



Indian School Al Wadi Al Kabir

Assessment I (2026-2027)

CHEMISTRY (043)

Class: XI

Max. Marks: 70

Date: 20/09/2026

Set - 1

Time: 3 Hours

General Instructions:

Read the following instructions carefully.

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

SECTION A

The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1. The four quantum numbers of the outermost electron of an element are:
 $n = 3, l = 1, m_l = -1$ and $m_s = -\frac{1}{2}$
Identify the element.
a) Al b) Si c) S d) P
2. Which of the following has the lowest energy?
a) 4f b) 5d c) 5p d) 6s
3. The number of unpaired electrons present in Ni^{2+} is
a) 8 b) 1 c) 2 d) 3
4. Element X has the electronic configuration $[\text{Ne}] 3s^2 3p^5$, while element Y has the configuration $[\text{Ar}] 4s^1$. Which statement is correct?
a) X has a larger atomic radius than Y.
b) X has a higher first ionization enthalpy than Y.

- c) Y has a greater negative electron gain enthalpy than X.
d) Both X and Y belong to the same period.
5. How many moles of ions are present in 40 mL of 0.05 mol L⁻¹ NaCl solution?
a) 0.004 b) 0.002 c) 0.001 d) 0.008
 6. The empirical formula mass of glucose (C₆H₁₂O₆) is
a) 30 u b) 180 u c) 60 u d) 15 u
 7. Which of the following is not a chalcogen?
a) Oxygen (O) b) Nitrogen (N) c) Sulphur (S) d) Selenium (Se)
 8. The general outer electronic configuration of p-block elements is
a) ns²np¹⁻⁸ b) ns²np¹⁻⁶ c) ns¹np¹⁻⁸ d) ns²np¹⁻¹⁰
 9. Among the following molecules, which one has the highest bond angle?
a) NH₃ b) H₂O c) BF₃ d) CH₄
 10. Which of the following is an odd-electron molecule?
a) CO₂ b) NO₂ c) CO d) BF₃
 11. The bond order of NO⁺ is
a) 1 b) 2 c) 3 d) 4
 12. Equal masses of methane (CH₄) and carbon tetrachloride (CCl₄) are taken. Which statement is correct?
a) Both contain an equal number of molecules.
b) Methane contains more molecules than carbon tetrachloride.
c) Carbon tetrachloride contains more molecules than methane.
d) Both contain an equal number of atoms.

**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):** In the ground state, there are two electrons in the 4s orbital of copper.
Reason (R): Half-filled and completely filled sub-shells are more stable.
 14. **Assertion (A):** The limiting reagent determines the maximum amount of product formed in a chemical reaction.
Reason (R): The limiting reagent is completely consumed before the other reactants.

15. **Assertion (A):** BeCl₂ is a polar molecule.
Reason (R): The shape of BeCl₂ is linear.
16. **Assertion (A):** Electron gain enthalpy of oxygen is less negative than that of sulphur.
Reason (R): Sulphur is more electronegative than oxygen.

SECTION B

This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.

17. a) What is the maximum volume of butane, in mL, which will completely burn in 130 mL of oxygen?
$$\text{C}_4\text{H}_{10} + 6.5 \text{ O}_2 \rightarrow 4 \text{ CO}_2 + 5 \text{ H}_2\text{O}$$

b) Find the numbers of neutrons and electrons in a chloride ion, ³⁷Cl⁻.
18. Draw the boundary surface diagrams of:
i) p_x ii) d_{z^2}
19. a) The density of a 4 M solution of NaOH is 2.5 g mL⁻¹. Calculate the molality.
(Na = 23u, O = 16u, H = 1u)
b) What is the unit of mole fraction?
20. a) State the modern periodic law.
b) Atomic size increases on moving down the group. Why?
- OR**
- a) Write the general outer electronic configuration of *f-block* elements.
b) Write the IUPAC name and symbol of the element with atomic number 104.
21. Which of the following is more covalent and why?
a) MgCl₂ or AlCl₃
b) NaCl or NaBr

SECTION C

This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

22. a) Calculate the wavelength of a cricket ball of mass 600 g moving with a velocity of 15 m s⁻¹. ($h = 6.6 \times 10^{-34}$ Js)
b) State Hund's rule of maximum multiplicity.
23. Zinc reacts with hydrochloric acid according to the equation:
$$\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$$

If 13 g of Zn is added to 10.95 g of HCl, determine:
a) the limiting reagent.
b) the mass of ZnCl₂ formed.
(Zn = 65u, Cl = 35.5u)

24. The first ($\Delta_i H_1$), second ($\Delta_i H_2$) and third ($\Delta_i H_3$) ionization enthalpies and electron gain enthalpy (in kJ mol^{-1}) of a few elements are given below:

Elements	$\Delta_i H_1$	$\Delta_i H_2$	$\Delta_i H_3$	$\Delta_{eg} H$
P	419	3050	4420	-50
Q	690	1200	5740	-68
R	1350	2660	4580	-320
S	1710	3380	5300	+65

Answer the following:

Which of the above elements is likely to be?

- a) an alkali metal b) an inert gas c) a halogen
25. Draw the Lewis representation of:
a) NO_3^- b) CN^- c) CO
Mention the charge on each atom.
26. a) State Heisenberg's Uncertainty Principle.
b) A microscope using suitable photons is employed to locate an electron in an atom within a distance of 10 nm. What is the uncertainty involved in the measurement of its velocity? (Given: mass of an electron = $9 \times 10^{-31} \text{ kg}$.)
27. Answer the following questions:
a) BF_3 is a non-polar molecule. Why?
b) Define intramolecular hydrogen bond. Give an example.
c) Which is more polar, NH_3 or NF_3 ? Why?
28. Consider the following:
 $\text{O}_2, \text{O}_2^-, \text{O}_2^+$
Find the bond order and arrange these species in increasing order of:
a) Bond length b) Bond strength
OR
a) Write any two conditions for the combination of atomic orbitals to form molecular orbitals.
b) Explain the following observations using Molecular Orbital theory:
i) He_2 does not exist.
ii) B_2 is paramagnetic in nature.

SECTION D

The following questions are case -based questions. Each question has an internal choice and carries 4 (1+1+2) marks. Read the passage carefully and answer the questions that follow.

29. Answer the following questions:

Solutions are homogeneous mixtures of two or more components. The concentration of a solution is a measure of the amount of solute that has been dissolved in a given

amount of solvent or solution. A concentrated solution is one that has a relatively large amount of dissolved solute. There are several ways by which the concentration of the solution can be described quantitatively.

a) 600 mL of 0.8 mol L⁻¹ HCl solution is diluted to 1.5 L by mixing with water. What is the concentration of the diluted solution?

b) Molarity depends on temperature. Why?

c) Calculate the molality of a solution which contains 83.25g of CaCl₂ dissolved in 750g of water. (Ca = 40u, Cl = 35.5u)

OR

c) Calculate the mass of NaOH to be dissolved in water to form 400 mL of 1.5molL⁻¹ sodium hydroxide solution.

30. The first ($\Delta_i H_1$) ionization enthalpies (in kJ mol⁻¹) of a few second-period elements are given below:

Li	Be	B	C	N	O	F
520	899	-	1086	-	1314	1681

Answer the following questions:

a) Define first ionisation enthalpy.

b) Name the element having the highest first ionisation enthalpy in the modern periodic table.

c) Using the table above, predict the first ionization enthalpy of:

(i) Boron

(ii) Nitrogen

OR

c) i) Write a chemical equation to represent the second ionisation of Ca including state symbols.

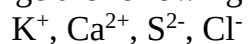
ii) Which element in period 3 has the highest second ionisation enthalpy?

SECTION E

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

31. Answer the following questions:

a) Arrange the following in increasing order of size.



b) [BF₄]⁻ is known, but [BF₆]³⁻ is unknown. Why?

c) What are isoelectronic species? Give examples.

d) Name the element with the most negative electron gain enthalpy.

e) The first electron gain enthalpy of lithium is -60 kJ mol⁻¹. Write an equation including state symbols to represent the first electron gain enthalpy of lithium.

OR

- a) First ionisation enthalpy of P is larger than that of S. Why?
- b) Identify the smaller ion/atom in the following:
 - i) Mg or Mg^{2+}
 - ii) Cl or Cl^-
- c) Which block of the periodic table contains the transition elements? Give an example of a transition element.
- d) Define electronegativity. Name the second most electronegative element.
- e) What are transuranium elements?

- 32.
- a) Calculate the radius and energy associated with the 3rd orbit of Li^{2+} .
 - b) Among the following pairs of orbitals, which orbital will experience the greater effective nuclear charge?
 - i) 1s and 2s
 - ii) 3p and 3d
 - c) Which of the following orbitals is not possible?
1s, 2p and 3f

OR

- a) 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.
- b) Calculate the angular nodes and radial nodes present in the 4f subshell.
- c) How many electrons in an atom can have the following quantum numbers?
 $n = 4, l = 1, m_s = +\frac{1}{2}$

- 33.
- a) Define the term Hybridisation.
 - b) Explain the Hybridisation in CH_4 . Predict its shape and bond angle.
 - c) Classify the following as polar and non-polar molecules:
 $\text{CO}_2, \text{SO}_2, \text{O}_2, \text{CHCl}_3$

OR

- a) Draw the resonance structures and resonance hybrid of NO_2^- .
- b) Complete the following table:

COMPOUND	SHAPE	BOND ANGLE	HYBRIDISATION
SF_6			
BeCl_2			