



Delhi Public School, Howrah

PERIODIC TEST - II (2025-2026)

CLASS - XI

SUBJECT - CHEMISTRY (Code No. 043)

Care must be taken not to write anything on the question paper. All the questions must be attempted in the correct sequence.

TIME - 3 HOURS

F.M. - 70

General Instructions:

Read the following instructions carefully.

1. There are 33 questions in this question paper with internal choice.
2. SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
3. SECTION B consists of 5 short answer questions carrying 2 marks each.
4. SECTION C consists of 7 short answer questions carrying 3 marks each.
5. SECTION D consists of 2 case-based questions carrying 4 marks each.
6. SECTION E consists of 3 long answer questions carrying 5 marks each.
7. All questions are compulsory.
8. Use of log tables and calculators is not allowed.

SECTION- A

Question 1 to 16 are multiple choice questions. Only one of the choices is correct.

Select and write the correct choice as well as the answer to these questions.

1. 0.5 g of an element X combines with 1 g of oxygen to form an oxide, and 1 g of X combines with 1.5 g of oxygen to form another oxide. Identify the law illustrated. 1
A. Law of definite proportions B. Law of multiple proportions
C. Law of conservation of mass D. Law of reciprocal proportions
2. Which electronic transition in a hydrogen atom produces radiation of shortest wavelength? 1
A. $n = \infty \rightarrow n=1$ B. $n=3 \rightarrow n=2$ C. $n=4 \rightarrow n=2$ D. $n=5 \rightarrow n=2$
3. Which element shows diagonal relationship with lithium? 1
A. Mg B. Ca C. Na D. Be
4. Which compound exhibits the highest bond angle? 1
A. H_2O B. NH_3 C. $BeCl_2$ D. BF_3
5. Which of the following reactions does not represent a redox change? 1
A. $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$ B. $FeCl_3 + 3NH_4OH \rightarrow Fe(OH)_3 + 3NH_4Cl$
C. $H_2 + Cl_2 \rightarrow 2HCl$ D. $2Na + 2H_2O \rightarrow 2NaOH + H_2$
6. 0.1 mole of urea is dissolved in 100 mL of solution. Calculate its molarity. 1
A. 0.1 M B. 0.5 M C. 1.0 M D. 2.0 M
7. Which of the following hydrocarbons will show geometrical isomerism? 1
A. 2-butene B. Propene C. Ethane D. 2-butyne
8. Determine the total number of nodes in a 3p orbital. 1
A. 0 B. 1 C. 2 D. 3
9. Which set of ions does not have same electronic configuration? 1
A. Na^+ , K^+ , Rb^+ B. Na^+ , Mg^{2+} , Al^{3+} C. F^- , O^{2-} , N^{3-} D. Li^+ , Be^{2+} , B^{3+}
10. Choose the correct option for the hybridisation of the central atom in PCl_5 and SF_6 . 1
A. sp^3 , sp^3d^2 B. sp^3d , sp^3d^2 C. sp^3 , sp^3d D. sp^2 , sp^3d^2
11. Which of the following species does not undergo disproportionation? 1
A. Cl_2 B. F_2 C. Br_2 D. I_2
12. The correct order of inductive effect (-I) is 1
A. $-NO_2 > -CN > -Cl > -CH_3$ B. $-CH_3 > -Cl > -CN > -NO_2$
C. $-Cl > -NO_2 > -CN > -CH_3$ D. $-CN > -NO_2 > -Cl > -CH_3$

Given below are two statements labelled as Assertion (A) and Reason (R).

Select the most appropriate answer from the options given below:

A. Both A and R are true and R is the correct explanation of A.

B. Both A and R are true but R is not the correct explanation of A.

C. A is true but R is false.

D. A is false but R is true.

13. **Assertion (A):** Mole fraction is unitless. 1
Reason (R): The value of mole fraction of a component present in a solution can be zero.
14. **Assertion (A):** Atom is the smallest particle of an element, but not of compound. 1
Reason (R): When a molecule of a compound is further broken, it gives atoms of elements.
15. **Assertion (A):** Ionisation enthalpy of nitrogen is higher than that of oxygen. 1
Reason (R): Extra stability of half-filled 2p subshell is present in nitrogen.
16. **Assertion (A):** CO₂ molecules have zero dipole moment. 1
Reason (R): Two C=O bond dipoles cancel due to bent geometry.

SECTION: B

Question No. 17 to 21 are very short answer questions carrying 2 marks each.

17. **Attempt either option A or B** 2X1
A. I. Explain why the second ionisation enthalpy of chromium is much higher than the first.
II. Write the electronic configuration of element with Z=29.

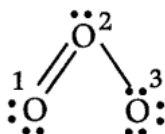
OR

- B. I. Differentiate between the terms 'electron gain enthalpy' and 'electronegativity'.
II. Arrange N, P, O, S, F and Cl on the basis of their electron affinity.
18. A. Write the significance of bond order on the basis of molecular orbital theory. 2X1
B. Why is the order of He₂ molecule zero?
19. Calculate the mass per cent of the following constituent elements of calcium phosphate. (Given, Ca=40u, P=31u, O=16u) 2X1
A. Calcium
B. Oxygen
20. A. Define lobe of an orbital. 2X1
B. How many electrons can be filled in all the orbitals with n+l=4?
21. Write the number of sigma and pi bond in the following molecules. 2
A. CH₃CH₂-NO₂
B. HCONHCH₃

SECTION: C

Question No. 22 to 28 are short answer questions, carrying 3 marks each.

22. Compare the bond order and magnetic behaviour of O₂, O₂⁺, O₂²⁻ using Molecular Orbital Theory. 3
23. Give reason for the following observations. 3X1
A. Law of conservation of mass fails in nuclear reaction.
B. Law of conservation of mass is not valid for reactions taking place in open container.
C. The reverse statement of law of definite proportion is incorrect.
24. A. An oxide of nitrogen contains 30.4% nitrogen. If its molar mass is 92 g/mol, determine its molecular formula. 3X1
B. Calculate the mass of water produced when 16 g of methane undergoes complete combustion.
C. Find the molecular mass of solid oxalic acid.
25. **Attempt any 3 of the following questions:** 3X1
A. Draw the structure of XeF₄ using VSEPR.
B. Explain why the bond angle in NH₃ is greater than in PH₃.
C. Show the resonance structures of CO₃²⁻.
D. Find the formal charge of the 1st oxygen atom in the following structure.



26. A. Assign oxidation number to S in **Na₂S₂O₃**. Justify your answer. **2X1.5**
 B. What is comproportionation reaction? Give an example.
27. Balance the following equation in acidic medium by half-reaction method: **3**

$$\text{Fe}^{2+} + \text{MnO}_4^- \rightarrow \text{Fe}^{3+} + \text{Mn}^{2+}$$
28. A. Draw the structure of the following compound. **3X1**
2-chloro-2-methylbutan-1-ol
 B. Explain which electron displacement effect accounts for the given order of acidity.
 $\text{Cl}_3\text{CCOOH} > \text{Cl}_2\text{CHCOOH} > \text{ClCH}_2\text{COOH}$
 C. Identify the functional groups present in the following compounds
 I. **2, 2, 4-Trimethylpentane** II. **Hexanedial**

SECTION: D

Question No. 29 & 30 are case-based/data -based questions carrying 4 marks each.

29. We can pinpoint an aeroplane moving in the sky. Whatever may be its speed, we can locate both its exact position as well as direction. However, it is not possible to do so in case of a moving microscopic particle such as electron. In fact, we cannot see any such particles without disturbing it. This was stated by Heisenberg in the form of uncertainty principle. The mathematical form of the principle is; $\Delta x \cdot \Delta p \geq h/4\pi$ (constant). Since the product of Δx and Δp ($m\Delta v$) is constant, if one is very small, other is bound to be large. The principle as such has no significance in daily life since it applies to those particles which we cannot see.

Based on the information provided in the case, answer the following questions:

1+1+2

I. Analyse why the uncertainty principle does not apply to macroscopic objects like an airplane but is significant for microscopic particles such as electrons.

OR

Evaluate the statement: "Mass plays a role in the applicability of Heisenberg uncertainty principle."

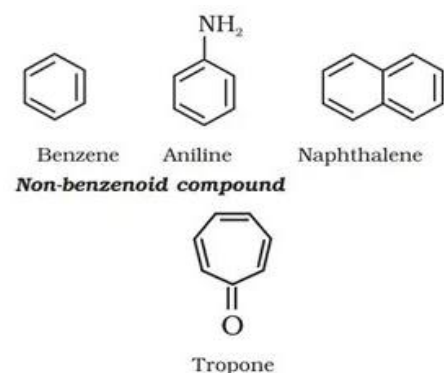
II. If Δp decreases by half, predict what happens to Δx ?

A. Becomes half. B. Remains same. C. Becomes one-fourth. D. Increases.

III. Using Heisenberg uncertainty principle, explain why electron cannot exist inside the nucleus.

30. Aromatic compounds are special types of organic compounds. These include benzene and other related ring compounds (benzenoid). Like alicyclic compounds, aromatic compounds may also have hetero atom in the ring. Such compounds are called heterocyclic aromatic compounds. Some of the examples of various types of aromatic compounds are as follows:

Benzenoid aromatic compounds



Heterocyclic aromatic compounds



Based on the information provided above, answer the following questions:

1+1+2

I. A. Explain why aromatic compounds are considered a special class compared to alicyclic compounds.

OR

B. Determine the number of π electrons present in a pyridine ring.

II. Differentiate between *benzenoid* and *heterocyclic aromatic compounds* with examples.

III. Relate the extra stability of aromatic compounds to the structure of benzenoid compounds.

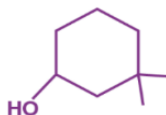
SECTION: E

The following questions are long answer type and carry 5 marks each. All questions have an internal choice.

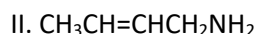
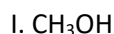
31. **Attempt either A or B**

5X1

- A. I. Between $\text{O}_2\text{NCH}_2\text{CH}_2\text{O}^-$ and $\text{CH}_3\text{CH}_2\text{O}^-$, determine which is expected to be more stable and why.
II. Distinguish between inductive effect and resonance effect.
III. Explain how the electronegativity of carbon atoms varies with their state of hybridisation in an organic compound.
IV. Write IUPAC name of the given compound.



- V. Identify which of the following compounds will not exist as a resonance hybrid and justify your answer.



OR

- B. I. Explain why $(\text{CH}_3)_3\text{C}^+$ is more stable than $\text{CH}_3\text{-CH}^+$.
II. Draw the enol form of acetone.
III. State the hybridisation of the central carbon atom in $\text{H}_2\text{C}=\text{C}=\text{CH}_2$.
IV. Draw the bond-line structural formula for 2-hydroxy-1,2,3-propanetricarboxylic acid.
V. Write the IUPAC name of the given compound.



32. **Attempt either A or B**

5X1

- A. I. Justify the placement of alkali metals in group 1 of the periodic table.
II. Determine the position of the element with $Z=114$.
III. Explain why the first member of every group shows anomalous behaviour.
IV. Among the following elements, identify the one that will attract the shared pair of electrons most strongly.

Electronegativity of X: 0.95

Electronegativity of Y: 2.5

Electronegativity of Z: 3.9

- V. Name the least metallic element of group-13.

OR

- B. I. The electronegativity values of two atoms X and Y are 0.7 and 3.7. Predict the nature of bond formed between them.
II. Why do Zn and Cd show similarity in their properties?
III. Write the IUPAC name of the elements with atomic number 123.
IV. Determine the position of an element with atomic number 88 in the periodic table.
V. Arrange the following elements on the basis of first ionization enthalpy.

Li, Be, B, C, N, O, F, Ne

33. **Attempt either A or B**

3+2

- A. I. Calculate energy difference between the $n=2$ and $n=3$ orbits of hydrogen atom. ($R_H = 2.18 \times 10^{-18} \text{ J}$).
II. An element with mass number 81 contains 31.7% more neutrons as compared to protons. Assign the atomic symbol.

OR

- B. I. Show that the circumference of the Bohr orbit for the hydrogen atom is an integral multiple of the de Broglie wavelength associated with the electron revolving around the orbit.
II. Explain why the energy of electrons is considered negative in Bohr model.