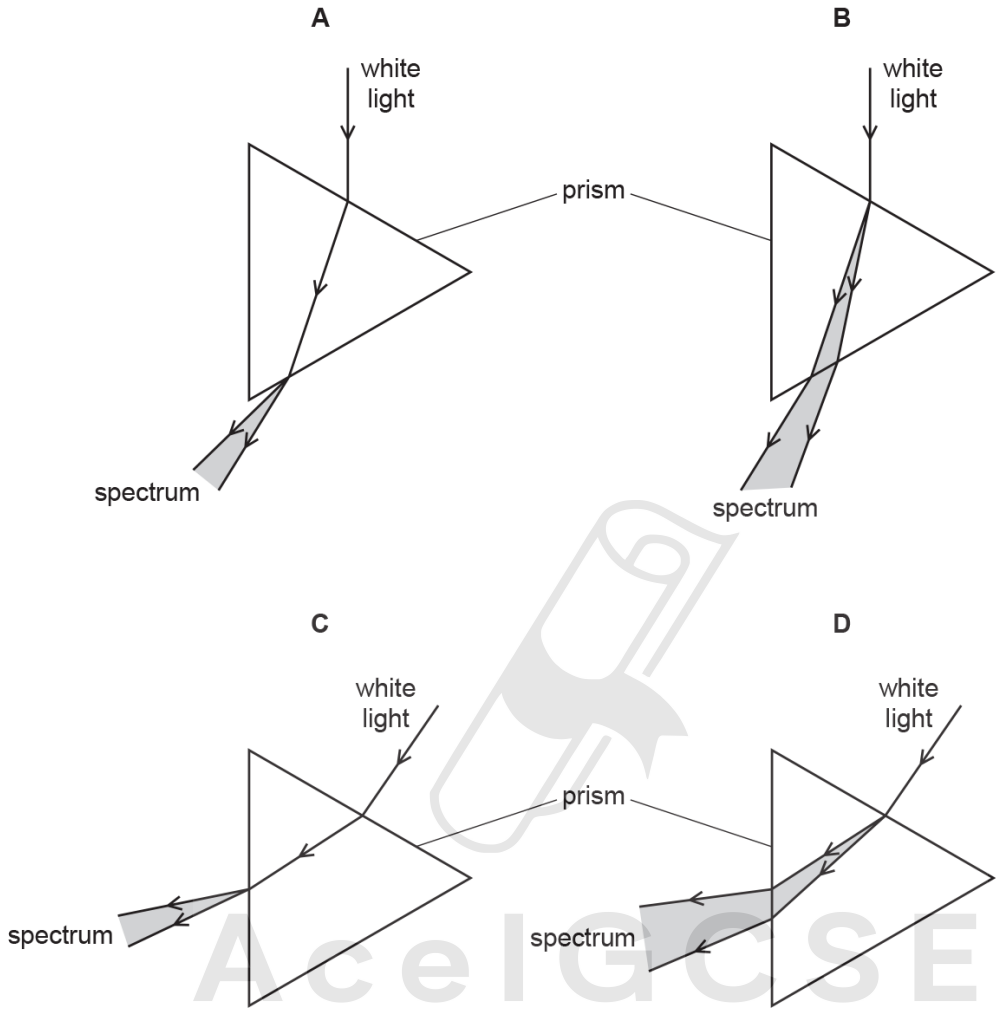
Which distance is the focal length of the lens?

A PQ **B** PR **C** QR **D** QS

113. 0625_w13_qp_13 Q: 23

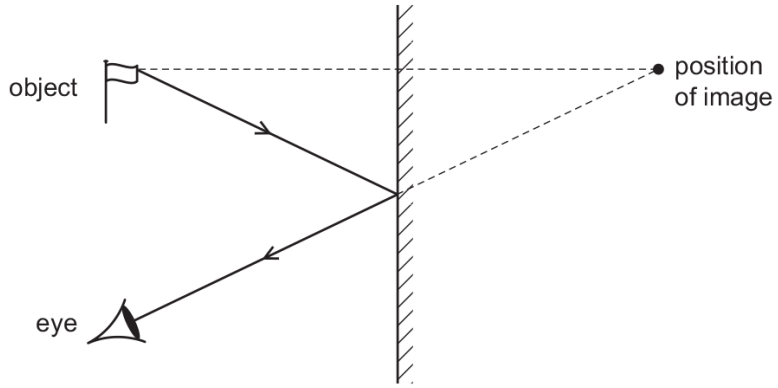
A teacher demonstrates the dispersion of white light using a triangular glass prism.

Which diagram shows how this dispersion happens?



114. 0625_s12_qp_11 Q: 23

The image formed by a plane mirror is upright.



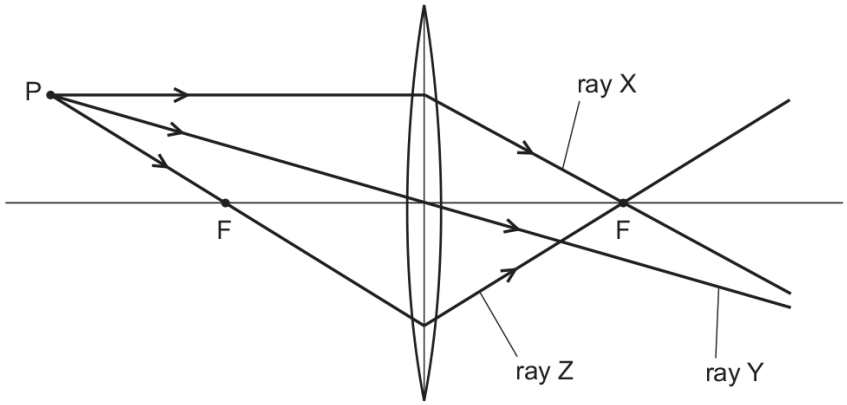
What are the other characteristics of the image?

	laterally inverted (left to right)	magnified (larger than the object)	virtual
A	no	yes	yes
B	yes	no	no
C	yes	no	yes
D	yes	yes	no

115. 0625_s12_qp_11 Q: 24

A student draws three rays of light from point P through a converging lens.

Each point labelled F is a principal focus of the lens.



Which of the rays are drawn correctly?

A ray Y only

B ray Z only

C ray X and ray Y

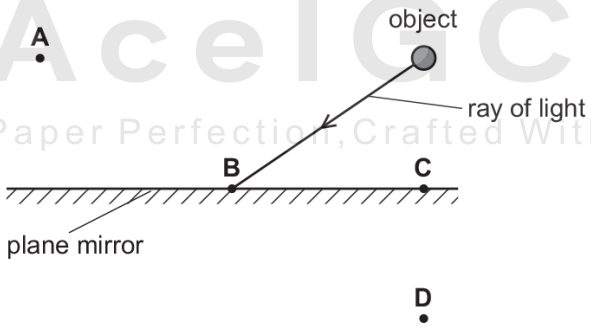
D ray X and ray Z

---

116. 0625_s12_qp_12 Q: 23

A plane mirror is used to form an image of an object.

At which labelled point is the image formed?

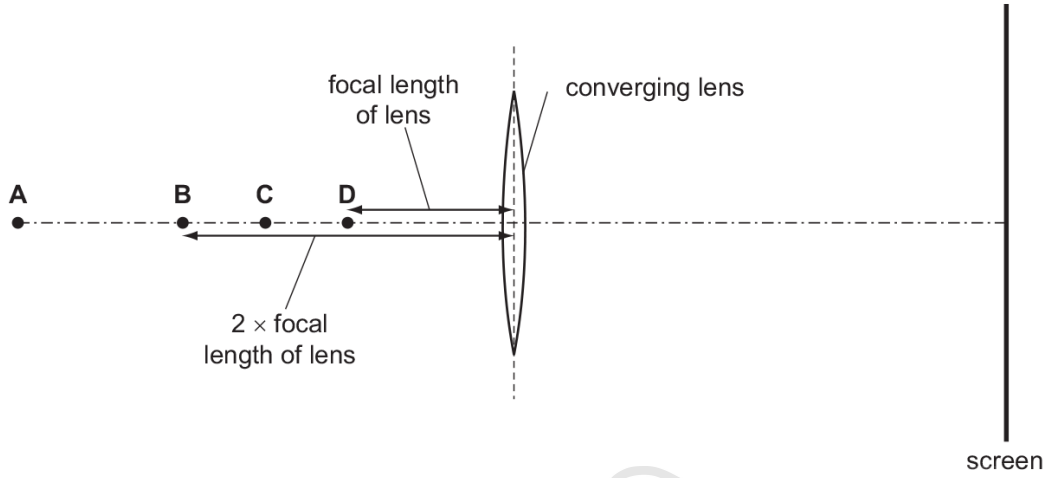


---

117. 0625_s12_qp_12 Q: 24

A converging lens in a projector is used to make an **enlarged** image of a small piece of film on a screen.

At which labelled point could the piece of film be placed so that the lens produces this image?



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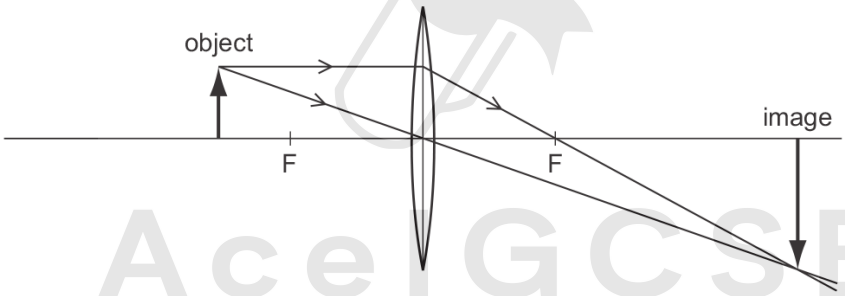
118. 0625_w12_qp_11 Q: 23

A thin converging lens forms an image.



What is the nature of this image and can it be formed on a screen?

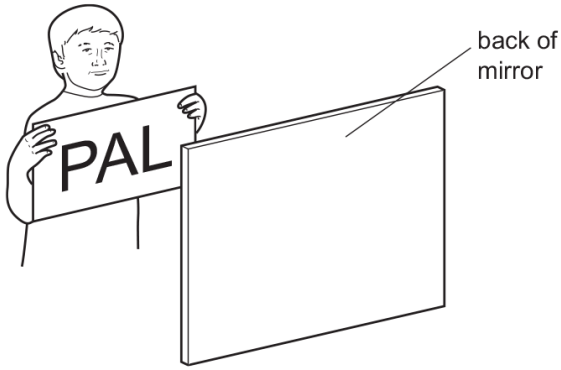
	nature of image	can be formed on a screen?
A	not real	no
B	not real	yes
C	real	no
D	real	yes

---

119. 0625_w12_qp_11 Q: 24

A piece of paper has ‘PAL’ written on it.

A student holds the paper in front of a plane mirror.



What does the student see?

A

B

C

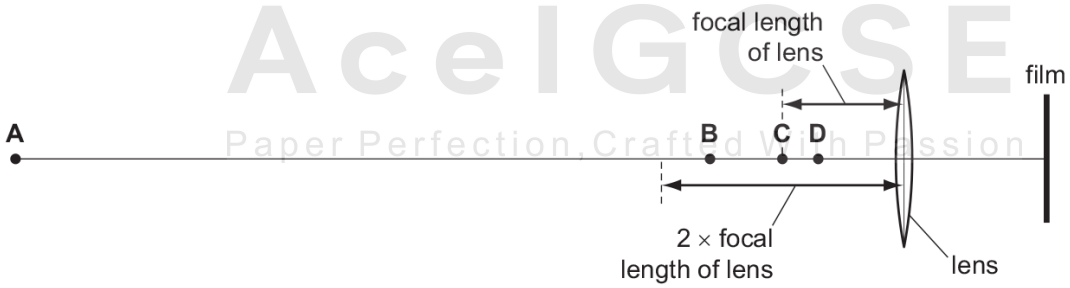
D

---

120. 0625_w12_qp_13 Q: 23

The converging lens in a camera is used to make an image on a film.

At which labelled point could a large object be placed so that it makes a smaller image?



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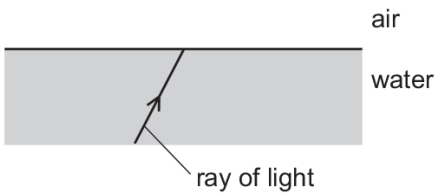
121. 0625_w12_qp_13 Q: 24

A ray of light in water is incident on the surface. The angle of incidence is much smaller than the critical angle.



What happens to this ray?

A It is completely reflected.

B It is completely refracted.

C It is partially reflected and partially refracted.

D It is refracted at an angle of refraction of 90°.

SN	Paper	Q. No.	Answer
01	0625_m22_qp_22	23	C
02	0625_m22_qp_22	24	B
03	0625_m22_qp_22	25	D
04	0625_m21_qp_22	21	D
05	0625_m21_qp_22	22	A
06	0625_m21_qp_22	23	C
07	0625_m21_qp_22	24	D
08	0625_s21_qp_21	22	B
09	0625_s21_qp_21	23	A
10	0625_s21_qp_21	24	A
11	0625_s21_qp_22	22	B
12	0625_s21_qp_22	23	B
13	0625_s21_qp_22	24	A
14	0625_s21_qp_23	22	B
15	0625_s21_qp_23	23	A
16	0625_s21_qp_23	24	A
17	0625_w21_qp_21	19	B
18	0625_w21_qp_21	20	C
19	0625_w21_qp_21	21	D
20	0625_w21_qp_22	19	B
21	0625_w21_qp_22	20	C
22	0625_w21_qp_22	21	B
23	0625_w21_qp_23	19	B
24	0625_w21_qp_23	21	A
25	0625_m20_qp_22	25	A
26	0625_m20_qp_22	26	D
27	0625_p20_qp_20	25	D
28	0625_p20_qp_20	26	D
29	0625_s20_qp_21	22	C
30	0625_s20_qp_21	23	C
31	0625_s20_qp_22	22	B
32	0625_s20_qp_22	23	C
33	0625_s20_qp_23	23	A
34	0625_w20_qp_21	21	D
35	0625_w20_qp_21	23	B
36	0625_w20_qp_21	24	B
37	0625_w20_qp_22	21	D
38	0625_w20_qp_22	23	D
39	0625_w20_qp_22	25	B
40	0625_w20_qp_23	21	D
41	0625_w20_qp_23	23	D
42	0625_w20_qp_23	24	B
43	0625_m19_qp_22	23	D
44	0625_m19_qp_22	24	A
45	0625_s19_qp_21	21	C
46	0625_s19_qp_21	22	C
47	0625_s19_qp_22	21	D
48	0625_s19_qp_22	22	B
49	0625_s19_qp_23	21	D
50	0625_s19_qp_23	22	B
51	0625_w19_qp_21	22	C
52	0625_w19_qp_21	23	A
53	0625_w19_qp_22	23	C
54	0625_w19_qp_22	24	B
55	0625_w19_qp_23	22	B
56	0625_w19_qp_23	23	D
57	0625_m18_qp_22	24	D
58	0625_m18_qp_22	25	C
59	0625_m18_qp_22	26	B
60	0625_s18_qp_21	21	A
61	0625_s18_qp_21	22	D
62	0625_s18_qp_22	22	A
63	0625_s18_qp_23	22	A
64	0625_w18_qp_21	22	D
65	0625_w18_qp_21	23	B
66	0625_w18_qp_22	22	D
67	0625_w18_qp_23	22	A
68	0625_w18_qp_23	23	B
69	0625_m17_qp_22	21	D
70	0625_m17_qp_22	22	B
71	0625_s17_qp_21	20	D
72	0625_s17_qp_22	20	C
73	0625_s17_qp_23	20	A
74	0625_s17_qp_23	21	D
75	0625_w17_qp_21	21	A
76	0625_w17_qp_21	22	C
77	0625_w17_qp_22	21	D
78	0625_w17_qp_22	22	A
79	0625_w17_qp_23	21	D
80	0625_w17_qp_23	22	C
81	0625_m16_qp_22	22	D
82	0625_m16_qp_22	23	B
83	0625_p16_qp_20	25	D
84	0625_p16_qp_20	26	D
85	0625_s16_qp_21	22	D
86	0625_s16_qp_21	23	D
87	0625_s16_qp_22	23	A
88	0625_s16_qp_23	22	D
89	0625_s16_qp_23	23	C
90	0625_w16_qp_21	22	D
91	0625_w16_qp_21	23	B
92	0625_w16_qp_22	23	A
93	0625_w16_qp_23	21	D
94	0625_w16_qp_23	22	A
95	0625_m15_qp_12	20	B
96	0625_m15_qp_12	21	B
97	0625_s15_qp_11	22	C
98	0625_s15_qp_12	20	A

SN	Paper	Q. No.	Answer
99	0625_w15_qp_11	21	B
100	0625_w15_qp_11	22	D
101	0625_w15_qp_12	20	B
102	0625_w15_qp_13	22	C
103	0625_s14_qp_11	21	B
104	0625_s14_qp_11	22	B
105	0625_s14_qp_12	22	A
106	0625_w14_qp_11	20	B
107	0625_w14_qp_11	23	B
108	0625_w14_qp_13	23	A
109	0625_s13_qp_11	22	A
110	0625_w13_qp_11	22	B
111	0625_w13_qp_11	23	C
112	0625_w13_qp_13	22	C
113	0625_w13_qp_13	23	B
114	0625_s12_qp_11	23	C
115	0625_s12_qp_11	24	C
116	0625_s12_qp_12	23	D
117	0625_s12_qp_12	24	C
118	0625_w12_qp_11	23	D
119	0625_w12_qp_11	24	B
120	0625_w12_qp_13	23	A
121	0625_w12_qp_13	24	C