

The background of the slide is a light gray gradient. It is decorated with numerous water droplets of various sizes and shapes, scattered across the top and bottom edges. The droplets are rendered with realistic shading and highlights, giving them a three-dimensional appearance. The text 'CHAPTER 1' is centered in the middle of the page.

CHAPTER 1

WHAT IS CHEMISTRY?

- THE STUDY OF ALL SUBSTANCES AND THE CHANGES THEY CAN UNDERGO.

SCIENTIFIC METHOD-

- OBSERVATION
- STATING A QUESTION
- HYPOTHESIS – POSSIBLE ANSWER
- EXPERIMENT
- CONCLUSION – WHAT YOU FOUND IN YOUR EXPERIMENT



SCIENTIFIC METHOD LEADS TO

- NATURAL LAW – TELLS YOU HOW NATURE BEHAVES BUT NOT WHY IT BEHAVES.

FINALLY YOU FORM A

- THEORY – EXPLAINS WHY NATURE BEHAVES IN THE WAY DESCRIBED BY NATURAL LAW.

- USED FOR PREDICTION OF RESULTS FOR FURTHER EXPERIMENTS.
- 



- DURING THE EXPERIMENT...

- EXPERIMENTAL CONTROL - FACTOR THAT REMAINS CONSTANT DURING THE EXPERIMENT. IT IS COMPARED WITH THE VARIABLE.

- VARIABLE - FACTOR THAT IS BEING TESTED DURING THE EXPERIMENT.





- **MEASUREMENT...**

- **WHEN WE PERFORM EXPERIMENTS, WE NEED TO USE SOME FORM OF MEASUREMENT.**

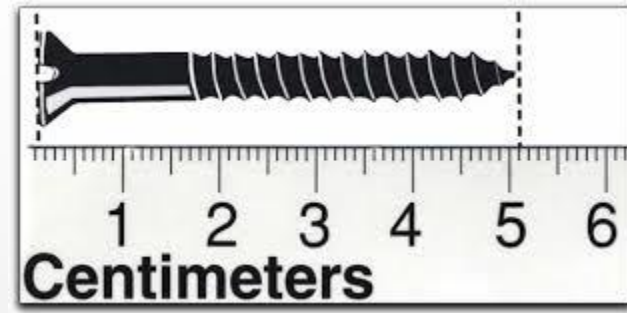
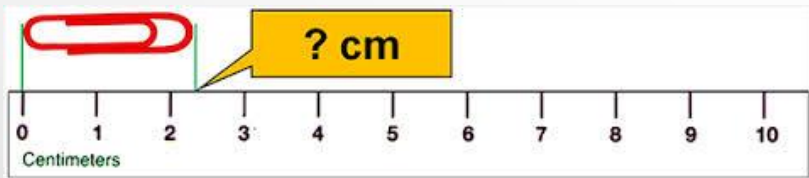
- **MEASUREMENTS CONTAIN NUMBERS AND UNITS**



RELIABILITY OF NUMBER PART OF MEASUREMENTS

- PRECISION VS ACCURACY
 - PRECISION – MEASUREMENT THAT GIVES THE SAME RESULT AGAIN AND AGAIN UNDER THE SAME CONDITIONS
 - ACCURACY – MEASUREMENT THAT IS CLOSE TO THE ACCEPTED VALUE.

ALL MEASUREMENTS INVOLVE SOME ESTIMATION



WHICH RULER REQUIRES THE MOST ESTIMATING?

SIGNIFICANT DIGITS

- DEFINED AS CERTAIN DIGITS AND THE ONE ESTIMATED DIGIT OF A MEASUREMENT

RULES FOR DETERMINING HOW MANY SIG DIGS A MEASUREMENT HAS

- ALL NON-ZEROS ARE SIGNIFICANT
- ZEROS AS PLACEHOLDERS ARE NOT SIGNIFICANT!
- ZEROS NOT PLACEHOLDERS ARE SIGNIFICANT!
- ZEROS IN THE MIDDLE OF NON-ZEROS ARE SIGNIFICANT!



ATLANTIC – PACIFIC RULE ~ AN EASIER WAY TO DEAL WITH ZEROS

- COUNTING RULES...

- FIRST DIGIT YOU COUNT MUST BE
A NON-ZERO

- ONCE YOU START TO COUNT DO NOT STOP UNTIL
YOU ARE OUT OF DIGITS TO COUNT

- USE THE ATLANTIC-PACIFIC RULE TO DECIDE WHETHER
TO COUNT LEFT TO RIGHT OR RIGHT TO LEFT



THE ATLANTIC-PACIFIC RULE

- IF THE DECIMAL IS PRESENT, COUNT FROM THE PACIFIC SIDE (LEFT)
- IF THE DECIMAL IS ABSENT, COUNT FROM THE ATLANTIC SIDE (RIGHT)

P
a
c
i
f
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c



A
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HOW MANY SIGNIFICANT DIGITS ARE PRESENT?

- 1700 cm
- 0.00960 kg
- 64050 L
- 45.00 mg
- 0.0607 m

YOU TRY IT...HOW MANY SIG. DIGS. ARE
PRESENT?

- 10100 mL
- 0.50090 dg
- 60.0 mL
- 1500. g
- 4.010×10^4 L

CALCULATION RULES FOR SIG DIGS

- MULTIPLICATION AND DIVISION
 - THE MEASUREMENT WITH THE SMALLEST NUMBER OF SIG. DIGS. DETERMINES HOW MANY DIGITS ARE ALLOWED IN THE ANSWER.
 - EX. 4.3×6.45 WILL HAVE 2 SIG. DIGS. IN THE ANSWER.
 - $27.735 = 28$



- ADDITION AND SUBTRACTION

- THE NUMBER OF SIGNIFICANT DIGITS IS DEPENDENT UPON OR ROUNDED OFF TO THE MEASUREMENT WITH THE LARGEST UNCERTAINTY. ***USE THE LEAST AMOUNT OF DECIMAL SPOTS***

- EX. $6.45 + 2.36 + 4.6 =$

- 13.41 ROUNDED TO 13.4



RULES FOR SCIENTIFIC NOTATION

- EXPRESS THE SAME NUMBER OF SIGNIFICANT DIGITS
- ALWAYS KEEP ONE DIGIT TO THE LEFT OF THE DECIMAL POINT

CHANGING FROM STANDARD TO SCIENTIFIC NOTATION

- MOVE THE DECIMAL SO THAT THERE IS ONLY ONE DIGIT ON THE LEFT OF THE DECIMAL
- COUNT THE NUMBER OF SPACES MOVED...THIS IS YOUR EXPONENT'S VALUE
 - IF YOU MOVED TO THE LEFT THIS A POSITIVE EXPONENT
 - IF YOU MOVED TO THE RIGHT THIS A NEGATIVE EXPONENT

CHANGING FROM SCIENTIFIC TO STANDARD NOTATION

- MOVE THE DECIMAL THE NUMBER OF SPACES EQUAL TO THE EXPONENT NUMBER
 - IF THE EXPONENT IS POSITIVE MOVE TO THE RIGHT
 - IF THE EXPONENT IS NEGATIVE MOVE TO THE LEFT



CHAPTER 2...ENERGY AND MATTER

MEASURING TEMPERATURE

- KELVIN – BASED ON ABSOLUTE ZERO
- THE POINT AT WHICH THE MOTION OF PARTICLES CEASES

$$\bullet K = 273 + C$$

$$\bullet C = K - 273$$

MATTER

- **MATTER – ANYTHING THAT HAS MASS AND VOLUME**

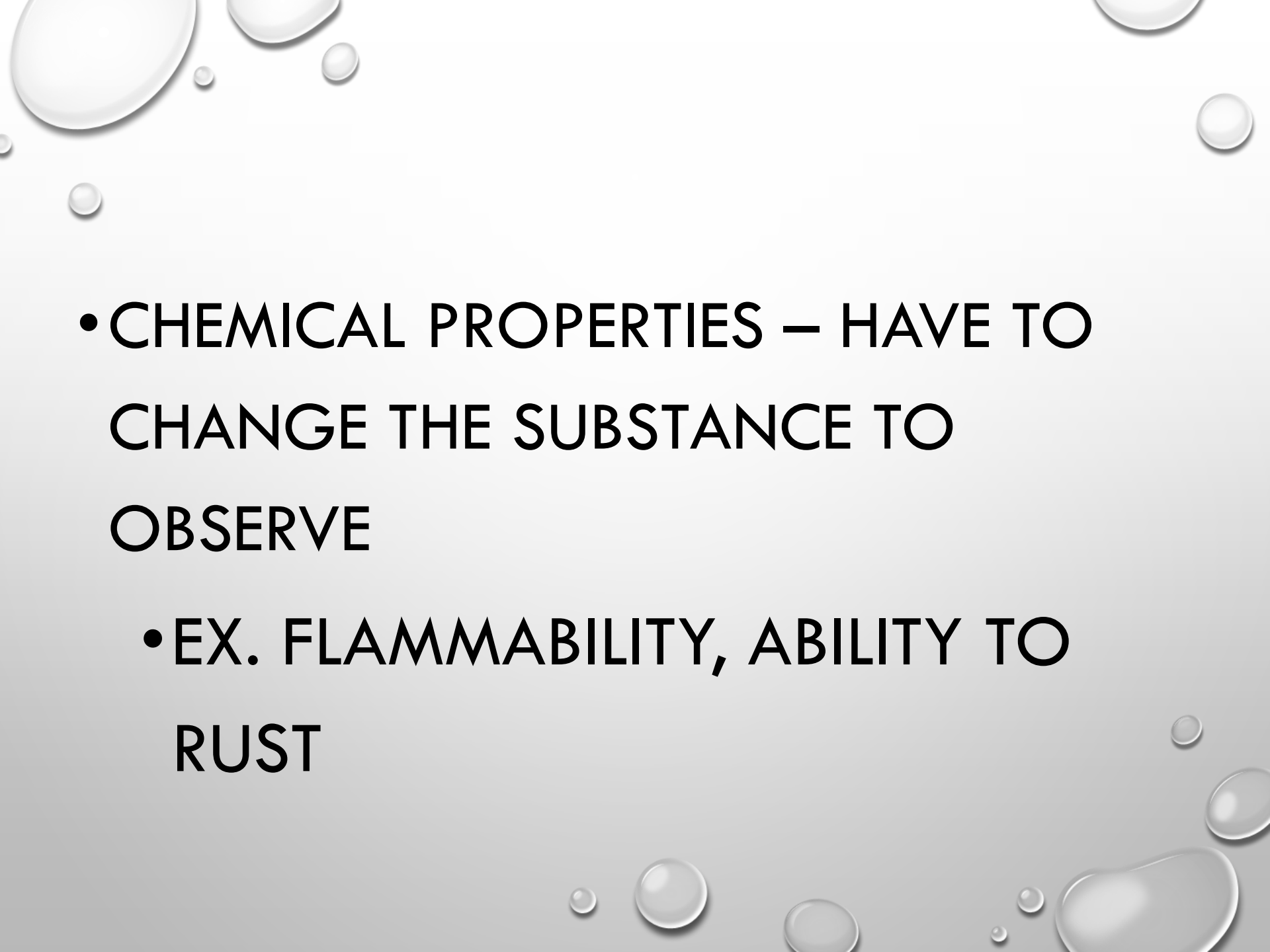
SOLID – DEFINITE MASS AND VOLUME

LIQUID – DEFINITE VOLUME, NO DEFINITE SHAPE

GAS – NO DEFINITE SHAPE OR VOLUME

PROPERTIES OF MATTER

- PHYSICAL PROPERTIES – CAN BE OBSERVED WITHOUT CHANGING THE IDENTITY.
- EX. DENSITY, COLOR, MP, BP, CRYSTALLINE SHAPE AND CONDUCTIVITY

- 
- The background of the slide is a light gray gradient, decorated with several realistic water droplets of various sizes. The droplets are rendered with soft shadows and highlights, giving them a three-dimensional appearance. They are scattered across the slide, with a higher concentration in the top-left and bottom-right corners.
- **CHEMICAL PROPERTIES – HAVE TO CHANGE THE SUBSTANCE TO OBSERVE**
 - **EX. FLAMMABILITY, ABILITY TO RUST**

CHANGES

- **PHYSICAL CHANGE – DOES NOT ALTER THE SUBSTANCE**
 - **EX. BREAKING GLASS, MELTING BUTTER**
- **CHEMICAL CHANGE – CHANGES THAT ALTER THE SUBSTANCE.**
 - **BAKING A CAKE, IRON RUSTING**

The background of the slide is a light gray gradient, decorated with several realistic water droplets of various sizes. The droplets are rendered with soft shadows and highlights, giving them a three-dimensional appearance. They are scattered across the page, with a larger one in the top left, a smaller one in the top right, and several others in the bottom right corner.

LAW OF CONSERVATION OF MATTER


- **MATTER CANNOT BE CREATED NOR DESTROYED, IT JUST CHANGES FORM.**

ELEMENTS, COMPOUNDS, MIXTURES

- ELEMENT – A SUBSTANCE THAT CANNOT BE SEPARATED INTO SIMPLER SUBSTANCES BY CHEMICAL MEANS.
 - FOUND ON THE PERIODIC TABLE.
- COMPOUND – SUBSTANCE THAT CONTAINS 2 OR MORE ELEMENTS, CHEMICALLY COMBINED IN FIXED PROPORTIONS.



● ELEMENTS, COMPOUNDS, MIXTURES

- MIXTURE- BLEND OF 2 OR MORE PURE SUBSTANCES
 - SUBSTANCES RETAIN THEIR OWN PROPERTIES
 - SEPARATED BY PHYSICAL MEANS
 - FILTRATION, DISTILLATION
- 

MIXTURES

- **HOMOGENEOUS SOLUTIONS – NO VISIBLY DIFFERENT PARTS**
 - EX. SALT WATER, AIR
- **HETEROGENEOUS MIXTURE – VISIBLY DIFFERENT PARTS**
 - EX. CHOCOLATE CHIP COOKIES

**END OF PART ONE...QUIZ COMING
SOON TO A CHEM CLASS NEAR YOU**



PART TWO...

- MEASURING UNITS
- DIMENSIONAL ANALYSIS TO CHANGE FROM ONE TYPE OF UNIT TO ANOTHER

SI BASE UNITS

- MASS = KILOGRAM (kg)
- LENGTH = METER (m)
- TIME = SECONDS (s)
- COUNT, QUANTITY = MOLE (MOL)
- TEMPERATURE = KELVIN (K)
- ELECTRIC CURRENT = AMPERE (A)
- LUMINOUS INTENSITY = CANDELA (Cd)

METRIC PREFIXES

- LARGE

- MEGA (M) $1 \text{ M} \underline{\hspace{1cm}} = 1 \times 10^6 \underline{\hspace{1cm}}$

- KILO (K) $1 \text{ K} \underline{\hspace{1cm}} = 1 \times 10^3 \underline{\hspace{1cm}}$

- SMALL

- DECI $1 \underline{\hspace{1cm}} = 1 \times 10^{-1} \text{ d} \underline{\hspace{1cm}}$

- CENTI $1 \underline{\hspace{1cm}} = 1 \times 10^{-2} \text{ c} \underline{\hspace{1cm}}$

- MILLI $1 \underline{\hspace{1cm}} = 1 \times 10^{-3} \text{ m} \underline{\hspace{1cm}}$

- MICRO $1 \underline{\hspace{1cm}} = 1 \times 10^{-6} \mu \underline{\hspace{1cm}}$

- NANO $1 \underline{\hspace{1cm}} = 1 \times 10^{-9} \text{ n} \underline{\hspace{1cm}}$

- PICO $1 \underline{\hspace{1cm}} = 1 \times 10^{-12} \text{ p} \underline{\hspace{1cm}}$

DERIVED UNITS

- MADE FROM COMBINING 2 OR MORE BASE UNITS.
 - EX. AREA = LENGTH X WIDTH = m^2
- VOLUME = LENGTH X WIDTH X HEIGHT = cm^3
- DENSITY = MASS / VOLUME = g/cm^3

RATIO UNITS

- COMMON METHOD OF EXPRESSING CALCULATION RESULTS AND/OR MEASUREMENT IN CHEMISTRY
- SIMILAR TO A FRACTION
- UNITS IN NUMERATOR AND DENOMINATOR



• EX.

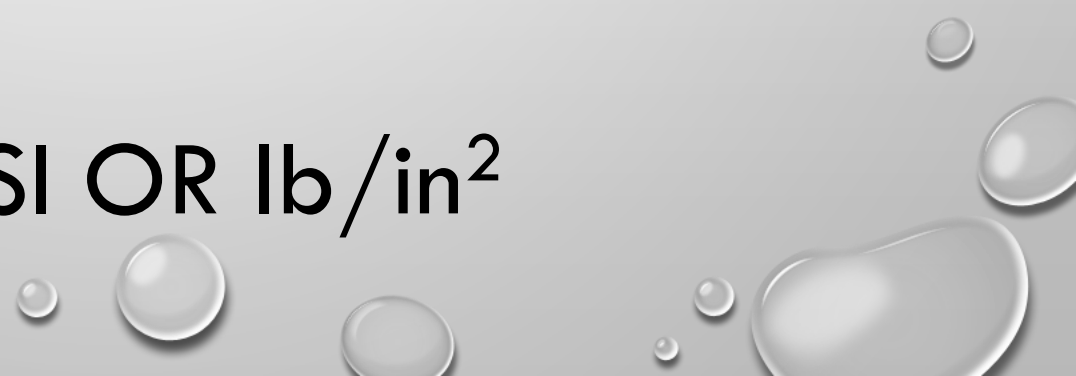
• SPEED = MPH OR mi/h

• LUNCHMEAT = DOLLARS/lb

• DENSITY = g/cm³ OR g/mL

• POPULATION DENSITY =
PEOPLE/km²

• PRESSURE = PSI OR lb/in²





- ADDITIONS TO SI UNITS...

- VOLUME = LITER (L)

- PRESSURE = ATMOSPHERE (ATM) OR
MILLIMETER OF HG (MM HG)

- TEMPERATURE = CELSIUS DEGREE (C^o)

- ENERGY = CALORIE (CAL)



DIMENSIONAL ANALYSIS/ FACTOR-LABEL METHOD

- TREAT UNITS AS FACTORS, WHICH CAN BE CANCELLED
- MUST KNOW YOUR EQUALITIES OR CONVERSION FACTORS
- CHOOSE THE EQUALITY THAT CANCELS OUT THE ORIGINAL UNIT

• STEPS:

- 1) BEGIN WITH KNOWN
- 2) DECIDE ON AN EQUALITY
- 3) ARRANGE UNITS TO CANCEL
OUT ORIGINAL UNITS
- 4) DO THE MATH!

HOW MANY MINUTES ARE IN 4 HOURS?

- $4 \text{ HOURS} \times \frac{60 \text{ MIN}}{1 \text{ HOUR}} = 240 \text{ MIN}$

● HOW MANY KILOGRAMS ARE IN 5 G?

$$\bullet 5 \text{ G} \times \frac{1 \text{ KG}}{1000 \text{ G}}$$

=

0.005 KG

CHANGE 286 cg TO mg

(BOTH UNITS HAVE PREFIXES SO MUST DO TWO CONVERSIONS...ONE TO BASE UNIT THEN TO OTHER PREFIX UNIT!)

$$286 \text{ cg} \times \frac{1 \text{ g}}{100 \text{ cg}} \times \frac{1 \text{ mg}}{1 \times 10^6 \text{ g}} = 0.00000286 \text{ mg}$$

OR

$$2.86 \times 10^{-6} \text{ mg}$$

- TO CHANGE FROM ENGLISH TO METRIC UNITS, USE CHART ON PAGE 38.
- HOW MANY INCHES ARE IN 354 cm?

$$354 \text{ cm} \times \frac{1 \text{ in}}{2.54 \text{ cm}} = 139 \text{ in}$$