

فيزياء - الجزء الأول نواتج التعلم من 1 إلى 6 انكسار الضوء



تم تحميل هذا الملف من موقع المناهج الإماراتية

موقع المناهج ← المناهج الإماراتية ← الصف العاشر المتقدم ← فيزياء ← الفصل الثالث ← ملفات متنوعة ← الملف

تاريخ إضافة الملف على موقع المناهج: 09:59:03 2026-06-10

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المزيد من مادة
فيزياء:

إعداد: عبدالله المهدي

التواصل الاجتماعي بحسب الصف العاشر المتقدم



صفحة المناهج
الإماراتية على
فيسبوك

الرياضيات

اللغة الانجليزية

اللغة العربية

التربية الاسلامية

المواد على تلغرام

المزيد من الملفات بحسب الصف العاشر المتقدم والمادة فيزياء في الفصل الثالث

ملزمة مراجعة تكويني وفق الهيكل

1

شرح التداخل في الأغشية الرقيقة والحيود - الجزء الثاني

2

شرح التداخل والحيود - الجزء الأول

3

هيكل فيزياء صف عاشر متقدم

4

الوحدة السابعة الحركة في بعدين الدرس الثالث السرعة المتجهة النسبية

5



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MINISTRY OF EDUCATION



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Physics**

UAE Edition
Grade 10 Advanced
Student Edition



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PHYSICS

Inspire

2025/2026 T 3



Ministry of Education. **UAE**
Curriculum and Assessment Sector.
Testing and Assessment Dep.
Centralized Exams.
End of Term 3 Exam Coverage

Academic Year العام الدراسي	2 ²⁵ _K / 2 ²⁶ _K
Term / الفصل	3
Subject الموضوع	PHYSICS (INSPIRE) 10
Grade الصف	
Stream. المسار	Advanced المتقدم

دكتور اعداد وتطوير مناهج ومعلم بالتعليم

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تابعونا على

قناة المهدي أكاديمي

عزيزي الطالب / عزيزتي الطالبة

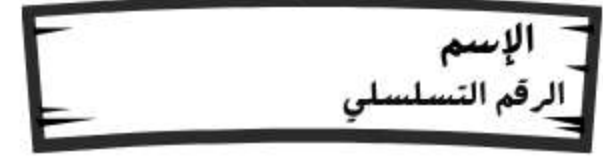


نحن لا نجمع الهيكل في أسئلة فقط
ولكن نقوم بالشرح الجزئيات المطلوبة
في الهيكل ثم نقوم بجمع الأسئلة عليها من الكتاب

هذا الجزء الأول من ملف الشرح

هناك ملف آخر للأسئلة... يجب الحل

لحجز الأجزاء الأخرى تواصل معنا



قناة تليجرام



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للتواصل





الجزء الأول نواتج التعلم من 1 إلى 6 انكسار الضوء

ملف الشرح

Part 1: Learning Outcomes 1-6 - Refraction of Light

الترتيب Type	السؤال Question	نواتج التعلم / معايير الأداء Learning Outcome/Performance Criteria **	المرجع في كتاب الطالب النسخة الانجليزية Reference in the Student Book (English Version)	
			Example/Exercise مثال/تمرين	Page. صفحة
1		Describe refraction of light (or a wave) as it crosses the boundary between two different mediums and represent that in a ray diagram.	Student Book Figures (18,19)	90 90,91
2		Identify that during refraction, the wavelength and speed of light (or a wave) change but frequency remains the same.	Student Book	92-93
3		State and apply Snell's law of refraction.	Student Book Example (4) Practice Prob. (30,32,33)	91-93 92 92
4		Calculate the refractive index of a medium using a suitable mathematical representation ($n=$).	Student Book Check Your Prog. (38)	93 96
5		Define the critical angle as the angle of incidence at which the refracted light ray lies along the boundary of the two mediums.	Student Book Figures (21)	94 94
6		Apply the concepts of refraction, critical angle, and total internal reflection to solve numerical problems.	Student Book Check YourProg. (36,37,39,40,41)	92-94 96





1

Describe refraction of light (or a wave) as it crosses the boundary between two different mediums and represent that in a ray diagram.

Student Book
Figures (18,19)

90
90,91



DEFINITION

Refraction (انكسار)

The change in direction (bending) of waves at the boundary between two different media.





Refraction occurs when light travels from one transparent medium to another due to the difference in speed of light in the two media



Refraction depends on the properties of the medium, including the speed of light

Note that the frequency is constant because it depends on the source, not the medium. and periodic Time also constant

What changes from one medium to another is the speed and wavelength... but the frequency is constant.

The angle of incidence is the angle between the incident light ray and the normal to the interface

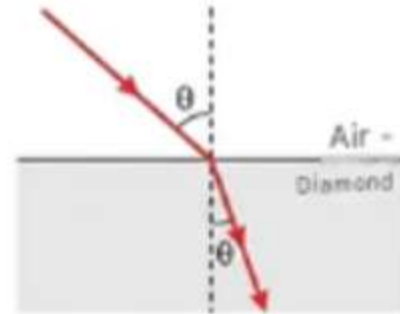
The angle of refraction is the angle between the refracted light ray and the normal



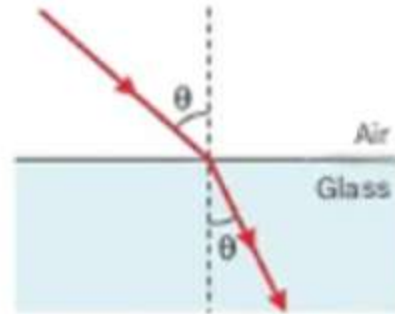




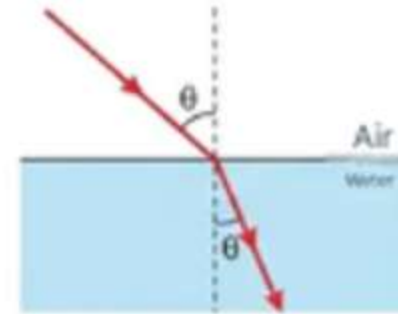
When the ray is **refracted near** the normal, i.e., when the angle of **incidence** is **greater than** the angle of refraction



Air - Diamond



Air - Glass



Air - Water

When the **speed of light in the first medium** is **greater than** the speed of light in the second medium, the speed of light in air is greater than in any other medium

$$\frac{\sin \theta_1}{\sin \theta_2} = \frac{V_1}{V_2}$$

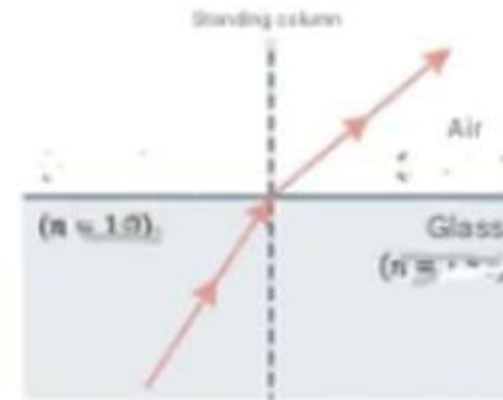
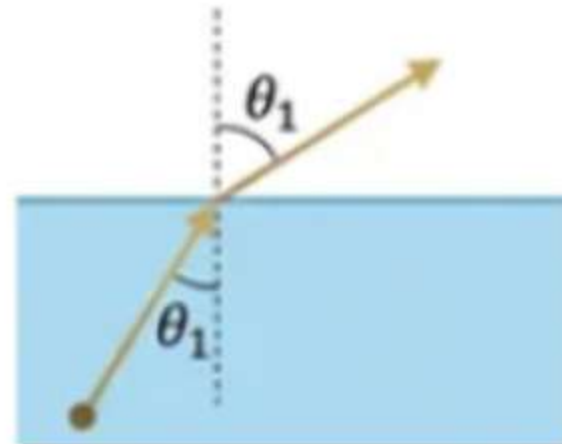


$$V_1 > V_2$$

$$\sin \theta_1 > \sin \theta_2$$



When the ray is **refracted away from the normal**... that is, the angle of incidence is less than the angle of refraction.



When the **speed of light in the first medium is less than** the speed of light in the second medium

$$\frac{\sin \theta_1}{\sin \theta_2} = \frac{V_1}{V_2}$$

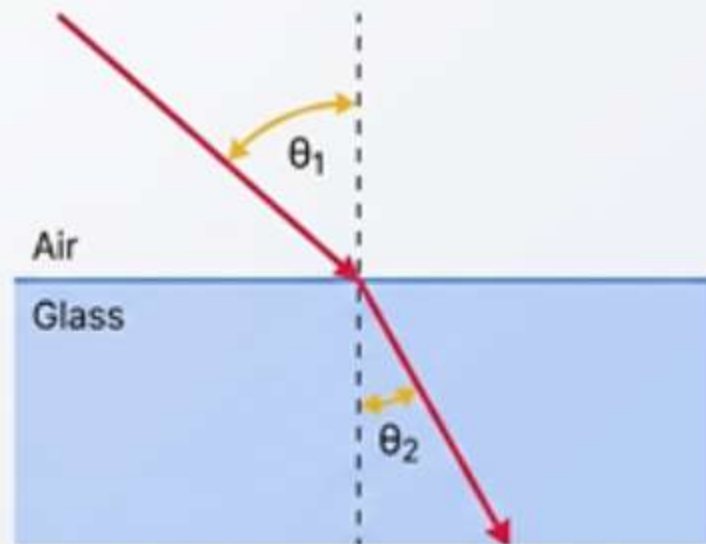
$$V_1 < V_2$$

$$\sin \theta_1 < \sin \theta_2$$

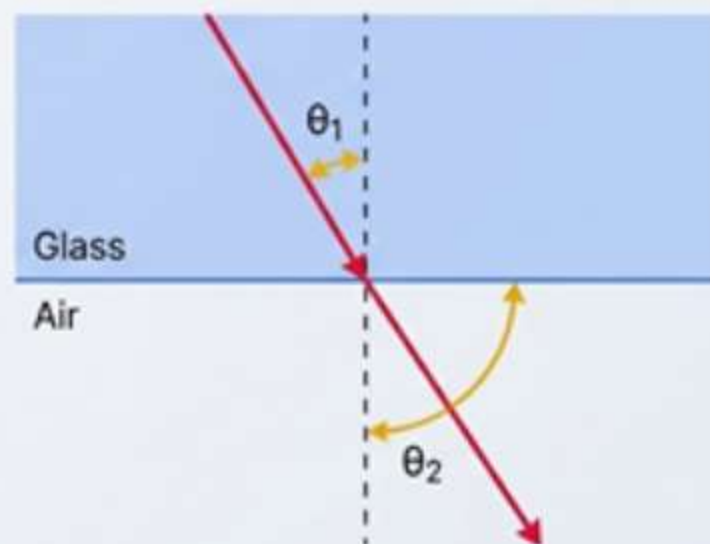


Fast → Slow Medium

Lower Density to Higher Density (e.g., Air to Glass)

**Result:** Speed decreases.**Rule:** Bends TOWARDS the normal.**Formula:** Angle of Incidence (θ_1) > Angle of Refraction (θ_2)**Slow → Fast Medium**

Higher Density to Lower Density (e.g., Glass to Air)

**Result:** Speed increases.**Rule:** Bends AWAY from the normal.**Formula:** Angle of Incidence (θ_1) < Angle of Refraction (θ_2)



refractive index
of the medium (n)
"Constant value
for the medium"

=

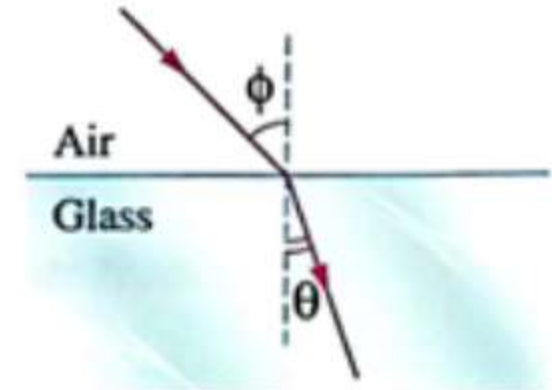
The ratio of the speed of light in space or air (c) to its speed in the medium (v)

=

The ratio of the wavelength of light in air (λ_{air}) to its wavelength in the medium (λ_{medium})

=

The ratio of the sine of the angle of incidence in the space or the air ($\sin \phi$) to the sine of the angle of refraction in the medium ($\sin \theta$)





$$n = \frac{\sin \theta_1}{\sin \theta_2} = \frac{C}{V} = \frac{\lambda_1}{\lambda_2}$$



The refractive index of any medium is **always greater than one**

because the speed of light in space or air is a universal constant that equals to 3×10^8 m/s and it is greater than its speed in any other medium.





$$\frac{\sin \theta_1}{\sin \theta_2} = \frac{V_1}{V_2} = \frac{\lambda_1}{\lambda_2} = \frac{n_2}{n_1}$$



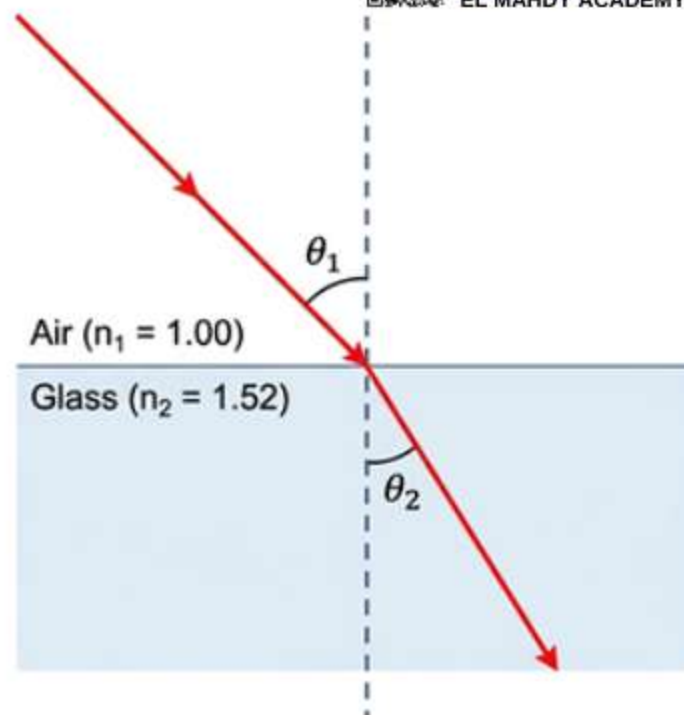
Snell's Law of Refraction

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

- n_1 = Index of refraction of the first medium (Where light starts)
- θ_1 = Angle of incidence (Measured from the normal line)
- n_2 = Index of refraction of the second medium (Where light enters)
- θ_2 = Angle of refraction (Measured from the normal line)

The Golden Rule

The product of the index of refraction and the sine of the angle is constant across the boundary. If n increases, θ must decrease to balance the equation.



$$\frac{\sin \theta_1}{\sin \theta_2} = \frac{n_2}{n_1}$$

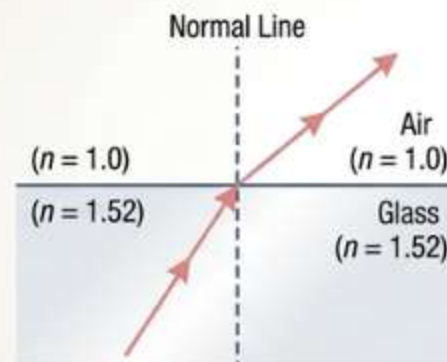




WHEN DOES A RAY BEND TOWARD OR AWAY FROM THE NORMAL LINE IN RELATIVE REFRACTION?

Case 1: From Lower to Higher Index Medium

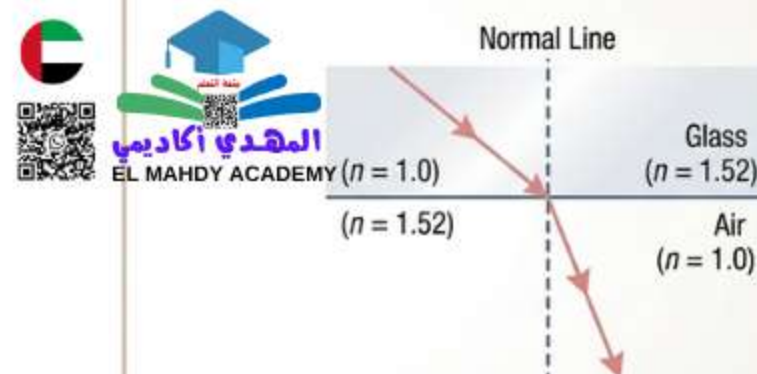
Air ($n = 1.0$) to Glass ($n = 1.52$)



Speed decreases, so the ray bends towards the normal line.

Case 2: From Higher to Lower Index Medium

Glass ($n = 1.52$) to Air ($n = 1.0$)



Speed increases, so the ray bends away from the normal line.

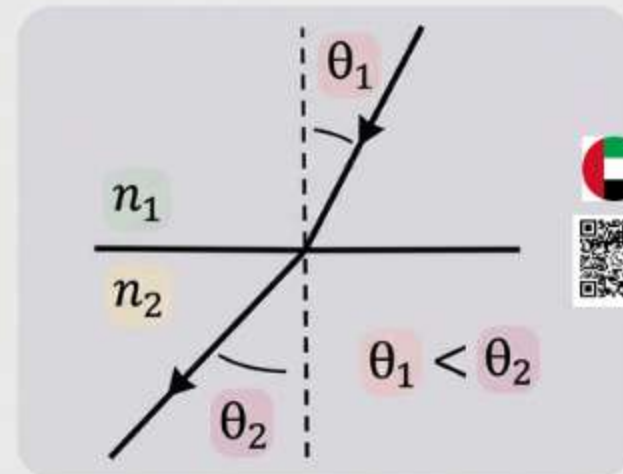


Tip: Consider a car moving from an asphalt road to a sand road. The first wheel to hit the sand slows down first, causing the car to turn *toward* the (similar to a ray bending toward the normal in a higher-index medium).



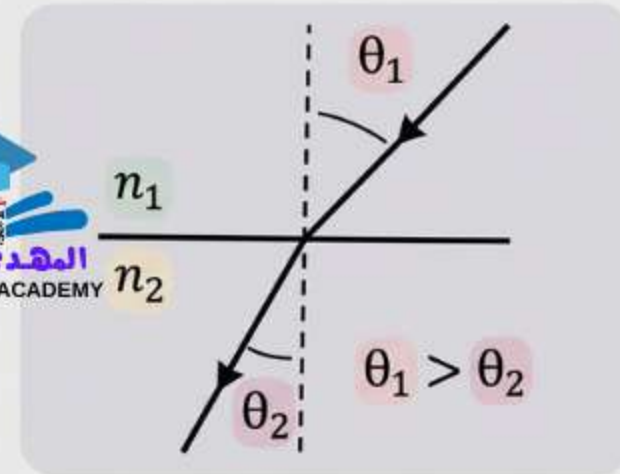
If $n_1 > n_2$ then the light

refracts **away** from the normal

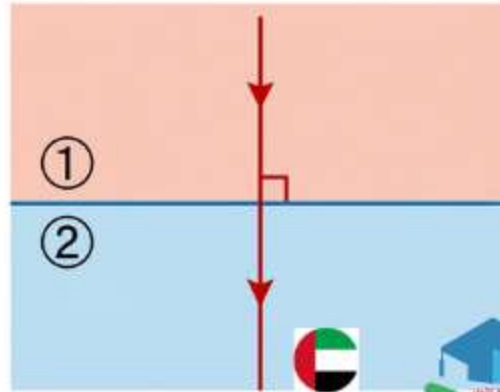


If $n_1 < n_2$ then the light

refracts **towards** the normal



$$\frac{\sin \theta_1}{\sin \theta_2} = \frac{V_1}{V_2} \frac{\lambda_1}{\lambda_2} = \frac{n_2}{n_1}$$

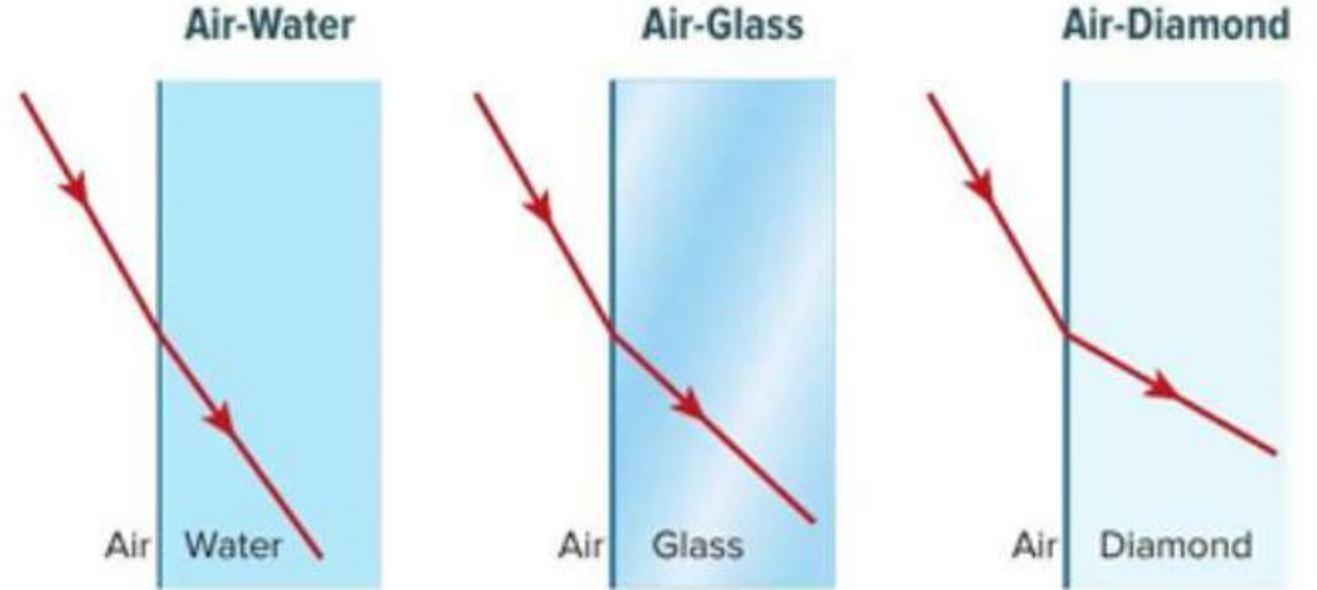


The light ray incident perpendicularly on the interface between two **transparent media does not undergo deviation** because the angle of incidence of the ray equals **zero** ($\varphi = 0^\circ$), and **according to Snell's law** ($n_1 \sin \varphi = n_2 \sin \theta$), Therefore ($n_2 \sin \theta = 0$) and consequently the angle of refraction ($\theta = 0^\circ$).





تعالى نفسر هذا الشكل



The faster the speed of light in a medium, the less the refraction (i.e., the degree of deviation) from the path.

.But what is the degree of refraction? This is called the refractive index





طبق هنا قانون سنل على كل سطح فاصل



$$\frac{\sin \theta_1}{\sin \theta_2} = \frac{n_2}{n_1}$$

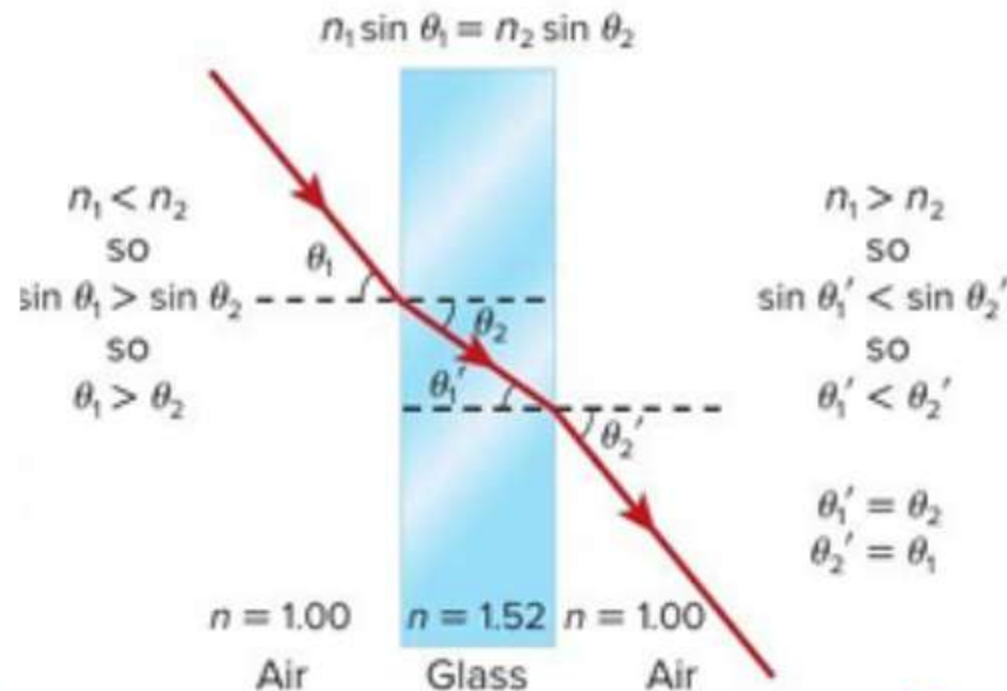
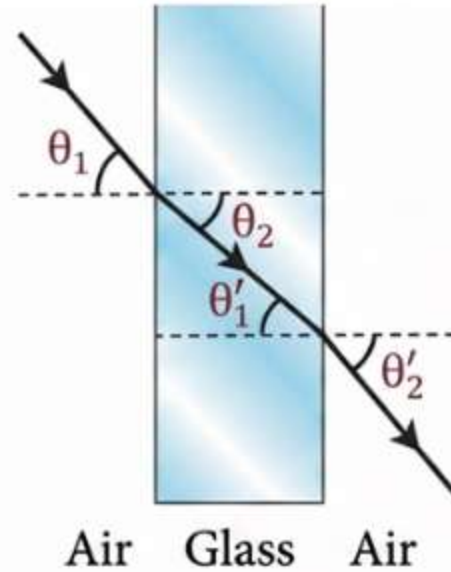


Figure 19 When light travels from air through glass and back to air, it refracts toward and then away from the normal.





The figure shows the refraction of a light ray falling from air to glass, then exiting from glass to air. Which of the following is correct?

Another Example



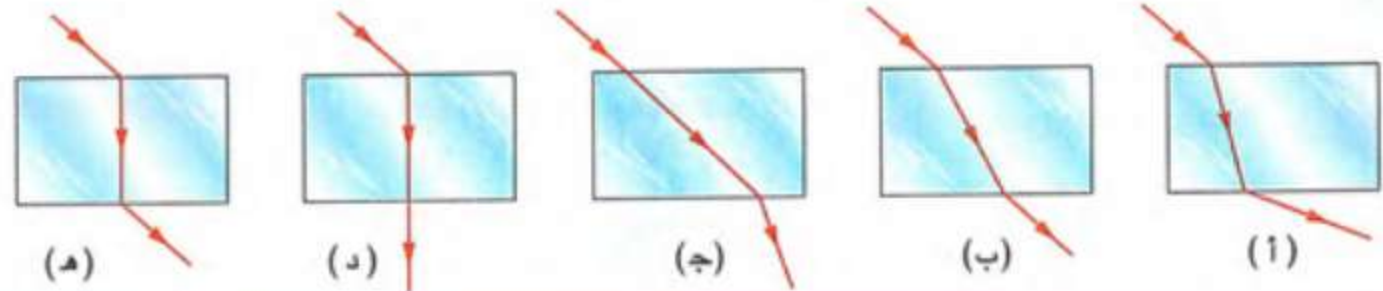
$\theta_1 = \theta_2$ (A)

$\theta'_2 = \theta'_1$ (B)

$\theta'_2 = \theta_1$ (C)

$\theta_1 = \theta'_1$ (D)

اختر من الأشكال التالية الشكل الصحيح الذي يعبر عن انكسار الضوء في متوازي مستطيلات من الزجاج، مع بيان السبب.





الزاوية الحرجة كلام في الشرح كثير ... اتبع الدكتور

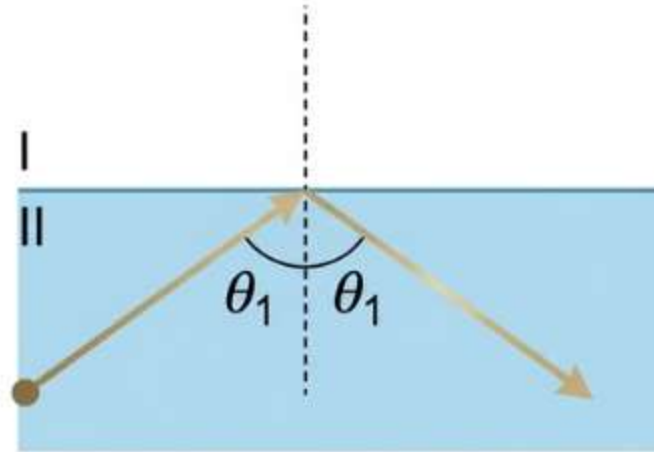


قانون الزاوية الحرجة

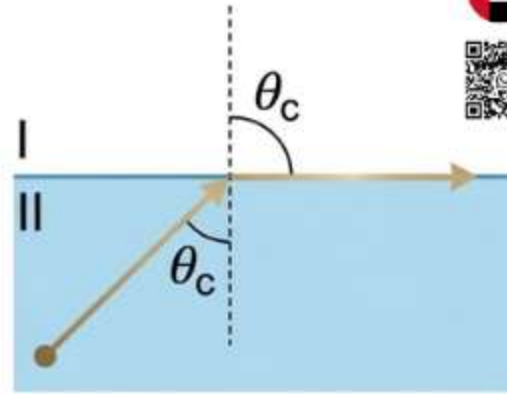




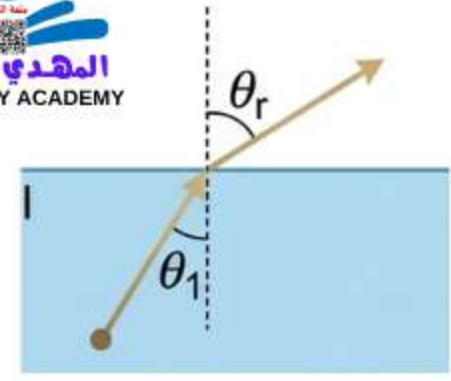
critical angle كلام في الشرح كثير ... اتبع الدكتور



Total Internal Reflection:
 $\theta_1 > \theta_c$



Critical Angle: $\theta_1 = \theta_c$
(Ray travels along the interface)



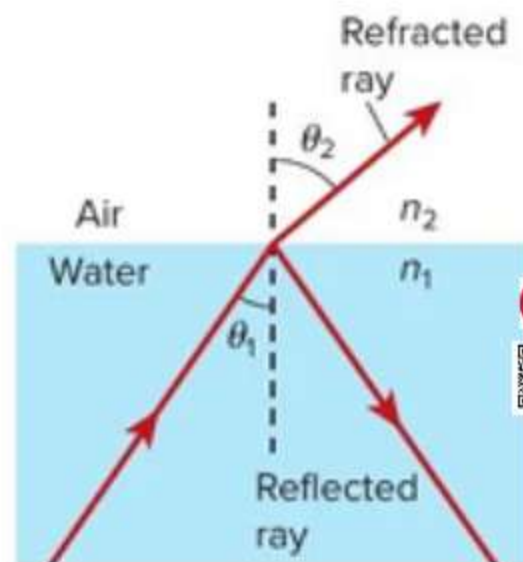
$\theta_r < \theta_c$
Normal Refraction
(to outside): $\theta_1 < \theta_c$

Critical Angle: The angle of incidence in the medium with the larger refractive index that corresponds to a refraction angle of exactly 90 degrees.

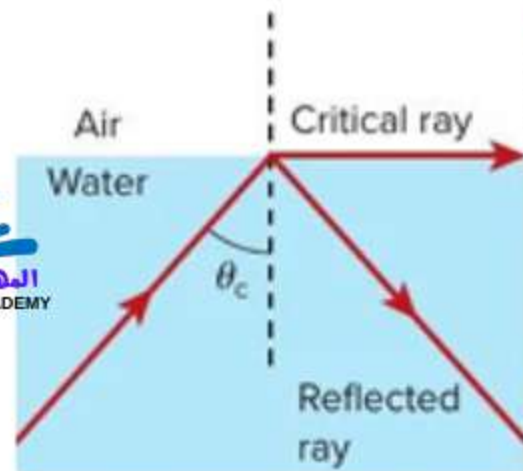
Total Internal Reflection: The incidence of a ray from the medium with the **larger refractive index** at an angle **greater than the Critical Angle**, resulting in complete reflection back into the same medium, such that the angle of incidence equals the angle of reflection.



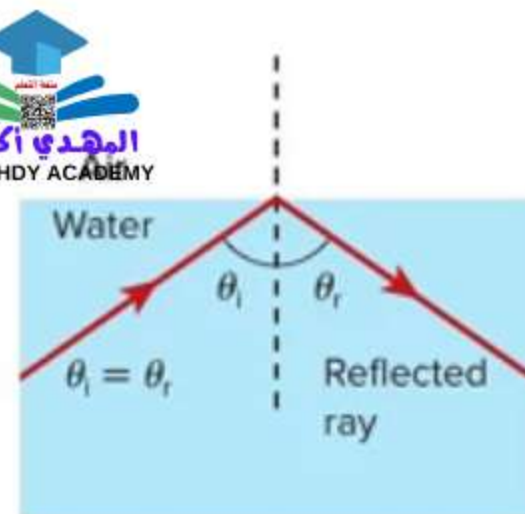
critical angle اتبع الدكتور



At an angle of incidence less than the critical angle, light is partially refracted and partially reflected.



A ray refracted along the boundary of the medium forms the critical angle.



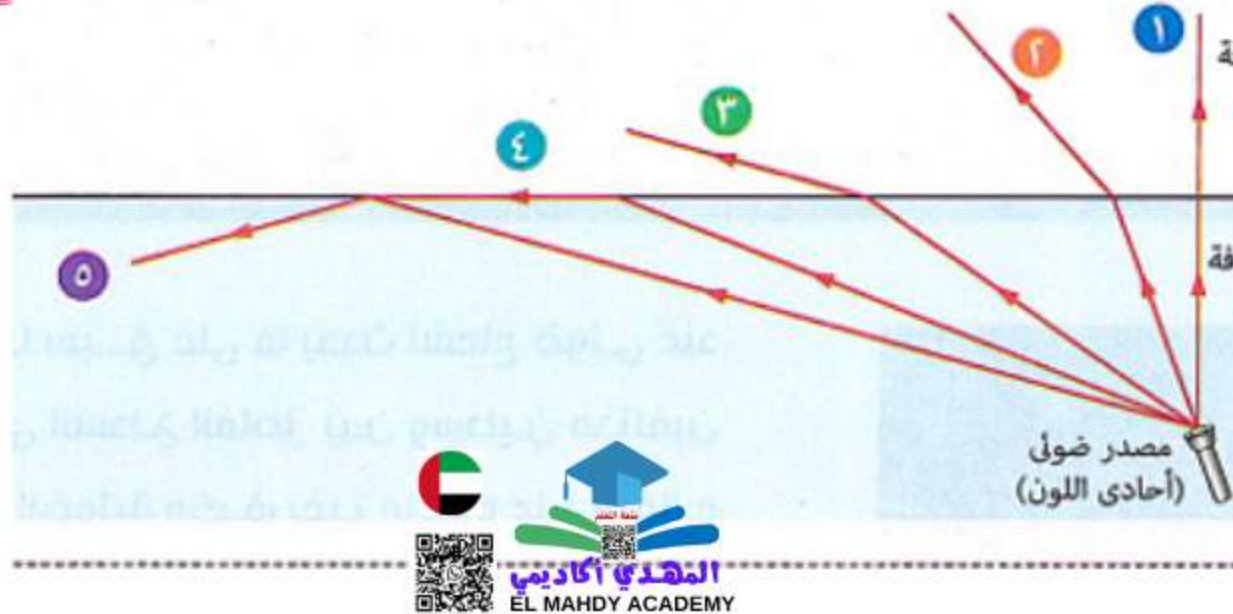
An angle of incidence greater than the critical angle results in total internal reflection, which follows the law of reflection.

Figure 21 Refraction and reflection of light traveling between mediums depend on the angle of incidence θ_i .



الزاوية الحرجة كلام في الشرح كثير ... اتبع الدكتور

$$\frac{n_2}{n_1} = \sin \theta_c$$



$$\frac{\sin \theta_1}{\sin \theta_2} = \frac{V_1}{V_2} = \frac{\lambda_1}{\lambda_2} = \frac{n_2}{n_1} = \sin \theta_c$$

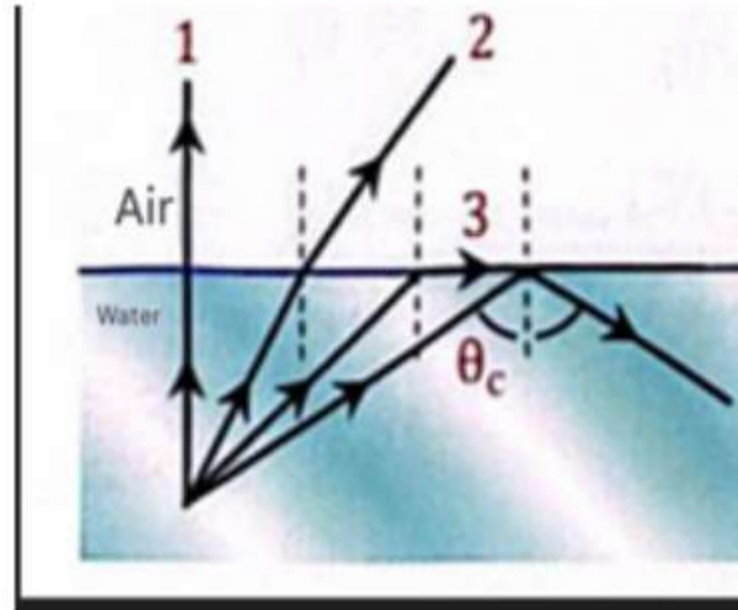
critical angle in high refractive index medium

when the second medium is air. $n_2 = 1$ The equation simplifies to: $\frac{1}{n} = \sin \theta_c$





Find the error in this figure



Find the error in the figure.

Location of critical angle (A)

No refraction of ray 1 (B)

Transmission of rays from water to air (C)

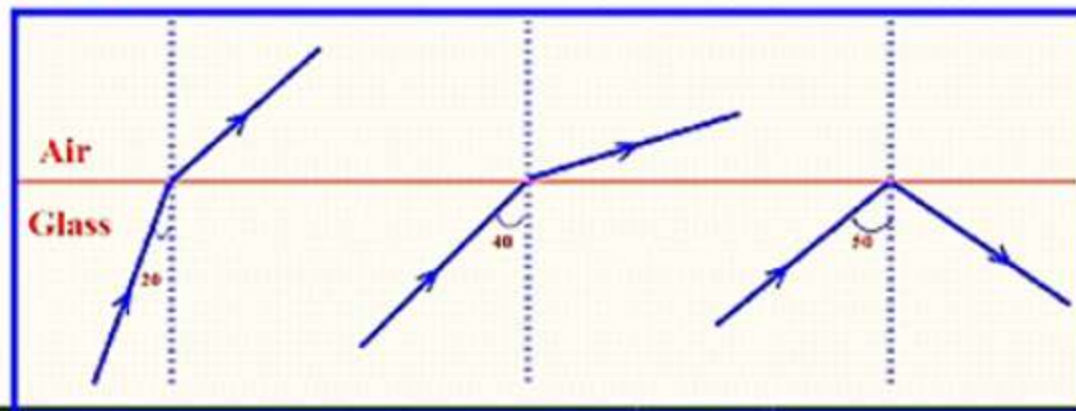
Refraction of ray 3 parallel to the surface (D)





Three rays of light are incident on the boundary between a glass block and air. The angles of incidence are different. **What is the possible critical angle** for light in the glass?

تسقط ثلاثة أشعة ضوئية على الحد الفاصل بين كتلة زجاجية والهواء. زوايا السقوط مختلفة. **ما الزاوية الحرجة المحتملة للضوء في الزجاج؟**



A	15°	B	45°
C	30°	D	60°



الجزء الثاني نواتج التعلم من 7 إلى 10 العدسات

ملف الشرح

Part 2: Learning Outcomes 7-10 - Lenses

7	Identify the principal axis, the focal points, and the focal length of a convex or a concave lens.	Student Book Figures (28), (31)	98~99 98,99
8	Draw a ray diagram to find the image of an object located at different distances from a convex lens and determine the location and properties of the formed image.	Student Book Figures (28,29,30) Practice Prob. (47)	98~99 98~99 101
9	Describe how a convex lens acts as a magnifier.	Student Book	99
10	Apply the thin lens equation to calculate the image distance, the object distance, or the focal length of a convex or a concave lens using appropriate algebraic signs for focal length and corresponding distances.	Student Book Example (5) Practice Prob. (43,44,45) Check Your Prog. (51,55,56)	100 101 101 106





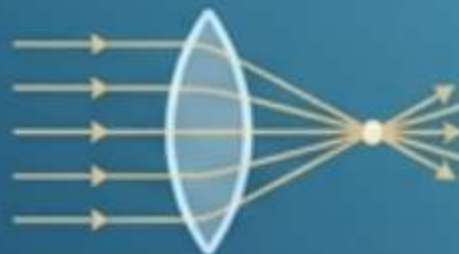
7

Identify the principal axis, the focal points, and the focal length of a convex or a concave lens.

Student Book
Figures (28), (31)

98~99
98,99

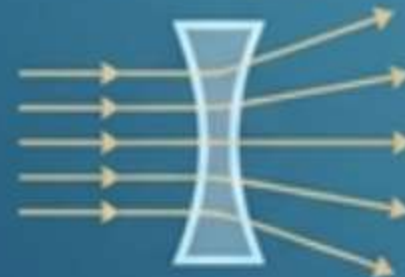
Convex Lenses (Converging)



- Thicker in the middle.
- Refracts parallel rays to a single focal point.



Concave Lenses (Diverging)



- Thinner in the middle.
- Spreads parallel rays outward.



- **Focal Point (F):** The common point where refracted parallel light rays converge (or appear to diverge from).
- **Principal Axis:** The imaginary horizontal line passing through the center of the lens.





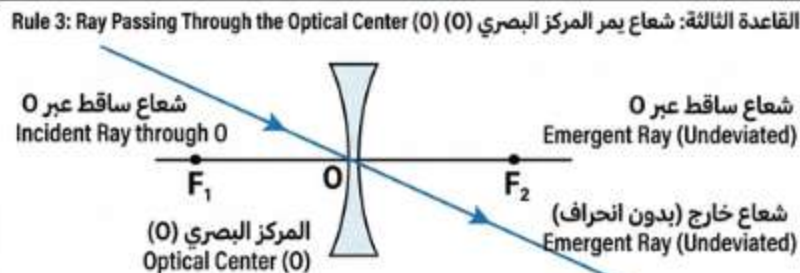
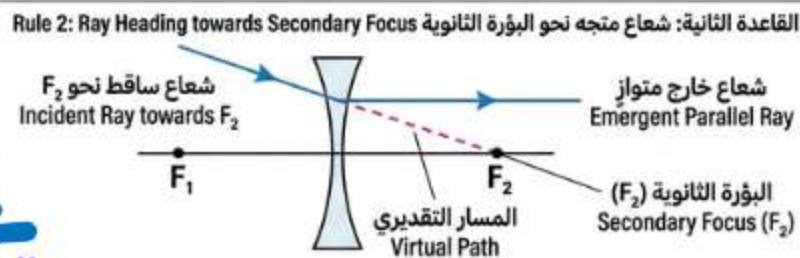
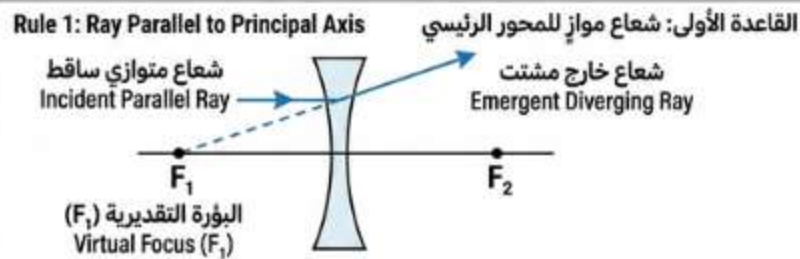
نرسم هنا





Concave Lenses: Principle of Image Formation

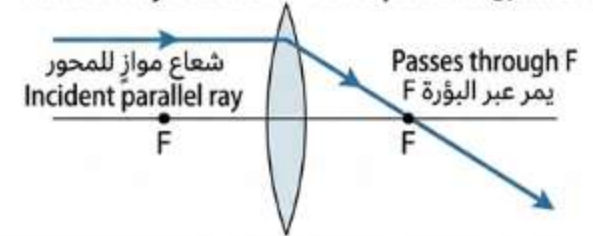
العدسات المقعرة: مبدأ تكوين الصورة



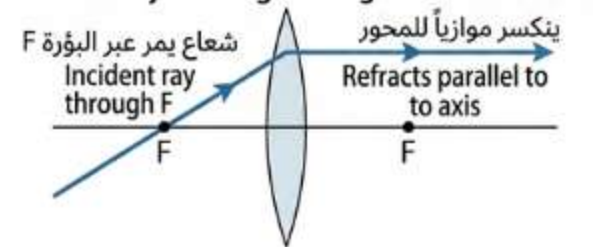
نرسم هنا العدسة المحدبة والمقعرة ونحدد عليها, والأشعة

قواعد تتبع الأشعة في العدسة المحدبة

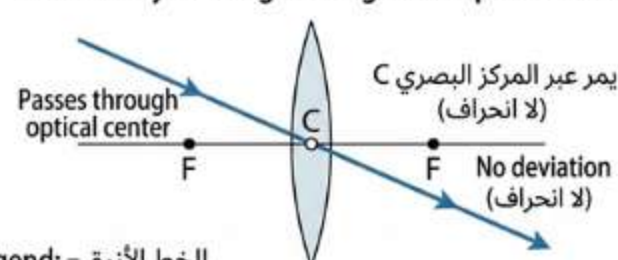
Rule 1: Ray Parallel to Principal Axis: القاعدة الأولى:



Rule 2: Ray Passing Through the Focal Point



Rule 3: Ray Passing Through the Optical Center



Legend: الخط الأزرق =

Blue line = Light Ray
Thin Biconvex Lens Symbol
رمز عدسة محدبة رقيقة
مفتاح الرموز: المحيبي





Concave Lens

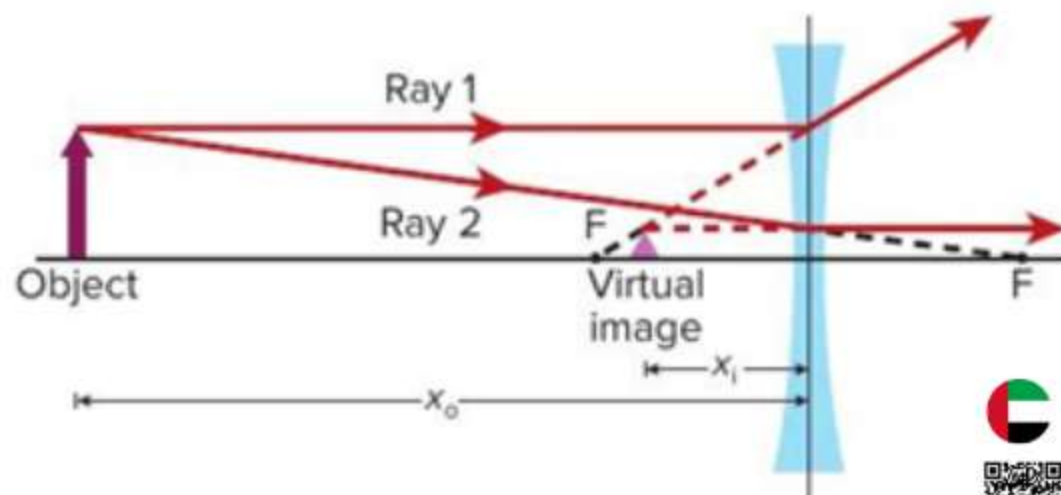


Figure 31 An object placed any distance from a concave lens will always produce an image that is virtual and reduced.

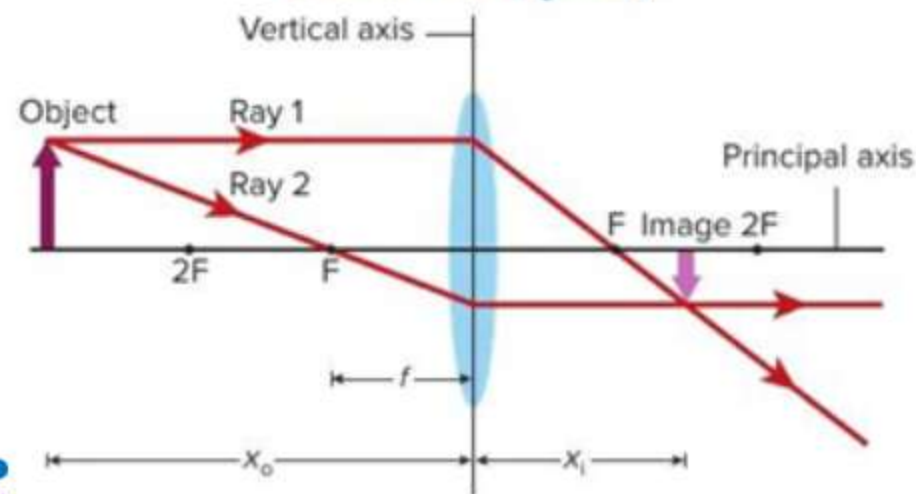
Convex Lens ($x_o > 2f$)

Figure 28 An object placed at a distance greater than twice the focal length from the lens will produce an image that is real, reduced in size, and inverted.



COLOR CONVENTION

Light ray		red
Object		magenta
Image		lilac



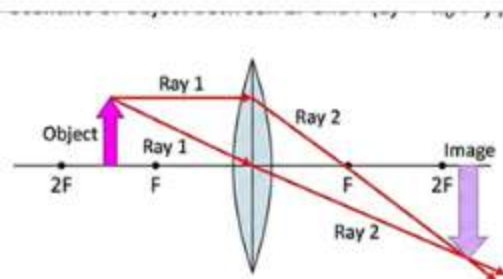


8

Draw a ray diagram to find the image of an object located at different distances from a convex lens and determine the location and properties of the formed image.

Student Book
Figures (28,29,30)
Practice Prob. (47)

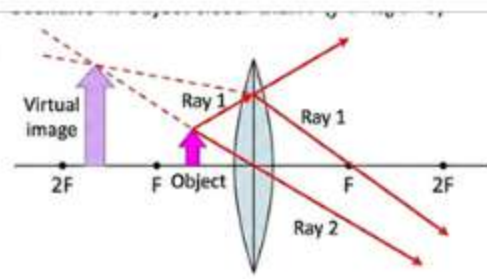
98~99
98~99
101



Rays: Intersect beyond $2F$.

Result:

- Type: Real Image
- Orientation: Inverted
- Size: Enlarged

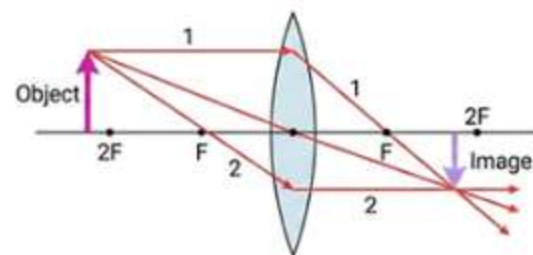


Rays: The refracted rays diverge! We must draw sight lines backward (dashed lines) to find the intersection.

Result:

- Type: Virtual Image
- Orientation: Upright
- Size: Enlarged (This is how a magnifying glass works!)

Scenario 1: Object is beyond $2F$ ($x_o > 2f$)

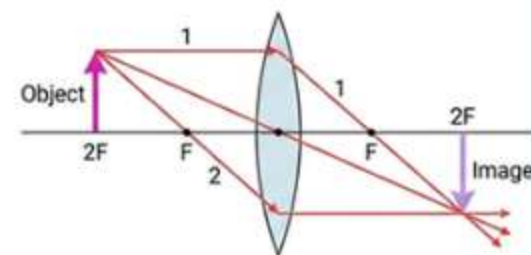


Rays: Intersect between F and $2F$ on the opposite side.

Result:

- Type: Real Image
- Orientation: Inverted (Upside down)
- Size: Reduced (Smaller)

Scenario 2: Object is exactly at $2F$ ($x_o = 2f$)



Rays: Intersect exactly at $2F$ on the opposite side.

Result:

- Type: Real Image
- Orientation: Inverted
- Size: Same Size





نرسم الحالات



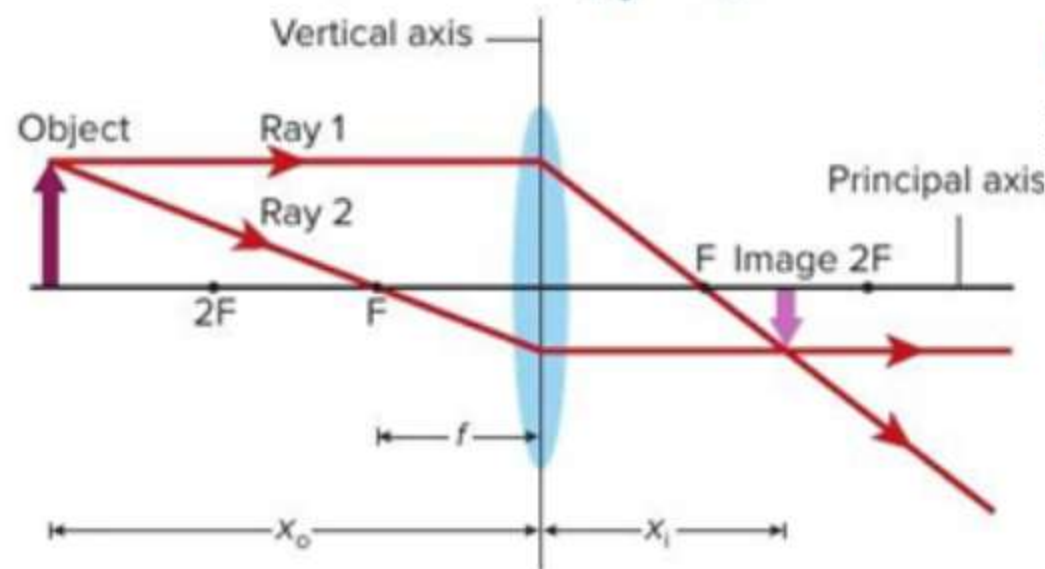
Convex Lens ($x_o > 2f$)

Figure 28 An object placed at a distance greater than twice the focal length from the lens will produce an image that is real, reduced in size, and inverted.

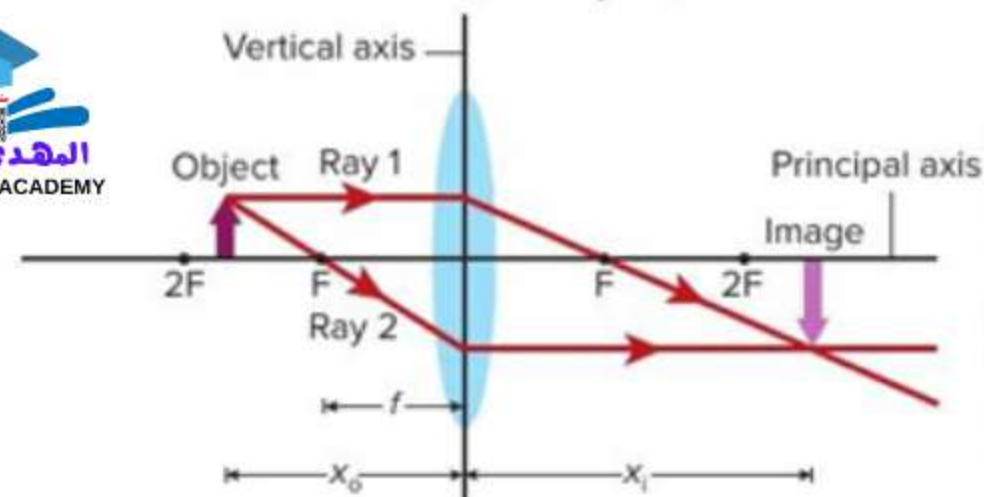
Convex Lens ($2f > x_o > f$)

Figure 29 An object placed at a distance less than twice the focal length but greater than one focal length from the lens will produce an image that is real, enlarged, and inverted.





9 Describe how a convex lens acts as a magnifier.

Student Book

99

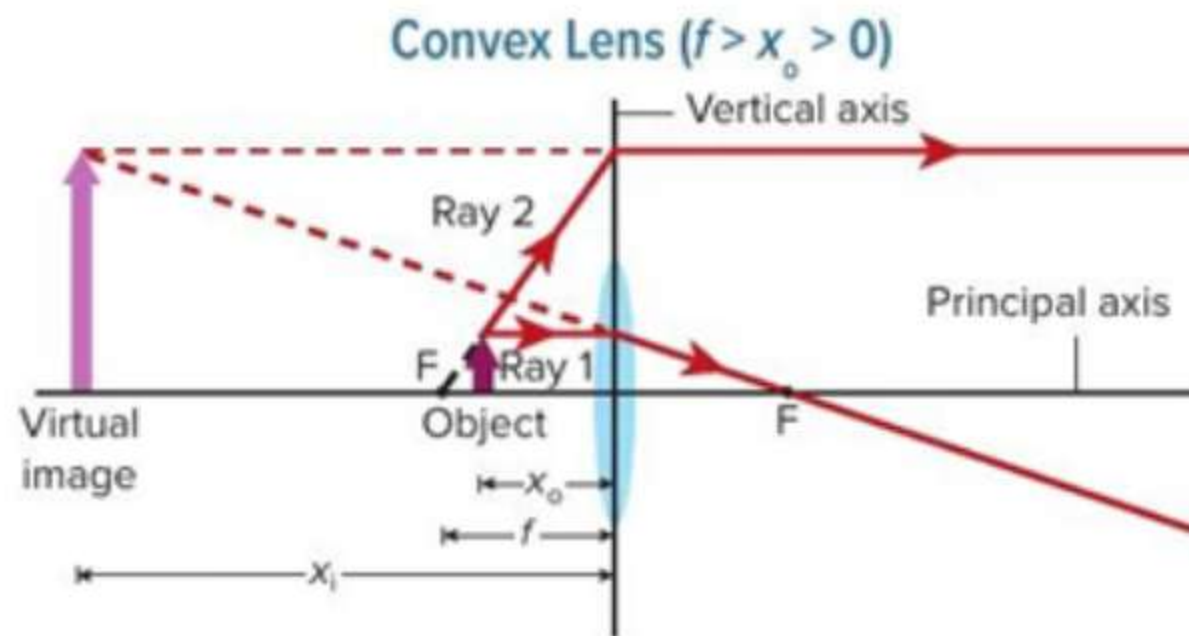


Figure 30 An object placed at a distance less than the focal length from the lens will produce an image that is virtual and enlarged.



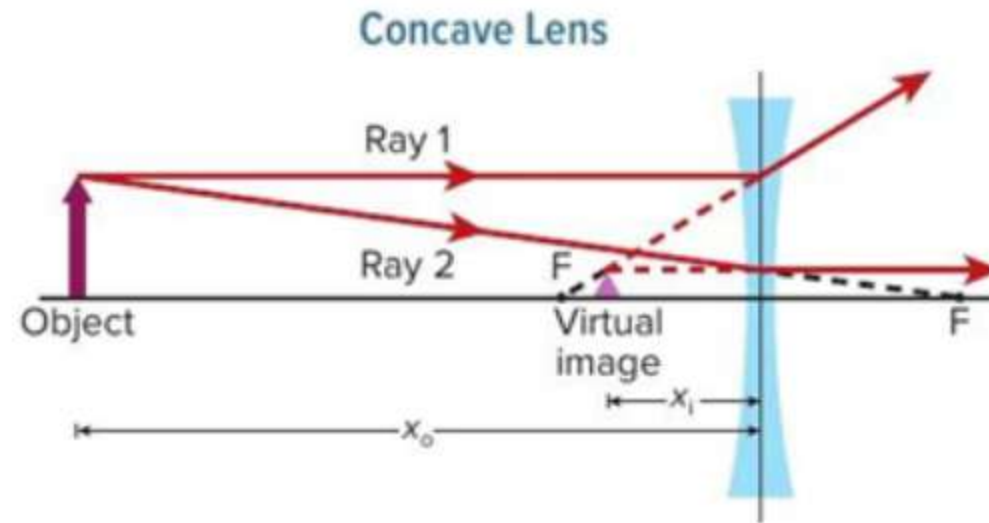


Figure 31 An object placed any distance from a concave lens will always produce an image that is virtual and reduced.





10

Apply the thin lens equation to calculate the image distance, the object distance, or the focal length of a convex or a concave lens using appropriate algebraic signs for focal length and corresponding distances.

Student Book

100

Example (5)

101

Practice Prob. (43,44,45)

101

Check Your Prog. (51,55,56)

106

$$\frac{1}{f} = \frac{1}{x_i} + \frac{1}{x_o}$$

$$\frac{1}{f} = \frac{1}{x_i} + \frac{1}{x_o}$$

focal length $[+]$: Convex lens
 $[-]$: Concave lens

x_i : image position $[+]$: Real image
 $[-]$: Virtual image

x_o : object position $[+]$: Real object

Magnification Equations $m = -\frac{x_i}{x_o} = \frac{h_i}{h_o}$

h_i : image height $[+]$: Upright image
 $[-]$: Inverted image

h_o : object height $[+]$: Upright real object

Magnification (m) m Magnitude ($|m|$)Sign (m)

$|m| > 1$
 Enlarged image

$|m| = 1$
 Same size image

$|m| < 1$
 Reduced image

$[+]$
 Virtual image

$[-]$
 Real image





$$\frac{1}{f} = \frac{1}{x_i} + \frac{1}{x_o}$$



$$\frac{1}{f} = \frac{1}{x_i} + \frac{1}{x_o}$$

f : focal length

[+] : Convex lens

[-] : Concave lens

x_i : image position

[+] : Real image

[-] : Virtual image

x_o : object position

[+] : Real object

Magnification Equations

$$m = -\frac{x_i}{x_o} = \frac{h_i}{h_o}$$

h_i : image height

[+] : Upright image

[-] : Inverted image

h_o : object height

[+] : Upright real object

Magnification (m)

m

Magnitude ($|m|$)

$|m| > 1$

Enlarged image

$|m| = 1$

Same size image

$|m| < 1$

Reduced image

Sign (m)

[+]

Virtual image

[-]

Real image





الجزء الثاني نواتج التعلم من 11 إلى 15 الشق المزدوج

ملف الشرح

Part 2: Learning Outcomes 11-15- Double slite experiment

11	- Define coherent and incoherent light. - Explain how coherent light is generated by passing monochromatic light through slits.	Student Book	112~113
12	Explain how bright and dark interference fringes are created in a double-slit interference investigation with monochromatic light.	Student Book Figures (5)	113~114 114
13	Apply the relation ($\lambda = xd/L$) to calculate the wavelength or to find an unknown distance in a double-slit investigation given the other values.	Student Book	115
14	Explain that constructive interference occurs at locations x_m on either side of the central bright band such that $m\lambda = x_m d/L$, where $m = 0, 1, 2, \dots$	Student Book	115
15	- Apply the relation ($\lambda = xd/L$) to calculate the wavelength or to find an unknown distance in a double-slit investigation given the other values. - Solve problems on interference of light.	Example (1) Practice Prob. (1,2,3) Check Your Prog. (13)	116 116 120









Single-Slit Diffraction	Feature	Double-Slit Diffraction
	Diagram	
A central bright fringe with weaker bright and dark fringes on both sides.	Pattern on the screen	A series of equally spaced bright and dark fringes.
Very wide and brightest.	Central maximum	Bright, but narrower than in single-slit.
Present on both sides of the central maximum.	Minima (dark fringes)	Equally spaced dark fringes between bright fringes.
Present, but much weaker and not equally spaced.	Bright fringes (other than central)	All bright fringes (except the central) are of equal intensity (ideally).
Intensity of fringes decreases rapidly away from the center.	Intensity distribution	All bright fringes have (nearly) the same intensity.



عزيزي الطالب / عزيزتي الطالبة



المهدي أكاديمي
EL MAHDY ACADEMY

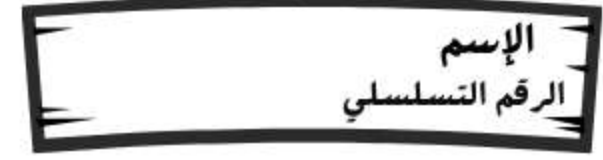


نحن لا نجمع الهيكل في أسئلة فقط
ولكن نقوم بالشرح الجزئيات المطلوبة
في الهيكل ثم نقوم بجمع الأسئلة عليها من الكتاب

هذا الجزء الأول من ملف الأسئلة والشرح على اليوتيوب

هناك ملف آخر للشرح ... يجب مذاكرته قبل الحل

لحجز الأجزاء الأخرى تواصل معنا



الإسم
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