# Physics Honors: Eclipses

# What is an Eclipse?

An astronomical event that occurs when one celestial object (Earth or moon) moves into the shadow of another or a celestial object passes in front of the sun, blocking its light.



## Parts of an Eclipse

Umbra – The dark inner portion of the shadow cone.

Penumbra – the lighter outer portion of the shadow.



# Solar Eclipses

- Sun's light is blocked by the Moon
- Sun, Moon and Earth are in line
- The moon comes between the sun and the earth and casts a shadow on part of the earth (New Moon)
- Occurs during the day
- Usually occurs 2-5 times/year, but all over the world



#### 3 Types of Solar Eclipses

1) Total Solar Eclipse

2) Partial Solar Eclipse

3) Annular Eclipse



## **Total Solar Eclipses**

- Observers in the "umbra" shadow see a total eclipse
- Can only occur if you are at the exact spot within the moon's umbra (which isn't very big).
- ONLY PLACE where it is safe to view the Sun
- Can see the corona
- Only lasts a few minutes
- Path of Totality about 10,000 miles long, only 100 miles wide



Odd Høydalsvik ©

## Partial Solar Eclipse

- Observers in the "penumbra" shadow see a partial eclipse
- Not safe to look directly at the sun
- Only lasts a few minutes





#### Annular Solar Eclipse

- When the Moon is farthest (Apogee) from the earth in its orbit to completely cover the Sun
- The umbra doesn't reach the Earth
- Sun appears as a donut around the Moon





## Lunar Eclipse

- Sun's light is blocked by the Earth
- Earth's shadow on Moon
- Earth comes between the Sun and moon and casts a shadow on the Moon (Full Moon)
- Sun, Earth and Moon are in line
- During the night
- 0 -3 times/year



#### Lunar Eclipses

The diagram shows that the moon is covered by the Earth's shadow, which makes this Eclipse safe to look at. Notice the moon sometimes turns red when totality occurs.







# Why is the Moon sometime red during lunar eclipses?

- The Earth's atmosphere filters some sunlight and allows it to reach the Moon's surface
- The blue light is removed—scattered down to make a blue sky over those in daytime
- Remaining light is red or orange
- Some of this remaining light is bent or refracted so that a small fraction of it reaches the Moon
- Exact appearance depends on dust and clouds in the Earth's atmosphere

https://www.youtube.com/watch?v=cxrLRbkOwKs