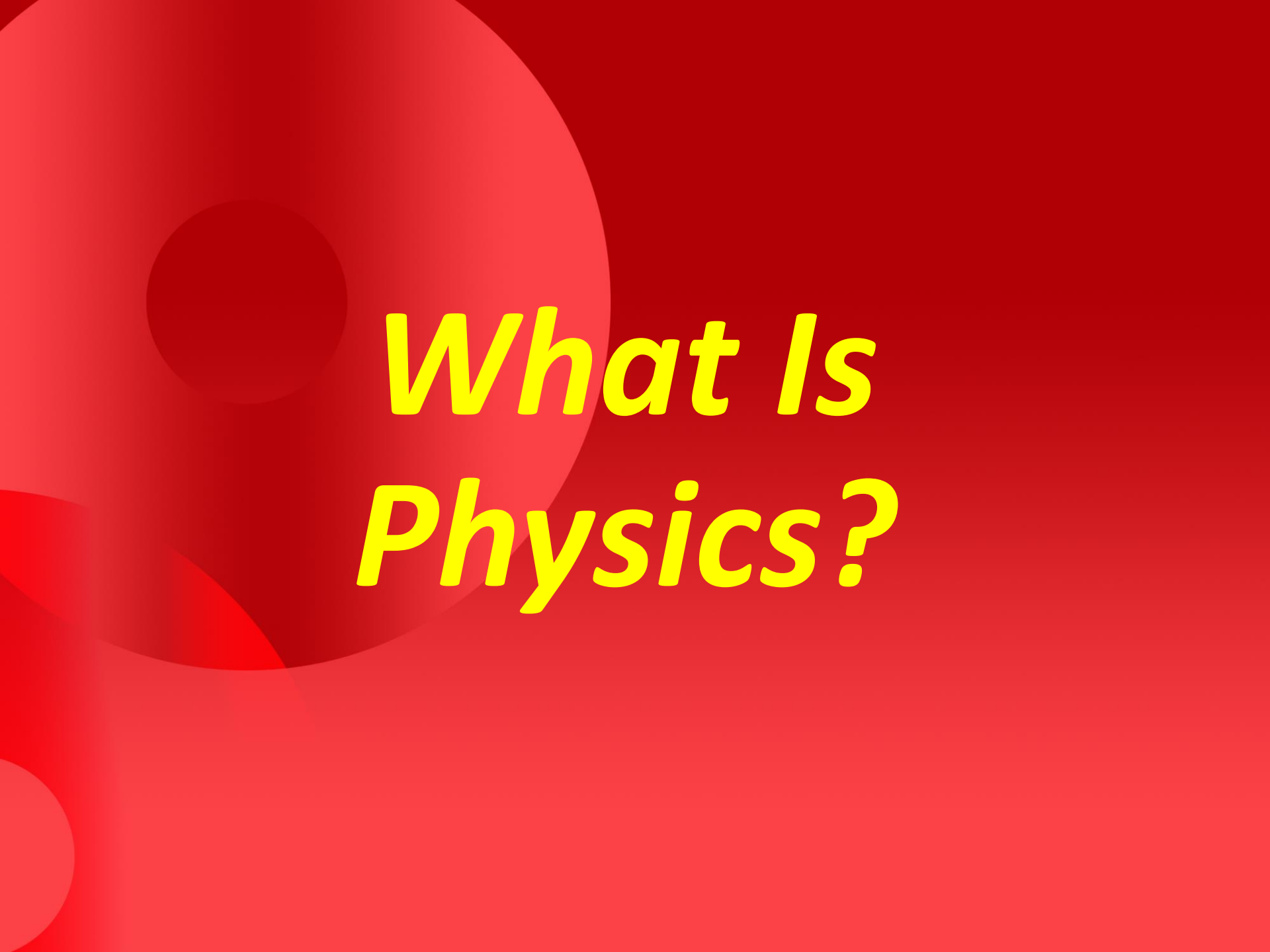


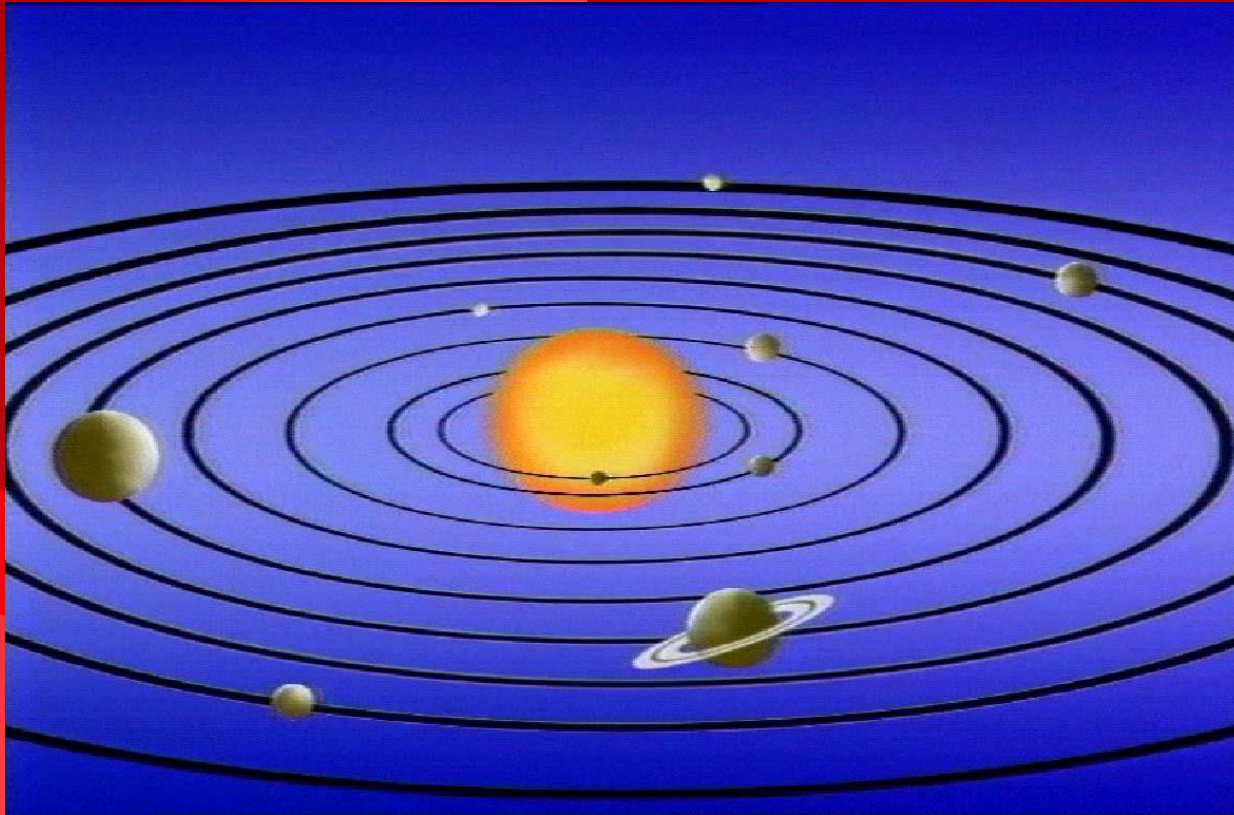
Welcome to Physics



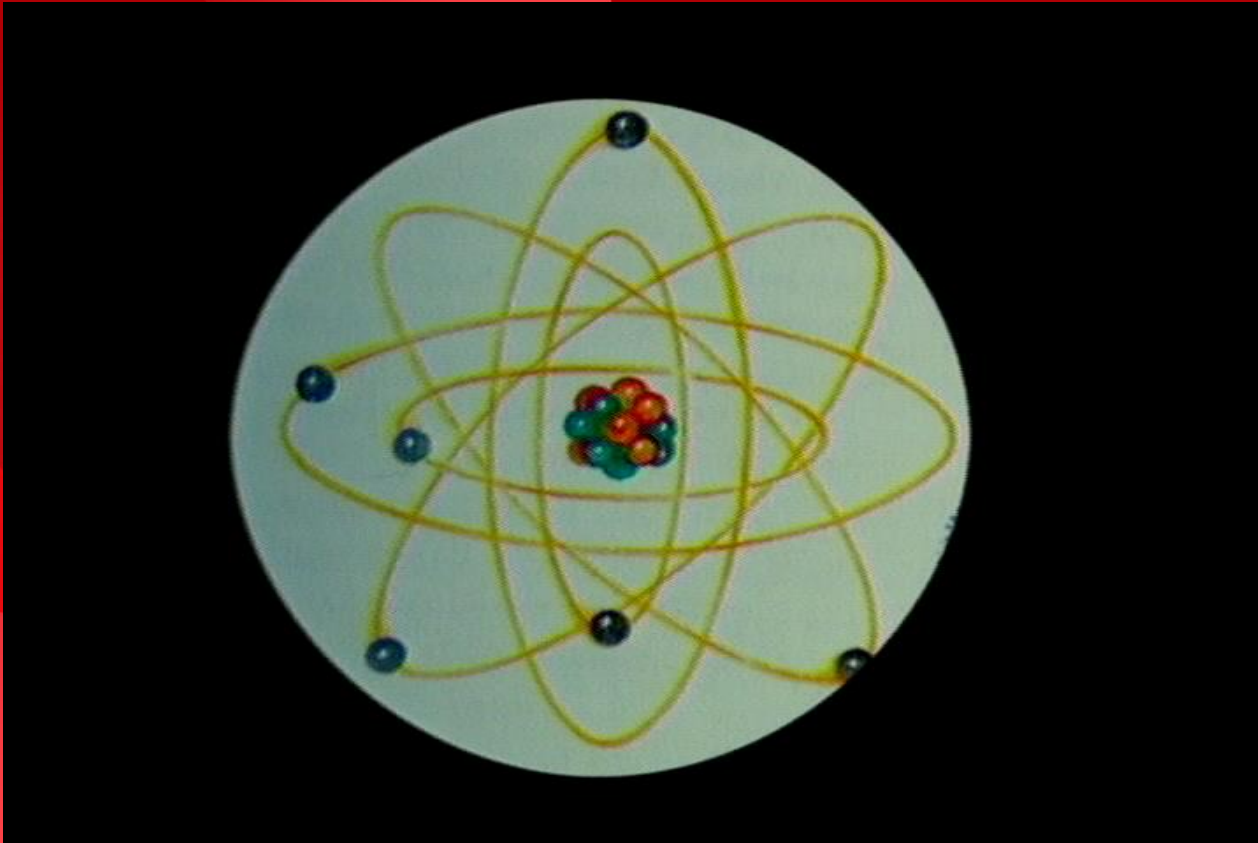
The background is a solid red color with several overlapping circles of varying shades of red and pink. The circles are positioned in the upper left and lower left areas, creating a layered, abstract effect.

What Is Physics?

From the very large.....



.....to the very small



**.....and everything in
between**

- solids**
- liquids**
- gases**



In this course...

- **Introduction to physics**
- **Learn problem-solving skills**

- **Build a good foundation for other fields too**
- **Learn how to think critically**

How much
math do you
need??

- **No calculus *but*:**

- **Algebra**

- **Trigonometry**

- **Linear and quadratic equations**



**Lots of common
sense!!**

Main Areas Of Physics

- **Classical Mechanics**
- **Electricity and Magnetism**

- **Thermal Physics**
- **Quantum Mechanics**

The background features a solid red field with several overlapping circles in various shades of red and pink. A large, bright yellow circle is partially visible on the left side, containing the word "Dimensions" in a bold, yellow, sans-serif font.

Dimensions

All things in physics can
be expressed in terms of
only three **fundamental
dimensions:**

- Time **T**
- Length **L**
- Mass **M**

Dimensional Quantities

- Area has dimensions of L^2
- Density has dimensions of M / L^3 (or ML^{-3})

- Frequency has dimensions of $1/T$
- Speed has dimensions of L/T

Angle is dimensionless!

Systems Of Units

- **MKS system**

- **L** = metres (m)

- **M** = kilograms (kg)

- **T** = seconds (s)

- **CGS system**

- **L** = centimetres (m)

- **M** = grams (kg)

- **T** = seconds (s)

The background is a solid red color. On the left side, there are several overlapping circles in various shades of red and pink. A large, semi-transparent pink circle is the most prominent, with a smaller, darker red circle inside it. Other circles of different sizes and shades are visible in the bottom left and top left corners. The word "Length" is written in a bold, yellow, sans-serif font, positioned in the center-right area of the image.

Length

Distance

Length (m)

- Tall person 2×10^0
- Cricket ground 3×10^2
- Radius of Earth 6.4×10^6
- Earth to Sun 1.5×10^{11}
- Radius of universe 1×10^{26}

Distance

Length (m)

- Thickness of paper 1×10^{-4}
- Diameter of hydrogen atom 1×10^{-10}
- Diameter of proton 1×10^{-15}

The image features a solid red background. On the left side, there are several overlapping circles of varying shades of red, creating a layered, abstract effect. The word "Time" is written in a bold, yellow, sans-serif font, positioned in the center-right area of the image. The text is clear and stands out against the red background.

Time

Time (s)

- **Light travel Earth-Moon** 1.3×10^0
- **One hour** 3.6×10^3
- **One year** 3.2×10^7
- **Age of Universe** 5.0×10^{17}

Time (s)

- Open/close eyelid 1.0×10^0
- One cycle of radio wave 1.0×10^{-8}

The background is a solid red color. On the left side, there are several overlapping circles of different shades of red, creating a layered, organic effect. The word "Mass" is centered in the middle of the image.

Mass

Object

Mass (kg)

- Student
- Car
- Ship

$$7 \times 10^1$$

$$1 \times 10^3$$

$$1 \times 10^6$$

Object

Mass (kg)

➤ Earth

6×10^{24}

➤ Sun

2×10^{30}

➤ Milky Way

4×10^{41}

Object

Mass (kg)

- Dust particle
- Oxygen Atom
- Electron

$$1 \times 10^{-9}$$

$$3 \times 10^{-25}$$

$$9 \times 10^{-31}$$

Converting Units

Useful conversion factors

1 inch = 2.54 cm

1 m = 3.28 ft

**Example: convert miles
per hour to metres
per second**

$$1 \frac{mi}{hr}$$

$$= 1 \frac{mi}{hr} \times 5280 \frac{ft}{mi} \times \frac{1}{3.28} \frac{m}{ft} \times \frac{1}{3600} \frac{hr}{s}$$

$$= 0.447 \frac{m}{s}$$

Dimensional Analysis

**This is a very
important tool to
check your work**

Doing a problem you get
the answer:

$$d = v t^2$$

(velocity x time²)

Units on left side = **L**

Units on right side =
 $L/T \times T^2 = L \times T$

**Left units and right
units don't match, so
something is wrong !!**

Rules for dimensions

**Dimensions (M,L,T)
can be treated
algebraically!**

**Multiply or divide
quantities of any
dimension**

Add or subtract
quantities of same
dimension

Significant Figures

- Only use *reliably* known digits!
- General rules for calculations:

➤ **Addition :**

$$95.9 + 39.32 = 135.22$$

rounds off to 135

➤ Subtraction:

$$95.9 - 39.32 = 56.58$$

rounds off to 56.6

➤ **Multiplication:**

$$(105.8)(31.4) = 3322.12$$

rounds off to 3320

➤ **Division:**

$$(105.8)/(31.4) = 3.36943$$

rounds off to 3.37

Order-of- magnitude Estimates

- **Weight of adult** ~ 100 kg
- **Weight of a 1-year old child** ~ 10 kg
- **Weight of a cricket ball** ~ 1 kg

**Example: How many
seconds are there in
a human lifetime?**

- $(80 \text{ yr})(365 \text{ days/yr})$
 $(24 \text{ hr/day})(60 \text{ min/hr})$
 $(60 \text{ s/min}) = 2.5 \times 10^9 \text{ s}$
- $(10^2 \text{ yr})(10^2 \text{ days/yr})$
 $(10^1 \text{ hr/day})(10^2 \text{ min/hr})$
 $(10^2 \text{ s/min}) \sim 10^9 \text{ s}$