FIITJEE

CBSE TERM - I
ALL XIITH STUDYING BATCHES

Part Test – I
CHEMISTRY
(29th October 2021)

Time: 1:30 Hours   **Maximum Marks: 45**

General Instructions:

1.   The question paper contains three sections A, B and C

2.   Section A consists of 25 questions MCQ Single Option Correct, out of which students will attempt any 20 questions only. Each question carries +1 Mark.

3.   Section B consists of 24 questions MCQ Single Option Correct, out of which 5 questions are Assertion-Reasoning type. Students will attempt any 20 questions only. Each question carries +1 Mark.

4   Section C consists of 6 questions MCQ Single Option Correct out of which 4 questions are based on case studies. Students will attempt any 5 questions only. Each question carries +1 Mark.

5.   There is no negative marking.
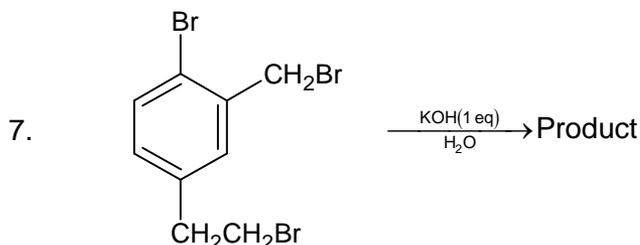

Name of the Candidate   :   ....

Enroll Number   :   ....

Date of Examination   :   ....
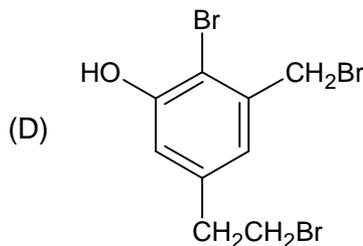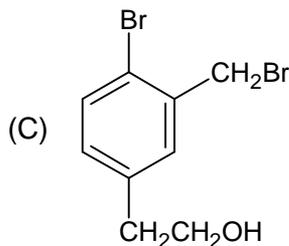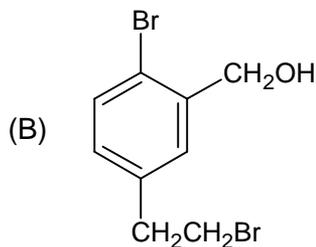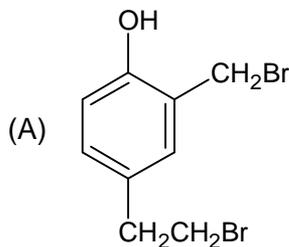

CHEMISTRY

SECTION – A

*This section contains **25 Multiple Choice Questions** number **1 to 25**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.*
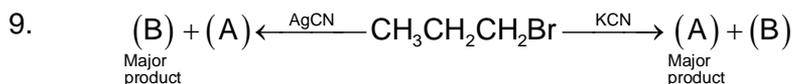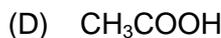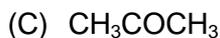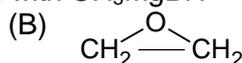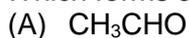
1. In a primitive cubic unit cell of a metal, the metal atoms are present at the
    (A) corners
    (B) corners and face centres
    (C) corners and body centre
    (D) face centre and body centre

2. The boiling point of four liquids follows the order:
    P > Q > R > S
    The vapour of which liquid will be present in maximum amount in the saturated vapour of the mixture of the liquids?
    (A) P
    (B) Q
    (C) R
    (D) S

3. What is the coordination number of a metallic crystal having FCC unit cell?
    (A) 6
    (B) 8
    (C) 12
    (D) 10

4. 100 mL of 0.2 M $CaCl_2$ solution is isotonic with
    (A) 100 mL of 0.2 M $C_6H_{12}O_6$ solution
    (B) 200 mL of 0.3 M NaCl solution
    (C) 100 mL of 0.3 M KCl solution
    (D) 200 mL of 0.1 M $Al_2(SO_4)_3$ solution

5. The number of tetrahedral and octahedral voids in hexagonal primitive unit cell are:
    (A) 8, 4
    (B) 2, 1
    (C) 12, 6
    (D) 6, 12

6. Sodium metal crystallizes in a body centred cubic lattice with the cell edge a = 3.29 A^0 what is radius of sodium atom
    (A) 1. 8574 A^0
    (B) 1.645 A^0
    (C) 1.299 A^0
    (D) 1.424 A^0

7.
    $\xrightarrow[H_2O]{KOH(1\ eq)}$ Product

    The product of above reaction is:

(A)

OH

CH$_2$Br

CH$_2$CH$_2$Br

(B)

Br

CH$_2$OH

CH$_2$CH$_2$Br

(C)

Br

CH$_2$Br

CH$_2$CH$_2$OH

(D)

Br

HO

CH$_2$Br

CH$_2$CH$_2$Br

8.   Which forms a primary alcohol when treated with CH_3MgBr?
(A) CH_3CHO
(B)

CH$_2$—CH$_2$ O (epoxide)

(C) CH_3COCH_3
(D) CH_3COOH

9. $(B) + (A) \xleftarrow{AgCN} CH_3CH_2CH_2Br \xrightarrow{KCN} (A) + (B)$
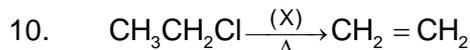
Major product (left)   Major product (right)

In the above reaction, products (A) and (B) are:
(A) chain isomers
(B) position isomers
(C) functional isomers
(D) optical isomers

10. $CH_3CH_2Cl \xrightarrow[\Delta]{(X)} CH_2 = CH_2$

The reagent (X) used in the above reaction is :
(A) KOH/H_2O
(B) KOH/C_2H_5OH
(C) KOH/HCN
(D) KOH/H_2SO_4

11.   Which of the following reaction takes place through S_N1 path?
(A) $C_2H_5Cl + KOH \xrightarrow{H_2O} C_2H_5OH + KCl$
(B) $C_2H_5Cl + NaCN \xrightarrow{CH_3OH} C_2H_5CN + NaCl$
(C) $C_2H_5Cl + KNO_2 \xrightarrow{AgNO_3} C_2H_5NO_2 + KCl$
(D) $C_2H_5Cl + NaN_3 \xrightarrow{DMSO} C_2H_5N_3 + NaCl$
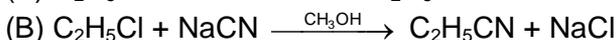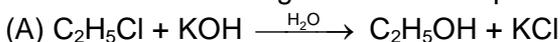
12.   Which of the following is less than zero for ideal solution
(A) $\Delta Hmix$
(B) $\Delta Vmix$
(C) $\Delta Gmix$
(D) $\Delta Emix$

13.   The vapour pressure of a mixture of liquids P and Q is expressed in the following way.
V.P = (240 + 120 X_P) mm of Hg
Where X_P is the mole fraction of P
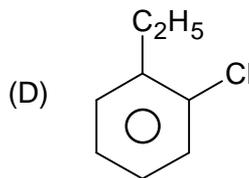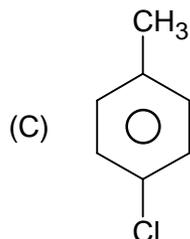Which of the following pure liquid has the highest vapour pressure?
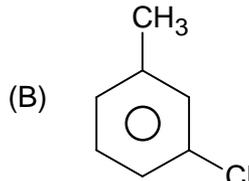(A) P
(B) Q
(C) Both have same V.P
(D) Unpredictable

14. Which of the following 0.1 M aqueous solutions will have the lowest freezing point?
(A) K_2SO_4 (B) NaCl
(C) Urea   (D) Glucose

15. $(X) \xrightarrow[\text{Liq.NH}_3]{\text{KNH}_2} \text{Products}$

Which will form maximum number of monosubstituted products in the above reaction?

(A)

(B)

(C)

(D)
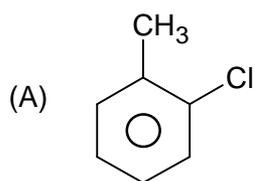
16. Which of the following cannot form a yellow precipitate with I_2/NaOH?
(A) CH_3COCH_3 (B) CH_3CHO
(C) CH_3CH_2OH (D) $CH_3CH_2\underset{\underset{OH}{|}}{C}HCH_2CH_3$

17. $\xrightarrow{\text{NH}_3}$ Product

The product of above reaction is:

(A)

(B)

(C)

(D)
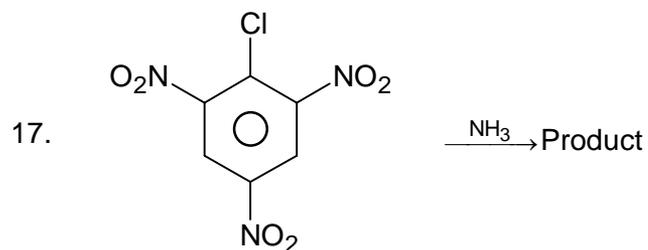
18. Which of the following compound is most reactive towards OH^- ion through S_N1 path?

(A)

(B)

(C)

(D)
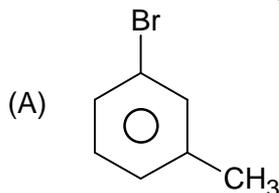
19. A metal crystal contains b.c.c unit cell, what is the co-ordination number of the metal?
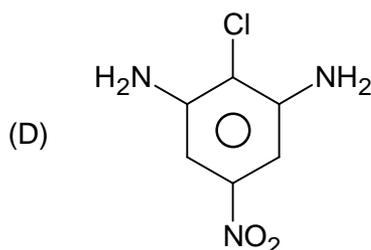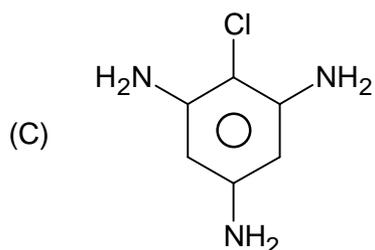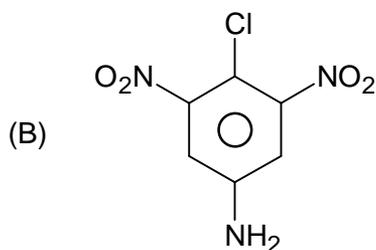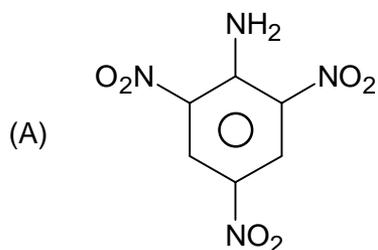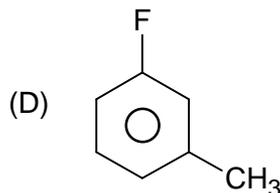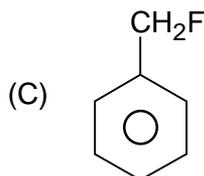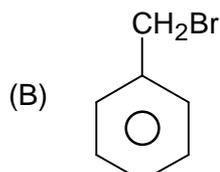   (A) 6   (B) 8
   (C) 4   (D) 10

20. Equimolar quantities of which of the following can decrease the vapour pressure of water by maximum extent?
   [Assume complete dissociation of salts]
   (A) $NaCl$ (B) $CaCl_2$
   (C) $AlCl_3$ (D) CCl_4

21. In the crystal of NaCl, Na^+ ions are present at
   (A) face centres and edge centres   (B) corners and body centre
   (C) edge centres and body centre   (D) face centres and corners

22. Isotonic solutions have identical value of
   (A) vapour pressure   (B) osmotic pressure
   (C) either (A) or (B)   (D) Both (A) & (B)

23. For which of the following substance, there is maximum difference between theoretical and experimental colligative properties?
   (A) Tolune   (B) Benzene
   (C) Benzoic acid   (D) Styrene

24. Which of the following properties change(s) in a crystal due to Schottky defect?
   (A) Density decreases   (B) Electrical neutrality is not maintained
   (C) Crystal contains more cation than anion (D) None of these

25.
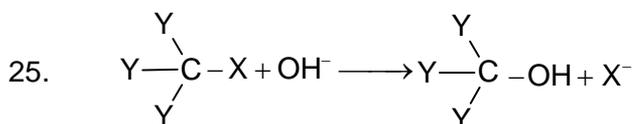
   The rate of above second order reaction will be maximum if 'X' and 'Y' are respectively.
   (A) 'CH₃' and 'Cl'   (B) 'Br' and 'H'
   (C) 'CH₃' and 'Br'   (D) 'H' and 'F'

SECTION – B

*This section contains **24 Multiple Choice Questions** number **26 to 49, out of which 5 questions are Assertion-Reasoning type.** Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.*

26. Correct order of leaving group tendency is
    (A) $I^- > Br^- > Cl^- > F^-$
    (B) $F^- > Cl^- > Br^- > I^-$
    (C) $Cl^- > F^- > Br^- > I^-$
    (D) $I^- > Cl^- > Br^- > F^-$

27. The S_N2 reactivity order for halides is
    (A) $R - F > R - Cl > R - Br > R - I$
    (B) $R - I > R - Br > R - Cl > R - F$
    (C) $R - Br > R - I > R - Cl > R - F$
    (D) $R - Cl > R - Br > R - F > R - I$

28. In S_N1 reaction, the first step involves the formation of
    (A) free radical
    (B) carbanion
    (C) carbocation
    (D) final product

29. Arrange the following alkyl chlorides in order of decreasing reactivity in an S_N1 reaction:
    (I) isopropyl bromide
    (II) propyl bromide
    (III) tert-butyl bromide
    (IV) methyl bromide
    (A) (III) > (I) > (II) > (IV)
    (B) (I) > (III) > (IV) > (II)
    (C) (IV) > (III) > (II) > (I)
    (D) (I) > (II) > (III) > (IV)

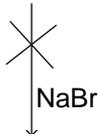30. $CH_3 - CH_2 - CH_2 - CH_2 - OH$

    | NaBr

    The reaction fails because
    (A) –OH group is not a good leaving group
    (B) Br^- is not a good nucleophile
    (C) both of these
    (D) none of these

31. Which of the following reagents is called Lucas reagent?
    (A) A mixture of HBr and $ZnCl_2$
    (B) A mixture of HI and $ZnCl_2$
    (C) A mixture of HCl and $ZnCl_2$
    (D) A mixture of HCl and $AlCl_3$

32. $CH_3 - CH_2 - CH_2 - I \xrightarrow[\text{EtOH}]{\text{Aq.KCN}} P_{(\text{Major})}$
    P should be
    (A) $CH_3 - CH_2 - CH_2 - CN$
    (B) $CH_3 - CH = CH_2$
    (C) both A & B in equal proportions
    (D) none of these

33. When a non-volatile solute is dissolved in a solvent, the relative lowering of vapour pressure is equal to
    (A) concentration of solute in g/L
    (B) concentration of solute in g/100 mL
    (C) mole fraction of solute
    (D) mole fraction of solvent

34. Which of the following 0.1 M aqueous solutions will have the lowest freezing point?
(A) K_2SO_4 (B) NaCl
(C) Glucose   (D) Urea

35. Which one of the following pairs of solution can we expect to be isotonic at the same temperature?
(A) 0.1 M urea and 0.1 M NaCl   (B) 0.1 M urea and 0.2 M $MgCl_2$
(C) 0.1 M NaCl and 0.1 M Na_2SO_4 (D) 0.1 M $Ca(NO_3)_2$ and 0.1 M Na_2SO_4

36. If mole fraction of a solvent in a solution decreases then
(A) vapour pressure of solution increases   (B) boiling point decreases
(C) osmotic pressure increases   (D) freezing point of solution increases

37. If liquids A and B form an ideal solution
(A) the free energy of mixing is zero
(B) the free energy as well as entropy of mixing are zero
(C) enthalpy of mixing is zero
(D) the entropy of mixing is zero

38. When a solution containing non-volatile solution is diluted with water
(A) its osmotic pressure increases   (B) its boiling point increases
(C) its freezing point increases   (D) its vapour pressure increases

39. The coordination number of a metal crystallizing in a hexagonal close packed structure is
(A) 12   (B) 4
(C) 8   (D) 6

40. Which of the following, when doped into a crystal of ultrapurified germanium, will convert it into a p-type semiconductor?
(A) C   (B) As
(C) In   (D) Na

41. Which of the following is true about the size of tetrahedral and octahedral voids?
(A) Size of tetrahedral void = Size of octahedral void
(B) Size of tetrahedral void > Size of octahedral void
(C) Size of tetrahedral void < Size of octahedral void
(D) Size of voids depends on the size of atoms present in packing

42. When NaCl is doped with 10^{-5} mol% $SrCl_2$ then what is the number of cationic vacancies per mole of NaCl?
(A) $2 \times 10^{-7} N_A$ (B) $10^{-7} N_A$
(C) $10^{-5} N_A$ (D) $10^{-6} N_A$

43. If a metal has bcc unit cell of edge length 400 pm, then atomic radius will be
(A) 141 pm   (B) 173 pm
(C) 100 pm   (D) 200 pm

44. Sodium chloride, NaCl usually crystallizes in a face centred cubit lattice. How many ions are in contact with any single Na^+ ion?
   (A) 4   (B) 6
   (C) 8   (D) 1

45. Assertion : Molecular solids have low melting point.
   Reason : Molecular solids are composed of covalent molecules.
   (A) Both assertion and reason are true and the reason is the correct explanation of assertion.
   (B) Both assertion and reason are true but the reason is not the correct explanation of assertion.
   (C) Assertion is true but reason is false.
   (D) Assertion is false but reason is true.

46. Assertion : Antiferromagnetic solids have a net magnetic moment.
   Reason : MnO is an antiferromagnetic solid.
   (A) Both assertion and reason are true and the reason is the correct explanation of assertion.
   (B) Both assertion and reason are true but the reason is not the correct explanation of assertion.
   (C) Assertion is true but reason is false.
   (D) Assertion is false but reason is true.

47. Assertion : Ideal solutions obey Raoult's law.
   Reason : ΔH_{mix} and ΔV_{mix} of ideal solutions are zero.
   (A) Both assertion and reason are true and the reason is the correct explanation of assertion.
   (B) Both assertion and reason are true but the reason is not the correct explanation of assertion.
   (C) Assertion is true but reason is false.
   (D) Assertion is false but reason is true.

48. Assertion : Azeotropic mixture are formed only by non-ideal solutions.
   Reason : Boiling point of an azeotropic mixture is either higher or lower than both the components of solution.
   (A) Both assertion and reason are true and the reason is the correct explanation of assertion.
   (B) Both assertion and reason are true but the reason is not the correct explanation of assertion.
   (C) Assertion is true but reason is false.
   (D) Assertion is false but reason is true.

49. Assertion : The vapour pressure of 0.5 molal urea and 0.5 molal can sugar will be different.
    Reason : The vapour pressure of solution may be calculate as:
    $$P = P^0 x_A$$
    P^0 = Vapour pressure of pure solvent, x_A = Mole fraction of solvent
    (A) Both assertion and reason are true and the reason is the correct explanation of assertion.
    (B) Both assertion and reason are true but the reason is not the correct explanation of assertion.
    (C) Assertion is true but reason is false.
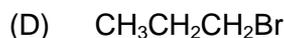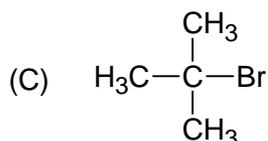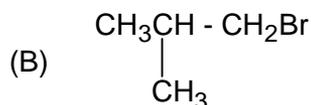   (D) Assertion is false but reason is true.

SECTION – C

This section contains 6 Multiple Choice Questions number 50 to 55, out of which 4 questions are based on case studies. Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE is correct.

(Case study - 50 – 53)

A primary alkyl halide(A) C_4H_9Br reacted with alcoholic KOH to give compound(B). Compound(B) is reacted with HBr to give compound(C) which is an isomer of (A). When (A) reacted with sodium metal, it gave a compound (D) C_8H_{18} that is different than the compound obtained when n-butyl bromide reacted with sodium metal.

The following questions are multiple choice questions. Choose the most appropriate answer.

50. Compound(A) is
    (A) $CH_3CH_2CH_2CH_2Br$

    (B)
    $$CH_3\underset{\underset{\displaystyle CH_3}{|}}{CH} - CH_2Br$$

    (C)
    $$H_3C\underset{\underset{\displaystyle CH_3}{|}}{\overset{\overset{\displaystyle CH_3}{|}}{C}}Br$$

    (D) $CH_3CH_2CH_2Br$

51. Which type of isomerism is present in compound(A) and (C)?
    (A) Positional
    (B) Functional
    (C) Chain
    (D) Both A & C
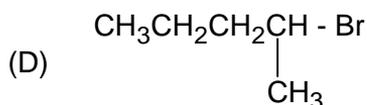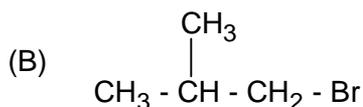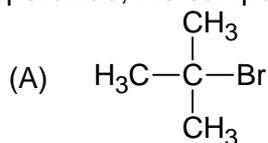
52. IUPAC name of compound (D) is
    (A) n-octane
    (B) 2, 5-dimethylhexane
    (C) 2-methylheptane
    (D) 3, 4-dimethyl hexane

53. When compound(C) is treated with alc.KOH and then treated with HBr in presence of peroxide, the compound obtained is

    (A)
    $$H_3C\underset{\underset{\displaystyle CH_3}{|}}{\overset{\overset{\displaystyle CH_3}{|}}{C}}Br$$

    (B)
    $$CH_3\underset{\underset{\displaystyle CH_3}{|}}{CH} - CH_2 - Br$$

    (C) $CH_3CH_2CH_2CH_2Br$

    (D)
    $$CH_3CH_2CH_2\underset{\underset{\displaystyle CH_3}{|}}{CH} - Br$$

54. Percentage of free space in cubic close packed structure and in body centred packed structure are respectively
    (A) 32% and 48%
    (B) 48% and 26%
    (C) 30% and 26%
    (D) 26% and 32%

55. Ethylene glycol is used as an antifreeze in a cold climate. Mass of ethylene glycol which should be added to 4 Kg of water to prevent it from freezing at -6°C will be
    (K_f for water = 1.86 K kg mol^{-1} and molar mass of ethylene glycol = 62 g mol^{-1})
    (A) 304.60 g
    (B) 800.00 g
    (C) 204.30 g
    (D) 400.00 g