Series : SSJ/2

SET – 4

प्रश्न पत्र कोड नं.
Question Paper Code No. **056/2/4**

रोल नं.
Roll No.

परीक्षार्थी QP कोड को OMR उत्तर-पत्रक के मुख-पृष्ठ पर अवश्य लिखें/भरें।
Candidates must write / fill the QP Code in the space allotted on OMR Sheet.

नोट / NOTE :

(i) कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ **32** हैं।
Please check that this question paper contains **32** printed pages.

(ii) कृपया जाँच कर लें कि इस प्रश्न-पत्र में **55** बहुविकल्पीय प्रश्न (MCQs) हैं।
Please check that this question paper contains **55** Multiple Choice Questions (MCQs.)

(iii) प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए QP कोड नम्बर को छात्र OMR शीट में उपयुक्त स्थान पर लिखें।
QP Code given on the right hand side of the question paper should be written on the appropriate place of the OMR Sheet by the candidates.

(iv) परीक्षा शुरू होने के वास्तविक समय से पहले इस प्रश्न-पत्र को पढ़ने के लिए **20** मिनट का अतिरिक्त समय आबंटित किया गया है।
20 minute additional time has been allotted to read this question paper prior to actual time of commencement of examination.

रसायन विज्ञान (सैद्धान्तिक)
CHEMISTRY (Theory)
Term – 1 (सत्र – 1)

निर्धारित समय : 90 मिनट
Time allowed : 90 Minutes

अधिकतम अंक : 35
Maximum Marks : 35

ENGLISH VERSION

General Instructions :

(i) *This question paper contains* ***55*** *questions out of which* ***45*** *questions are to be attempted.*

(ii) *All questions carry* ***equal*** *marks.*

(iii) *The question paper consists of three Sections – Section* ***A****,* ***B*** *and* ***C****.*

(iv) ***Section A*** *contains* ***25*** *questions. Attempt any* ***20*** *questions from Q. No.* ***1 to 25****.*

(v) ***Section B*** *contains* ***24*** *questions. Attempt any* ***20*** *questions from Q. No.* ***26 to 49****.*

(vi) ***Section C*** *contains* ***6*** *questions. Attempt any* ***5*** *questions from Q. No.* ***50 to 55****.*

(vii) *The first* ***20*** *questions attempted in Section* ***A*** *&* *Section* ***B*** *and first* ***5*** *questions attempted in Section* ***C*** *by a candidate will be evaluated.*

(viii) *There is only* ***one*** *correct option for every multiple choice question (MCQ). Marks will not be awarded for answering more than* ***one*** *option.*

(ix) *There is no negative marking.*

SECTION – A

This section consists of **25** Multiple Choice Questions with overall choice to attempt any **20** questions. In case more than desirable number of questions are attempted, ONLY first **20** will be considered for evaluation.

1. In a crystal of an ionic compound, the ions Q form the ccp lattice and the ions P occupy all the tetrahedral voids. The formula of the compound is

(a) PQ_2 (b) P_2Q

(c) PQ (d) PQ_3

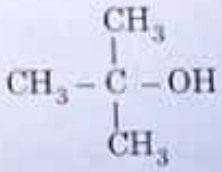
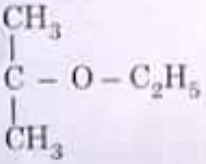
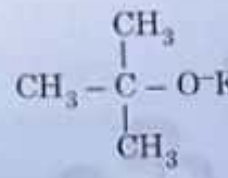
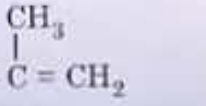
2. Increasing the temperature of an aqueous solution will cause

(a) Increase in Molarity
(b) Increase in Molality
(c) Decrease in Molarity
(d) Decrease in Molality

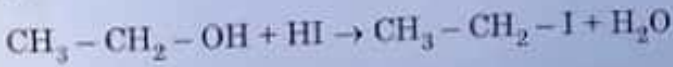
3. Which of the following conditions is correct for an ideal solution ?

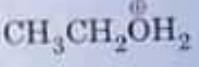
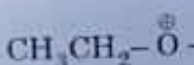
(a) $\Delta H_{mix} = 0$ and $\Delta V_{mix} = 0$
(b) $\Delta H_{mix} > 0$ and $\Delta V_{mix} > 0$
(c) $\Delta H_{mix} < 0$ and $\Delta V_{mix} < 0$
(d) $\Delta H_{mix} > 0$ and $\Delta V_{mix} < 0$

4. 2-Bromo-2-methylpropane is allowed to react with alcoholic KOH solution. The major product formed is

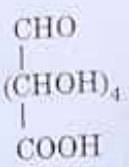
(a) 
(b) 
(c) 
(d) 

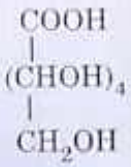
5. Which of the following intermediates is formed in the reaction shown below ?



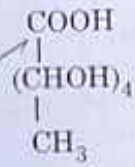
(a) 
(b) 
(c) Both and
(d) 

6. Glucose is oxidized by Br_2 water to give

(a) 

(b) 

(c) 

(d) 

7. Which of the following has the largest bond angle ?

(a) NH_3

(b) H_2O

(c) PH_3

(d) NH_4^+

8. Which of the following elements does not show an oxidation state higher than +2 ?

(a) Oxygen

(b) Sulphur

(c) Selenium

(d) Tellurium

9. Which of the following is a molecular solid ?

(a) KCl

(b) SiO_2

(c) Cu

(d) Ar

10. For determination of molar mass of polymers and proteins, which colligative property is used ?

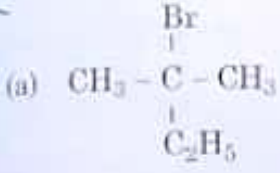
(a) Relative lowering in vapour pressure

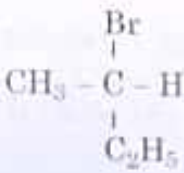
(b) Elevation in boiling point

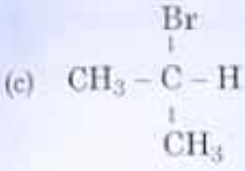
(c) Osmotic pressure

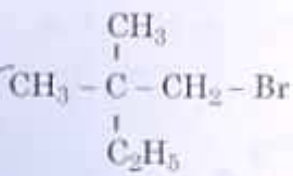
(d) Depression in freezing point

11. Which of the following molecules is chiral in nature ?

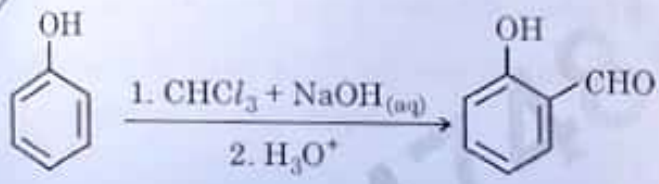
(a) 

(b) 

(c) 

(d) 

12. The reaction :



is an example of

(a) Reimer-Tiemann reaction
(b) Kolbe's reaction
(c) Williamson's synthesis
(d) Wurtz reaction

13. Which of the following is fibrous protein ?

(a) Albumin
(b) Keratin
(c) Insulin
(d) Globin

14. The acid strength of HF, HCl, HBr and HI increases in the order

(a) HF < HCl < HBr < HI
(b) HI < HBr < HCl < HF
(c) HBr < HI < HCl < HF
(d) HF < HBr < HI < HCl

15. Which is not correct about concentrated H_2SO_4 ?

(a) Dehydrating agent

(b) Oxidising agent

(c) $Ka_2 > Ka_1$

(d) It forms two series of salts.

16. Pure water boils at 373.15 K and nitric acid boils at 359.15 K. An azeotropic mixture of H_2O and HNO_3 boils at 393.55 K. Distilling the azeotropic mixture will cause

(a) Pure nitric acid to distil over first.

(b) Pure water to distil over first.

(c) One of them to distil over with a small amount of the other.

(d) both of them to distil over in the same composition as that of the mixture being distilled.

17. A 5% (by mass) solution of glucose (molar mass = 180 g mol^{-1}) is isotonic with 1% solution (by mass) of a substance 'X'. The molar mass of 'X' is

(a) 36 g mol^{-1}

(b) 18 g mol^{-1}

(c) 72 g mol^{-1}

(d) 900 g mol^{-1}

18. An S_N1 reaction of an enantiomerically pure chiral alkyl halide gives a product

(a) with retention of configuration

(b) with inversion of configuration

(c) with racemisation

(d) with partial racemisation

19. In the following reaction,

$$PhCH = CH_2 \xrightarrow[H_2O_2/OH^-]{B_2H_6} (?)$$

(Where Ph is Phenyl)

The product formed is

(a) $PhCH(OH) - CH_3$

(b) $PhCH_2 - CH_2 - OH$

(c) $PhCH_2CHO$

(d) $Ph - C(=O) - CH_3$

20. α-D-Glucopyranose and β-D-Glucopyranose are

(a) Isomers which differ in configuration at C-5

(b) Geometrical isomers

(c) Functional isomers

(d) Anomers

21. Fluorine does not exhibit variable oxidation states due to

(a) Non-availability of d-orbitals in valence shell

(b) Low bond dissociation enthalpy

(c) High electronegativity

(d) Small size

22. The formation of $O_2^+[PtF_6]^-$ is the basis for the formation of Xenon fluoride. This is because

(a) O_2 and Xe have comparable electronegativities.

(b) O_2 and Xe have comparable sizes.

(c) O_2 and Xe have comparable ionization enthalpies.

(d) O_2 and Xe have comparable electron gain enthalpies.

23. Chlorobenzene reacts with Cl_2 in the presence of $FeCl_3$ giving ortho and para chloro compounds. The reaction is

(a) Nucleophilic substitution reaction

(b) Nucleophilic addition reaction

(c) Electrophilic addition reaction

(d) Electrophilic substitution reaction

24. Phenol is more acidic than ethanol because

(a) Ethoxide ion is more stable than Phenoxide ion.

(b) Phenoxide ion is more stable than Ethoxide ion.

(c) Phenol undergoes electrophilic substitution reaction.

(d) Phenol undergoes protonation easily.

25. Which of the following statements is not correct about amorphous solids ?

(a) Amorphous solids are anisotropic.

(b) Amorphous solids have a tendency to flow.

(c) Amorphous solids have short range order.

(d) Amorphous solids have irregular shape.

SECTION – B

This section consists of **24** Multiple Choice Questions with overall choice to attempt any **20** questions. In case more than desirable number of questions are attempted, ONLY first **20** will be considered for evaluation.

26. An element with molar mass 96 g mol^{-1} forms a cubic unit cell with edge length 4×10^{-8} cm. If density is 10 g cm^{-3}, the nature of unit cell is ($N_A = 6 \times 10^{23}$ mol^{-1})

(a) simple cubic
(b) bcc
(c) fcc
(d) End centered cubic

27. When 2.5 g of a non-volatile solute was dissolved in 50 mL of water, it gave boiling point elevation of 0.52 °C. The molar mass of the solute is (K_b for water = 0.52 Km^{-1})

(a) 100 g mol^{-1}
(b) 50 g mol^{-1}
(c) 25 g mol^{-1}
(d) 75 g mol^{-1}

28. Which of the following gas is released on heating ammonium dichromate $(NH_4)_2Cr_2O_7$?

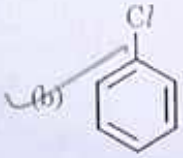
(a) NO_2
(b) N_2O
(c) NO
(d) N_2

29. On its reaction with water and alkalies, the behaviour of $SO_{2(g)}$ is very similar to that of which gas ?

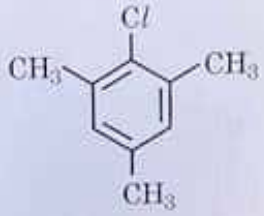
(a) NO_2
(b) CO_2
(c) NH_3
(d) N_2O

30. Which of the following is most reactive towards nucleophilic substitution reaction ?

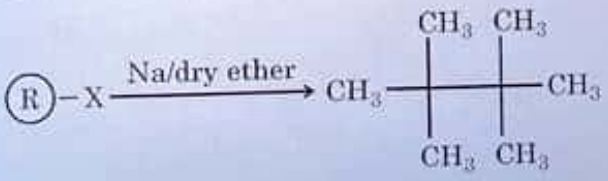
(a) 

(b) 

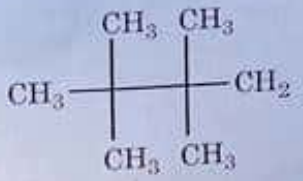
(c) 

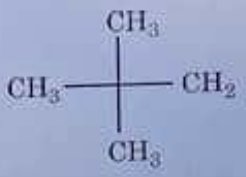
(d) 

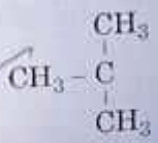
31. In the following reaction

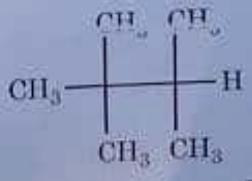


(R) in the above reaction is

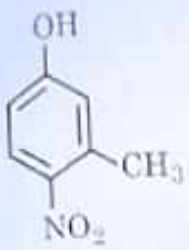
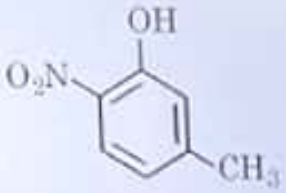
(a) 

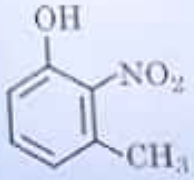
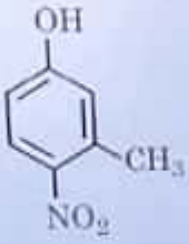
(b) 

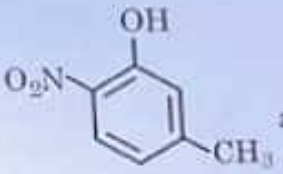
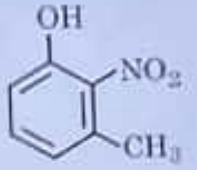
(c) 

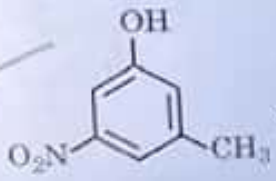
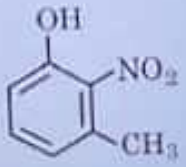
(d) 

32. The structure(s) of the major product(s) expected from the mononitration of 3-methylphenol will be

(a)  and 

(b)  and 

(c)  and 

(d)  and 

33. 1-Phenylethanol may be prepared by the reaction of C_6H_5MgBr with

(a) $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$

(b) CH_3-CHO

(c) $HCHO$

(d) CH_3-CH_2-CHO

34. Two among the three components of DNA are 2-deoxyribose and a nitrogen containing heterocyclic base. The third component is

(a) D-ribose
(b) Thymine
(c) Guanine
(d) Phosphoric acid

35. Which one among the following bases is usually not present in RNA ?

(a) Uracil
(b) Thymine
(c) Adenine
(d) Guanine

36. Glucose on reaction with $(CH_3CO)_2O$ forms glucose pentaacetate which confirms the presence of

(a) – CHO group
(b) – COOH group
(c) Five – OH groups
(d) A straight chain

37. To increase the solubility of CO_2 gas in soft drinks, the bottle is sealed under

(a) Low pressure
(b) High temperature
(c) Constant pressure
(d) High pressure

38. A solution of a pair of volatile liquids A and B shows negative deviation from Raoult's law. This is because

(a) $p_A > p^\circ_A x_A$ and $p_B > p^\circ_B x_B$
(b) The intermolecular forces A – A, B – B < A – B.
(c) Both ΔH_{mixing} and ΔV_{mixing} are positive.
(d) All of the above

39. The structure of XeF_6 is

(a) Distorted Octahedral
(b) Regular Octahedral
(c) Square Pyramidal
(d) Square Planar

40. On the basis of ΔH°_{bond}, which of the following has the strongest bond ?

(a) H – I
(b) H – Cl
(c) H – F
(d) H – Br

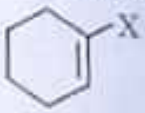
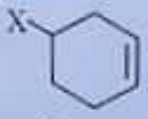
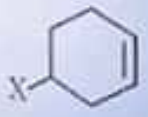
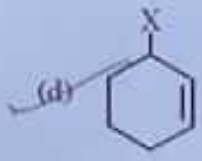
41. Which of the following oxoacids of Sulphur contains peroxide linkage ?

(a) H_2SO_4
(b) $H_2S_2O_7$
(c) H_2SO_3
(d) $H_2S_2O_8$

42. Which of the following reactions is not correct ?

(a) $2F_2 + 2H_2O \rightarrow 4H^+ + 4F^- + O_2$
(b) $2I_2 + 2H_2O \rightarrow 4H^+ + 4I^- + O_2$
(c) $Cl_2 + H_2O \rightarrow HCl + HOCl$
(d) $Br_2 + H_2O \rightarrow HBr + HOBr$

43. Which of the following belongs to the class of allylic halides ?

(a) 
(b) 
(c) 
(d) 

44. Which reagent will be required for one step conversion of benzenediazonium chloride to phenol ?

(a) Cu_2Cl_2
(b) $NaOH_{(aq)}$
(c) H_2O
(d) Alcoholic KOH

Given below are the questions **(45 – 49)** 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.

45. **Assertion (A)** : Relative lowering in vapour pressure is a colligative property.

Reason (R) : Relative lowering in vapour pressure depends upon mole fraction of pure solvent.

46. **Assertion (A)** : ZnO on heating turns yellow.

Reason (R) : Excess Zn^{2+} ions move to interstitial sites and the electron to neighbouring interstitial sites.

47. **Assertion (A)** : F_2 is a powerful oxidizing agent.

Reason (R) : Fluorine shows anomalous behaviour.

48. **Assertion (A)** : Monoclinic Sulphur is stable at room temperature.

Reason (R) : Both Rhombic Sulphur and Monoclinic Sulphur have S_8 molecules.

49. **Assertion (A)** : Reaction of $(CH_3)_3C - Br$ with CH_3ONa gives majorly 2-methylpropene.

Reason (R) : CH_3ONa acts as a strong base.

SECTION – C

This section consists of **6** Multiple choice questions with an overall choice to attempt any **5**. In case more than desirable number of questions are attempted, ONLY first **5** will be considered for evaluation.

50. Match the following :

I	II
i. $Cl_{2(g)}$	A. Inert at room temperature
ii. $He_{(g)}$	B. Reducing agent
iii. $N_{2(g)}$	C. Bleaching agent
iv. $F_{2(g)}$	D. Low solubility in blood
v. Moist $SO_{2(g)}$	

Which of the following is the best matched option ?

(a) i-B ii-A iii-C iv-D

(b) i-D ii-B v-A iii-C

(c) i-C ii-D iii-A v-B

(d) i-A ii-D iii-C iv-B

51. Which of the following analogies is correct ?

(a) Chloroform-acetone : Positive deviation :: Ethanol-H_2O : Negative deviation.

(b) $p_A = p_A^\circ \cdot x_A$: Henry's law : : $p = K_H \cdot x$: Raoult's law

(c) $P_{Total} = p_A + p_B$: Non-ideal solution : : $P_{Total} > p_A + p_B$: Ideal solution

(d) $\pi = CRT$: Osmotic pressure :: $P > \pi$: Reverse osmosis.

P.T.O.

52. Complete the following analogy :

o-nitrophenol : A :: o-cresol : B

(a) A : more acidic than phenol B : less acidic than phenol

(b) A : less acidic than phenol B : more acidic than phenol

(c) A : more acidic than phenol B : more acidic than phenol

(d) A : less acidic than phenol B : less acidic than phenol

Case : Read the passage given below and answer the following questions 53-55.

No crystal is found to be perfect at room temperature. These defects are basically irregularities in the arrangement of constituent particles. These defects can be stoichiometric or Non-stoichiometric. Stoichiometric defects are of two types : Schottky and Frenkel defect. Schottky is basically a vacancy defect while Frenkel is an interstitial defect. Due to non-stoichiometric defects, the formula of the ionic compound is different from the ideal formula. These defects are also of two types : (i) Metal excess defect and (ii) Metal deficiency defect.

53. What type of defect is shown by AgCl ?

(a) Schottky defect (b) Frenkel defect

(c) Metal excess defect (d) Metal deficiency defect

54. Which of the following defects lowers the density of the crystal but does not affect the stoichiometry ?

(a) Schottky defect (b) Frenkel defect

(c) Metal excess defect (d) Metal deficiency defect

55. Excess of potassium makes KCl crystals violet due to the formation of

(a) Cation vacancies (b) Anion vacancies

(c) F-centres (d) Interstitial defect