

Module – I(Quantum Mechanics & Spectroscopy)

- (1) The concept of matter wave was suggested by _____
- (a) Heisenberg
 - (b) de Broglie
 - (c) Schrodinger
 - (d) Laplace
- (4) The total probability of finding the particle in space must be _____
- (a) zero
 - (b) unity
 - (c) infinity
 - (d) double
- (8) The square of the magnitude of the wave function is called _____
- (a) current density
 - (b) probability density
 - (c) zero density
 - (d) volume density
- (9) The operator ∇ is called _____ operator
- (a) Hamiltonian
 - (b) Laplacian
 - (c) Poisson
 - (d) vector
- (2) According to the wave function and its first partial derivative should be _____ functions for all values of X
- (a) Zero
 - (b) Continuous
 - (c) Infinity
 - (d) discontinuous
- (4) If there exist only one eigen function corresponding to a given eigen value, then the eigen value is called _____
- (a) Non degenerate
 - (b) degenerate
 - (c) discrete
 - (d) continuum
5. For a particle inside a box, the potential is maximum at $x =$ _____
- (a) L
 - (b) 2L
 - (c) L/2

(d) 3L

11. Calculate the Zero-point energy for a particle in an infinite potential well for an electron confined to a 1 nm atom.

- a. 3.9×10^{-29} J
- b. 9×10^{-29} J
- c. 5.9×10^{-29} J
- d. 6.9×10^{-29} J

12. The different types of energies associated with a molecule are _____

- a. Electronic energy
- b. Vibrational energy
- c. Rotational energy
- d. All of the mentioned

4. The region of electromagnetic spectrum for nuclear magnetic resonance is _____

- a) Microwave
- b) Radio frequency
- c) Infrared
- d) UV-rays

5. Which of the following is an application of molecular spectroscopy?

- a) Structural investigation
- b) Basis of understanding of colors
- c) Study of energetically excited reaction products
- d) All of the mentioned

1. A photon of wavenumber 100 cm^{-1} has a wavelength of

- a. 1 m
- b. 1 mm
- c. 1000 nm
- d. 100 m

2. The energy in joules of a photon of wavelength 355 nm is

- a. 5.596×10^{28} J
- b. 5.596×10^{19} J
- c. 5.596×10^{17} J
- d. 5.596×10^{26} J

3. How many normal modes of vibration are there for C^{60} ?

- a. 134
- b. 180
- c. 60
- d. 175

4. 1. Beer Lambert's law gives the relation between which of the following?

- a) Reflected radiation and concentration
- b) Scattered radiation and concentration

- c) Energy absorption and concentration
 d) Energy absorption and reflected radiation
4. Beer's law states that the intensity of light decreases with respect to _____
 a) Concentration
 b) Distance
 c) Composition
 d) Volume
5. Lambert's law states that the intensity of light decreases with respect to _____
 a) Concentration
 b) Distance
 c) Composition
 d) Volume
8. Transmittance is given as $T = P/P_0$. If P_0 is the power incident on the sample, what does P represent?
 a) Radiant power transmitted by the sample
 b) Radiant power absorbed by the sample
 c) Sum of powers absorbed and scattered
 d) Sum of powers transmitted and reflected
9. What is the unit of absorbance which can be derived from Beer Lambert's law?
 a) $L \text{ mol}^{-1} \text{ cm}^{-1}$
 b) $L \text{ gm}^{-1} \text{ cm}^{-1}$
 c) Cm
 d) No unit
10. Select the wavelength range corresponding to UV-visible region?
 (a) 400 nm - 800 nm
 (b) 200 nm - 800 nm
 (c) 10 nm -700 nm
 (d) 700 nm - 800 nm

Module – II(Phase Rule)

1. Number of components present in aqueous phosphoric acid is

- a. 4
 b. 6
 c. 3
 d. 2

Ans – d

2. Each Crystalline form of the same element is called

- a. Polymorphs
 b. Enantiomers
 c. Dynamic allotropy
 d. Bucky ball

Ans – a

3. The transition temperature of $S_{(L)} \leftrightarrow S_{(R)}$ at 1 atm is

- a. 140°C
 b. 114°C

- c. 120°C
- d. 95.6°C

Ans – d

4. Maximum number of phases that can remain in equilibrium at any moment cannot exceed

- a. 4
- b. 3
- c. 2
- d. None of these

Ans – b

5. The fusion curve of monoclinic sulphur is slightly inclined towards right, because

- a. Monoclinic sulphur transforms into rhombic sulphur
- b. It is monovariant
- c. The triple point lies on this curve
- d. The melting point rises due to increases in volume on melting

Ans – d

1. Gibbs phase rule for general system:

- (a) $P+F=C-1$
- (b) $P+F=C+1$
- (c) $P+F=C-2$
- (d) $P+F=C+2$

3. The degree of freedom at triple point in unary diagram for water _____.

- (a) 0
- (b) 1
- (c) 2
- (d) 3

2. Gibbs phase rule is, when no chemical reaction occurs

- (a) $F - C + P = 2$
- (b) $F + C - P = 2$
- (c) $F + C + P = 2$
- (d) $F - C - P = 2$

4. At equilibrium the total Gibb's free energy for all phases is

- (a) Minimum
- (b) Maximum
- (c) Infinity
- (d) Zero

3. In a single – component condensed system, if degree of freedom is zero, maximum number of phases that can co – exist _____

- a) 2
- b) 3

- c) 0
 - d) 1
6. What is degree of freedom when two phases co – exist?
- a) 2
 - b) 3
 - c) 0
 - d) 1
2. What is the point at which all the three phases of a system exist?
- a) Triple point
 - b) Sublimation point
 - c) Vapor point
 - d) Eutectic point
3. For water system, the number of phases at the triple point is _____
- a) 0
 - b) 1
 - c) 2
 - d) 3
5. Select the wrong statements from the following statements with respect to a phase diagram.
- a) Gives information about concentration
 - b) Gives information about solubility
 - c) Gives information on melting and boiling points
 - d) Gives information on relative concentration
10. Under what condition, will we get a stable phase diagram?
- a) Solid + Liquid
 - b) Solid + Vapor
 - c) Liquid + vapor
 - d) Liquid + Solid

Module – III(Fuels)

1. A Bomb calorimeter is used for finding the _____ calorific value of solids & liquids.
 - a. Higher
 - b. Same
 - c. Lower
 - d. None of the above
2. $\text{CO(g)} + \text{H}_2\text{(g)}$ combination is known as _____.
 - a. Producer gas
 - b. Coal gas
 - c. Water gas
 - d. Biogas
3. The SI unit of Calorific value for solid fuel is _____.
 - a. Calories/gram
 - b. BTU/lb
 - c. Kcal/kg
 - d. Joule/gram
4. Which one of the following is not a secondary fuel –
 - a. Petrol
 - b. Charcoal

- c. Natural Gas
- d. Biogas

25. Gross & net calorific value is the same for

- A. blast furnace gas
- B. coke oven gas
- C. L.D. converter gas
- D. none of these

26. Presence of _____ in a dry gaseous fuel does not contribute to its calorific value.

- A. sulphur
- B. oxygen
- C. hydrogen
- D. carbon

2. Higher efficiency in the combustion of solid fuel can not be achieved by

- A. proper fuel preparation.
- B. keeping the flue gas exhaust temperature very high.
- C. adopting efficient-fuel firing technique & equipment.
- D. supplying correct quantity of combustion air.

3. During combustion of gaseous fuels, deficiency of air

- A. lengthens the flame.
- B. tends to shorten the flame.
- C. does not affect the flame length.
- D. increases the flame temperature.

2. The principle constituents of a fuel are.....

- A. Carbon and hydrogen
- B. Oxygen and hydrogen
- C. Sulphur and oxygen
- D. Sulphur and hydrogen

4. Which of the following fuel has the highest calorific value.....

- A. Peat
- B. Coke
- C. Bituminous coal

D. Anthracite coal

Module – IV (CORROSION)

6. Chemically the Rust is

- a. Fe_2O_3
- b. $\text{FeO} \cdot \text{Fe}_2\text{O}_3$
- c. $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$
- d. $\text{FeO} \cdot x\text{H}_2\text{O}$

Ans – c

7. Water – line corrosion is enhanced by the presence of

- a. Hydroxides
- b. Chlorides
- c. Carbonates
- d. Silicates

Ans – b

8. Caustic embrittlement is a particular case of

- a. Pitting corrosion
- b. Dry corrosion
- c. Stress corrosion
- d. Wet corrosion

Ans – c

9. Galvanizing is the process of coating iron with

- a. Mg
- b. Cu
- c. Zn
- d. Ni

Ans – c

10. The rate of corrosion is more when

- a. Anodic area is large
- b. Anodic area is small
- c. Cathodic area is small
- d. None of the above

Ans – b

11. Corrosion is an example of

- a. Oxidation
- b. Reduction
- c. Electrolysis
- d. Erosion

12. The metal which is protected by a layer of its own oxide
- Cu
 - Fe
 - Au
 - Al
13. In Galvanic corrosion
- More noble metal gets corroded
 - less noble metals gets corroded
 - The metal having a higher standard reduction potential gets corroded
 - The metal placed lower in the electrochemical series get corroded
14. In electrochemical corrosion
- Anode undergoes corrosion
 - Cathode undergoes corrosion
 - Both undergo oxidation
 - None undergoes oxidation
15. In differential aeration corrosion
- Poor oxygenated part acts as anode
 - Rich oxygenated part acts as anode
 - Poor oxygenated part acts as cathode
 - Rich oxygenated part acts as cathode
16. In an electrochemical series, the metal at the Top is
- Most noble
 - Most stable
 - Most active
 - Most protective
17. Corrosion of zinc metal containing an impurity of copper is called
- Water line corrosion
 - Moist corrosion
 - Stress corrosion
 - Galvanic corrosion
18. In cathodic coating, base metal is coated with
- More noble metal
 - Less noble metal
 - More active metal
 - Having more reduction potential
19. In electroplating, the object to be protected from corrosion is made as
- Anode
 - Cathode
 - Both anode & cathode

d. None of the above

20. In general, corrosion is maximum when the PH of the corroding medium is

a. Above 7.0

b. Equal to 7.0

c. Below 7.0

d. Equal to 1.0

Module – V (Nano materials)

1. Who first used the term Nano – technology and when ?

a. Richard Feynman(1959)

b. Norio Taniguchi(1974)

c. Eric Drexler(1986)

d. Sumio Iijima(1991)

2. Which is a 0 – D(Zero dimension) Nano material?

a. Nano rod

b. Carbon nanotube

c. Graphene

d. Nano coating

3. The extensively used Nano particles as catalyst is _____.

a. Silver

b. Copper

c. Gold

d. Cerium

4. What is Graphene?

a. A new material made from carbon nanotubes

b. A one – atom thick sheet of Carbon

c. Thin film made from fullerenes

d. A soft tool to measure & graphically represent nanoparticles

5. Coating the Nano crystals with the ceramics is carried that leads to _____.

a. Corrosion

b. Corrosion resistance

c. Wear & tear

d. Soft

1. Nanomaterials are the materials with at least one dimension measuring less than _____

a) 1 nm

b) 10 nm

c) 100 nm

d) 1000 nm

3. The colour of the nano gold particles is _____

a) Yellow

b) Orange

c) Red

d) Variable

10. The size of atoms is nearly _____

- a) 0.01 nm
- b) 0.1 nm
- c) 1 nm
- d) 10 nm

1. The four types of Artificial nanomaterials are _____

- a) Carbon-based, non-metallic, composites and ceramics
- b) Carbon-based, metallic, composites and ceramics
- c) Carbon-based, non-metallic, composites and dendrimers
- d) Carbon-based, metallic, composites and dendrimers

4. Nano sized polymers built from branched units are called _____

- a) Dendrimers
- b) Composites
- c) Carbon-based materials
- d) Metal-based materials

7. On both ends of the CNTs, which carbon nanostructure is placed?

- a) Graphite
- b) Diamond
- c) C⁶⁰
- d) Benzene

9. Quantum dots can be used in _____

- a) Crystallography
- b) Optoelectronics
- c) Mechanics
- d) Quantum physics'

1. Nanostructures have sizes in between:

- a. 1 and 100 Å
- b. 1 and 100 nm
- c. 100 and 1000 nm
- d. None of the above

Q.1 . Spherical gold nanoparticles are ____ dimensional nanomaterials

- a) Zero
- b) One
- c) Two
- d) Three

Q.5 (2,3) carbon nanotube is

- a) Zigzag
- b) Armchair
- c) Chiral
- d) Both chiral and zigzag