ASSISTANT CHEMIST UNDER P.H.E DEPARTMENT

YEAR OF ADVT:2019 DATE OF EXAM:28-MAY-2024

Booklet Serial No. 20007

DO NOT BREAK THE SEAL OF THE BOOKLET UNTIL YOU ARE TOLD TO DO SO

QUESTION BOOKLET

SERIES : III

Subjects : General English and Chemistry

Full Marks : 300 **Time Allowed : 2½ Hours**

Read the following instructions carefully before you begin to answer the questions.

INSTRUCTIONS TO CANDIDATES

1. This Booklet contains 150 questions to be answered in a separate OMR Answer Sheet using Black Ballpoint Pen in the following two Parts :

Part—A : General English	:	**50 questions**
Part—B : Chemistry	:	**100 questions**

2. **All** questions are compulsory.

3. You will be supplied the Answer Sheet separately by the Invigilator. You must complete the details of particulars asked for.

4. Answer must be shown by completely blackening the corresponding circle in the Answer Sheet against the relevant question number by Black Ballpoint Pen. OMR Answer Sheet without marking Series shall not be evaluated.

Example :

Suppose the following question is asked :

The Capital of Meghalaya is

(A) Guwahati

(B) Kohima

(C) Shillong

(D) Delhi

You will have four alternatives in the Answer Sheet for your response corresponding to each question of the Question Booklet as below :

Ⓐ Ⓑ Ⓒ Ⓓ

In the above illustration, if your chosen response is alternative (C), i.e., Shillong, then the same should be marked on the Answer Sheet by blackening the relevant circle with a Black Ballpoint Pen only as below :

Ⓐ Ⓑ ● Ⓓ

The example shown above is the only correct method of answering.

5. Answer the questions as quickly and as carefully as you can. Some questions may be difficult and others easy. Do not spend too much time on any one question.

6. There will NOT be any negative marking for wrong answers.

7. The Answer Sheet must be handed over to the Invigilator before you leave the Examination Hall.

8. No Rough Work is to be done on the Answer Sheet. Space for Rough Work has been provided in the Question Booklet.

SEAL

PART—A : GENERAL ENGLISH

(*Marks* : 100)

Each question carries **2** marks

Section—I

Directions **(Q. Nos. 1–10) : Choose the correct sentences.**

1. 1. Although Ben is poor, he is not dishonest.

2. Poor as Ben is, he is not dishonest.

3. Ben is poor and not dishonest.

(A) 1 and 2

(B) 1 and 3

(C) 2 and 3

(D) 1, 2 and 3

2. 1. We never imagined that she would win the prize.

2. We had never ever imagined that she would win the prize.

3. Little did we imagine that she would win the prize.

(A) 1 and 2

(B) 1 and 3

(C) 2 and 3

(D) 1, 2 and 3

3. 1. The parents told the Principal that it was not their intention to interfere in the running of the school.

2. The parents said they did not intend to interfere with the running of the school.

3. The parents said they had no intention of interfering with the running of the school.

(A) 1 and 2

(B) 1 and 3

(C) 2 and 3

(D) 1, 2 and 3

4. 1. It was thought that Mike might have stolen the money.

2. Mike was suspected to stealing the money.

3. Suspicion fell on Mike for stealing the money.

(A) 1 and 2

(B) 1 and 3

(C) 2 and 3

(D) 1, 2 and 3

5. 1. According to the newspaper, the athletes from Third World Countries were felicitated at the Olympic Games.

2. The newspaper reported that athletes from Third World Countries were felicitated at the Olympic Games.

3. It was reported in the newspaper that athletes from Third World Countries were felicitated at the Olympic Games.

(A) 1 and 2

(B) 1 and 3

(C) 2 and 3

(D) 1, 2 and 3

6. 1. His amateur attempt to disguise failed and the police arrested the overconfident trickster.

2. His amateur attempt at disguise failed and the police arrested the overconfident trickster.

3. His amateur attempt at disguising failed and the police arrested the overconfident trickster.

(A) 1 and 2

(B) 1 and 3

(C) 2 and 3

(D) 1, 2 and 3

7. 1. He firmly believes that the Stonehenge was built by aliens.

2. It is his firm conviction that the Stonehenge was built by aliens.

3. He is firmly convinced that the Stonehenge was built by aliens.

(A) 1 and 2

(B) 1 and 3

(C) 2 and 3

(D) 1, 2 and 3

8. 1. It is not my concern what he does with his money.

2. What he does with his money is none of my concern.

3. What he does with his money is no concern of mine.

(A) 1 and 2

(B) 1 and 3

(C) 2 and 3

(D) 1, 2 and 3

9. 1. He said he was sorry to leave the country.

2. He expressed his regret at leaving the country.

3. He said he was sorry at leaving the country.

(A) 1 and 2

(B) 1 and 3

(C) 2 and 3

(D) 1, 2 and 3

10. 1. Rather than arrive at a hasty decision we should talk it out.

2. Rather than arrive at a hasty decision we should talk it over.

3. Rather than arrive at a hasty decision we should talk about it.

(A) 1 and 2

(B) 1 and 3

(C) 2 and 3

(D) 1, 2 and 3

Section—II

Directions **(Q. Nos. 11–20) : Choose an appropriate antonym for the words printed in BOLD LETTERS from the options given below.**

11. FALLACIOUS

(A) folly

(B) spurious

(C) authenticate

(D) authentic

12. FLACCID

(A) flabby

(B) taut

(C) tense

(D) terse

13. IMPEDE

(A) facilitate

(B) favour

(C) oblige

(D) obstruct

14. LATENT

(A) conspicuous

(B) inure

(C) innate

(D) concise

15. PROPITIOUS

(A) favourable

(B) opportune

(C) optimistic

(D) unfavourable

16. RUN-OF-THE-MILL

(A) ordinary

(B) outrageous

(C) exceptional

(D) extreme

17. SURREPTITIOUS

(A) dishonest

(B) cunning

(C) honest

(D) secret

18. TREPIDATION

(A) apprehension

(B) apprehensive

(C) composure

(D) composite

19. UNGAINLY

(A) graceful

(B) gracefulness

(C) gawky

(D) clumsy

20. WEARISOME

(A) tedious

(B) tenacious

(C) refreshing

(D) rejuvenate

Section—III

Directions **(Q. Nos. 21–30) : In the following passage, fill in each of the numbered blanks with the correct form of the word given in the brackets.**

The joint family **21** (cease) to exist. But it once **22** (have) great value since it **23** (be) a form of social security and every age group **24** (have) a role to play in it. However, when one **25** (hear) the tragic stories of elderly people who **26** (be) cast out of their homes, one realises what an asset they **27** (might be) if they **28** (be, to keep) the young ones company. For, who **29** (play) with a child the way a grandparent **30** (do)?

Section—IV

Directions **(Q. Nos. 31–40) : In the following sentences there is a part of the sentence that is underlined. From the alternatives given below No. (A) repeats the original and the other three alternatives, (B), (C) and (D) vary. Select the alternative that can best explain the underlined words.**

31. Such people never have and never will be trusted.

(A) never have and never will be trusted

(B) never have and will be trusted

(C) never have been and never will be trusted

(D) never have had anyone trust them and never will have anyone

32. As no one knows the truth as fully as him, no one but him can provide the testimony.

(A) as fully as him, no one but him

(B) as fully as he

(C) as fully as he does, no one but he

(D) as fully as he does, no one but he alone

33. The use of radar as well as a two-way radio paging make it possible for the police to intercept most speeches.

(A) make it possible

(B) makes it possible

(C) allows the possibility

(D) makes possible

34. No sooner had he entered the room when the lights went out and everybody began to scream.

(A) when the lights went out

(B) than the lights went out

(C) and the lights went out

(D) then the lights went out

35. If I would have known the nature of the job earlier, I would not have accepted it.

(A) If I would have

(B) In case I would have

(C) Had I

(D) If I realised

36. It is unanimously resolved that the parties should unitedly undertook launching of popular programmes.

(A) should unitedly undertook

(B) should be unitedly undertaken

(C) should unitedly undertake

(D) should be undertaken in unity

37. The teacher told us that the prize would be presented the next day.

(A) would be presented the next day

(B) would be presented on the next day

(C) shall be presented tomorrow

(D) shall be presented the following day

38. Acquisition of certain specific skills can be facilitated from general awareness, education and exposure to novel situation.

(A) can be facilitated from

(B) may facilitate through

(C) can be facilitated by

(D) may be facilitated by

39. The play had so many scenes which were so humourous that it was hardly possible to keep a straight face.

(A) hardly possible to keep

(B) hardly impossible to keep

(C) hardly impossible for keeping

(D) hardly possible for keeping

40. His speech was optimistic, but at the end of it, he stroke a note of caution.

(A) stroke a note of caution

(B) striked a note of caution

(C) struck a note of caution

(D) struck with a note of caution

Section—V

Directions **(Q. Nos. 41–50) : Choose an appropriate meaning from the options given below, for the words printed in BOLD LETTERS.**

41. IMBIBE

(A) reject

(B) eject

(C) emit

(D) absorb

42. EMANATE

(A) large

(B) emerge

(C) to attract

(D) decrease

43. ANNOTATION

(A) prologue

(B) explanatory note

(C) translation

(D) quip

44. EQUIPOISE

(A) patience

(B) modesty

(C) balance

(D) representation

45. SALUBRIOUS

(A) outdoor

(B) spacious

(C) luxurious

(D) healthy

46. FINESSE

(A) atrocity

(B) weakness

(C) tact

(D) refinement

47. MISCONSTRUED

(A) miscalculated

(B) misunderstood

(C) caused

(D) misfired

48. ANCILLARY

(A) spare

(B) primary

(C) accept

(D) auxiliary

49. GOAD

(A) spur

(B) restrain

(C) pursue

(D) supersede

50. PROLIFIC

(A) barren

(B) backward

(C) abundant

(D) sparse

PART—B : CHEMISTRY

(*Marks* : 200)

Each question carries **2** marks

51. In a hydrogen-oxygen fuel cell, combustion of hydrogen occurs to

(A) produce high purity water

(B) create potential difference between the two electrodes

(C) generate heat

(D) remove adsorbed oxygen from electrode surfaces

52. Rate = $k[A]^0[B]^1[C]^2$ for a given reaction. If the concentration of all the reactants is increased by 50%, the rate of reaction will be increased by

(A) $\frac{3}{2}$ times

(B) $\frac{9}{4}$ times

(C) $\frac{27}{8}$ times

(D) $\frac{81}{16}$ times

53. Two-third life for a first-order reaction is 55 minutes. The value of its velocity constant is nearly

(A) $0{\cdot}02\ min^{-1}$

(B) $0{\cdot}01\ min^{-1}$

(C) $0{\cdot}02\ hr^{-1}$

(D) $2{\cdot}02\ min^{-1}$

54. The unit of rate constant of elementary reaction depends on the

(A) temperature of the reaction

(B) concentration of reactant

(C) activation energy of the reaction

(D) molecularity of the reaction

55. Smoke precipitator works on the principle of

(A) centrifugation

(B) absorption

(C) neutralisation of charge on colloids

(D) addition of electrolytes

56. Point out the ***false*** statement.

(A) Brownian movement and Tyndall effect are shown by colloidal systems.

(B) Gold number is a measure of the protective power of a lyophilic colloid.

(C) The colloidal solution of a liquid in liquid is called a gel.

(D) Hardy-Schulze rule is related with coagulation.

57. Which of the following characteristics is ***not*** correct for physical adsorption?

(A) Adsorption on solid is reversible

(B) Adsorption increases with increase in temperature

(C) Adsorption is spontaneous

(D) Both enthalpy and entropy of adsorption are negative

58. Different gold sols have different colours like red, blue, purple, golden, etc. This is mainly because of

(A) variable valency of gold

(B) different concentrations of gold

(C) different types of impurities

(D) different radius of colloidal particles

59. On adding a catalyst to a reversible reaction

(A) value of equilibrium constant is decreased

(B) the rate of forward reaction is increased and that of backward reaction is decreased

(C) equilibrium concentrations remain unchanged

(D) equilibrium concentrations are increased

60. A freshly prepared $Fe(OH)_3$ precipitate is peptised by adding $FeCl_3$ solution. The charge on the colloidal particle is due to the preferential absorption of

(A) Cl^- ions

(B) Fe^{3+} ions

(C) OH^- ions

(D) None of the above

61. Which of the following minerals contains titanium?

(A) Cassiterite

(B) Rutile

(C) Haematite

(D) Spodumene

62. The main purpose of adding flux to an ore in the blast furnace is to convert

(A) infusible impurities to fusible material

(B) soluble impurities to insoluble impurities

(C) fusible impurities to infusible impurities

(D) mineral into silicate

63. Among the following, the least basic nitrogen trihalide is

(A) NF_3

(B) NCl_3

(C) NBr_3

(D) NI_3

64. The numbers of P—O—P and P—O—H bonds present respectively in pyro-phosphoric acid molecules are

(A) 1, 2

(B) 0, 4

(C) 1, 4

(D) 1, 8

65. H_2SO_4 ***cannot*** act as a dehydrating agent for

(A) $H_2C_2O_4$

(B) HCOOH

(C) $C_{12}H_{22}O_{11}$

(D) NH_3

66. Choose the end products formed on complete hydrolysis of XeF_6.

1. HF
2. $XeOF_4$
3. XeO_2F_2
4. XeO_3

Select the correct answer using the codes given below.

(A) 1, 3 and 4

(B) 1 and 4

(C) 2, 3 and 4

(D) 1, 2 and 3

67. The correct order of acidic strength is

(A) $Cl_2O_7 > SO_2 > P_4O_{10}$

(B) $Cl_2O > Cl_2O_6 > Cl_2O_7$

(C) $SO_2 > N_2O_5 > SO_3$

(D) $P_4O_6 > P_4O_{10}$

68. Paramagnetism of Cr ($Z = 24$), Mn^{2+} ($Z = 25$) and Fe^{3+} ($Z = 26$) are x, y and z respectively. What is their correct order?

(A) $x = y = z$

(B) $x > y > z$

(C) $x = y > z$

(D) $x > y = z$

69. Which of the following statements is/are correct about Zn, Cd and Hg?

1. They exhibit high enthalpies of atomisation as the *d*-subshell is fully filled.
2. Zn and Cd do not show variable oxidation states while Hg does show.
3. Compounds of Zn, Cd and Hg are paramagnetic.
4. Zn, Cd and Hg are soft metals.

Select the correct answer using the codes given below.

(A) 1, 2 and 3

(B) Both 1 and 3

(C) Both 2 and 4

(D) 4 only

70. The actinoids exhibit more number of oxidation states in general than the lanthanoids. This is because

(A) the actinoids are more reactive than the lanthanoids

(B) of lesser energy difference between $5f$ and $6d$ than between $4f$ and $5d$

(C) the $5f$ orbitals show more screening effect than the $4f$ orbitals

(D) the $5f$ orbitals are more buried than the $4f$ orbitals

71. The IUPAC name of coordination complex $K_2[OsCl_5N]$ is

(A) potassium pentachloridoazidoosmate(VII)

(B) potassium pentachloridoazoosmate(VI)

(C) potassium pentachloridonitridoosmate(VI)

(D) potassium nitroosmate(III)

72. In $Fe(CO)_5$, the Fe—C bond possesses

(A) π character only

(B) both σ and π characters

(C) ionic character

(D) σ character only

73. The type of isomerism present in nitro-pentaamine chromium (III) chloride is

(A) optical

(B) linkage

(C) coordination position

(D) polymerisation

74. Tertiary alkyl halides are practically inert to S_N2 mechanism because of

(A) insolubility

(B) instability

(C) inductive effect

(D) steric hindrance

75. Which of the following would exhibit Kharasch effect?

(A) $CH_3CH=CH_2 + HCl \xrightarrow{\text{peroxide}}$

(B) $CH_2=CH_2 + HBr \xrightarrow{\text{peroxide}}$

(C) $CH_3CH=CH_2 + HBr \xrightarrow{\text{peroxide}}$

(D) $CH_2=CH_2 + HCl \longrightarrow$

76. The order of reactivity of alkyl halides towards elimination reaction is

(A) $3° > 2° > 1°$

(B) $2° > 1° > 3°$

(C) $3° > 1° > 2°$

(D) $1° > 2° > 3°$

77. *o*-Methoxybromobenzene is treated with sodamide and then with ammonia. The product formed is

(A) *o*-methoxyaniline

(B) aniline

(C) methoxybenzene

(D) *m*-methoxyaniline

78. Which one of the following does ***not*** undergo iodoform test?

(A) 1-Propanol

(B) Ethanol

(C) 2-Propanol

(D) Propanone

79. In Victor Meyer's test, the colours given by 1°, 2° and 3°alcohols are respectively

(A) red, colourless and blue

(B) red, blue and colourless

(C) colourless, red and blue

(D) red, blue and violet

80. The compound that does ***not*** liberate CO_2, on treatment with aqueous sodium bicarbonate solution, is

(A) benzoic acid

(B) benzenesulphonic acid

(C) salicylic acid

(D) carbolic acid

81. Which alcohol of molecular formula C_4H_9OH ***cannot*** be obtained by the reduction of carbonyl compound?

(A) 2-Methylpropan-1-ol

(B) 2-Methylpropan-2-ol

(C) Butanol

(D) Butan-2-ol

82. An aldehyde which undergoes Cannizzaro's reaction and reduces Schiff's reagent but does ***not*** reduce Fehling's solution is

(A) CH_3CHO

(B) HCHO

(C) benzaldehyde

(D) salicylaldehyde

83. Which of the following reagents will convert phenylglyoxal to $C_6H_5CH(OH)COOH$?

(A) Conc. NaOH

(B) Acidic $K_2Cr_2O_7$

(C) Na_2CrO_4/H_2SO_4

(D) $NaNO_2/HCl$

84. Acetanilide on nitration followed by alkaline hydrolysis mainly gives

(A) *o*-nitroacetanilide

(B) *p*-nitroaniline

(C) *m*-nitroaniline

(D) 2,4,6-trinitroaniline

85. The correct order of basic nature is

(A) $NH_3 < CH_3NH_2 < (CH_3)_2NH$

(B) $CH_3NH_2 < (CH_3)_2NH < NH_3$

(C) $CH_3NH_2 < NH_3 < (CH_3)_2NH$

(D) $(CH_3)_2NH < NH_3 < CH_3NH_2$

86. Primary amines on heating with CS_2 followed by reaction with excess of mercuric chloride yields isothiocyanates. This reaction is called

(A) Hofmann mustard oil reaction

(B) Perkin reaction

(C) Fries reaction

(D) Diels-Alder reaction

87. The secondary and tertiary amines ***cannot*** be distinguished by

(A) Hinsberg reagent

(B) Grignard reagent

(C) Liebermann's nitroso test

(D) carbylamine test

88. Rapid interconversion of α-D-glucose and β-D-glucose in aqueous solution is known as

(A) recemisation

(B) asymmetric induction

(C) epimerisation

(D) mutarotation

89. An example of a carbohydrate made up of two units of different monosaccharides is

(A) sucrose

(B) maltose

(C) isomaltose

(D) starch

90. Coupling reaction of phenols takes place in

(A) slight acidic medium

(B) slight basic medium

(C) highly basic medium

(D) highly acidic medium

91. Which of the following statements about amino acids are ***not*** true?

1. They are low melting crystalline solids.
2. Most naturally occurring amino acids have L-configuration.
3. Isoelectric point of neutral amino acids lie at pH between 5·5 to 6·3.
4. Glycine is the only naturally occurring α-amino acid which is optically active.

Select the correct answer using the codes given below.

(A) Both 1 and 3

(B) Both 1 and 4

(C) Both 3 and 4

(D) Both 2 and 4

92. From the given polymers, choose which are thermoplastics.

1. Nylon
2. Polyethylene
3. PVC
4. Terylene
5. Bakelite

Select the correct answer using the codes given below.

(A) 1, 2, 3 and 4

(B) 2, 3 and 4

(C) 1, 3 and 5

(D) 1, 2, 3, 4 and 5

93. The most suitable method for determination of the molecular mass of a polymer is

(A) osmotic pressure

(B) Victor Meyer method

(C) elevation in boiling point

(D) depression in freezing point

94. Identify the correct statement.

(A) Drugs which bind to the active site of an enzyme are called allosteric drugs.

(B) A chemical messenger gives message to the cell by entering the cell.

(C) Drugs which compete with natural substrate on active site are called competitive inhibitors.

(D) Penicillin is a bacteriostatic antibiotic.

95. Which of the following is a non-ionic detergent?

(A) Cetyl trimethyl ammonium chloride

(B) Sodium alkyl sulphonate

(C) Sodium dodecyl benzene sulphonate

(D) Sodium dodecyl sulphate

96. Chloropicrin is obtained by the reaction of

(A) steam on carbon tetrachloride

(B) nitric acid on chlorobenzene

(C) chlorine on picric acid

(D) nitric acid on chloroform

97. Which of the following are added to increase the shelf life of foods?

(A) Sweeteners

(B) Artificial flavours

(C) Antioxidants

(D) Food colours

98. Which of the following is mismatched?

(A) Paracetamol—Antipyretic

(B) Barbituric acid—Tranquilliser

(C) Tetracycline—
Bactericidal antibiotic

(D) Erythromycin—
Bacteriostatic antibiotic

99. The hardness of water determined by EDTA method involves

(A) complex titration

(B) complexion titration

(C) acid-base titration

(D) complexometric titration

100. Coordination compounds have great importance in biological systems. In this context, which of the following statements is ***incorrect***?

(A) Carboxypeptidase A is an enzyme and contains zinc.

(B) Hemoglobin is the red pigment of blood and contains iron.

(C) Cyanocobalamin is B_{12} and contains cobalt.

(D) Chlorophylls are green pigments in plants and contain calcium.

101. What kind of isomerism is exhibited by the octahedral complex $[Co(NH_3)_4 Br_2]Cl$?

(A) Geometrical and ionisation

(B) Geometrical and optical

(C) Optical and ionisation

(D) Geometrical only

102. Bulletproof vests are made up of

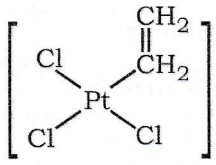
(A) Lexan

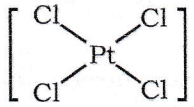
(B) PMMA

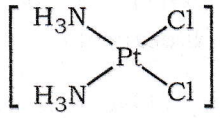
(C) Nomex

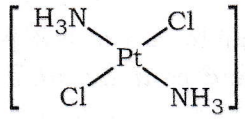
(D) Kevlar

103. Which of the following is considered to be an anti-cancer species?

(A) 

(B) 

(C) 

(D) 

104. An increase in equivalent conductance of a strong electrolyte with dilution is mainly due to

(A) increase in the ionic mobility of ions

(B) 100% ionisation of the electrolyte at normal dilution

(C) increase in both, i.e., number of ions and ionic mobility of ions

(D) increase in the number of ions

105. Which of the following concentration terms changes with increase in temperature?

(A) Molality

(B) Weight fraction of solute

(C) Molarity

(D) Mole fraction

106. A wedding ring presented to a bride contains 788 mg of gold and the rest is diamond. If the weight of the ring is 1 gram, the bride receives (At. wt. of Au = 197, C = 12)

(A) more number of gold atoms

(B) more number of carbon atoms

(C) equal number of gold and carbon atoms

(D) gold and carbon atoms in the ratio of 4 : 1

107. If the kinetic energy of a particle is doubled, de Broglie wavelength becomes

(A) 2 times

(B) 4 times

(C) $\sqrt{2}$ times

(D) $\frac{1}{\sqrt{2}}$ times

108. The element with atomic number 56 belongs to which block?

(A) *s*-block

(B) *p*-block

(C) *d*-block

(D) *f*-block

109. The strength in grams per litre of sulphuric acid, 12 ml of which neutralises 15 ml of N/10 sodium hydroxide solution, is

(A) 6·125

(B) 5·302

(C) 3·065

(D) 12·25

110. The lattice energy (numerical value) of chlorides of alkali metals is in the order

(A) LiCl > NaCl > KCl > RbCl > CsCl

(B) LiCl < NaCl < KCl < RbCl < CsCl

(C) NaCl < KCl < LiCl < RbCl < CsCl

(D) NaCl < KCl < RbCl < CsCl < LiCl

111. In case of XeO_2F_2 and XeF_6, Xe is with

(A) same hybridisation but with different geometry

(B) different hybridisation but with same geometry

(C) different hybridisation and different geometry

(D) same geometry and same hybridisation

112. Which of the following has the minimum dipole moment?

(A) But-1-ene

(B) *trans*-pent-2-ene

(C) *trans*-but-2-ene

(D) 2-methyl-prop-1-ene

113. Heat of neutralisation of a strong acid by a strong base is a constant value because

(A) the salt formed does not hydrolyse

(B) all the H^+ and OH^- ions react in every case

(C) the strong base and strong acid react partially

(D) the strong base and strong acid react only in aqueous solution

114. Identify the correct statement regarding a spontaneous process.

(A) Endothermic processes are never spontaneous.

(B) Exothermic processes are always spontaneous.

(C) Lowering of energy in the reaction process is the only criterion for spontaneity.

(D) For a spontaneous process in an isolated system, the change in entropy is positive.

115. When 2 moles of an ideal gas $\left(C_{p,m} = \frac{5}{2}R\right)$ are heated from 300 K to 600 K at constant pressure, the change in entropy of the gas (ΔS) is

(A) $\frac{3}{2}R\ln 2$

(B) $-\frac{3}{2}R\ln 2$

(C) $5R\ln 2$

(D) $\frac{5}{2}R\ln 2$

116. If the concentrations of the reactants in the reaction $X + Y \rightleftharpoons Z$ are tripled, then its equilibrium constant will

(A) become three times

(B) become nine times

(C) become one-ninth

(D) remain the same

117. The standard state Gibbs' energy change for the isomerisation reaction, *cis*-2-pentene to *trans*-2-pentene is –3·67 kJ mole at 400 K. If more *trans*-2-pentene is added to the reaction vessel

(A) more *cis*-2-pentene is formed

(B) equilibrium shifts in the forward direction

(C) equilibrium remains unaltered

(D) more *trans*-2-pentene is produced

118. Two sparingly soluble salts of AX and BX_2 have their solubility products equal and very low. Then

(A) solubility of AX is greater than that of BX_2

(B) $S_1 = S_2^{3/2}$ if S_1 and S_2 are molar solubilities of AX and BX_2

(C) addition of HNO_3 will increase the solubility of both the salts if X is the conjugate base of a weak acid

(D) solubility of AX is equal to that of BX_2

119. Three solutions of strong electrolytes 25 ml of 0·1 M HX, 25 ml of 0·1 M H_2Y and 50 ml of 0·1 N $Zn(OH)_2$ are mixed. pOH of the solution is

(A) 1·6

(B) 7·0

(C) 11·4

(D) 12·4

120. In which of the following compounds, does oxygen have a fractional oxidation state?

(A) Sodium peroxide

(B) Potassium superoxide

(C) Lithium monoxide

(D) Carbon suboxide

121. Which among the following is/are the case(s) of disproportionation reaction?

1. $Cl_2 + 2OH^- \rightarrow Cl^- + H_2O + ClO_2^-$
2. $2HgO \rightarrow 2Hg + O_2$
3. $2HCuCl_2 \rightarrow Cu + Cu^{2+} + 4Cl^- + 2H^+$
4. $MgCO_3 \rightarrow MgO + CO_2$

Select the correct answer using the codes given below.

(A) Only 1

(B) Both 2 and 3

(C) Both 1 and 3

(D) Both 1 and 4

122. Which of the following alkali metal nitrates on heating decomposes to give NO_2 gas?

(A) $NaNO_3$

(B) KNO_3

(C) $LiNO_3$

(D) $CsNO_3$

123. In the Castner-Kellner cell, Na^+ is discharged instead of H^+ ions because

(A) Hg reduces the mobility of Na^+

(B) the discharge potential of Na^+ is lower than that of hydrogen ions at mercury electrode

(C) Hg forms amalgam with H_2

(D) Hg directly combines with H^+ ions

124. Which of the following substances is hardest?

(A) Norbide

(B) Borazone

(C) Boron oxide

(D) Graphite

125. Which of the following statements is true?

(A) The solution of borax in water is acidic.

(B) PbI_4 is a stable compound.

(C) In Group 13, atomic and ionic radii decrease regularly from top to bottom.

(D) Carbon monoxide combines with transition metals to form metal carbonyls.

126. The isomerism shown by propane nitrile and ethane carbylamine is

1. functional
2. position
3. tautomerism
4. chain

Select the correct answer using the codes given below.

(A) Both 1 and 3

(B) Both 1 and 4

(C) Only 1

(D) 1, 2 and 3

127. The lowest molecular weight alkane (containing carbon and hydrogen only) capable of exhibiting optical isomerism must have

(A) 5 carbons

(B) 7 carbons

(C) 6 carbons

(D) 3 carbons

128. An organic compound of molecular formula, $C_4H_{10}O$, does ***not*** react with sodium. With excess of HI, it gives only one type of alkyl halide. The compound is

(A) 2-methoxypropane

(B) 2-butanol

(C) 1-methoxypropane

(D) ethoxyethane

129. Which of the following is more readily attacked by an electrophile?

(A) Nitrobenzene

(B) Benzoic acid

(C) Benzaldehyde

(D) Phenol

130. Which of the following contains four pairs of electrons around the central atom?

(A) Carbocation

(B) Carbanion

(C) Free radical

(D) Carbene

131. Which one of the following will form the most stable intermediate by heterolytic cleavage of C—Cl bond?

(A) CH_3CH_2Cl

(B) $CH_2{=}CHCH_2Cl$

(C) CH_3Cl

(D) $CH_2{=}CHCl$

132. Diazo compounds sometimes do ***not*** respond to Lassaigne's test for nitrogen because

(A) they contain very little carbon

(B) they are quite stable compounds and do not decompose to elemental nitrogen

(C) they form organometallic compounds with sodium

(D) during heating nitrogen gas is evolved

133. In the presence of peroxide, hydrogen chloride and hydrogen iodide do ***not*** give anti-Markownikov addition to alkenes because

(A) both are highly ionic

(B) one is oxidising and the other is reducing

(C) one of the steps is endothermic in both the cases

(D) all the steps are exothermic in both the cases

134. Identify the reagent from the following lists which can easily distinguish between 1-butyne and 2-butyne.

(A) Bromine, CCl_4

(B) H_2, Lindlar catalyst

(C) Dil. H_2SO_4, $HgSO_4$

(D) Ammoniacal Cu_2Cl_2 solution

135. Phenylmagnesium bromide reacts with methanol to give

(A) a mixture of benzene and Mg(OMe)Br

(B) a mixture of toluene and Mg(OH)Br

(C) a mixture of phenol and Mg(Me)Br

(D) a mixture of anisole and Mg(OH)Br

136. Which of the following is ***incorrect*** for the addition of X_2 to alkene?

(A) Reaction involves cyclic halonium ion as intermediate

(B) Vicinal dihalides are formed

(C) Addition takes place with C—C bond cleavage

(D) Rearranged product is obtained

137. The compound formed in the positive test for nitrogen with Lassaigne's solution of an organic compound is

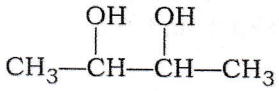
(A) $Fe_4[Fe(CN)_6]_3$

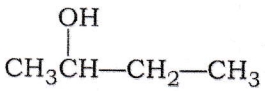
(B) $Na_3[Fe(CN)_6]$

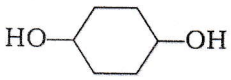
(C) $Fe(CN)_3$

(D) $Na_4[Fe(CN)_5NOS]$

138. Which of the following molecules can have both diastereomers and enantiomers?

(A) 

(B) 

(C) 

(D) $CH_3CH{=}CHCH_2CH_3$

139. Reduction potential of *A*, *B*, *C* and *D* are 0·8 V, 0·79 V, 0·34 V and –2·37 V respectively. Which element displaces all other three elements?

(A) *B*

(B) *A*

(C) *D*

(D) *C*

140. The distance between an octahedral and a tetrahedral void in f.c.c. lattice would be

(A) $\sqrt{3}a$

(B) $\frac{\sqrt{3}}{2}a$

(C) $\frac{a\sqrt{2}}{3}$

(D) $\frac{a\sqrt{3}}{4}$

141. The presence of *F*-centres in a crystal makes it

(A) dimagnetic

(B) colourless

(C) non-conducting

(D) coloured

142. Which liquid pair shows a positive deviation from Raoult's law?

(A) Acetone-Chloroform

(B) Benzene-Methanol

(C) Water-Nitric acid

(D) Water-Hydrochloric acid

143. A pressure cooker reduces cooking time for food because

(A) the higher pressure inside the cooker crushes the food material

(B) cooking involves chemical changes helped by rise in temperature

(C) heat is more evenly distributed in the cooking space

(D) boiling point of water involved in cooking increases

144. Which of the following solutions is isotonic with blood?

(A) 0·16 *M* KCl

(B) 1·6 *M* KCl

(C) 0·16 *M* NaCl

(D) 1·6 *M* $CaCl_2$

145. A compound *X* undergoes tetramerisation in a given organic solvent. The van't Hoff factor *i* is

(A) 4·0

(B) 0·25

(C) 0·125

(D) 2·0

146. Which of the following is ***not*** true about Henry's law?

(A) The gas in contact with the liquid should undergo association in the liquid

(B) There should not be any chemical interaction between the gas and the liquid

(C) The pressure should be low

(D) To increase solubility of CO_2 in soft drinks, the bottles are sealed under low pressure

147. The amount of ice that will separate on cooling a solution containing 50 g of ethylene glycol in 200 g water to –9·3 °C is (K_f = 1·86 K molality^{-1})

(A) 38·71 g

(B) 38·71 mg

(C) 42 g

(D) 42 mg

148. A gas *X* at 1 atm is bubbled through a solution containing a mixture of 1 *M Y* and 1 *M Z* at 25 °C. If the reduction potential of $Z > Y > X$, then

(A) *Y* will oxidise *X* and not *Z*

(B) *Y* will oxidise *Z* and not *X*

(C) *Y* will oxidise both *X* and *Z*

(D) *Y* will reduce both *X* and *Z*

149. The standard reduction potentials of $Cu^{2+}(aq)/Cu(s)$ and $Cu^{2+}(aq)/Cu^{+}(aq)$ are 0·339 V and 0·153 V respectively. The standard electrode potential of $Cu^{+}(aq)/Cu(s)$ half-cell is

(A) 0·525 V

(B) 0·827 V

(C) 0·184 V

(D) 0·490 V

150. A current is passed through two voltameters connected in series. The first voltameter contains $XSO_4(aq)$ while the second voltameter contains $Y_2SO_4(aq)$. The relative atomic masses of *X* and *Y* are in the ratio 2 : 1. The ratio of the mass of *X* liberated to the mass of *Y* liberated is

(A) 1 : 1

(B) 1 : 2

(C) 2 : 1

(D) None of the above