**DOs:**
1. Check whether the CET No. has been entered and shaded in the respective circles on the OMR answer sheet.
2. This Question Booklet is issued to you by the invigilator after the 2nd Bell i.e., after 2.30 p.m.
3. The Serial Number of this question booklet should be entered on the OMR answer sheet.
4. The Version Code of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely.
5. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

**DON'Ts:**
1. THE TIMING AND MARKS PRINTED ON THE OMR ANSWER SHEET SHOULD NOT BE DAMAGED / MUTILATED / SPOILED.
2. The 3rd Bell rings at 2.40 p.m., till then;
   - Do not remove the paper seal present on the right hand side of this question booklet.
   - Do not look inside this question booklet.
   - Do not start answering on the OMR answer sheet.

**IMPORTANT INSTRUCTIONS TO CANDIDATES**
1. This question booklet contains 60 questions and each question will have one statement and four distracters. (Four different options / choices.)
2. After the 3rd Bell is rung at 2.40 p.m., remove the paper seal on the right hand side of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet. Read each item and start answering on the OMR answer sheet.
3. During the subsequent 70 minutes:
   - Read each question carefully.
   - Choose the correct answer from out of the four available distracters (options / choices) given under each question / statement.
   - Completely darken / shade the relevant circle with a BLUE OR BLACK INK BALL POINT PEN against the question number on the OMR answer sheet.

**Correct Method of shading the circle on the OMR answer sheet is as shown below:**
![Shading Method](https://via.placeholder.com/150)

4. Please note that even a minute unintended ink dot on the OMR answer sheet will also be recognised and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
5. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
6. After the last bell is rung at 3.50 p.m., stop writing on the OMR answer sheet and affix your LEFT HAND THUMB IMPRESSION on the OMR answer sheet as per the instructions.
7. Hand over the OMR ANSWER SHEET to the room invigilator as it is.
8. After separating the top sheet (Our Copy), the invigilator will return the bottom sheet replica (Candidate’s copy) to you to carry home for self-evaluation.
9. Preserve the replica of the OMR answer sheet for a minimum period of ONE year.

[Turn Over]
1. The unit cell with crystallographic dimensions, \(a \neq b \neq c, \alpha = \gamma = 90\) and \(\beta \neq 90\) is
   - (1) Triclinic
   - (2) Monoclinic
   - (3) Orthorhombic
   - (4) Tetragonal

2. While charging the lead storage battery, ______.
   - (1) \(\text{PbSO}_4\) on anode is reduced to \(\text{Pb}\)
   - (2) \(\text{PbSO}_4\) on cathode is reduced to \(\text{Pb}\)
   - (3) \(\text{PbSO}_4\) on cathode is oxidized to \(\text{Pb}\)
   - (4) \(\text{PbSO}_4\) on anode is oxidized to \(\text{PbO}_2\)

3. Adenosine is an example of
   - (1) Nucleotide
   - (2) Purine base
   - (3) Pyrimidine base
   - (4) Nucleoside

4. Orlon has monomeric unit
   - (1) Acrolein
   - (2) Glycol
   - (3) Vinyl cyanide
   - (4) Isoprene

5. The two electrons have the following set of quantum numbers:
   \[P = 3, 2, -2, +\frac{1}{2}\]
   \[Q = 3, 0, 0, +\frac{1}{2}\]
   Which of the following statement is true?
   - (1) \(P\) and \(Q\) have same energy
   - (2) \(P\) has greater energy than \(Q\)
   - (3) \(P\) has lesser energy than \(Q\)
   - (4) \(P\) and \(Q\) represent same electron

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Space For Rough Work

A-1 2 C
6. \( \text{H}_2\text{O}_2 \) cannot oxidise
   (1) \( \text{PbS} \)  (2) \( \text{Na}_2\text{SO}_3 \)
   (3) \( \text{O}_3 \)  (4) \( \text{KI} \)

7. In the given set of reactions,
   \[ 2\text{-Bromopropane} \xrightarrow{\text{AgCN, alc./heat}} \text{X} \xrightarrow{\text{LiA/H}_4} \text{Y} \]
   the IUPAC name of product ‘Y’ is
   (1) N-Methylpropanamine  (2) N-Isopropylmethanamine
   (3) Butan-2-amine       (4) N-Methylpropan-2-amine

8. On heating with concentrated \( \text{NaOH} \) solution in an inert atmosphere of \( \text{CO}_2 \), white phosphorous gives a gas. Which of the following statement is incorrect about the gas?
   (1) It is less basic than \( \text{NH}_3 \).
   (2) It is more basic than \( \text{NH}_3 \).
   (3) It is highly poisonous and has smell like rotten fish.
   (4) Its solution in water decomposes in the presence of light.

9. Sodium metal crystallizes in B.C.C. lattice with edge length of 4.29 Å. The radius of sodium atom is
   (1) 2.857 Å  (2) 1.601 Å
   (3) 2.145 Å  (4) 1.857 Å

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Space For Rough Work

C 3 A-1
10. 0.06% (w/v) aqueous solution of urea is isotonic with
   (1) 0.06% glucose solution  (2) 0.6% glucose solution
   (3) 0.01 M glucose solution  (4) 0.1 M glucose solution

11. In a first order reaction, the concentration of the reactant is reduced to 12.5% in one hour. When was it half completed?
   (1) 3 hr  (2) 20 min
   (3) 30 min  (4) 15 min

12. The electrolyte having maximum flocculation value for Agl/Ag⁺ sol. is
   (1) NaCl  (2) Na₂S
   (3) Na₂SO₄  (4) Na₃PO₄

13. Copper is extracted from Copper pyrites by heating in a Bessemer converter. The method is based on the principle that
   (1) Copper has more affinity for oxygen than Sulphur at high temperature.
   (2) Iron has less affinity for oxygen than Sulphur at high temperature.
   (3) Copper has less affinity for oxygen than Sulphur at high temperature.
   (4) Sulphur has less affinity for oxygen at high temperature.

14. Which of the following will be able to show geometrical isomerism?
   (1) MA₂B – Square planar  (2) MA₂B₂ – Tetrahedral
   (3) MABCD – Square planar  (4) MABCD – Tetrahedral

Space For Rough Work

A-1  4  C
15. The electronic configuration of Gd$^{2+}$ is (at. no. of Gd is 64)
   
   (1) [Xe] 4f$^6$
   
   (2) [Xe] 4f$^7$
   
   (3) [Xe] 4f$^7$ 5d$^1$ 6s$^2$
   
   (4) [Xe] 4f$^7$ 5d$^1$

16. $\text{MSO}_4\text{NH}_4\text{OH} \xrightarrow{\text{white}} \text{X} \xrightarrow{\text{excess NH}_4\text{OH}} \text{Y} \xrightarrow{\text{H}_2\text{S}} \downarrow \text{Z}$

Here M and Z are

(1) Cu, ZnS

(2) Zn, ZnS

(3) Fe, FeS

(4) Al, Al$_2$S$_3$

17. The hydrolysis of optically active 2-bromobutane with aqueous NaOH result in the formation of

(1) (+) butan-2-ol

(2) (−) butan-2-ol

(3) (±) butan-1-ol

(4) (±) butan-2-ol

18. The distinguishing test between methanoic acid and ethanoic acid is

(1) Litmus test

(2) Tollen’s test

(3) Esterification test

(4) Sodium bicarbonate test

19. In H$_2$–O$_2$ fuel cell the reaction occurring at cathode is

(1) $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(l)$

(2) $\text{O}_2(\text{g}) + 2\text{H}_2\text{O}(l) + 4\text{e}^- \rightarrow 4\text{OH}^-_{(\text{aq})}$

(3) $\text{H}^+ + \text{e}^- \rightarrow \frac{1}{2}\text{H}_2$

(4) $\text{H}^+_{(\text{aq})} + \text{OH}^-_{(\text{aq})} \rightarrow \text{H}_2\text{O}(l)$

Space For Rough Work
20. Which of the following curve is in accordance with Freundlich adsorption isotherm?

(1) \[ \log I = \frac{x}{p} \]

(2) \[ \log I = \frac{x}{p} \]

(3) \[ \log I = \frac{x}{p} \]

(4) \[ \log I = \frac{x}{p} \]

21. How many ions per molecule are produced in the solution when Mohr salt is dissolved in excess of water?

(1) 4  
(2) 5  
(3) 6  
(4) 10

22. Glycogen is

(1) a polymer of \( \beta\)-D-glucose units  
(2) a structural polysaccharide  
(3) structurally very much similar to amylopectin  
(4) structurally similar to amylopectin but extensively branched

23. Number of possible alkynes with formula \( C_5H_8 \) is

(1) 2  
(2) 3  
(3) 4  
(4) 5

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Space For Rough Work
24. Which of the following aqueous solution has the highest freezing point?
   (1) 0.1 M Sucrose  
   (2) 0.01 M NaCl  
   (3) 0.1 M NaCl  
   (4) 0.01 M Na₂SO₄

25. Half life period of a first order reaction is 10 min. Starting with initial concentration 12 M, the rate after 20 min is
   (1) 0.0693 M min⁻¹  
   (2) 0.693 × 3 M min⁻¹  
   (3) 0.0693 × 3 M min⁻¹  
   (4) 0.0693 × 4 M min⁻¹

26. The salt which responds to dilute and concentrated H₂SO₄ is
   (1) CaF₂  
   (2) Ba(NO₃)₂  
   (3) Na₂SO₄  
   (4) Na₃PO₄

27. On heating potassium permanganate, one of the following compound is not obtained:
   (1) O₂  
   (2) MnO  
   (3) MnO₂  
   (4) K₂MnO₄

28. \[ \text{dry ether} \]

The product ‘B’ is
   (1) OH  
   (2) MgBr  
   (3)  
   (4) OH

Space For Rough Work
29. The formation of cyanohydrin from a ketone is an example of
   (1) Nucleophilic substitution  (2) Nucleophilic addition
   (3) Electrophilic addition    (4) Electrophilic substitution

30. One of the following is an essential amino acid.
   (1) Tyrosine                (2) Cysteine
   (3) Isoleucine              (4) Serine

31. The aqueous solution of following salt will have the lowest pH :
   (1) NaC/O₃                  (2) NaC/O
   (3) NaC/O₂                  (4) NaC/O₄

32. For one of the element various successive ionization enthalpies (in kJ mol⁻¹) are given below:

<table>
<thead>
<tr>
<th>I.E.</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>5th</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>577.5</td>
<td>1810</td>
<td>2750</td>
<td>11,580</td>
<td>14,820</td>
</tr>
</tbody>
</table>

The element is
   (1) Si                 (2) P
   (3) Al                (4) Mg

33. 0.30 g of an organic compound containing C, H and Oxygen on combustion yields 0.44 g CO₂ and 0.18 g H₂O. If one mol of compound weighs 60, then molecular formula of the compound is

   (1) CH₂O           (2) C₃H₈O
   (3) C₄H₆O         (4) C₂H₄O₂

Space For Rough Work
34. One of the following amide will not undergo Hoffmann bromamide reaction:

(1) CH₃CONH₂
(2) CH₃CONHCH₃
(3) C₆H₅CONH₂
(4) CH₃CH₂CONH₂

35. Cheilosis and digestive disorders are due to the deficiency of

(1) Thiamine
(2) Ascorbic acid
(3) Riboflavin
(4) Pyridoxine

36. How many Coulombs of electricity are required for the oxidation of one mol of water to dioxygen?

(1) 9.65 × 10⁴ C
(2) 1.93 × 10⁴ C
(3) 1.93 × 10⁵ C
(4) 19.3 × 10⁵ C

37. 100 cm³ of 1 M CH₃COOH was mixed with 100 cm³ of 2 M CH₃OH to form an ester. The change in the initial rate if each solution is diluted with equal volume of water would be

(1) 2 times
(2) 4 times
(3) 0.5 times
(4) 0.25 times

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Space For Rough Work
38. Which of the following colloids cannot be easily coagulated?
   (1) Lyophobic colloids
   (2) Multimolecular colloids
   (3) Macromolecular colloids
   (4) Irreversible colloids

39. The complex ion having minimum magnitude of $\Delta_0$(CFSE) is
   (1) $[\text{Cr}((CN)_6)]^{3-}$
   (2) $[\text{Co}((NH_3)_6)]^{3+}$
   (3) $[\text{Co}((Cl)_6)]^{3-}$
   (4) $[\text{Cr}((H_2O)_6)]^{3+}$

40. The arrangement of following compounds:
   i. bromomethane
   ii. bromoform
   iii. chloromethane
   iv. dibromomethane
   In the increasing order of their boiling point is
   (1) iii < i < iv < ii
   (2) iv < iii < i < ii
   (3) ii < iii < i < iv
   (4) i < ii < iii < iv

41. Iodoform can be prepared from all, except
   (1) propan-2-ol
   (2) butan-2-one
   (3) propan-1-ol
   (4) acetophenone

Space For Rough Work
42. Identify ‘Q’ in the following sequence of reactions:

\[
\text{COCH}_3 \xrightarrow{\text{PCl}} \text{p} \xrightarrow{\text{excess NaNH}_2} Q
\]

(1) \(\text{ }\)
(2) \(\text{ }\)
(3) \(\text{ }\)
(4) \(\text{ }\)

43. Cryolite is

(1) \(\text{Na}_3\text{AlF}_6\) and is used in the electrolysis of alumina for decreasing electrical conductivity.
(2) \(\text{Na}_3\text{AlF}_6\) and is used in the electrolysis of alumina for lowering the melting point of alumina only.
(3) \(\text{Na}_3\text{AlF}_6\) and is used in the electrolysis of alumina for lowering the melting point and increasing the conductivity of alumina.
(4) \(\text{Na}_3\text{AlF}_6\) and is used in the electrolytic refining of alumina.

44. Which of the following compound of Xenon has pyramidal geometry?

(1) \(\text{XeOF}_4\)  
(2) \(\text{XeF}_2\)  
(3) \(\text{XeO}_3\)  
(4) \(\text{XeF}_4\)

45. After adding non-volatile solute freezing point of water decreases to \(-0.186\) °C. Calculate \(\Delta T_b\) if \(K_f = 1.86 \text{ K kg mol}^{-1}\) and \(K_b = 0.521 \text{ K kg mol}^{-1}\)

(1) 0.521  
(2) 0.0521  
(3) 1.86  
(4) 0.0186

Space For Rough Work
46. Plot of Maxwell’s distribution of velocities is given below:

Which of the following is correct about this plot?

(1) \( T_1 < T_2 \)  
(2) \( f_1 > f_2 \)
(3) \( T_1 > T_2 \)  
(4) \( V_1 < V_2 \)

47. The pair of compound which cannot exist together in solution is

(1) \( \text{NaHCO}_3 \) and \( \text{NaOH} \)
(2) \( \text{NaHCO}_3 \) and \( \text{H}_2\text{O} \)
(3) \( \text{NaHCO}_3 \) and \( \text{Na}_2\text{CO}_3 \)
(4) \( \text{Na}_2\text{CO}_3 \) and \( \text{NaOH} \)

48. What amount of dioxygen (in gram) contains \( 1.8 \times 10^{22} \) molecules?

(1) 0.0960  
(2) 0.960
(3) 9.60  
(4) 96.0

Space For Rough Work
49. Using MOT, compare $O_2^+$ and $O_2^-$ species and choose the incorrect option.
   
   (1) $O_2^+$ have higher bond order than $O_2^-$.  
   (2) $O_2^-$ is less stable.  
   (3) $O_2^+$ is diamagnetic while $O_2^-$ is paramagnetic.  
   (4) Both $O_2^+$ and $O_2^-$ are paramagnetic.

50. Which of the following is not true?
   
   (1) Erythromycin is a bacteriostatic antibiotic.  
   (2) Ampicillin is not a natural antibiotic.  
   (3) Prontosil is not converted into sulphanilamide in the body.  
   (4) Vancomycin is a broad spectrum antibiotic.

51. In the reaction
   
   $$S + \frac{3}{2}O_2 \rightarrow SO_3 + 2x \text{ kJ} \text{ and } SO_2 + \frac{1}{2}O_2 \rightarrow SO_3 + y \text{ kJ}$$
   
   heat of formation of $SO_2$ is
   
   (1) $x + y$  
   (2) $x - y$  
   (3) $2x - y$  
   (4) $2x + y$

52. Arrange the following compounds in the increasing order of their acidic strength:
   
   i. m-nitrophenol  
   ii. m-cresol  
   iii. phenol  
   iv. m-chlorophenol
   
   (1) $iii < ii < i < iv$  
   (2) $ii < iv < iii < i$  
   (3) $ii < iii < iv < i$  
   (4) $ii < iii < i < iv$

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Space For Rough Work
53. In the sequence of following reactions:

\[ P \xrightarrow{(1) \text{Br}_2} Q \xrightarrow{(1) \text{NaNO}_2/\text{HCl}} 273 - 278 \text{K} \xrightarrow{(2) \text{H}_2\text{O}/\text{H}_3\text{PO}_4} \text{OH} \xrightarrow{\text{KMnO}_4} \text{Br} \text{COOH} \]

the starting compound ‘P’ is

(1) o-nitro toluene
(2) m-nitro toluene
(3) o-bromo toluene
(4) p-nitro toluene

54. Acetic acid is treated with Ca(OH)_2 and the product so obtained is subjected to dry distillation. The final product is

(1) ethanal
(2) propanal
(3) propanone
(4) ethanol

55. The correct statement is

(1) BF_3 is the strongest Lewis acid among the other boron halides.
(2) BI_3 is the weakest Lewis acid among the boron halides.
(3) There is maximum pπ – pπ back bonding in BF_3.
(4) There is minimum pπ – pπ back bonding in BF_3.

56. Which of the following compound possesses the “C – H” bond with the lowest bond dissociation energy?

(1) Toluene
(2) Benzene
(3) n-pentane
(4) 2, 2-dimethyl propane
57. In presence of HCl, H₂S results the precipitation of Group-2 elements but not Gp-4 elements during qualitative analysis. It is due to

(1) higher concentration of S²⁻  (2) higher concentration of H⁺
(3) lower concentration of S²⁻  (4) lower concentration of H⁺

58. One of the following conversion results in the change of hybridization and geometry:

(1) CH₄ to C₂H₆  (2) NH₃ to NH₄⁺
(3) BF₃ to BF₄⁻  (4) H₂O to H₃O⁺

59. Water softening by Clark’s process uses

(1) CaHCO₃  (2) NaHCO₃
(3) Na₂CO₃  (4) Ca(OH)₂

60. An alkali metal hydride (NaH) reacts with diborane in ‘A’ to give a tetrahedral compound ‘B’ which is extensively used as reducing agent in organic synthesis. The compounds ‘A’ and ‘B’ respectively are

(1) C₂H₆ and C₂H₅Na  (2) CH₃COCH₃ and B₃N₃H₆
(3) C₆H₆ and NaBH₄  (4) (C₂H₅)₂O and NaBH₄

Space For Rough Work

C  15  A-1