



Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities!*

PRESENTATION ON

Analysis Of Explosives and Post Blast Residues by Chemical Methods, Microscopic Methods and Instrumental Methods

CUFS 2416 EXPLOSIVE AND POST BLAST INVESTIGATION

B.SC. FORENSIC SCIENCE (SEM 6)
SCHOOL OF FORENSIC SCIENCES
BHUBANESWAR CAMPUS

CONTENTS

Introduction

Microscopic Method

Chemical Method

Instrumental Method

- **Chromatography Method**
- **Spectroscopic Method**

INTRODUCTION

WHAT IS EXPLOSIVE & POST BLAST RESIDUE ?

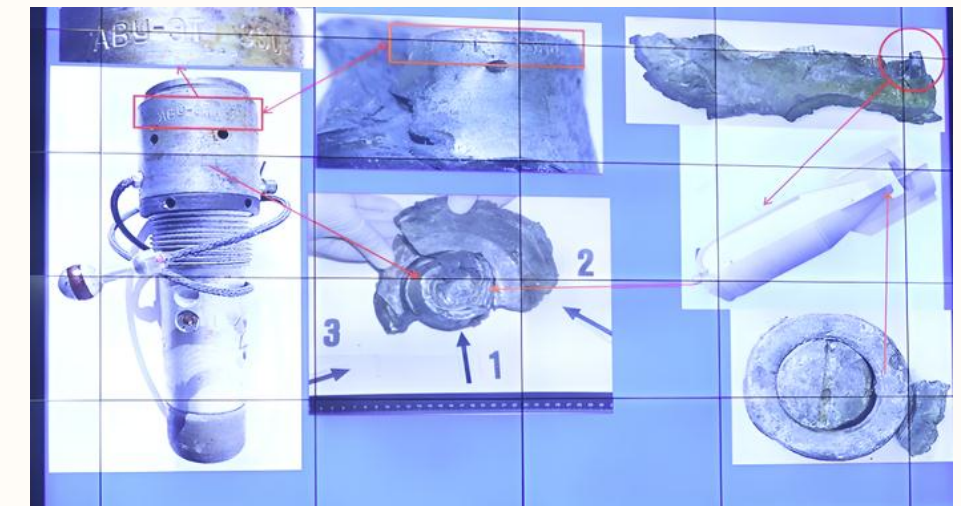
An **explosive** is a substance (solid liquid or gas) or device that releases energy (shock waves, heat, light, sound & pressure) in a sudden and intense manner, causing a blast or explosion.

Material left behind after an explosion has occurred

- Fragments of the explosive device
- Debris from the explosion
- Traces of the explosive materials

OBJECTIVE

- To gather evidence and information
- To determine the cause of an explosion
- To determine nature of explosive
- Understand the dynamics of the event
- Identify any criminal or malicious activity

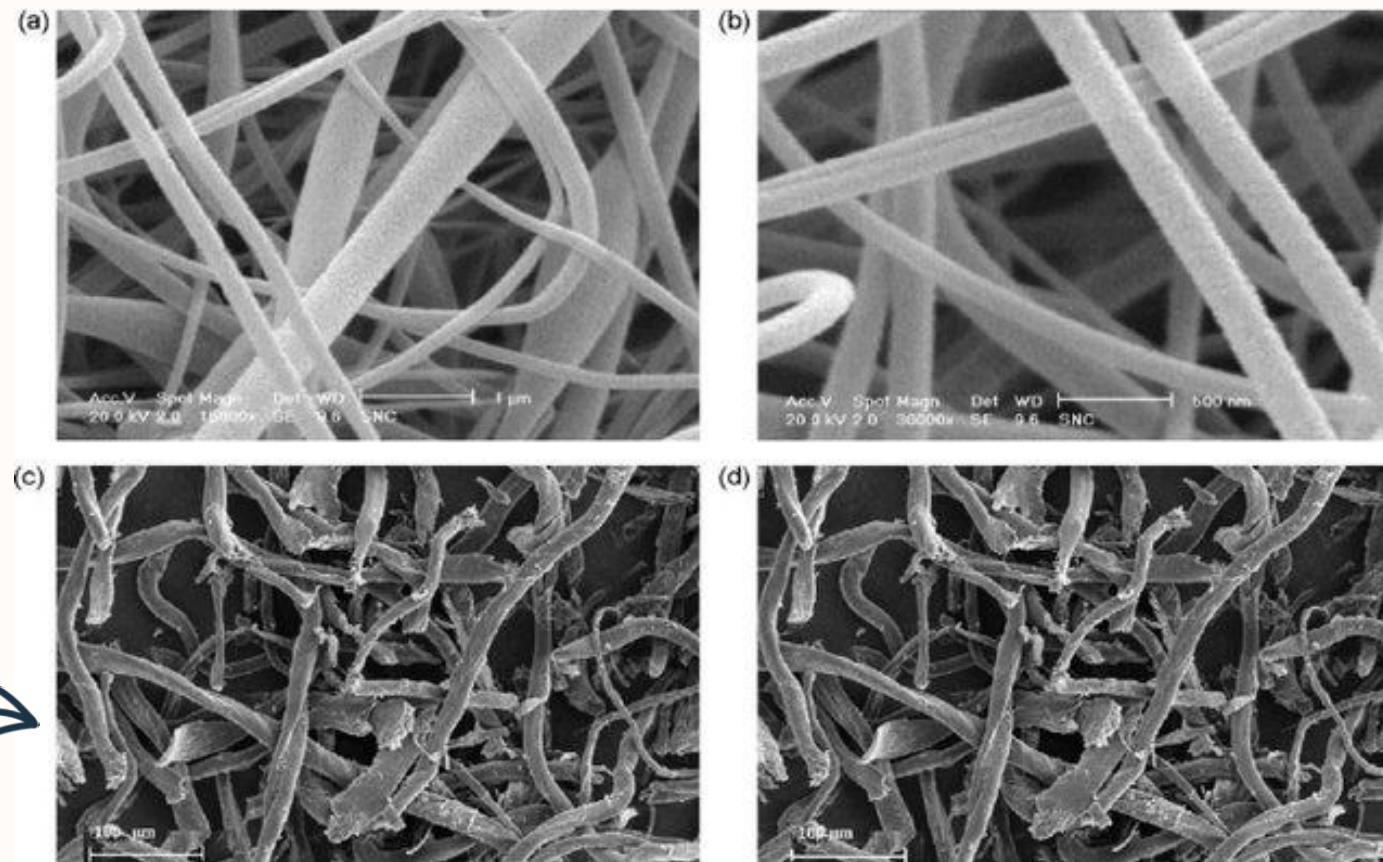
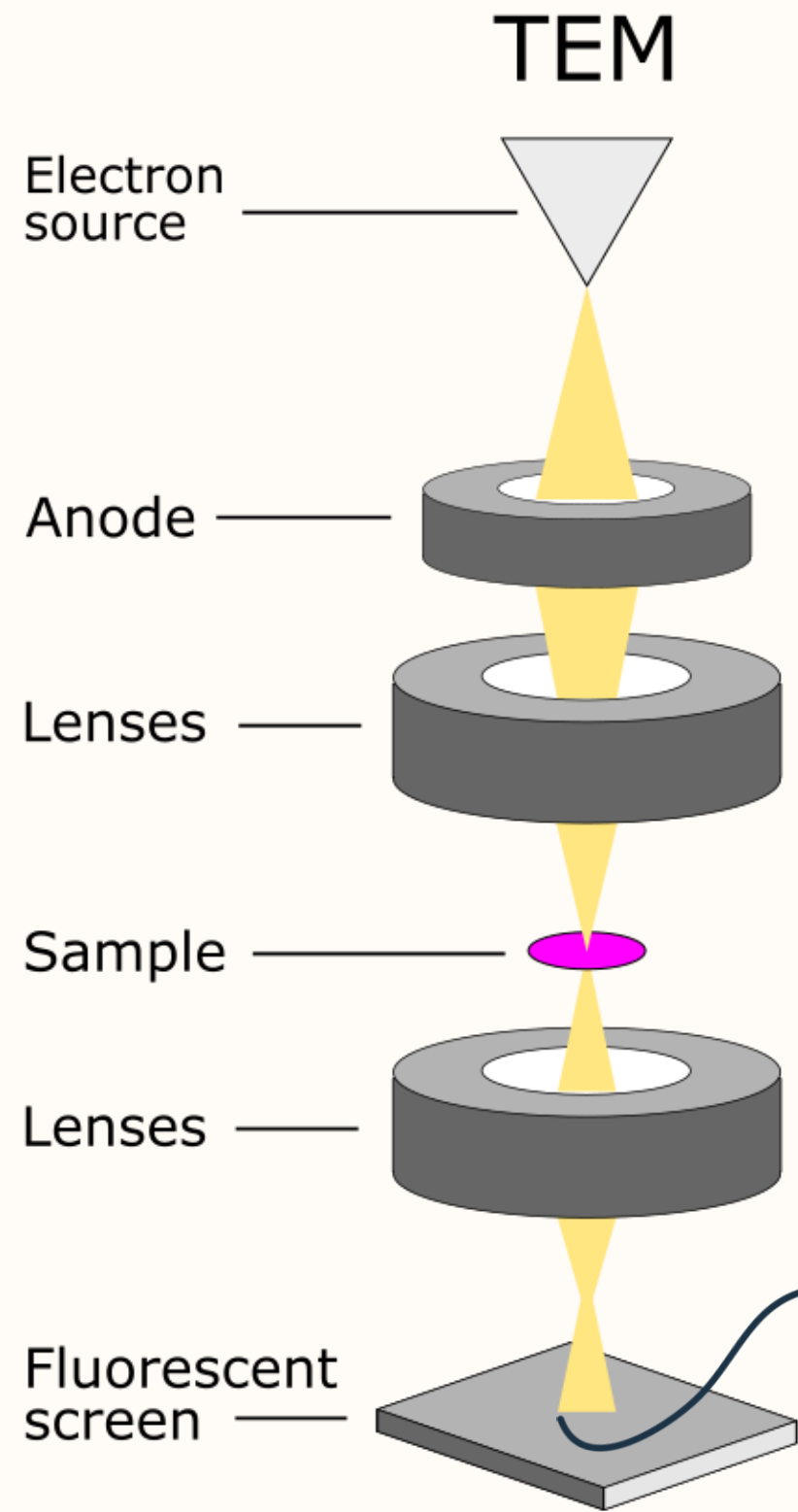


MICROSCOPIC TEST OF LOW EXPLOSIVE & HIGH EXPLOSIVE

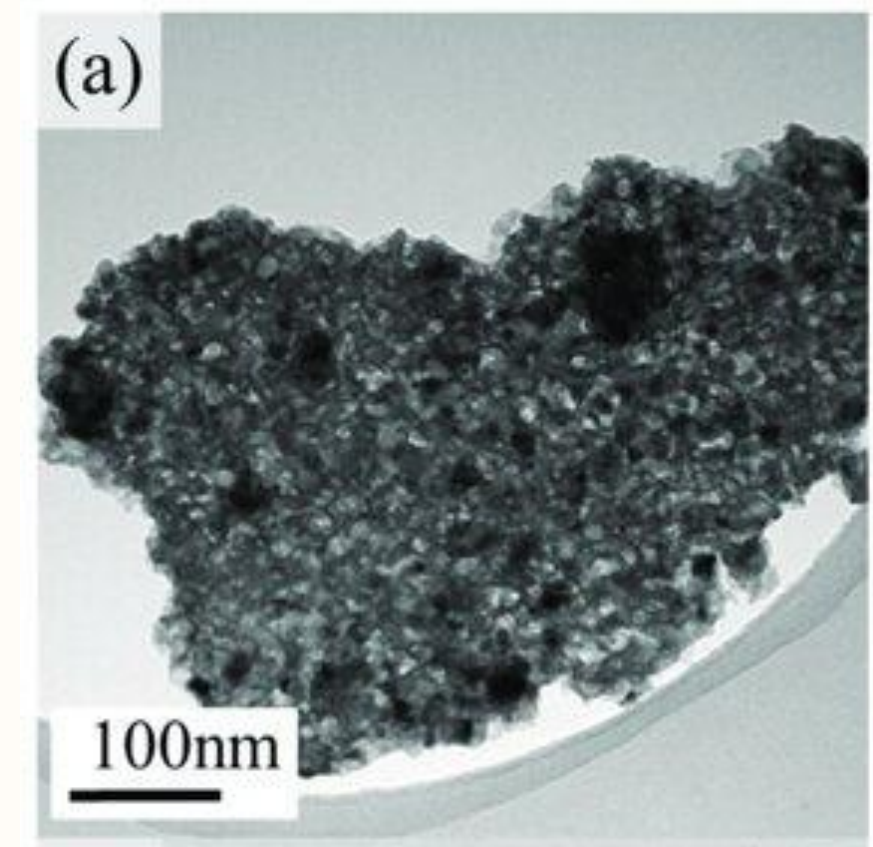
MICROSCOPIC TEST FOR LOW EXPLOSIVE

S. No	Name of explosive	Name of the test	Sample preparation	Procedure	Image analysis
1	Nitro cellulose	TEM	Thin film of Nitro cellulose on a suitable TEM gride. (carbon-coated)	Transfer the sample film to the TEM instrument and observe it in a low resolution to high resolution electron beam.	Lattice-like structure of nitro cellulose fibers is visible.
2	Black powder	TEM	Thin film of Black powder on a suitable TEM gride.	Transfer the sample film to the TEM instrument and observe it in a low resolution to highh resolution electrone beam.	Potassium nitrate and charcoal components are typically black in colour and can be seen as dark grey or black area in the image

MICROSCOPIC TEST FOR LOW EXPLOSIVE



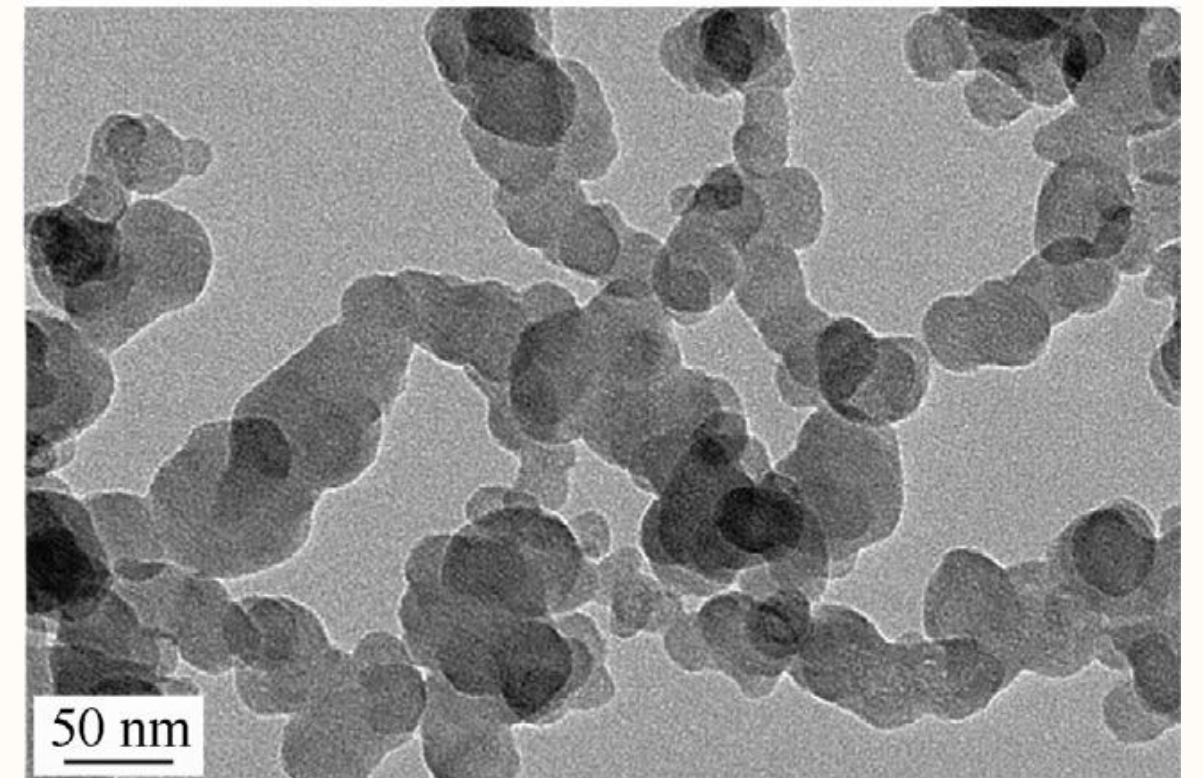
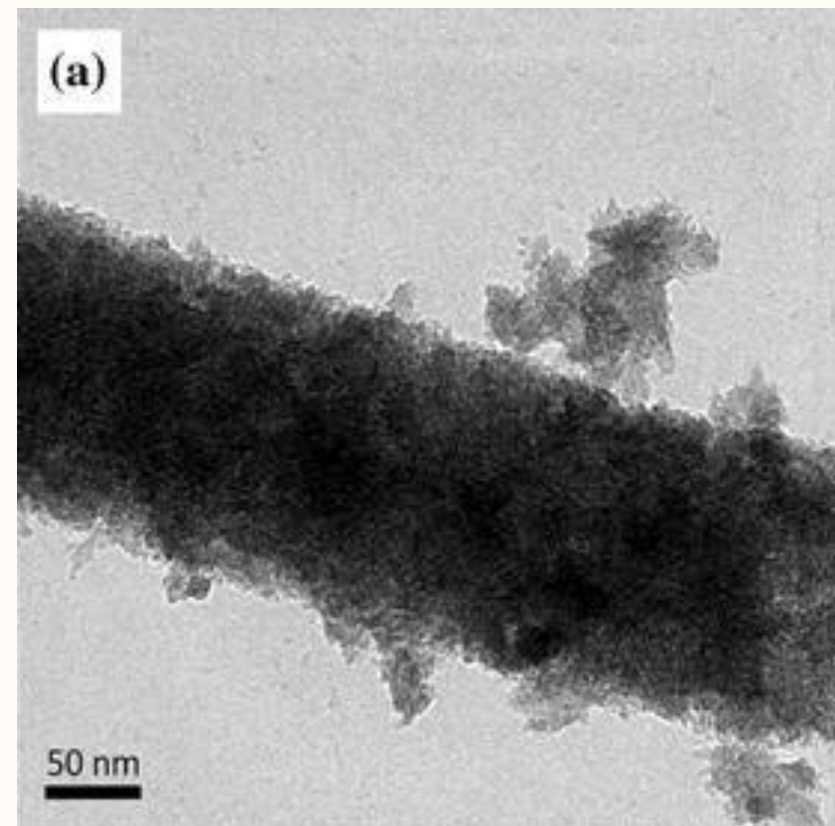
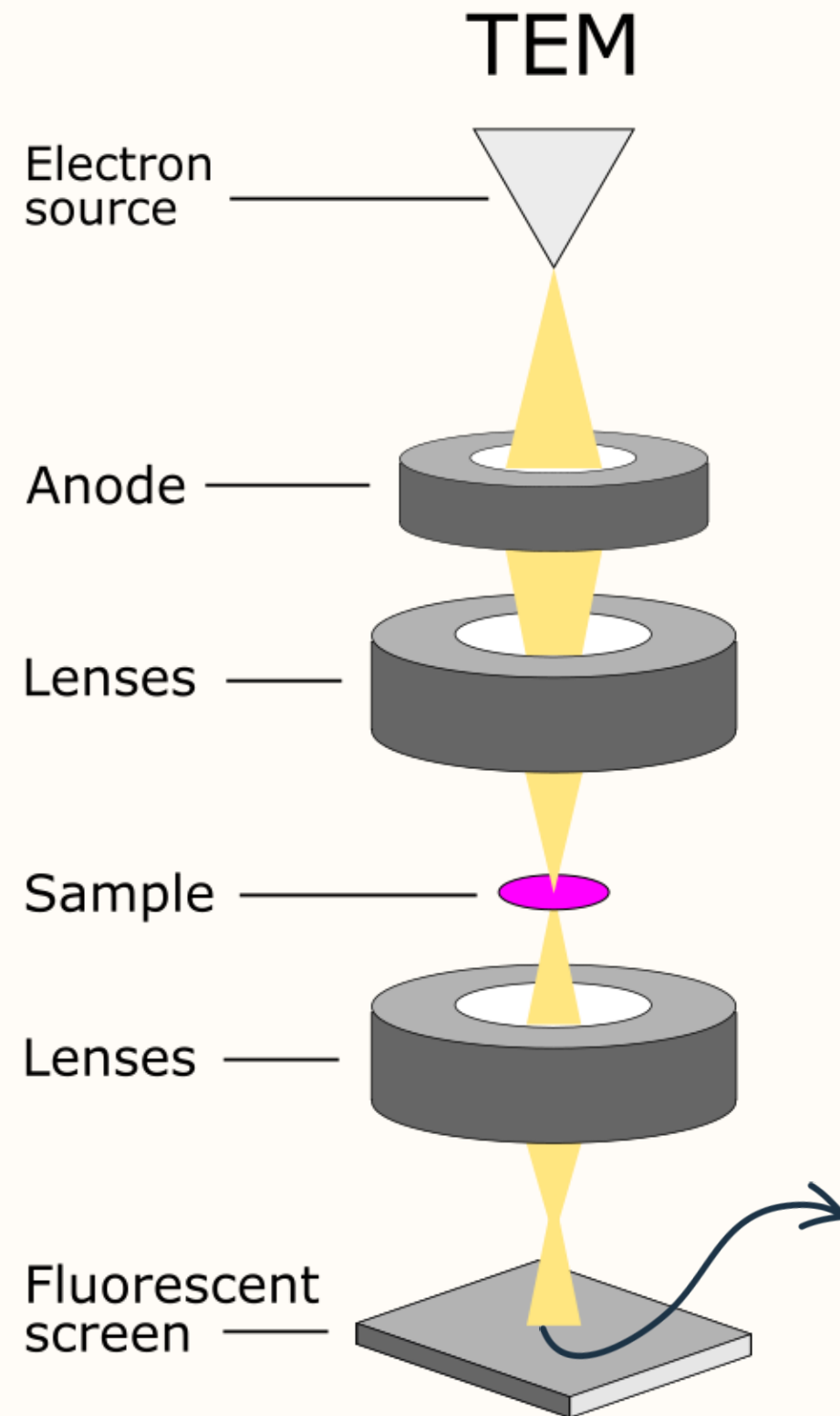
Nitro cellulose
Black powder



MICROSCOPIC TEST FOR HIGH EXPLOSIVE

S. No	Name of explosive	Name of the test	Sample preparation	Observation	Image analysis
1	TNT	TEM	Thin film of TNT is prepared.	An electron beam is directed at the sample producing an internal image of the structure.	Crystal structure and lattice fringes of TNT can be seen.
2	RDX	TEM	Thin layer of RDX is deposited on a suitable substrate with a coating of copper or gold.	The image is examined under TEM to provide a high resolution image of RDX particles.	Typically small rough spherical particles with crystalline structure are observed.

MICROSCOPIC TEST FOR HIGH EXPLOSIVE



Nano-RDX

CHEMICAL TEST OF LOW EXPLOSIVE & HIGH EXPLOSIVE

CHEMICAL TEST FOR LOW EXPLOSIVES

S. No	Name of explosive	Name of the test	Reagent preparation	Procedure	Observation
1	Chemical Test for Nitro Cellulose	The Iodine test	Iodine solution	<ul style="list-style-type: none">• Obtain a small sample of the material to be tested and place it on a clean, white plate or piece of paper.• Drip a few drops of iodine solution onto the sample.	If the sample contains nitrocellulose, a blue-black color will form within seconds.
2	Chemical Test for Black Powder	The Nitrates Test	Concentrated nitric acid	<ul style="list-style-type: none">• Take a small amount of the sample and place it on a piece of filter paper.• Add a few drops of concentrated nitric acid to the sample.	If the sample contains nitrates, the filter paper will turn a characteristic pink/purple color, indicating the presence of nitrates.

CHEMICAL TEST FOR HIGH EXPLOSIVES

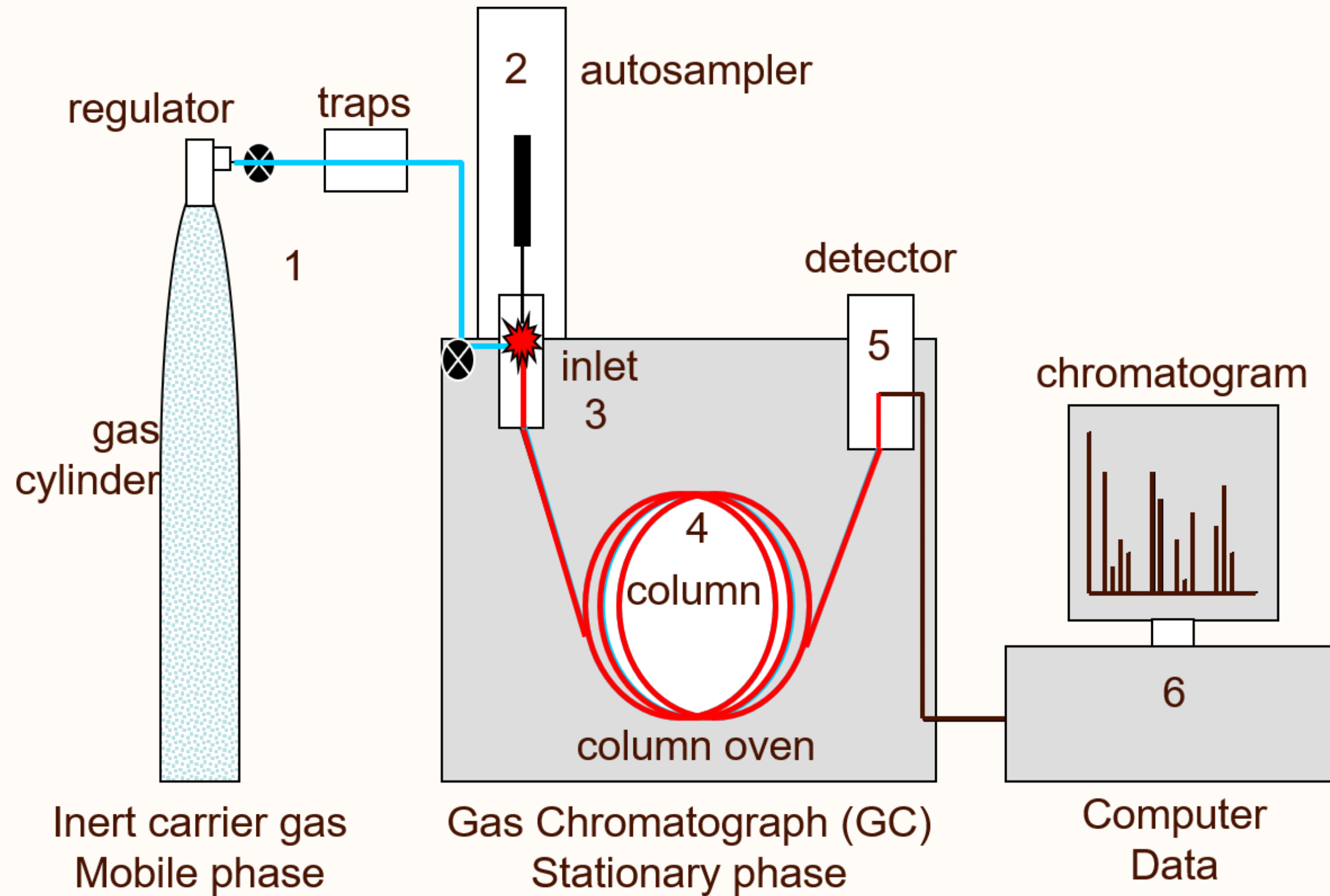
S. No	Name of explosive	Name of the test	Reagent preparation	Procedure	Observation
1	Chemical Test for TNT	The Diaminonaphthalene test	Diaminonaphthalene	<ul style="list-style-type: none">• A small amount of the suspected TNT sample is placed into a test tube.• Then add Adequate amount of Diaminonaphthalene and mix it properly.	Appearance of red-violet colour.
2	Chemical Test for RDX	The Sodium hydroxide test for RDX	Prepare a solution of sodium hydroxide (NaOH) in water.	<ul style="list-style-type: none">• Take a small amount of the sample to be tested and add a few drops of the NaOH solution to it.• Stir the mixture thoroughly to ensure complete reaction between the sample and the NaOH solution.	If RDX is present in the sample, the mixture will turn yellow or orange-yellow

INSTRUMENTAL METHOD OF LOW EXPLOSIVE & HIGH EXPLOSIVE

ANALYSIS OF LOW EXPLOSIVE BY CHROMATOGRAPHIC METHOD

S. No	Name of explosive	Name of test	Sampling	Solvent System	Column	T-o-R	Name of detector	Rf
1	Nitro Cellulose	HS-GC	A known amount of nitrocellulose is placed in the headspace.	Hexane and Isopropanol	DB-1 column	15-30 minutes.	Flame Ionization Detector (FID)	0.5-0.6
2	Black Powder	HS-GC	A known amount of nitrocellulose is placed in the headspace.	hexane and ethanol	DB-1 column	20-30 minutes.	Flame Ionization Detector (FID)	0.2 to 0.7

ANALYSIS OF LOW EXPLOSIVE BY CHROMATOGRAPHIC METHOD



ANALYSIS OF HIGH EXPLOSIVE BY CHROMATOGRAPHIC METHOD

S. No	Name of explosive	Name of test	Sample Preparation	Solvent System	Visualiser	Observation
1	TNT	TLC	TNT is dissolved in methanol	Chloroform and Methanol (80:20).	Anisaldehyde, or exposing to UV-light	TNT will fluoresce under UV light, allowing for its detection. The Rf value for TNT in the solvent system mentioned is around 0.45
2	RDX	TLC	RDX is dissolved in methanol	Toluene and Ethyl acetate in a ratio of 9:1.	Iodine vapor	A typical Rf value for RDX in this solvent system is 0.9 to 1.0.

ANALYSIS OF LOW EXPLOSIVE BY SPECTROSCOPIC METHOD

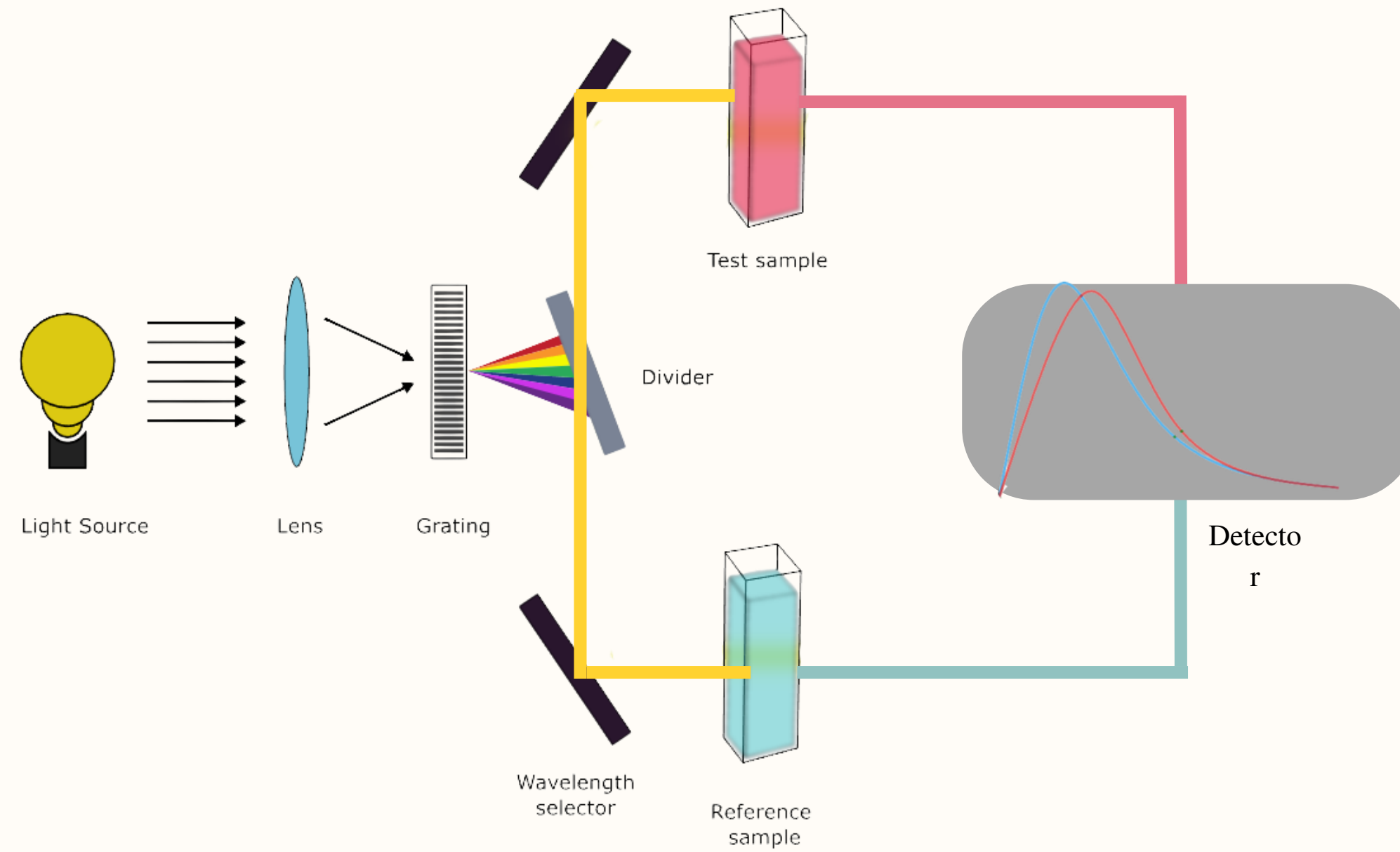
S. No	Name of explosive	Name of test	Sampling	Name of detector	Wavelength (nm)
1	Nitrocellulose	UV spectroscopy	Dilute Nitrocellulose in acetone	Photo-ionization detector (PID)	200-300 nm
2	Black Powder	UV spectroscopy	Dilute Black Powder in methanol	Photo-ionization detector (PID)	200-300 nm

NOTE:- The reason that the wavelength range for the detection of nitrocellulose and gunpowder is often the similar in ultraviolet ultraviolet spectroscopy is that both compound contains similar composition that absorbs UV light at similar wavelength.

ANALYSYS OF HIGH EXPLOSIVE BY SPECTROSCOPIC METHOD

S. No	Name of explosive	Name of test	Sampling	Name of detector	Wavelength (nm)
1	TNT	UV spectroscopy	Dilute TNT in methanol or acetonitrile.	Photo-ionization detector (PID)	220-360 nm
2	RDX	UV spectroscopy	Dilute RDX in methanol.	Photo-ionization detector (PID)	190-300 nm

ANALYSIS OF HIGH EXPLOSIVE BY SPECTROSCOPIC METHOD





THANK YOU

PRESENTATION ENDED

