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دائـــرة التـعليـــم والمـعـرفـــة
منطقـــة العيـــن التعليميـــة
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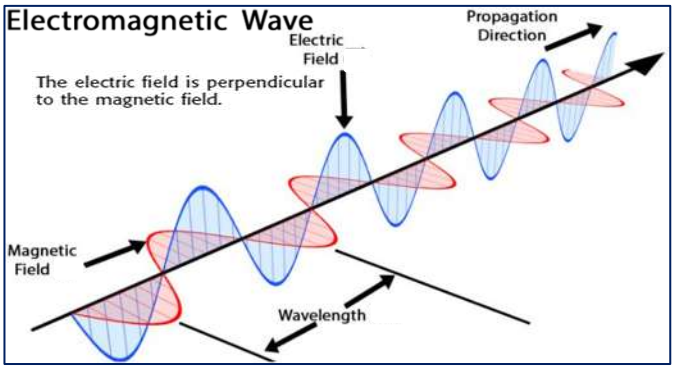
Where do light waves come from?

- The **light** comes *from* **flames**, the **Sun**, and the **glowing filaments** of **lightbulbs.**

☺ **Light** is ***made*** of: a) **Electric energy**
b) **Magnetic energy**

☞ This **energy** *travels* as a **wave.**
☞ The **wave** *has* of **frequency** and **amplitude**, *called* an **electromagnetic wave.**



✸ **Light waves *vibrate*** in the **direction *perpendicular*** to the **direction** of their **motion.**
✸ **Light waves** can ***travel*** **with** or **without** a **medium.**

- **Vacuum: Light** *travels* **very fast.**
- **Substance: Light** *travels* **slightly slower** through ***transparent*** **mediums like** { **air**, **water**, or **glass** }

Wavelength: Is the ***distance*** between **one peak** and the **next** in a **wave.**
Wave speed = wave **wavelength** * **frequency**

Light Is Also a Particle

Light is a **wave** and a **particle**? *because* **light** has ***properties*** of both **waves** and **particles.**

Properties of light particles:

1) **Travels** in **straight lines** called **(light rays).**
2) **Does not have mass.**
3) **Does have momentum.**
4) **Hits objects like in camera film**

✓ ***Particles*** of **light** are *called* **photons.**
✓ **Each photon** acts like a **wave** with a **frequency.**
✓ **A photon** has a **higher frequency** = has **more energy.**

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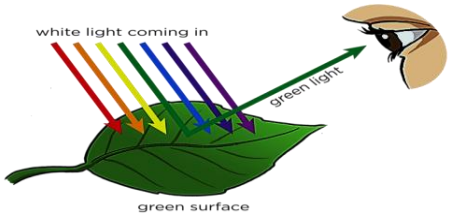
How does light make shadows?



- We see objects ***because*** **light** has **scattered off** them and **entered** our **eyes**.
- **Sometimes** when **light hits** an **object**, a **photon** is **absorbed**, these objects ***gain energy*.**
- The **light** that is **absorbed** is **usually transformed** into **heat energy.**
- **Darker objects absorb *more* light** than **lighter objects.**

☞ The ***types*** of **object** that **light can *passes* through** it:

1) Transparent	2) Translucent	3) Opaque
		
Objects that **allow almost all light through.**	**Objects** that **blur light** that **passes through.**	**Objects allows little** to **no light pass through.**
Do not allow shadow to form.	**Allow shadow to form.**	**Allow shadow to form.**

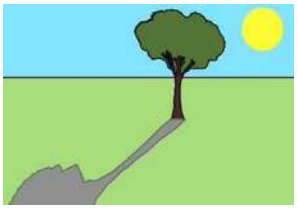
❁ This **object depends** on:

Its **material**, its **thickness**, and the **light color**.

- ✓ **Thicker objects** have **more particles** to **absorb photons**, so they are more likely to be **opaque.**
- ✓ The **area** *behind* **opaque** and **translucent** objects **block light** where the **shadow** is *formed*.

❖ **When are you most likely to see *shadows*?**

- ✓ On ***sunny days***; when someone ***shines a light*** on an **object**; when you are **on *a well-lit street.***



❖ **What makes a *shadow* appear to be large?**

- ✓ The **closer** a **light source** is to an **object**, the **larger** the **shadow** an **object** will **cast**.

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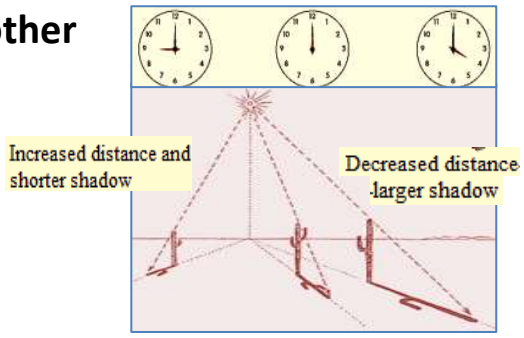
How does light make shadows?

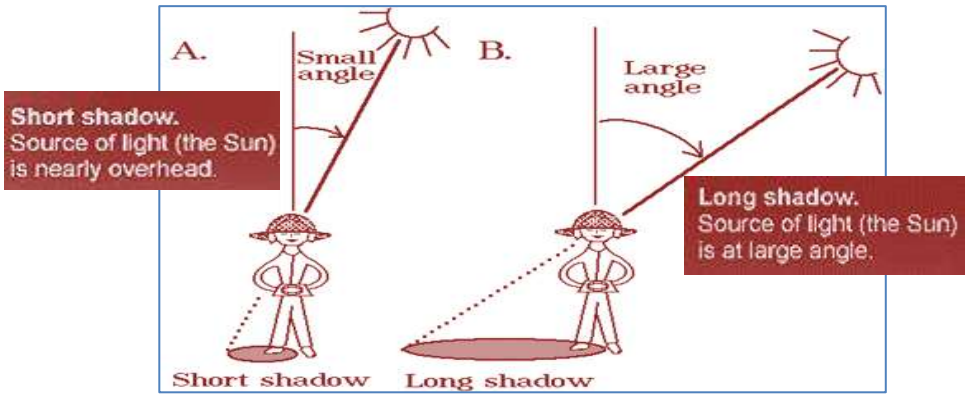
☺ You can find the **size** and **shape** of a **shadow** by **tracing light rays.**

❀ An **object** located ***between*** a **light source** and **another object**, it will **cast** a **shadow** on the **other object**.



☞ Light sources:

- **Shadows *depend* on:** the **angle** and the **distance** ***between*** a **light source** and an **object**, and ***between*** the **object** and the **place** where the **shadow** is **cast**.



❖ What are the ways in which light *interacts* with *matter*?

- ✓ It can **scatter**; it can be **absorbed** (opaque);
- ✓ it can be **allowed through** **partially** (translucent) or
- ✓ almost **completely** (transparent)

❖ Explain: why *shadows differ* in size depending on the *time of day*.

- ✓ **At midday,** the **Sun** shines **straight down**. **Shadows** are **small** and **close** to **objects**.
- ✓ **At other times,** the **angle** ***between*** the **Sun** and the **object** *casting* a ***shadow*** **increases**, causing a **longer** **shadow**.

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How does light bounce and bend?

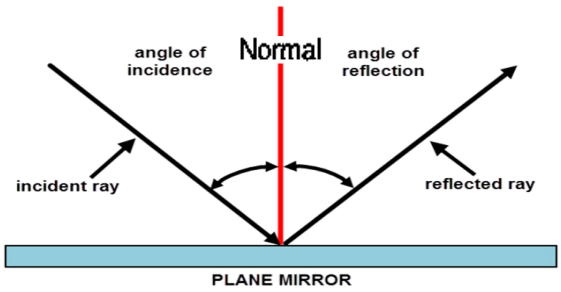
- **Light reflects off a mirror** the way **sound echoes off a cliff**.

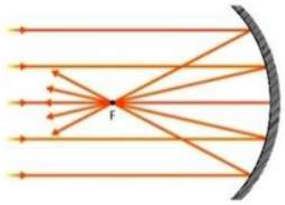
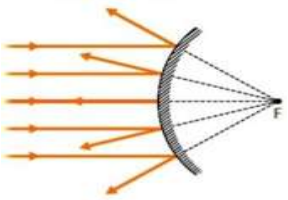
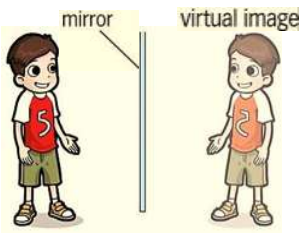
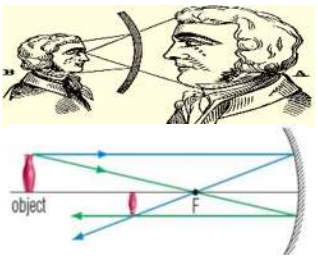
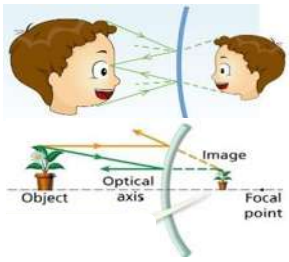
❖ Why the image in a mirror is clear?

✓ Because **most** of the **light wave reflects** the **same way off the mirror's smooth surface**.

➢ The law of reflection:

☞ The **angle** of an **incoming light ray equals** the **angle** of the **reflected light ray.**



Types of mirrors	Flat	Concave	Convex
1. Definition (Shape)	Is the **organized scattering** of a **wave**	If the **mirror curve in**	If the **mirror curve out**
2. Light reflection	**Distance** of **object** from the **mirror equal Distance of image** from the **mirror.**		
3. Images	Appears **behind** the **mirror**	Images **upright** or **upside down.** Also, images **enlarged** or **reduced**.	***always*** **produce images** that are **upright** and **small**.
			

❖ What does the surface of a mirror look like?

✓ Smooth and shiny

❖ What would happen to light if the glass did not have a shiny surface?

✓ The **light** would **pass through** the **glass** or be **scattered**. It **would not bounce off.**

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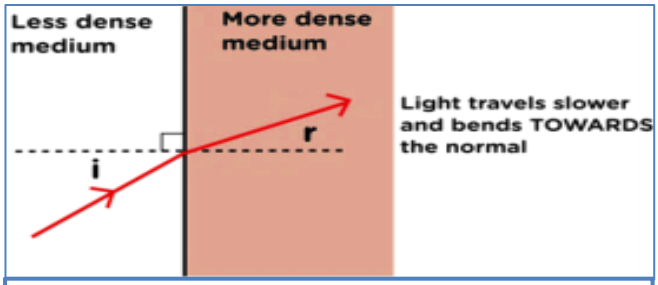
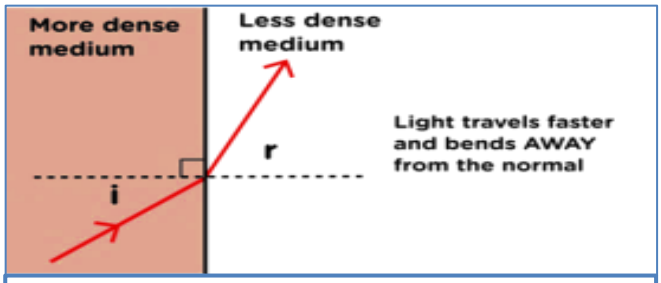
Light Can Bend

- A pencil in a **glass** of **water** shows **light refraction**.
- The **light** *from* the **object** is **bending**, ***not*** the **object**.
- ✸ When **light changes mediums**, it also **changes speed**.
- ✸ When **waves change speed**, they **refract**.

☺ The **refraction** is ***not*** **noticeable** with **sound waves**, but it is ***easily*** **seen** with **light waves**.



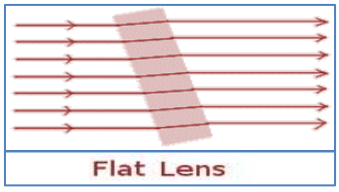
☺ **Rays entering** a **denser medium** **bend** to **make** a **bigger angle** with the **surface.**

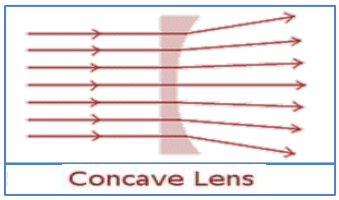


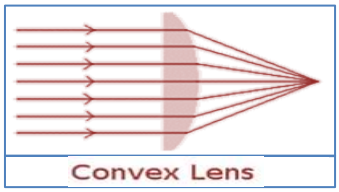
☺ **Rays entering** a **less dense medium** **bend** to **make** a **smaller angle** with the **surface.**

➢ **Lenses** use **refraction** to **shape images**.

☺ **Convex lenses *work*** *like* **Concave mirrors**,
☺ **Concave lenses *work*** *like* **Convex mirrors**.







Lenses are used in:

a) Eyeglasses to ***make*** **objects appear** in **focus.**
b) Cameras and **telescopes** to ***change*** the **size** of the **image**.

- The **image's size** and **location *depends*** on where the **object** *and* the **lens** are in **relation** to each other.

❖ What does a lens in a pair of eyeglasses do?

✓ The **lens *works*** on the **bend** and **focus** of **light** to **help us see**.

❖ What are two things that lenses can do?

✓ Lenses can ***bring*** **things** into **focus**.
✓ Lenses ***change*** the **size** of the **image**

❖ What happens when light rays enter a denser medium?

✓ They ***bend*** to **make** a **bigger angle** with the **surface**.

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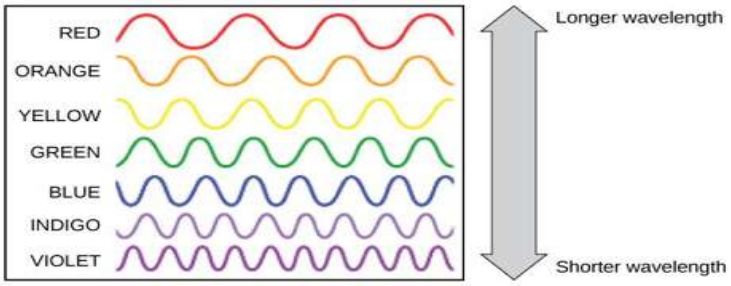
Why do we see colors?

❖ Where do the *colors* come from a rainbow?

✓ The **colors** are **already** in the **sunlight** that ***produces*** the **rainbow**.

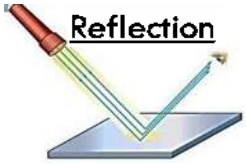
☺ **Visible light waves** with **longer** ***wavelengths*** look **red**.
☺ **Visible light waves** with **shorter** ***wavelengths*** look **violet**.

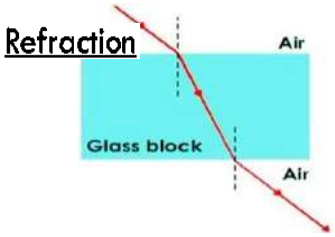
✸ **All** the **colors** between **red** and **violet** have ***wavelengths*** that are *between* them too.



✸ **White light:** is a ***collection*** of **many different wavelengths** ***mixed*** ***together***.

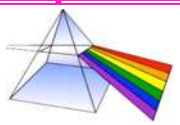
☺ **Different** ***wavelengths*** of **light** **reflect** and **refract** at ***different*** **angles**.

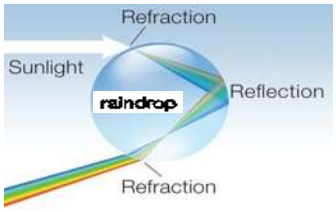




The ways of separating light:

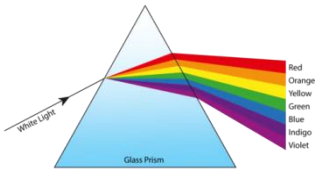
1) By **a prism**
2) By **a raindrops**





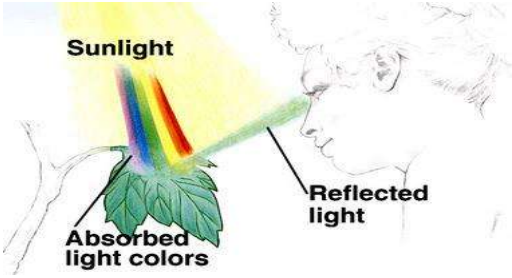
❖ What colors of the spectrum have refracted the most?

✓ The **prism** has **bent** the **violet** **wavelengths** the **most**.



❖ Why does an *opaque* object appear to be a certain color to us?

✓ It **scatters** **light** **back** to **our** **eyes.**
✓ The **color** **reflected** ***is*** the **color** of the **object**. and **all** other **colors** of **light** are **absorbed**.



❖ Why does a *translucent* object appear to be a certain color to us?

✓ It **appears** to be the **color** of the **light** that **passes** **through** the **object.**

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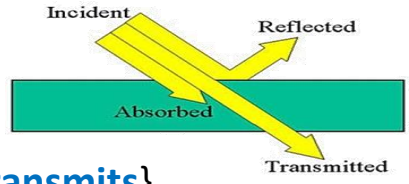
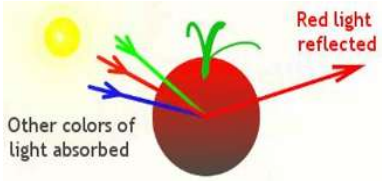
Overlapping Colors



✸ The **wavelength** of **light effects** on:

{**Scatters(reflected)**, **Absorbs**, and **Transmits**}

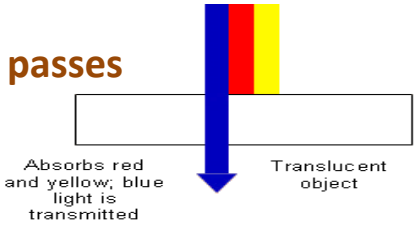


☞ **Opaque object:** (***scattered*** light or ***absorbed*** light)

- **Opaque objects appear the color of light** that they **scatter** and **absorb all** other **colors of light**.

☞ **Translucent object:** (***absorbed*** and ***pass through***)

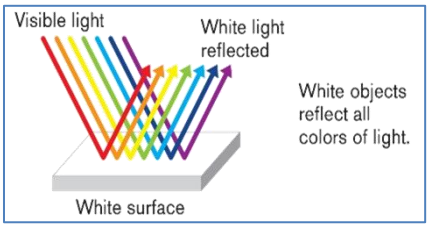
- **Translucent objects appear the color of the light that passes through** them and **absorb all** other **colors of light**.



❁ **Any color of light** can be **created** by **mixing** **red**, **green**, and **blue light** in the **right amounts**.
That is why **used** these colors in a **color television pictures.**

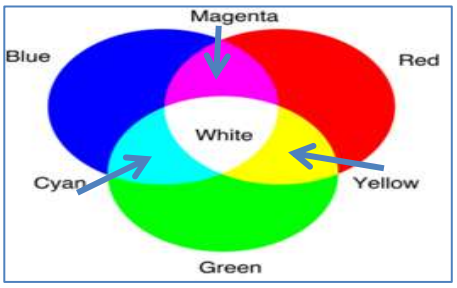
❀ **Primary light colors**: are {**red**, **green**, and **blue**}

✓ **White light:** ***come*** from **mixed equally**, **red**, **green**, and **blue** light.



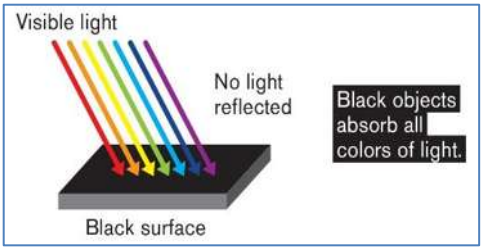
✓ **Magenta**, **cyan**, and **yellow** are used to **create color** by ***scattering***.

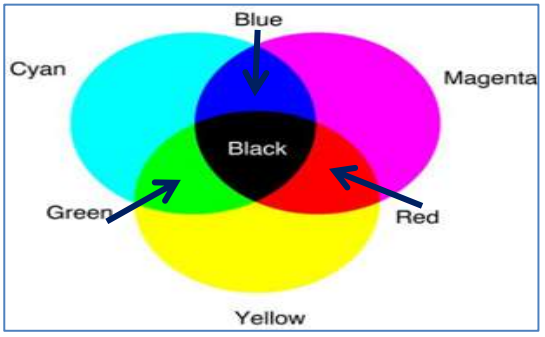
- ✸ **Magenta:** ***scatters*** only **red** and **blue**.
- ✸ **Cyan**: ***scatters*** only **blue** and **green**.
- ✸ **Yellow**: ***scatters*** only **red** and **green.**



☞ **Magenta** and **Cyan** when ***mixed***, together they only ***scatter*** **blue**.

✓ **Black:** come from **mixed equally**, **magenta**, **cyan**, and **yellow**, they **absorb all light** and **appear black**.





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Is all light visible?

- **Light**: is **made** of **electric** and **magnetic** **waves** that can ***move*** through **space**.
  - **Light**: is **just** a **form** of **radiation**.

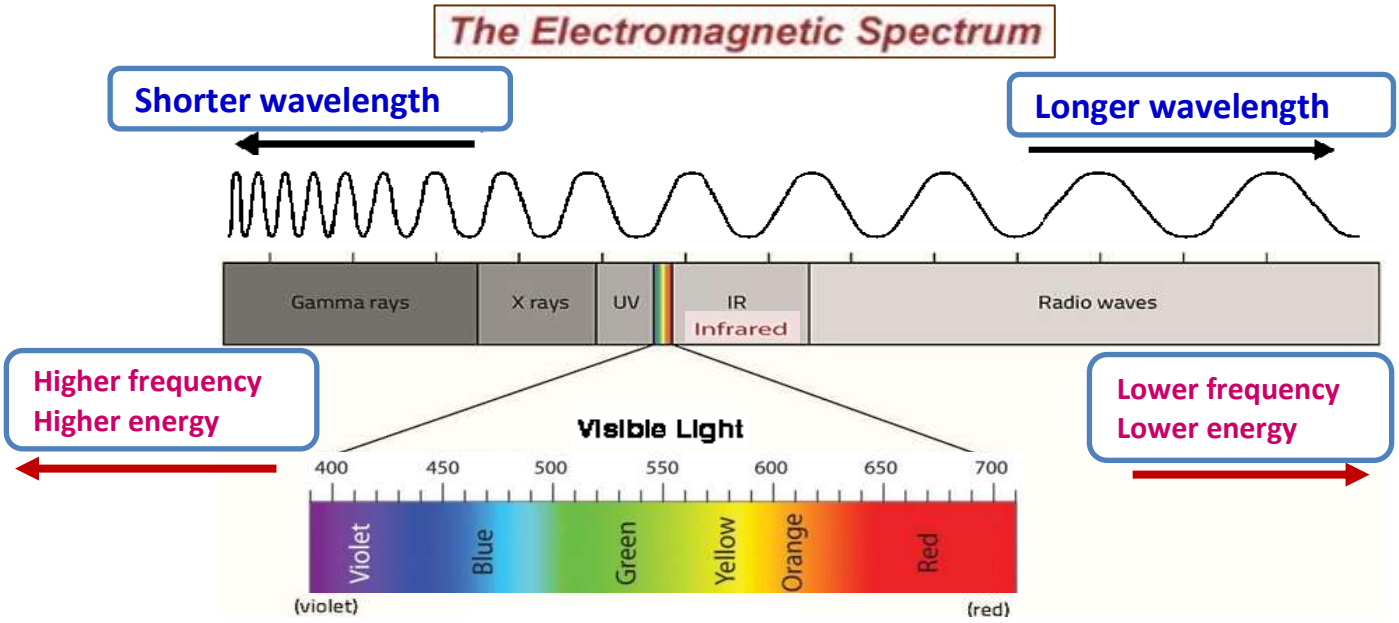
- There are **many** **forms** of **electromagnetic radiation** ***besides*** **visible light.**

1) **All** **travel** at the **speed** **of** **light.**
2) **Move** **through** **a** **vacuum**.
3) They **differ** in ***wavelength*** and ***energy***.

- **Electromagnetic Spectrum** = **Electromagnetic radiation** + **Visible light**

- **Sun:** is a **single** **source** of **all** **forms** of **electromagnetic radiation.**

- **Most** of the **radiation** ***from*** the **Sun** is **infrared**, **visible**, and **ultraviolet** **light**.



❖ Is all electromagnetic radiation visible?

- ✓ **No**, **only** a **small** **portion** of **electromagnetic** **radiation** is **visible**.

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دائـــرة التـعليـــم والمـعـرفـــة
منطقـــة العيـــن التعليميـــة
مدرسة المعالي النموذجية للتعليم الأساسي ح2

LESSON 2 DEFINITION

Vocabulary	Definition
1) Electromagnetic wave الموجة الكهرومغناطيسية	The **wave** *has* of **frequency** and **amplitude**.
2) Light الضوء	Is a **wave** made from **electric** and **magnetic** **energy**.
3) Wavelength طول الموجة	Is the ***distance*** *between* **one peak** and the **next** in a **wave**.
4) Photon الفوتون	Is a **tiny** **bundle** of **energy** by which **light** **travels**.
5) Scattering light تشتت الضوء	**Photons** **bounce** **off** at **random** **angles**.
6) Transparent الشفافة	**Objects** that **allow** **almost** all **light through**.
7) Translucent شبه الشفافة	**Objects** that **blur** **light** that **passes through.**
8) Opaque المعتمة	**Objects allows** **little** to **no** **light pass through.**
9) A shadow الظلال	Is the **absence** of **light** in an **otherwise lit area**.
10) Image الصورة	Is a **picture** of the **light** ***source*** that ***light makes*** when it **bounces** off a **shiny** **surface**.

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LESSON 2 DEFINITION

Vocabulary	Definition
11) Reflection الانعكاس	Is the **organized** **scattering** of a **wave**.
12) Concave mirror مرآة مقعرة	If the **mirror** **curve in.**
13) Convex mirror مرآة محدبة	If the **mirror** **curve out**.
14) Refraction الانكسار	Is the **bending** of **waves** as they **pass** ***from*** **one substance** ***into*** **another.**
15) Convex lenses العدسات المحدبة	The **lens** **curve out.**
16) Concave lenses العدسات المقعرة	The **lens** **curve in**.
17) Prism المنشور	Is a **cut piece** of **clear glass** or **plastic** in the ***form*** of a **triangle** or other **geometric** **shape**.
18) Spectrum الطيف	The **band** of **color** in a *rainbow*, or from *light* **passing through** a **prism**.
19) White light الضوء الأبيض	Is a **combination** of **all** the **colors** of **light**.
20) Electromagnetism الكهرومغناطيسية	Is a **way** in which **electric** and **magnetic** **forces interact.**