

QUESTION NO: 02
(PART - A)

Define ceramic and nano-ceramic materials. Why the nano-ceramics show better properties than their ceramic counterparts? Write the applications of ceramic materials.

CERAMICS:-

"Ceramics are the hard, brittle, heat and corrosion resistant, non-metallic solids made by shaping and firing natural and synthetic materials at high temperatures."

NANO-CERAMICS:-

"Ceramic materials composed of particles with ultrafine size i.e. less than 100 nm."

Nano-Ceramics Show Better Properties Than Their Ceramic Counterparts:

Nano-ceramics show better properties than their ceramic counterparts such as low cost, enhanced mechanical properties and temperature stability, better wear resistance and resistance against compression and bending,

due to exceptionally grounded small particle size, which gives them a non-porous structure and high surface area.

APPLICATIONS:

- Biomedical Implants
- Blades and rotors for gas turbines in aerospace.
- Electronic devices.
- Bricks and tiles for construction.
- Tableware and pottery.

(PART-B)

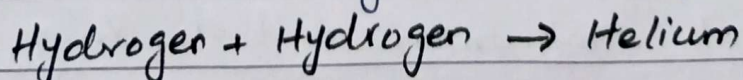
What is 'Black Hole'? How black holes are formed and discovered?

BLACK HOLE:-

"Black hole is an object of extreme density and very strong gravitational pull, even light can not escape from it."

Formation of Black Hole:- (COLLAPSE)

- A star nearly three times denser than the sun, burns hydrogen into helium through nuclear fusion.



- After millions of years, when it runs out of fuel, the fusion stops.
- Without fusion, gravity takes over and the star collapses inward.
- The outer layer explodes outward in a supernova, and the leftover core collapses into an incredibly dense point called **Black Hole**.

Discovery Of Black Hole:-

Black holes can not be detected directly because they do not emit light. They are discovered through various ways:

- 1- **Gravitational Effects:** If a visible star orbits an invisible companion, astronomers can measure the motion to infer the mass of an unseen object i.e. Black hole.
- 2- **Gravitational Waves:** When two black holes merge, they create ripples in space time called gravitational waves, through which they can be detected.
- 3- **X-ray Emissions:** When matter from a nearby star falls into the black hole, it heats up and emits x-rays.

- Chandra X-ray Telescope detect such emissions.

(Part - C)

Write two applications of each of the following electromagnetic radiations.

Electromagnetic Radiations:

"Electromagnetic radiations are the waves that require no medium for their propagation."

The following are the electromagnetic radiations along with their applications:

(i) Ultraviolet

- Highlighters
- Cosmetics Manufacturing

(ii) Infra-red

- Television Remotes
- Human body radiations
- Night vision technology

(iii) Microwaves

- Microwave Ovens
- Weather RADAR

(iv) Radio Waves

- Mobile phones
- Satellites

(V) X-rays

To visualise internal structure of body.

To study the arrangements of atoms in different materials. (XRD)

(PART-D)

What is Wildfire? Explain its types, causes, spread and preventions.

"WILD FIRE"

"A wildfire is an uncontrollable fire that wipes out large fields and areas of land."

TYPES OF WILD FIRE:

There are mainly three types of wildfire:

- 1- Ground Fire: It burns under the surface and lasts long even for months and years.
- 2- Surface Fire: It burns the surface of the forests.
- 3- Crown Fire: It burns the canopies of trees.

CAUSES OF WILD FIRE:

There are several causes of wildfire:

- Smoking
- Lightning
- Campfires

- Burning debris
- Dry weathers.

SPREAD OF WILDFIRE:

Wildfires spread with a combination of three factors:

- 1- **FUEL:** Dry vegetation burns faster and more quickly than wet vegetations, providing a fuel to wildfire.
- 2- **Wind:** Strong winds can cause erratic behavior and merge fires into megafires or wildfires.
- 3- **Topography:** Slope affects the direction of spread, with fires moving more rapidly when the slope is steeper enough.

PREVENTIONS FOR WILDFIRE:

- Safely managing campfires.
- Properly disposing of smoking materials.
- Creating defensible space around homes.
- Using Remote Sensing and GIS to locate wildfires at early stage.
- Using firefighters.

