

MHT CET 2026 April 21 Shift 1

Question Paper with Solutions (Memory Based)

Conducted by CET Cell, Maharashtra



General Instructions

- (i) **Duration:** The total duration of the examination is 3 hours (180 minutes).
- (ii) **Total Marks:** The complete paper carries a maximum of 200 marks.
- (iii) **Structure:** The paper has 3 Sections:
 - **Section A:** 50 Multiple Choice Questions (Physics)
 - **Section B:** 50 Multiple Choice Questions (Chemistry)
 - **Section C:** 100 Multiple Choice Questions (Biology)
- (iv) **Compulsory Questions:** All 200 questions are compulsory.
- (v) Each question has four options. Only **one** option is correct.
- (vi) **Right Answer:** Physics (+1 marks), Chemistry (+1 marks) and Biology(+1 marks).
- (vii) **Incorrect Answer:** (No Negative marking).
- (viii) **Unanswered/Marked for Review:** 0 marks.

1. Filarial disease (filariasis) is transmitted by which of the following mosquitoes?

- (A) Anopheles
- (B) Aedes
- (C) Culex
- (D) Mansonia

Correct Answer: (C) Culex

Solution:

Concept:

Filariasis (also called elephantiasis) is a parasitic disease caused mainly by the nematode worms *Wuchereria bancrofti* and *Brugia malayi*. These parasites are transmitted to humans through the bite of infected mosquitoes.

Step 1: Identify the transmitting vector.

The most common vector responsible for transmitting filariasis is the **Culex mosquito**, especially *Culex quinquefasciatus*.

Step 2: Transmission mechanism.

When an infected mosquito bites a human, the infective larvae enter the bloodstream and migrate to the lymphatic system.

Step 3: Effect on the human body.

The parasites grow and reproduce in the lymphatic vessels, causing blockage and severe swelling of body parts such as legs and genitals, a condition known as **elephantiasis**.

Quick Tip: Common mosquito-borne diseases: Malaria – Anopheles mosquito, Dengue/Chikungunya – Aedes mosquito, Filariasis – Culex mosquito.

2. Match the following diseases with their causative agents:

Column A (Disease)	Column B (Causative agent)
1. Common cold	A. Bacteria
2. Typhoid	B. Virus
3. Malaria	C. Protozoa

(A) 1 – B, 2 – A, 3 – C

(B) 1 – A, 2 – B, 3 – C

(C) 1 – C, 2 – A, 3 – B

(D) 1 – B, 2 – C, 3 – A

Correct Answer: (A) 1 – B, 2 – A, 3 – C

Solution:

Concept:

Different infectious diseases are caused by different types of pathogens such as bacteria, viruses, and protozoa. Identifying the causative agent helps in proper diagnosis and treatment.

Step 1: Common cold.

Common cold is caused by **viruses**, mainly the *Rhinovirus*.

Common Cold → Virus (B)

Step 2: Typhoid.

Typhoid fever is caused by the bacterium *Salmonella typhi*.

Typhoid → Bacteria (A)

Step 3: Malaria.

Malaria is caused by the protozoan parasite *Plasmodium* and transmitted by the female *Anopheles* mosquito.

Malaria → Protozoa (C)

Step 4: Write the correct matching.

1 – B, 2 – A, 3 – C

Quick Tip: Remember common disease-causing agents: Virus → Common cold, Dengue, AIDS. Bacteria → Typhoid, Cholera, Tuberculosis. Protozoa → Malaria, Amoebiasis.

3. The normal value of Tidal Volume (TV) in a healthy adult is approximately:

- (A) 500 mL
- (B) 2500 – 3000 mL
- (C) 1100 – 1200 mL
- (D) 4500 – 5000 mL

Correct Answer: (A) 500 mL

Solution:

Concept:

Tidal Volume (TV) is the volume of air that is inhaled or exhaled during a normal, relaxed breath. It is one of the important parameters used to measure lung function.

Step 1: Definition of tidal volume.

Tidal volume refers to the amount of air moved in or out of the lungs during a single normal breathing cycle.

Step 2: Normal value in humans.

In a healthy adult at rest, the average tidal volume is approximately:

$$TV \approx 500 \text{ mL}$$

Step 3: Comparison with other lung volumes.

For reference:

- Inspiratory Reserve Volume (IRV) $\approx 2500 - 3000$ mL
- Expiratory Reserve Volume (ERV) $\approx 1100 - 1200$ mL
- Vital Capacity (VC) $\approx 4500 - 5000$ mL

Quick Tip: Important lung volumes to remember: Tidal Volume (TV) 500 mL, Inspiratory Reserve Volume (IRV) 2500–3000 mL, Expiratory Reserve Volume (ERV) 1100–1200 mL.

4. Which of the following respiratory volumes represents the air remaining in the lungs after forced expiration?

- (A) Tidal Volume (TV)
- (B) Inspiratory Reserve Volume (IRV)
- (C) Residual Volume (RV)
- (D) Vital Capacity (VC)

Correct Answer: (C) Residual Volume (RV)

Solution:

Concept:

Different respiratory volumes describe the amount of air moving in and out of the lungs during breathing. **Residual Volume (RV)** is the volume of air that remains in the lungs even after a forceful expiration.

Step 1: Understand residual volume.

Residual Volume is the amount of air that remains in the lungs after the most forceful exhalation possible.

Step 2: Importance of residual volume.

Residual volume prevents the lungs from collapsing and ensures continuous gas exchange between breaths.

Step 3: Approximate value.

In a healthy adult, the residual volume is approximately:

$$RV \approx 1100 - 1200 \text{ mL}$$

Step 4: Differentiate from other lung volumes.

- Tidal Volume (TV): Air inhaled or exhaled in normal breathing.
- Inspiratory Reserve Volume (IRV): Extra air that can be inhaled after normal inspiration.
- Vital Capacity (VC): Maximum air that can be exhaled after maximum inspiration.

Quick Tip: Residual volume always remains in the lungs and cannot be expelled, even after forceful expiration. It helps keep alveoli open and prevents lung collapse.

5. Where is sperm produced?

- (A) Vas deferens
- (B) Epididymis
- (C) Seminiferous tubules
- (D) Prostate gland

Correct Answer: (C) Seminiferous tubules

Solution:

Concept:

Sperm production in males occurs through a process called **spermatogenesis**. This process takes place in specialized structures present in the testes called the **seminiferous tubules**.

Step 1: Location of seminiferous tubules.

Seminiferous tubules are highly coiled structures located inside the **testes**.

Step 2: Process occurring inside seminiferous tubules.

Inside these tubules, germ cells undergo meiosis and differentiation to form mature sperm cells.

Step 3: Role of other structures.

- **Epididymis**: Stores and allows maturation of sperm.
- **Vas deferens**: Transports sperm from epididymis to the urethra.
- **Prostate gland**: Produces components of seminal fluid.

Step 4: Conclusion.

Thus, sperm are produced in the **seminiferous tubules of the testes**.

Quick Tip: Remember: **Seminiferous tubules = sperm production**, while the epididymis stores and matures sperm.

6. If the stroke volume of the heart is 70 mL/beat and the cardiac output is 5250 mL/min, what is the heart rate?

- (A) 60 beats/min
- (B) 70 beats/min
- (C) 75 beats/min
- (D) 80 beats/min

Correct Answer: (C) 75 beats/min

Solution:

Concept:

Cardiac Output (CO) is the volume of blood pumped by each ventricle per minute. It is given by the formula:

$$CO = SV \times HR$$

where CO = Cardiac Output, SV = Stroke Volume (blood pumped per beat), HR = Heart Rate (beats per minute).

Step 1: Write the given values.

$$SV = 70 \text{ mL/beat}$$

$$CO = 5250 \text{ mL/min}$$

Step 2: Use the cardiac output formula.

$$CO = SV \times HR$$

Substitute the values:

$$5250 = 70 \times HR$$

Step 3: Solve for heart rate.

$$HR = \frac{5250}{70}$$

$$HR = 75 \text{ beats/min}$$

Quick Tip: Cardiac Output = Stroke Volume \times Heart Rate. A normal resting heart rate in adults is typically around 70 – 75 beats per minute.

7. Extrusion of the second polar body from the egg nucleus occurs:

- (A) After entry of sperm but before fertilization
- (B) After completion of fertilization

- (C) Before entry of sperm into the ovum
(D) Simultaneously with first cleavage

Correct Answer: (A) After entry of sperm but before fertilization

Solution:

Concept:

During **oogenesis**, the secondary oocyte is arrested in the **metaphase stage of meiosis II**. Completion of meiosis II occurs only after the sperm enters the ovum.

Step 1: State of the secondary oocyte.

At the time of ovulation, the ovum exists as a **secondary oocyte** and is arrested in metaphase II.

Step 2: Effect of sperm entry.

When a sperm enters the secondary oocyte, it triggers the completion of **meiosis II**.

Step 3: Formation of the second polar body.

Completion of meiosis II results in the formation of:

- One mature ovum
- One **second polar body**

Step 4: Timing of extrusion.

Thus, the second polar body is extruded **after the entry of sperm but before the completion of fertilization**.

Quick Tip: In humans, meiosis II in the secondary oocyte is completed only after sperm entry, which leads to the formation of the second polar body.

8. Which of the following population interactions is widely used in medical science for the production of antibiotics?

- (A) Commensalism
(B) Mutualism
(C) Parasitism
(D) Amensalism

Correct Answer: (D) Amensalism

Solution:

Concept:

Amensalism is a type of population interaction where one organism is harmed while the other organism remains unaffected.

This interaction is important in microbiology and medical science, especially in the production of antibiotics.

Step 1: Understand amensalism.

In amensalism, one species produces substances that inhibit or destroy another species, while the producer itself is not harmed.

Step 2: Example related to antibiotics.

A classic example is the fungus *Penicillium* producing the antibiotic **penicillin**, which inhibits the growth of bacteria.

Step 3: Application in medicine.

Many antibiotics used in medical science are derived from microorganisms that suppress the growth of other microorganisms through amensalistic interactions.

Step 4: Conclusion.

Thus, the population interaction widely used in antibiotic production is **amensalism**.

Quick Tip: Amensalism is often described as (0, -): one organism is unaffected while the other is harmed. Antibiotic production by fungi and bacteria is a classic example.

9. *Wuchereria bancrofti* is transmitted to the human body by:

- (A) Housefly
- (B) Anopheles
- (C) Culex
- (D) Aedes

Correct Answer: (C) Culex

Solution:

Concept:

Wuchereria bancrofti is a parasitic nematode that causes **lymphatic filariasis** (elephantiasis). The parasite is transmitted to humans through the bite of infected mosquitoes.

Step 1: Identify the transmitting vector.

The primary vector responsible for transmitting *Wuchereria bancrofti* is the **Culex mosquito**, especially *Culex quinquefasciatus*.

Step 2: Transmission process.

When an infected mosquito bites a human, the infective larvae enter the bloodstream and migrate to the lymphatic vessels.

Step 3: Effect on the body.

The parasites develop into adult worms in the lymphatic system, causing blockage of lymph vessels and swelling of body parts such as legs and genitals, a condition known as **elephantiasis**.

Quick Tip: Important mosquito vectors to remember: Anopheles → Malaria, Aedes → Dengue/Chikungunya, Culex → Filariasis.

10. What is the phenotypic ratio of a dihybrid cross in the F₂ generation?

- (A) 3 : 1
- (B) 1 : 2 : 1
- (C) 9 : 3 : 3 : 1
- (D) 1 : 1 : 1 : 1

Correct Answer: (C) 9 : 3 : 3 : 1

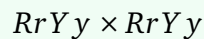
Solution:**Concept:**

A **dihybrid cross** involves the inheritance of **two different traits** simultaneously. According to **Mendel's Law of Independent Assortment**, the alleles of different genes assort independently during gamete formation.

Consider two traits:

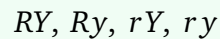
- Seed shape: *R* (Round) dominant over *r* (Wrinkled)
- Seed color: *Y* (Yellow) dominant over *y* (Green)

A typical dihybrid cross is:



Step 1: Determine the possible gametes.

Each parent can produce four types of gametes:



Step 2: Form the Punnett square combinations.

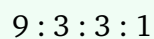
Combining the four gametes from each parent gives $4 \times 4 = 16$ possible offspring combinations.

Step 3: Determine the phenotypes.

The resulting phenotypes are:

- 9 Round Yellow
- 3 Round Green
- 3 Wrinkled Yellow
- 1 Wrinkled Green

Step 4: Write the phenotypic ratio.



Quick Tip: In a dihybrid cross involving two heterozygous parents ($AaBb \times AaBb$), the F_2 phenotypic ratio is always $9 : 3 : 3 : 1$, provided the genes assort independently and there is complete dominance.

11. Identify the "molecular scissors" used to cut DNA at specific sequences.

- (A) DNA Ligase
- (B) DNA Polymerase
- (C) Restriction Enzymes
- (D) RNA Polymerase

Correct Answer: (C) Restriction Enzymes

Solution:

Concept:

In **genetic engineering**, special enzymes are used to manipulate DNA. **Restriction enzymes** are known as **molecular scissors** because they cut DNA at specific recognition sequences. These enzymes were discovered in bacteria and are used by them as a defense mechanism against invading viral DNA.

Step 1: Understand the role of restriction enzymes.

Restriction enzymes recognize specific short DNA sequences called **recognition sites**. They cut the DNA at these sites, producing fragments.

Step 2: Example of restriction enzyme action.

For example, the enzyme *EcoRI* recognizes the sequence:

GAATTC

and cuts between specific bases, producing sticky ends.

Step 3: Role in recombinant DNA technology.

Restriction enzymes are widely used in:

- Gene cloning
- Recombinant DNA technology
- Genetic engineering
- DNA analysis

Because they precisely cut DNA, they are called "**molecular scissors**".

Quick Tip: Restriction enzymes cut DNA at specific recognition sequences, while DNA ligase joins DNA fragments together. Remember: **Restriction enzyme = cut, Ligase = join.**

12. Which hormone is responsible for apical dominance in plants?

- (A) Gibberellin
- (B) Cytokinin
- (C) Auxin

(D) Ethylene

Correct Answer: (C) Auxin

Solution:

Concept:

Apical dominance is the phenomenon in plants where the **main central shoot (apical bud)** suppresses the growth of lateral buds. This process ensures that the plant grows taller rather than becoming bushy.

The hormone primarily responsible for this phenomenon is **Auxin**.

Step 1: Understand the source of auxin.

Auxin is produced mainly in the **apical meristem** (the growing tip of the plant).

Step 2: Movement of auxin.

Auxin moves downward from the apical bud to other parts of the plant.

Step 3: Effect on lateral buds.

High concentrations of auxin inhibit the growth of lateral buds, thereby maintaining apical dominance.

Step 4: Experimental observation.

If the apical bud is removed, the auxin supply decreases and the lateral buds begin to grow, making the plant bushier.

Quick Tip: Auxin promotes stem elongation and maintains apical dominance. In contrast, cytokinins promote lateral bud growth and can reduce apical dominance.

13. Which antibody is most abundant in human colostrum (initial breast milk)?

- (A) IgG
- (B) IgM
- (C) IgA
- (D) IgE

Correct Answer: (C) IgA

Solution:

Concept:

Colostrum is the first milk produced by the mother immediately after childbirth. It is rich in proteins, nutrients, and antibodies that provide **passive immunity** to the newborn.

The antibody most abundant in colostrum is **Immunoglobulin A (IgA)**.

Step 1: Understand the role of colostrum.

Colostrum protects the newborn from infections during the early days of life when the infant's immune system is not fully developed.

Step 2: Identify the dominant antibody.

The major antibody present in colostrum is **secretory IgA (sIgA)**.

Step 3: Function of IgA.

IgA mainly protects the mucosal surfaces of the body, such as:

- Digestive tract
- Respiratory tract
- Urogenital tract

It prevents pathogens from attaching to mucosal cells and causing infection.

Step 4: Importance for the newborn.

Through colostrum, IgA provides **passive immunity**, helping the newborn resist infections during early life.

Quick Tip: Remember the mnemonic: “A for Alimentary canal”. IgA mainly protects mucosal surfaces and is abundant in secretions like saliva, tears, and colostrum.

14. In an ecosystem, which ecological pyramid is always upright and never inverted?

- (A) Pyramid of Biomass
- (B) Pyramid of Numbers
- (C) Pyramid of Energy
- (D) Pyramid of Producers

Correct Answer: (C) Pyramid of Energy

Solution:

Concept:

Ecological pyramids represent the relationship between different trophic levels in an ecosystem.

The three main ecological pyramids are:

- Pyramid of Numbers
- Pyramid of Biomass
- Pyramid of Energy

Among these, the **Pyramid of Energy** is **always upright** because energy flow in an ecosystem is **unidirectional** and decreases at each successive trophic level according to the **10% law of energy transfer**.

Step 1: Understand energy flow in an ecosystem.

Energy enters the ecosystem through producers (plants) via photosynthesis and then passes to consumers through food chains.

Step 2: Energy loss at each trophic level.

At each trophic level, a large portion of energy is lost as heat through metabolic activities. Only about **10% of the energy** is transferred to the next trophic level.

Step 3: Implication for ecological pyramids.

Because energy continuously decreases from producers to top consumers, the energy pyramid can **never be inverted**. Hence, it always remains **upright**.

Quick Tip: Remember: Pyramid of numbers and pyramid of biomass can sometimes be inverted in certain ecosystems, but the pyramid of energy is always upright due to continuous energy loss at each trophic level.

15. What is the ratio of escape velocity to orbital velocity?

- (A) 1 : 1
- (B) 2 : 1
- (C) $\sqrt{2}$: 1
- (D) 1 : $\sqrt{2}$

Correct Answer: (C) $\sqrt{2} : 1$

Solution:

Concept:

Escape velocity is the minimum velocity required for an object to escape the gravitational field of a planet without returning.

$$v_e = \sqrt{\frac{2GM}{R}}$$

Orbital velocity is the velocity required for a satellite to remain in circular orbit around a planet.

$$v_o = \sqrt{\frac{GM}{R}}$$

where G = gravitational constant, M = mass of the planet, R = radius of the planet.

Step 1: Write the ratio of escape velocity to orbital velocity.

$$\frac{v_e}{v_o} = \frac{\sqrt{\frac{2GM}{R}}}{\sqrt{\frac{GM}{R}}}$$

Step 2: Simplify the expression.

$$\frac{v_e}{v_o} = \sqrt{2}$$

Thus the ratio is

$$\sqrt{2} : 1$$

Quick Tip: Escape velocity is $\sqrt{2}$ times the orbital velocity for the same celestial body.

16. Find the moment of inertia of a solid sphere about its diameter.

- (A) $\frac{2}{3}MR^2$
- (B) $\frac{2}{5}MR^2$
- (C) $\frac{1}{2}MR^2$
- (D) $\frac{3}{5}MR^2$

Correct Answer: (B) $\frac{2}{5}MR^2$

Solution:

Concept:

The **moment of inertia** of a body measures its resistance to rotational motion about a given axis.

For a **solid sphere**, the moment of inertia about an axis passing through its centre (diameter) is a standard result.

Step 1: Recall the standard formula.

The moment of inertia of a solid sphere about its diameter is

$$I = \frac{2}{5}MR^2$$

where M = mass of the sphere, R = radius of the sphere.

Step 2: Interpret the result.

This means the rotational inertia of a solid sphere depends on both its mass and the square of its radius.

Quick Tip: Common moment of inertia results: Ring about centre = MR^2 , Solid cylinder/disc = $\frac{1}{2}MR^2$, Solid sphere = $\frac{2}{5}MR^2$.

17. If the distance between two charges is doubled, the Coulomb force becomes:

- (A) Twice
- (B) Half
- (C) One-fourth
- (D) Four times

Correct Answer: (C) One-fourth

Solution:

Concept:

Coulomb's law states that the electrostatic force between two point charges is

$$F = \frac{kq_1q_2}{r^2}$$

where q_1, q_2 = magnitudes of charges, r = distance between the charges, k = Coulomb's constant.

The force is **inversely proportional to the square of the distance** between the charges.

Step 1: Write the original force.

$$F = \frac{kq_1q_2}{r^2}$$

Step 2: Double the distance between the charges.

If the distance becomes $2r$, then

$$F' = \frac{kq_1q_2}{(2r)^2}$$

Step 3: Simplify the expression.

$$F' = \frac{kq_1q_2}{4r^2}$$

$$F' = \frac{F}{4}$$

Thus, the force becomes **one-fourth of the original force**.

Quick Tip: In Coulomb's law, force varies inversely with the square of distance. If distance doubles, force becomes $1/4$; if distance triples, force becomes $1/9$.

18. What is the de Broglie wavelength of a particle at rest?

- (A) Zero
- (B) Infinite
- (C) One
- (D) Undefined

Correct Answer: (B) Infinite

Solution:

Concept:

According to **de Broglie hypothesis**, every moving particle has an associated wavelength given by

$$\lambda = \frac{h}{p}$$

where λ = de Broglie wavelength, h = Planck's constant, p = momentum of the particle.

Step 1: Express momentum.

Momentum of a particle is

$$p = mv$$

where m is mass and v is velocity.

Step 2: Consider a particle at rest.

For a particle at rest,

$$v = 0$$

$$p = 0$$

Step 3: Substitute into de Broglie equation.

$$\lambda = \frac{h}{0}$$

Thus,

$$\lambda = \infty$$

Hence, the wavelength of a particle at rest is **infinite**.

Quick Tip: The de Broglie wavelength is inversely proportional to momentum. Lower momentum means larger wavelength; if momentum approaches zero, wavelength becomes extremely large.

19. The working of an optical fiber is based on which phenomenon?

- (A) Refraction
- (B) Diffraction
- (C) Total Internal Reflection
- (D) Interference

Correct Answer: (C) Total Internal Reflection

Solution:

Concept:

Optical fibers transmit light signals over long distances using the principle of **Total Internal Reflection (TIR)**.

Total internal reflection occurs when light travels from a **denser medium to a rarer medium** and the angle of incidence is greater than the **critical angle**.

Step 1: Structure of optical fiber.

An optical fiber consists of:

- Core (denser medium)
- Cladding (rarer medium)

Step 2: Propagation of light.

Light entering the core undergoes repeated total internal reflections at the boundary between the core and cladding.

Step 3: Result.

Because of continuous total internal reflection, the light signal travels through the fiber with very little loss.

Quick Tip: For total internal reflection to occur: 1. Light must travel from denser to rarer medium. 2. Angle of incidence must be greater than the critical angle.

20. What is the hybridization of carbon in an Ethyne (C_2H_2) molecule?

- (A) sp^3
- (B) sp^2

(C) sp

(D) sp^3d

Correct Answer: (C) sp

Solution:

Concept:

Hybridization describes the mixing of atomic orbitals to form equivalent hybrid orbitals. In the ethyne molecule (C_2H_2), each carbon atom forms a triple bond with another carbon atom and a single bond with hydrogen.

Step 1: Determine the bonding around carbon.

Each carbon forms:

- One σ -bond with hydrogen
- One σ -bond with the other carbon
- Two π -bonds between the carbon atoms

Step 2: Count the regions of electron density.

Each carbon has two regions of electron density (two σ -bonds).

Step 3: Identify the hybridization.

Two regions of electron density correspond to sp hybridization, giving a linear geometry with a bond angle of 180° .

Quick Tip: Number of sigma bonds around carbon determines hybridization: 2 sigma bonds $\rightarrow sp$, 3 sigma bonds $\rightarrow sp^2$, 4 sigma bonds $\rightarrow sp^3$.

21. Name the linkage that holds amino acids together in a protein.

(A) Glycosidic bond

(B) Ester bond

(C) Peptide bond

(D) Hydrogen bond

Correct Answer: (C) Peptide bond

Solution:

Concept:

Proteins are polymers made up of amino acid monomers. The bond that links two amino acids together is called a **peptide bond**.

Step 1: Structure of amino acids.

Each amino acid contains:

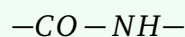
- An amino group ($-NH_2$)
- A carboxyl group ($-COOH$)
- A hydrogen atom
- A variable side chain (R-group)

Step 2: Formation of peptide bond.

A peptide bond forms when the carboxyl group of one amino acid reacts with the amino group of another amino acid.

Step 3: Condensation reaction.

During this reaction, a molecule of water is released, forming a **peptide linkage**:



This process forms long chains called **polypeptides** which fold into proteins.

Quick Tip: Remember: Proteins are made of amino acids joined by peptide bonds, carbohydrates by glycosidic bonds, and lipids by ester bonds.

22. Which element has the highest electronegativity in the periodic table?

- (A) Oxygen
- (B) Chlorine
- (C) Fluorine
- (D) Nitrogen

Correct Answer: (C) Fluorine

Solution:

Concept:

Electronegativity is the ability of an atom to attract shared electrons in a chemical bond. It generally increases across a period and decreases down a group in the periodic table.

Step 1: Trend in the periodic table.

Electronegativity increases from left to right across a period due to increasing nuclear charge.

Step 2: Trend down a group.

Electronegativity decreases down a group because atomic size increases and the attraction for bonding electrons decreases.

Step 3: Identify the most electronegative element.

Fluorine lies at the top-right of the periodic table (excluding noble gases), giving it the highest electronegativity value.

Step 4: Numerical value.

On the Pauling scale, the electronegativity of fluorine is approximately:

3.98

Quick Tip: Fluorine is the most electronegative element, followed by oxygen, chlorine, and nitrogen.

23. What is the product when Phenol reacts with neutral Ferric Chloride?

- (A) Green precipitate
- (B) Blue complex
- (C) Violet colored complex
- (D) Colorless solution

Correct Answer: (C) Violet colored complex

Solution:

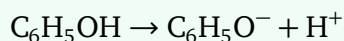
Concept:

Phenol reacts with **neutral ferric chloride** (FeCl_3) to form a colored complex. This reaction is commonly used as a **qualitative test for phenols**.

When phenol reacts with ferric chloride, a **violet (purple) colored complex** is formed due to the formation of a coordination compound between phenolate ions and Fe^{3+} .

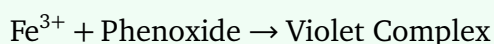
Step 1: Ionization of phenol.

Phenol slightly ionizes in solution to form phenoxide ions:



Step 2: Formation of ferric phenolate complex.

The phenoxide ions react with ferric ions:



Step 3: Observation.

A **violet colored complex** appears in the solution, confirming the presence of phenolic groups.

Quick Tip: Ferric chloride test is commonly used to detect phenols. A violet or purple coloration indicates the presence of phenolic compounds.

24. In a BCC (Body-Centered Cubic) unit cell, what is the coordination number?

- (A) 4
- (B) 6
- (C) 8
- (D) 12

Correct Answer: (C) 8

Solution:

Concept:

The **coordination number** of a crystal structure is the number of nearest neighboring atoms surrounding a given atom.

Step 1: Understand BCC structure.

In a **Body-Centered Cubic (BCC)** unit cell:

- Atoms are present at the 8 corners of the cube.

- One atom is present at the center of the cube.

Step 2: Nearest neighbors of the central atom.

The atom at the center is directly surrounded by the 8 corner atoms.

Step 3: Determine coordination number.

Thus, each atom in a BCC structure has **8 nearest neighbors**.

$$\text{Coordination Number} = 8$$

Quick Tip: Common coordination numbers: SC (Simple Cubic) = 6, BCC (Body-Centered Cubic) = 8, FCC (Face-Centered Cubic) = 12.