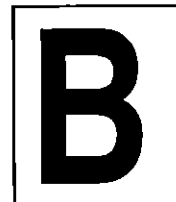# Sr. Scientific officer

## DO NOT OPEN THIS BOOKLET UNTIL YOU ARE ASKED TO DO SO.

### PRELIMINARY SCREENING
### TEST BOOKLET

TEST BOOKLET SERIES

**B**

Time allowed : $1\frac{1}{2}$ hours

Full marks : 100

Answer *all* the questions.

Questions are of equal value.

Serial No. ........**0194**..............

Roll No.:

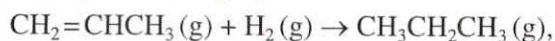Signature of the Candidate:

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## INSTRUCTIONS

Candidates should read the following instructions carefully before answering the questions:

1.  This booklet consists of 16 pages including this front page, containing 100 questions. **Verify the Page Nos. and Test Booklet series on each page and bring at once to the Invigilator's notice any discrepancy.**

2.  Answers will have to be given in the OMR Sheet supplied for the purpose.

3.  Before you proceed to mark in the OMR Sheet in response to various items in the Test Booklet, you have to fill in some particulars in the OMR Sheet. *Do not fold the OMR Sheet as this will result in error in your marks.*

4.  All questions are of multiple-choice answer-type. You will find *four* probable answers (A), (B), (C) and (D) against each question. Find out which of the four answers appears to you to be correct or the best. Now darken the circle corresponding to the letter of the selected answer in the OMR Sheet with **Black Ball Point Pen.**

5.  One and only one circle is to be fully blackened for answer. Any spot in any other circle (multiple circle) or in wrong circle will be considered as wrong answer. If more than one circle is encoded for a particular answer, it will be treated as a wrong answer. Use of whitener is strictly prohibited.

6.  *There will be negative marking of $\frac{1}{3}$ mark for each wrong answer.*

7.  *There are blank pages at the end of this Booklet for Rough Work.*

8.  *The OMR Sheet should be handed over to the Invigilator before leaving the Examination Hall. You are permitted to take away the used Test Booklet after completion of the examination.*
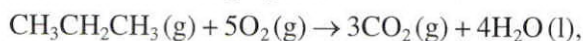
**Please Turn Over**

**1.** 5-Oxo-2-methylhexanal produced in ozonolysis from —

(A) 

(B) 

(C) 

(D) 
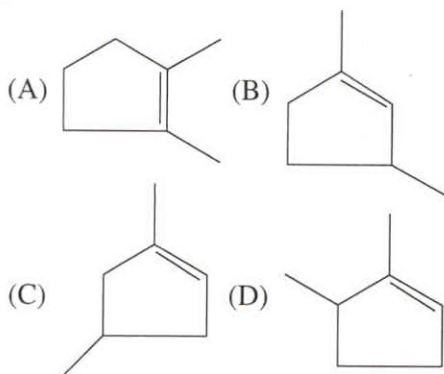
**2.** The standard reaction enthalpies for hydrogenation of propene

$$CH_2 = CHCH_3(g) + H_2(g) \rightarrow CH_3CH_2CH_3(g),$$

the combustion of propane

$$CH_3CH_2CH_3(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(l),$$

and combustion of hydrogen

$$H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l)$$
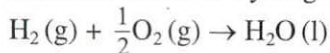
are respectively $-124 \, kJ \, mol^{-1}$, $-2220 \, kJ \, mol^{-1}$ and $-286 \, kJ \, mol^{-1}$.

The standard enthalpy of combustion of propene would be

(A) $-2058 \, kJ \, mol^{-1}$

(B) $2058 \, kJ \, mol^{-1}$

(C) $2630 \, kJ \, mol^{-1}$

(D) $-2630 \, kJ \, mol^{-1}$

**3.** The quantities – concentration, volume, pressure, chemical potential may be classified respectively as

(A) extensive, intensive, intensive, extensive

(B) intensive, intensive, extensive, intensive

(C) intensive, extensive, intensive, intensive

(D) extensive, extensive, intensive, intensive
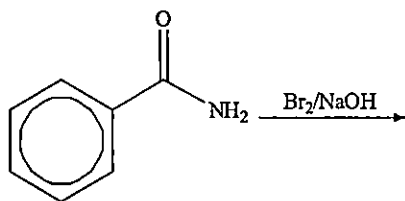
**4.** The structure of paracetamol is

(A) 

(B) 

(C) 

(D) 
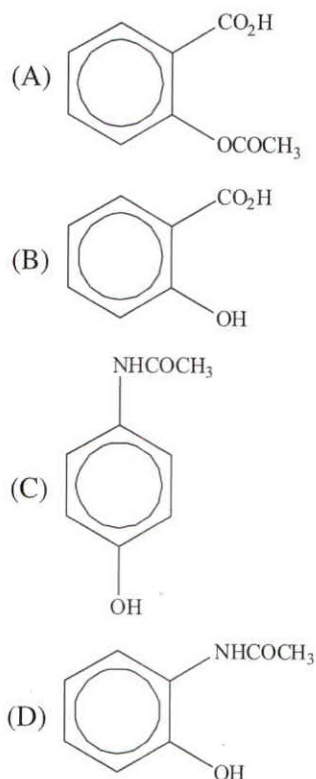
**5.** The qualitative detection of $Pb^{2+}$ ion using KI solution produces

(A) Green solution

(B) Pink solution

(C) Golden yellow precipitate

(D) Blue precipitate

**6.** The starting material for synthesis of alanine by stecker method is

(A) 

(B) $CH_3CHO$

(C) $CH_3CH_2OH$

(D) $CH_3CH=NOH$

**7.** Reactive intermediate formed in the following reaction is



(A) Isocyanate

(B) Carbene

(C) Carbanion

(D) Carbocation

**8.** Who has been elected as the new President of Brazil?

(A) Jair Bolsonaro

(B) Antonio Brito

(C) Luiz Inacio Lula da Silva

(D) Geraldo Alekmin

**9.** A freshly prepared radioactive source of half-life 2 hours emits radiation of intensity which is 64 times the permissible safe level. Minimum time after which it would be possible to work safely with this source is

(A) 6 hours

(B) 12 hours

(C) 20 hours

(D) 24 hours

**10.** Identify the correct statement about a reaction, when catalysed, keeping temperature unchanged.

(A) Energy of activation decreases.

(B) Value of equilibrium constant increases.

(C) Energy of activation increases.

(D) Value of equilibrium constant decreases.

**11.** Fill in the blank:

Rupa is inferior _____ Soma in legal practice.

(A) to

(B) than

(C) by

(D) with

**12.** Which of the following explains the underlined idiomatic expression?

She is kind to a fault.

(A) She is kind to all who commit faults.

(B) Kindness is a fault in her.

(C) She has committed many faults with her kindness.

(D) She is excessively kind.

**13.** The word 'deference' means

(A) difference

(B) respect

(C) punctuality

(D) love

**14.** Who has been appointed as the Governor of West Bengal?

(A) Arvind Kumar Sharma

(B) C V Ananda Bose

(C) Atanu Chakraborty

(D) Nripendra Misra

**15.** Find out the reagent suitable for detecting phenolic −OH group.
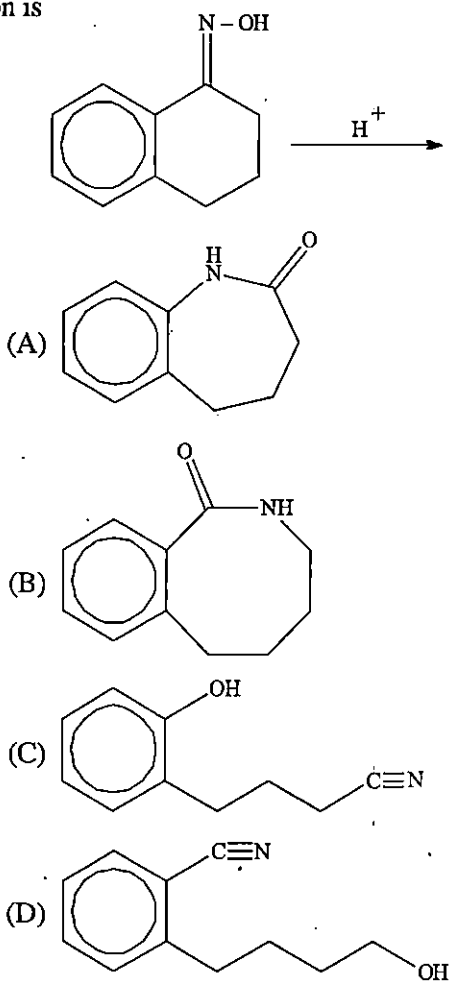
(A) $FeCl_3$ solution

(B) Tollen's reagent

(C) Neutral $FeCl_3$ solution

(D) DNP solution

**Please Turn Over**

**16.** In ring test for nitrate detection, the brown colour ring was formed due to the formation of which complex?

(A) $[Fe(N_2O)(H_2O)_5]SO_4$

(B) $[Fe(H_2O)_5(NO)]SO_4$

(C) $[Fe(H_2O)_4(NO_2)_2]$

(D) $[Fe(H_2O)_4(NO_3)_2]$

**17.** The major product obtained in the following reaction is



(A)



(B)



(C)



(D)
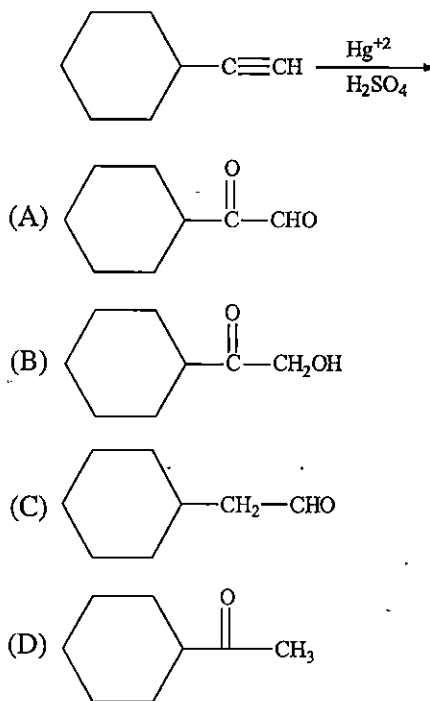


**18.** Winkler method is used to determine

(A) carbon dioxide

(B) dissolved oxygen

(C) biochemical oxygen demand

(D) graphite

**19.** Select the word nearest in meaning to the given word:

"ingenious"

(A) truthful

(B) foolish

(C) clever

(D) innovative

**20.** Find out the product of the following reaction:
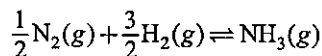


(A)



(B)



(C)



(D)



**21.** Insert an appropriate article if required.

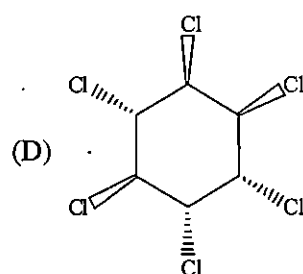_____ Punjab is the land of five rivers.

(A) No article

(B) The

(C) A

(D) An

**22.** The equilibrium constants of the reactions at temperature T, $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ and

$$\frac{1}{2}N_2(g) + \frac{3}{2}H_2(g) \rightleftharpoons NH_3(g)$$

are given by $K_1$ and $K_2$. They are related as

(A) $K_1 = K_2(RT)^2$

(B) $K_1 = (K_2)^2$

(C) $K_1 = \sqrt{K_2}$

(D) $K_1 = K_2$

**23.** The structure of gammaxane is

(A)



·(B)



(C)



(D)
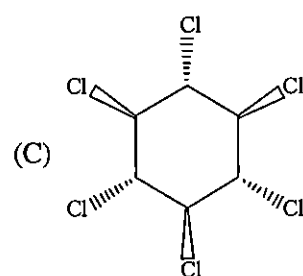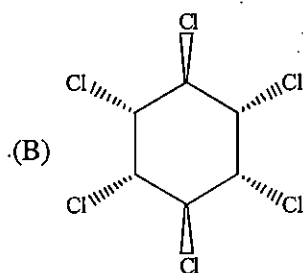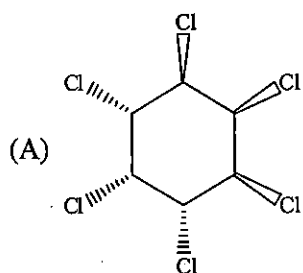


**24.** Major product of the following reaction is



(A)



(B)



(C)



(D)
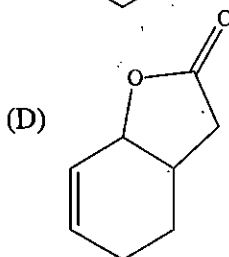


**25.** Which of the following compounds is not aromatic?

(A)



(B)



(C)



(D)



**Please Turn Over**

**26.** According to VSEPR model, which is not correct?

- (A) $[ICl_4]^-$ has Square planar geometry
- (B) $SiCl_4$ has Tetrahedral geometry
- (C) $SF_4$ has Tetrahedral geometry
- (D) $[SiF_6]^{2-}$ has Octahedral geometry

**27.** Which of the following statement is correct?

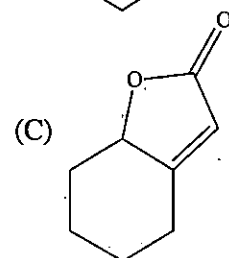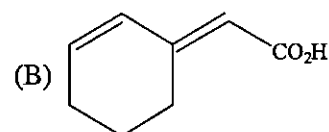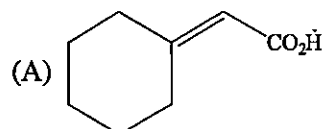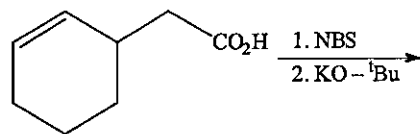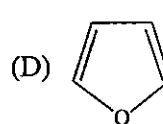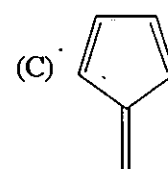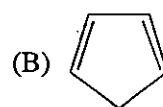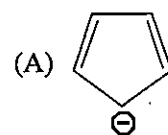- (A) Order of reaction cannot be fractional.
- (B) Reaction order cannot be zero.
- (C) Reaction order may always be determined from the stoichiometry of the reaction.
- (D) Reaction order is an experimental quantity.

**28.** The alkane does not present in LPG—

- (A) Ethane
- (B) Propane
- (C) Butane
- (D) Isobutane

**29.** Kameng Hydro Power Station has been inaugurated recently in which State?

- (A) Manipur
- (B) Assam
- (C) Arunachal Pradesh
- (D) Meghalaya

**30.** Which of the following is added for quick setting of cement?

- (A) Gypsum
- (B) Alum
- (C) Zinc sulphate
- (D) Sodium sulphate

**31.** Choose the correct preposition to fill in the blank:

_____ helping the poor with money, he helped them with food.

- (A) Beside
- (B) By
- (C) Besides
- (D) Over

**32.** Choose the word nearest in meaning to the underlined part of the sentence that follow:

He did it at the drop of a hat.

- (A) instantly
- (B) sceptically
- (C) doubtfully
- (D) happily

**33.** Who has been awarded the 2022 Sakharov Prize for Freedom of Thought?

- (A) Alexei Navalny
- (B) Malala Yousafzai
- (C) Dalai Lama
- (D) Ukrainian People

**34.** Nature has chosen Zn(II) ion at the active site of many hydrolytic enzymes because

- (A) Zn(II) is a poor Lewis acid.
- (B) Zn(II) is a good Lewis acid.
- (C) Zn(II) can have stability at variable oxidation state.
- (D) Zn(II) does not have chemically accessible redox states.

**35.** Iodometric titration of Cu(II) ion, actual redox potential of Cu(II)/Cu(I) in solution is higher than standard potential of the half reactions of Cu(II) to Cu(I), the reason is

- (A) Cu(II) forms iodobridge complex.
- (B) instant $CuI_2$ is formed in solution.
- (C) very low solubility of CuI in solution.
- (D) iodine is oxidised by Cu(II).

36. The 'hydrogen bomb' is mode on the basis of
    (A) Nuclear fission
    (B) Nuclear fusion
    (C) Nuclear transmutation
    (D) Redox reaction

37. The word opposite in meaning to 'eager' is
    (A) Thirsty
    (B) Avdent
    (C) Apathetic
    (D) Anger

38. The IUPAC nomenclature of $Na[PCl_6]$ is
    (A) Sodium hexachlorophosphine (V)
    (B) Sodium hexachlorophosphine
    (C) Sodium hexachlorophosphate (V)
    (D) Sodium hexachlorophosphite (V)

39. Choose the most basic compound.
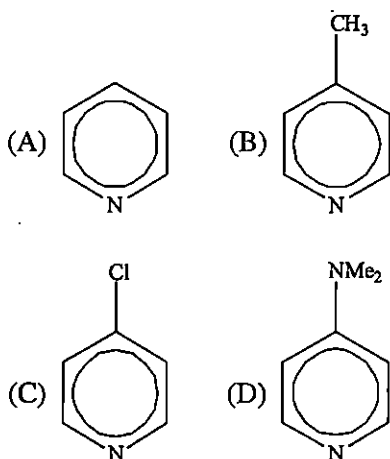


40. Which footballer has become the first player to score in 5 World Cups?
    (A) Lionel Messi
    (B) Cristiano Ronaldo
    (C) Pele
    (D) Rivaldo

41. An organic compound is known to contain only carbon, hydrogen and oxygen. The compound contains, by mass, 39.1% of carbon and 8.7% of hydrogen. The number of carbon atoms in the empirical formula is
    (A) 1
    (B) 8
    (C) 3
    (D) 2

42. Nylon 6 can be synthesized from
    (A) $\alpha$-Caprolactam
    (B) $\beta$-Caprolactam
    (C) $\gamma$-Caprolactam
    (D) $\varepsilon$-Caprolactam

43. Which of the following structures is not having formula $C_4H_6O_2$?
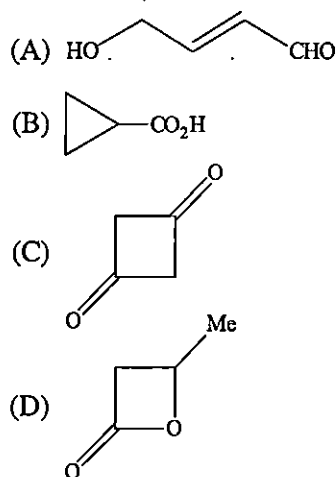


44. The following ceramic product is mostly used as pigment in paints:
    (A) $SiO_2$
    (B) $TiO_2$
    (C) $UO_2$
    (D) $ZrO_2$

**Please Turn Over**

**45.** For a reaction, the equilibrium constant is function of

    (A) the temperature of the reaction only.

    (B) the concentrations of the reactants and products only.

    (C) both the concentrations of the reactants, products and the temperature of the reaction.

    (D) the concentrations of the reactants, products, the temperature of the reaction and the pressure at which the reaction is performed.

**46.** The equation

$$\Delta_r H^\circ(T_2) = \Delta_r H^\circ(T_1) + \int_{T_1}^{T_2} \Delta_r C_P^\circ \, dT$$

with terms having usual significance is the statement of

    (A) Kohlrausch law

    (B) Nernst Heat theorem

    (C) Hess's law

    (D) Kirchhoff's law

**47.** What is so called energy currency in bioenergetics?

    (A) Molecular oxygen

    (B) Adenosine triphosphate

    (C) Water

    (D) Carbonic anhydrase

**48.** Fill in the blank:

Baboons, unlike humans, are _____ to HIV.

    (A) hostile

    (B) resistant

    (C) vaccinated

    (D) susceptible

**49.** Major product of the following reaction is

$$EtSCH_2CHClMe \xrightarrow{H_2O}$$

    (A) $EtSCHMeCH_2OH$

    (B) $EtSCH_2CHOHMe$

    (C) 

    (D) $EtSCH{=}CHMe$

**50.** What is the value of electron gain enthalpy of $Na^+$ (first ionization energy of Na = 5.1 eV)?

    (A) +2.55 eV

    (B) −10.2 eV

    (C) −5.1 eV

    (D) +10.2 eV

**51.** Choose the correct alternative to fill in the blank:

Either my shoes or your coat _____ always on the floor.

    (A) lies

    (B) lie

    (C) have been lying

    (D) were lying

**52.** If principle quantum number (n) is 6, then the correct sequence for filling of electrons will be

    (A) $ns{\to}(n{-}2)f{\to}(n{-}1)d{\to}np$

    (B) $ns{\to}(n{-}1)d{\to}(n{-}2)f{\to}np$

    (C) $ns{\to}(n{-}2)f{\to}np{\to}(n{-}1)d$

    (D) $ns{\to}np{\to}(n{-}1)d{\to}(n{-}2)f$

**53.** Which gas is not common component of photochemical smog?

    (A) Ozone

    (B) Acrolein

    (C) Peroxyacetyl nitrate

    (D) Chlorofluorocarbons

**54.** Give the meaning of the underlined word:
At the funeral, the chapel filled with people.

(A) A big room

(B) A big church

(C) Part of a large church

(D) A private hall

**55.** With increase in temperature, the viscosity of a gas and that of a liquid would

(A) increases and decreases respectively.

(B) decreases and increases respectively.

(C) Both decrease

(D) Both increase

**56.** Which of the following gases does not exhibit greenhouse effect?

(A) $CO_2$

(B) $O_3$

(C) $SO_3$

(D) $N_2O$

**57.** With increase in temperature, equilibrium constant for a reaction increases,

(A) only if the reaction is exothermic.

(B) only if the reaction is endothermic.

(C) whether the reaction is exothermic or endothermic.

(D) only if the reaction is of zero order.

**58.** A portion of following quantity is consumed in associated Pressure–Volume work —

(A) $C_P$

(B) $C_V$

(C) both of $C_P$ and $C_V$

(D) $C_P$ or $C_V$, depending on the temperature at which it is being measured.

**59.** With increase in temperature, increase in the rate constant of a reaction is guaranteed

(A) only for a multistep reaction.

(B) only for a single-step reaction.

(C) only for a first order reaction.

(D) only for a reaction, when catalysed.

**60.** Who has become the first female President of Slovenia?

(A) Tanja Fajon

(B) Katarina Kresal

(C) Natasa Pirc Musar

(D) Violeta Bulc

**61.** Urea is produced commercially from

(A) Carbon monoxide

(B) Nitrogen dioxide

(C) Nitric oxide

(D) Carbon dioxide

**62.** During the titration of $Zn^{2+}$ solution with EDTA using EBT as indicator, the colour change from red-wine to blue was observed due to the conversion of

(A) deprotonation of EBT.

(B) oxidation of EBT.

(C) replacement of EBT by EDTA at Zn center.

(D) replacement of EDTA by EBT at Zn center.

**Please Turn Over**

**63.** Major product of the following reaction is



KOH/EtOH

(A) 

(B) 

(C) 

(D) 
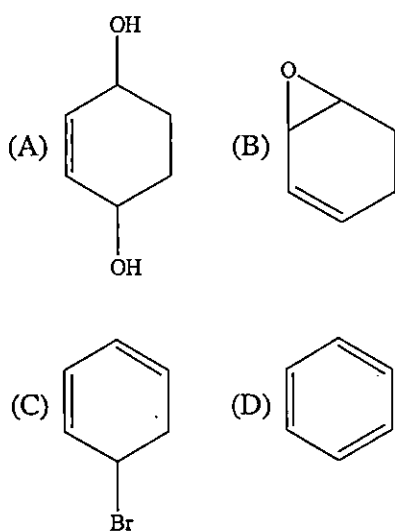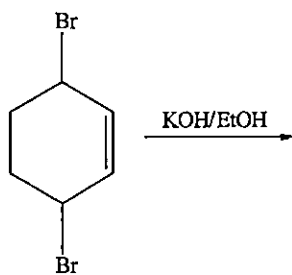
**64.** Choose the correct alternative to fill in the blank:

The jury _____ divided in their opinion.

(A) is

(B) are

(C) was

(D) has been

**65.** For an ideal gas, the order of average speed ($C_a$), root mean square speed ($C_r$) and most probable speed ($C_m$) is as follows:

(A) $C_r < C_a < C_m$

(B) $C_a < C_m < C_r$

(C) $C_m < C_a < C_r$

(D) $C_m < C_r < C_a$

**66.** Molecular weight of an alkane is 72 and gives monochlorination product. The alkane is

(A) $CH_3(CH_2)_3CH_3$

(B) $(CH_3)_2CHCH(CH_3)_2$

(C) $(CH_3)_2CHCH_2CH_3$

(D) $C(CH_3)_4$

**67.** The major product of the following scheme is



1. KOH/EtOH
2. KMnO$_4$/NaOH
3. H$^+$

(A) 

(B) 

(C) 

(D) 
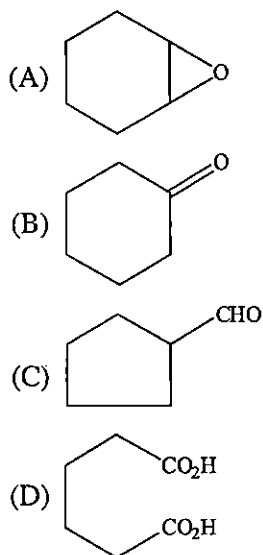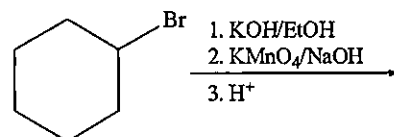
**68.** An explosive compound is

(A) DDT

(B) LTG

(C) LNG

(D) PETN

**69.** How many stereoisomers are possible for the following structure?

$$CH_3CH\!=\!CH\!-\!CHOHPh$$
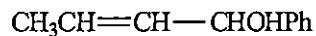
(A) 2

(B) 4

(C) 6

(D) 8

70. The equation $PV^\gamma = $ constant is valid for

   (A) adiabatic irreversible expansion of a real gas.
   (B) adiabatic reversible expansion of a real gas.
   (C) adiabatic reversible expansion of an ideal gas.
   (D) adiabatic irreversible expansion of an ideal gas.

71. Which Indian duo has won the French Open Men's Double Title?

   (A) Dhruv Kapila and MR Arjun
   (B) S. Sanjeeth and Manish Gupta
   (C) Satwiksairaj Rankireddy and Chirag Shetty
   (D) B. Sumeeth Reddy and Manu Attri

72. Conditions for which change in Gibbs free energy is the appropriate indicator of spontaneity?

   (A) Constant T and constant V.
   (B) Constant S and constant V
   (C) Constant T and constant P
   (D) Constant S and constant P

73. The hybridization states of the central atoms in the complexes $[Fe(CN)_6]^{3-}$, $[Fe(CN)_6]^{4-}$ and $[Co(NO_2)_6]^{3-}$ are

   (A) d2sp3, sp3 and dsp2 respectively.
   (B) d2sp3, sp3 and sp3d2 respectively.
   (C) d2sp3, sp3d2 and dsp2 respectively.
   (D) all d2sp3.

74. van der Waals equation of state is given by

   (A) $\left(P - \dfrac{a}{\bar{V}^2}\right)\left(\bar{V} - b\right) = RT$

   (B) $\left(P + \dfrac{a}{\bar{V}^2}\right)\left(\bar{V} - b\right) = RT$

   (C) $\left(P + \dfrac{a}{\bar{V}^2}\right)\left(\bar{V} + b\right) = RT$

   (D) $\left(P - \dfrac{a}{\bar{V}^2}\right)\left(\bar{V} + b\right) = RT$

75. Choose the alternative with the correct spelling:

   (A) Acomodation
   (B) Accomodation
   (C) Acommodation
   (D) Accommodation

76. Choose the word nearest in meaning to the underlined part of the sentence that follow:

   The son of the businessman is extravagant in buying gifts.

   (A) thriftless
   (B) judicious
   (C) sparing
   (D) economic

77. Use a phrasal verb in the following sentence:

   His boss _____ an explanation of his absence.

   (A) came off .
   (B) got on
   (C) called for
   (D) called in

78. Water hardness is determined by EDTA titration after the sample is buffered to pH—

   (A) 4
   (B) 2
   (C) 6
   (D) 10

79. The complexes $[Co(NH_3)_4(H_2O)Cl]Br_2$ and $[Co(NH_3)_4Br_2]Cl.H_2O$ are examples of which isomerism?

   (A) Ionisation isomerism
   (B) Linkage isomerism
   (C) Geometrical isomerism
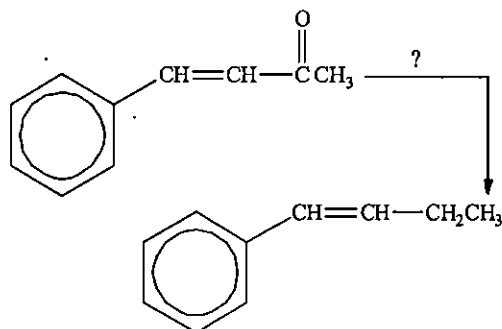   (D) Optical isomerism

**Please Turn Over**

**80.** Who is the new Chairman of the Rajya Sabha?

    (A) Jagdeep Dhankar

    (B) Pijush Goyal

    (C) Virendra Kumar

    (D) Giriraj Singh

**81.** Give the antonym of the following word: "indigent"

    (A) impecunious

    (B) cogent

    (C) wealthy

    (D) native

**82.** Find out the reagent for following conversion:



    (A) $NH_2NH_2/HO^-$

    (B) Zn-Hg/HCl

    (C) $Na/NH_3$

    (D) $LiAlH_4$

**83.** The one of the major content of Bohemian glass is

    (A) Magnesium

    (B) Potash

    (C) Soda

    (D) Bauxite

**84.** Fill in with the appropriate expression:

_____ friends she has are all sincere.

    (A) A few

    (B) The few

    (C) Few

    (D) Fewer

**85.** Who has won FIFA U-17 Women's World Cup, 2022?

    (A) Germany

    (B) Argentina

    (C) Colombia

    (D) Spain

**86.** The synonym of the underlined word in the sentence "Antony was a valiant man", is

    (A) Nervous

    (B) Cowardly

    (C) Quick

    (D) Brave

**87.** An aqueous solution of strong electrolyte is diluted; which one of the following statements is true ?

    (A) Specific conductance as well as equivalent conductivity of the solution decrease.

    (B) Specific conductance as well as equivalent conductivity of the solution increase.

    (C) Specific conductance decreases and equivalent conductivity increases.

    (D) Specific conductance increases and equivalent conductivity decreases.

**88.** Choose the correct form of the verb to fill in the blank:

The train _____ when we reached the station.

    (A) left

    (B) had left

    (C) would have left

    (D) will leave

**89.** The value of $\left(\frac{\partial P}{\partial V}\right)_T$ for one mole ideal gas is

(A) $\frac{P}{V}$

(B) $\frac{V}{P}$

(C) $-\frac{P}{V}$

(D) $\frac{V}{R}$

**90.** A reaction does not go to completion kinetically, only when

(A) it is a second-order reaction between two reactants with unequal initial concentration.

(B) it is a first-order reaction.

(C) it is an autocatalysis reaction of any order.

(D) it is a second-order reaction between two reactants with equal initial concentration.

**91.** For the process, $H_2O(liq)(1$ bar, $373K) \rightarrow H_2O(g)(1$ bar, $373K)$ the correct set of thermodynamic parameters is

(A) $\Delta G = 0, \Delta S > 0$

(B) $\Delta G = 0, \Delta S < 0$

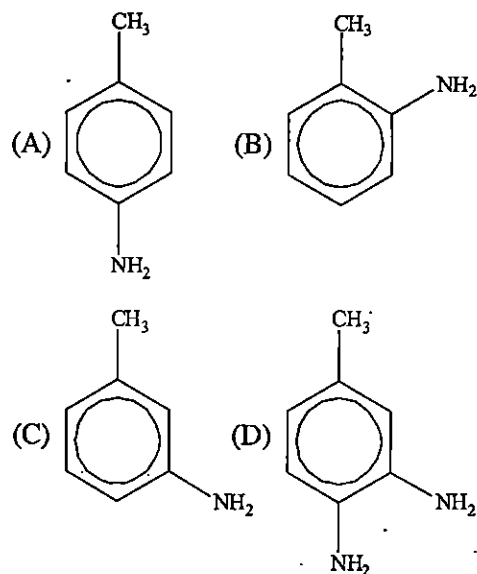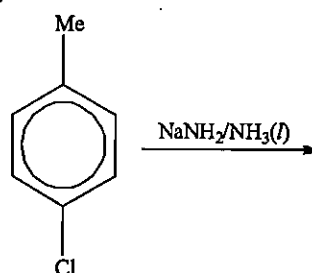(C) $\Delta G > 0, \Delta S = 0$

(D) $\Delta G < 0, \Delta S > 0$

**92.** Na/K pump is an system of

(A) Passive transport

(B) Active transport

(C) Channel transport

(D) Water pump

**93.** Highest amount of carbon present in coal —

(A) Anthracite

(B) Peat

(C) Bituminous

(D) Lignite

**94.** Find out the major product of the following reaction:



**95.** Addition of $FeCl_3$ solution to excess of hot water and to NaOH solution leads to formation of sols respectively due to

(A) adsorption of $Fe^{3+}$ ion and $OH^-$ ion.

(B) adsorption of $Fe^{3+}$ ion and $Cl^-$ ion.

(C) adsorption of $Cl^-$ ion and $Na^+$ ion.

(D) adsorption of $Fe^{3+}$ ion and $Na^+$ ion.

**96.** Major Dhyan Chand Khel Ratna Award 2022 has been awarded to

(A) Soumyajit Ghosh

(B) Manika Batra

(C) Neha Aggarwal

(D) Sharath Kamal Achanta

**Please Turn Over**

97. Which of the following shows Tyndall effect?

     (A) Aqueous solution of soap below critical micelle concentration.

     (B) Aqueous solution of soap above critical micelle concentration.

     (C) Aqueous solution of NaCl.

     (D) Aqueous solution of sugar.

98. Spontaneous polymerization is associated with

     (A) $\Delta S < 0, \Delta H < 0$

     (B) $\Delta S > 0, \Delta H > 0$

     (C) $\Delta S > 0, \Delta H < 0$

     (D) $\Delta S < 0, \Delta H > 0$

99. Gold sol is a

     (A) positively charged reversible sol.

     (B) positively charged irreversible sol.

     (C) negatively charged reversible sol.

     (D) negatively charged irreversible sol.

100. Choose the correct phrasal verb for the underlined word.

The firemen <u>extinguished</u> the fire at the earliest.

     (A) Put out

     (B) Put off

     (C) Put in

     (D) None of the above