# Carbon Nanotubes Chemistry Questions with Solutions

**Q-1:** Other name of carbon nanotubes is

a) Bulky tube
b) Buckytube
c) Bulk balls
d) Buckyball

**Answer: b)** Buckytube

**Q-2:** Give the full form and explanation for the following.
a) MWCNT
b) SWCNT

**Answer:**

a) **MWCNT:** It stands for multiwalled carbon nano tube.It's made up of many nested carbon nanotubes. This form of nanotube has two diameters, one called the outer diameter and the other called the inner diameter. MWCNTs have an exterior diameter of 2 to 100 nanometers, an inner diameter of 1-3 nanometers, and a length of one to several micrometres.

**b) SWCNT:** It stands for single walled carbon nanotubes. SWCNTs are made up of a single cylindrical carbon layer(1-D) with a diameter ranging from 0.4 to 2 nanometers and are around 2 micrometres long. Example: Armchair and zigzag nanotubes

**Q-3:** Chiral vector of the graphene layer determines the_____ properties of nanotubes

a) Magnetic
b) Electrical
c) Optical
d) Chemical

**Answer: b)** Electrical

**Q-4:** What thermal and mechanical properties do carbon nanotubes have?

**Answer:**

1) Carbon nanotubes are stronger than steel. They have mechanical tensile strength that can exceed steel by 400 times.
2) The thermal capacity of carbon nanotubes is extremely high. It is twenty times stronger than steel in general. As a result, unlike steel, it does not expand when heated.Therefore, carbon nanotubes are used in the construction of bridges and aircraft.
3) These tubes are good conductors of heat and electricity.
4) They are extremely light, with a density one-sixth that of steel.
5) Chemically, carbon nanotubes are unaffected. They are hence chemically stable. As a result, carbon nanotubes are corrosion-resistant.

**Q-5:** What is the building block of carbon nanotubes?

a) Mini tubes
b) Lattice
c) Unit Cell
d) Graphene

**Answer: d)** Graphene

Explanation: Carbon nanotubes (CNTs) are cylindrical molecules made up of single-layer carbon atoms coiled up into sheets called graphene.

**Q-6:** CNTs are chemically bonded with

a) sp bonds
b) $sp^2$ bonds
c) $sp^3$ bonds
d) No chemical bond

**Answer: b)** $sp^2$ bonds

Explanation: Graphene is a carbonaceous two-dimensional material having a hexagonal honeycomb crystal structure. A sigma connection connects each carbon atom in graphene to three other carbon atoms. Thus, imparting hybridisation of $sp^2$ in CNTs.

**Q-7:** A simple _____ degree rotation of a graphene sheet transforms the nanotube it creates from armchair to zigzag or vice versa.

a) 40
b) 30
c) 60
d) 180

**Answer: b)** 30

**Q-8:** What are substrates? Give examples of the substrates used in chemical vapour deposition method (CVD)?

**Answer:** The CNTS are grown on materials called substrates. Zeolite, silica, silicon plates covered with iron particles, and other substrates are often used in CVD.

**Q-9:** How is CVD classified on the basis of heat source?

**Answer:** The CVD can be one of the following, depending on the heating source

1) Thermally activated CVD heated by IR radiation, RF heater etc.
2) Photo assisted CVD which is heated by $CO_2$ laser, arc lamps, Nd:YAG laser, Argon ion laser etc.
3) Plasma assisted CVD which is heated by microwave radiation

**Q-10:** Preliminary filtration is one of the steps used in the liquid phase purification method of CNT. What is its purpose?

a) To remove bulk solid particles
b) To remove bulk graphite particles
c) To remove fullerenes and catalysts
d) To isolate MWCNT

**Answer: b)** To remove bulk graphite particles
**Q-11:** What are the several uses for carbon nanotubes?

**Answer:** The various uses of carbon nanotubes are:

1. Due to their excellent electrical properties, carbon nanotubes have been employed as electrodes in a variety of electrochemical experiments, including chemical and biological sensing applications.

2. Biosensors and electrochemical sensors can both be made with carbon nanotubes.

3. Due to their light weight, nanotubes are frequently used in windmill blades. It improves the windmill's efficiency and allows it to produce more power at a faster rate.

4. Breast cancer tumours are destroyed using nanotubes.

**Q-12:** Give an example of a display that uses carbon nanotubes to emit electrons. What makes them suitable for use as electron emitters?

**Answer:** Carbon nanotubes are the most promising material for field emitters due to their high electrical conductivity and amazing sharpness of their tip, and CNTs as electron emitters for field emission displays are a realistic example (FED).

A new generation of large-area, high-resolution, low-cost flat panel displays is now possible because of field emission display (FED) technology. However, CNT must be produced at exact sizes and densities for FED manufacture. Voltage is affected by height, diameter, and tip sharpness, whereas current is affected by density.

**Q-13:** Fill in the blanks

a) _____ doped carbon nanotubes are used for drug delivery.
b) In laser ablation method _____ inert gas atmosphere is usually employed.
c) _____ ampere current is required for the arc discharge method
d) A water cooled surface is used in laser ablation methods to collect _____.
e) _____ and _____ properties make CNTs suitable material for advanced biomaterial creation.

**Answers:**

a) Nitrogen
b) Argon
c) 50-120
d) Nano tubes
e) Electrical, optical

**Q-14:** How many methods are currently used for the production of carbon nanotubes?

**Answer:** Three

Explanation: CNTs can currently be made using three different methods: arc discharge, graphite laser ablation, and chemical vapour deposition (CVD).

**Q-15:** Are carbon nanotubes biodegradable?

**Answer:** Yes

Explanation: Carbon nanomaterial biodegradation by microbes and enzymes is now critical for reducing their poisoning of living organisms and removing them from the environment.

Carbon nanotubes (CNTs), graphene (GRA), and their derivatives can be degraded by a variety of microbes, including bacteria and fungi.

## Practise Questions on Carbon Nanotubes

**Q-1:** A nanowire is a

a) 1-D material
b) 3-D material
c) 2-D material
d) 0-D material

**Answer: a)** 1-D material

Explanation:

The following table lists the many types of materials and their examples:

| Material | Examples |
|---|---|
| 1-D | nanowire,nanorods,nanotubes,nanoribbons |
| 2-D | graphene,nanofilms,nanocoatings |
| 3-D | BSG nanostructure |
| 0-D | GQDs, CQDs |

One dimension is outside the nanoscale in one-dimensional nanomaterials (1D).
A nanowire is an example of a 1-D material and is also known as a SWCNT.

**Q-2:** In Laser ablation method of synthesis of carbon nanotubes, the substrate used is

a) Water cooled nickel collector
b) Water cooled copper collector
c) Water heated copper collector
d) Water cooled iron collector

**Answer: b)** Water cooled copper collector

Explanation: The water-cooled copper collector is the substrate on which the vaporised carbon atoms deposit and develop into CNTs in this approach.

**Q-3:** Explain the gas phase purification method of carbon nanotubes.

**Answer:** CNTs are oxidised at high temperatures before being extracted with nitric acid and hydrochloric acid multiple times in this procedure. With smaller levels of leftover catalyst and other non-CNT forms, the synthesised CNTs obtained are purer and more stable.

**Q-4:** What makes bucky papers ideal for developing more efficient heat sinks for chips?

**Answer:** Due to its unusually high current-carrying capacity, it is one of the most thermally conductive materials known and has numerous applications.

**Q-5:** What is the top down and bottom up approach for the synthesis of nanomaterials? Provide a schematic diagram to demonstrate.

**Answer:**

Top-Down approach: The top-down approach entails reducing the bulk material to nanosized structures or particles.High-energy wet ball milling, electron beam lithography, atomic force manipulation, gas-phase condensation, aerosol spray are examples of such techniques.

Bottom Up approach: Bottom-up approach refers to the build up of a material from the bottom into larger structures. Some well-known bottom–up techniques include hydrothermal synthesis, template assisted sol–gel, electrodeposition, and so on.

BYJU'S
The Learning App