Sl. No. : 050069 **PGCH**

Register Number | | | | | | | | |

2012

CHEMICAL ENGINEERING

Time Allowed : 3 Hours] **[Maximum Marks : 300**

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

IMPORTANT INSTRUCTIONS

1. This Booklet has a cover (this page) which should not be opened till the invigilator gives signal to open it at the commencement of the examination. As soon as the signal is received you should tear the right side of the booklet cover carefully to open the booklet. Then proceed to answer the questions.
2. This Question Booklet contains **200** questions.
3. Answer **all** questions.
4. **All** questions carry equal marks.
5. You must write your Register Number in the space provided on the top right side of this page. Do not write anything else on the Question Booklet.
6. An Answer Sheet will be supplied to you separately by the Invigilator to mark the answers. You must write your Name, Register No., Question Booklet Sl. No. and other particulars on side 1 of the Answer Sheet provided, failing which your Answer Sheet will not be evaluated.
7. You will also encode your Register Number, Subject Code, Question Booklet Sl. No. etc., with Blue or Black ink Ball point pen in the space provided on the side 2 of the Answer Sheet. If you do not encode properly or fail to encode the above information, your Answer Sheet will not be evaluated.
8. Each question comprises *four* responses (A), (B), (C) and (D). You are to select ONLY ONE correct response and mark in your Answer Sheet. In case you feel that there are more than one correct response, mark the response which you consider the best. In any case, choose ONLY ONE response for each question. Your total marks will depend on the number of correct responses marked by you in the Answer Sheet.
9. In the Answer Sheet there are **four** brackets [A] [B] [C] and [D] against each question. To answer the questions you are to mark with Ball point pen ONLY ONE bracket of your choice for each question. Select one response for each question in the Question Booklet and mark in the Answer Sheet. If you mark more than one answer for one question, the answer will be treated as wrong. *e.g.* If for any item, (B) is the correct answer, you have to mark as follows :

[A] ■ [C] [D]

10. You should not remove or tear off any sheet from this Question Booklet. You are not allowed to take this Question Booklet and the Answer Sheet out of the Examination Hall during the examination. After the examination is concluded, you must hand over your Answer Sheet to the Invigilator. You are allowed to take the Question Booklet with you only after the Examination is over.
11. Failure to comply with any of the above instructions will render you liable to such action or penalty as the Commission may decide at their discretion.
2. Do not tick-mark or mark the answers in the Question Booklet.
1. The last sheet of the Question Booklet can be used for Rough Work.

1. Partial recirculation of warm and humid air leaving a tower is more likely to occur in

A) a natural draft tower
B) a forced draft tower
C) an induced draft tower
D) spray tower.

2. The diffusivity of liquids is directly proportional to the temperature to the power of

A) 1
B) 2
C) 3
D) 3/2.

3. If lattice sites are unoccupied, an atom in an adjacent site may jump into such a vacancy. It is

A) Interstitialcy mechanism
B) Crowd-ion mechanism
C) Interstitial mechanism
D) Vacancy mechanism.

4. The absolute humidity Y' of water vapour-air mixture is given by

A) $Y' = \frac{\bar{P}_A}{P_t - \bar{P}_A} \times \frac{29}{18}$
B) $Y' = \frac{\bar{P}_A}{P_t - \bar{P}_A} \times \frac{18}{29}$
C) $Y = \frac{\bar{P}_A}{P_t - \bar{P}_A} \times \frac{18}{29}$
D) $Y = \frac{\bar{P}_A}{P_t - \bar{P}_A} \times \frac{29}{18}$.

5. The binary diffusivity in liquid is proportional to temperature

A) T
B) $T^{3/2}$
C) T^2
D) T^3.

6. The Knudsen diffusivity is proportional to

A) $D_{K.A} \propto T$
B) $D_{K.A} \propto T^{3/2}$
C) $D_{K.A} \propto T^{1/2}$
D) $D_{K.A} \propto T^2$.

7. Which one of the following scales is used for expressing specific gravity of petroleum products ?

A) Baume scale
B) API scale
C) Twaddell scale
D) Brix scale.

8. For air-water system at atmospheric conditions, Lewis number is

A) > 1 B) < 1

C) 1 D) 0.

9. For any reversible, cyclic process; the entropy of the system is

A) $\Delta s = 0$ B) $\Delta s < 0$

C) $\Delta s > 0$ D) $\Delta s = 1$.

10. In polytropic process $\left(PV^n = \text{constant} \right)$ $n = 1$. It means

A) an adiabatic process B) an isothermal process

C) an isobaric process D) a reversible process.

11. Proximate analysis of coal determines

A) Moisture, ash, sulphur, volatile matter

B) Carbon, ash, sulphur, nitrogen

C) Moisture, volatile matter, ash, fixed carbon

D) Carbon, hydrogen, nitrogen, sulphur.

12. The most preferred material for tower fill is

A) wood B) concrete

C) PVC D) chrome steel.

13. A compound of which melecular weight is 103, analyses C – 81·5%, H – 4·9%, N – 13·6%. What is the formula ?

A) $C_7 H_5 N$ B) $C_6 H_4 N_2$

C) $C_7 H_4 N$ D) $C_6 H_5 N$.

14. The diffusivity coefficient is defined as the ratio of its flux J_A to its ..... gradient.

A) Temperature B) Pressure

C) Concentration D) Velocity.

15. In mass transfer operations such as leaching, drying, adsorption and reverse osmosis, diffusion occurs in the ..... phase.

A) Liquid B) Solid

C) Gas D) Solid-solid.

16. The diffusion of solutes through certain types of polymeric solid is described in terms of

A) solubility B) permeability

C) diffusivity D) crystallinity.

17. Electrostatic precipitator is used to control the ..... pollutants.

A) Gas B) Air

C) Water D) Solid.

18. Diffusive movement may be within the fluid filling the pores or may also involve ..... diffusion of adsorbed solute.

A) Liquid B) Solid

C) Gas D) Surface.

19. The choice of solvent for absorption is not based on the property

A) viscosity B) thermal conductivity

C) volatility D) solubility.

20. In a packed tower, the liquid and gas compositions change continuously with ..... of packing.

A) volume B) density

C) height D) area.

21. Dry bulb temperature of a vapour-gas mixture is determined by immersion of a thermometer in the

A) Solute B) Gas

C) Vapour D) Vapour gas mixture.

22. The total effective interfacial surface for mass transfer is described as the product of specific interfacial surface and

A) volume B) height

C) area D) breadth.

23. The equilibrium vapour pressure that is exerted by a component in a solution is proportional to the mole fraction of that component. It is called as

A) Dalton's law B) Henry's law

C) Raoult's law D) Amagat law.

24. The absolute humidity is given by the ratio of

A) mass of solid/mass of gas B) mass of liquid/mass of gas

C) mass of vapour/mass of gas D) mass of gas/mass of water.

25. The Grosvenor humidity is called as

A) absolute humidity B) molar absolute humidity

C) mass absolute humidity D) molal absolute humidity.

26. The solubility of any gas is influenced by the temperature, in a manner described by

A) Raoult's law B) Henry's law

C) Fick's law D) van't Hoff's law.

27. The overall tray efficiency can be computed by the equation

A) equilibrium trays × real trays
B) $\frac{\text{equilibrium trays}}{\text{real trays}}$
C) real trays × equilibrium trays
D) $\frac{\text{real trays}}{\text{equilibrium trays}}$

28. The material balance is an expression of the law of conservation of ..... in accounting terms.

A) energy
B) power
C) mass
D) heat.

29. The most preferred material for the casing walls of a cooling tower is

A) PVC
B) FRP
C) CAB
D) Wood.

30. For processes in which chemical reactions occur, it is desirable to utilize the ..... units.

A) gram-mole
B) mole fraction
C) weight fraction
D) mass fraction.

31. Mole % of *A* is given by the equation

A) weight fraction × 100
B) mole fraction × 100
C) volumetric fraction × 100
D) atomic fraction × 100.

32. The newton-metre is the work done where a force of one newton acts over a distance of one metre. It is equal to ..... in S.I. unit.

A) kilowatt
B) joule
C) watt
D) erg.

33. Which of the following is a likely value of the superficial air velocity in hyperbolic tower ?

A) 100 m/s
B) 10 m/s
C) 1 m/s
D) 0·1 m/s.

34. In a cooling tower terminology, the 'range' means

A) the reduction in temperature of the hot water

B) the difference between the maximum and minimum air flow rates

C) the change in the air temperature

D) the reduction in temperature of the cold water.

35. If the 'approach' in a cooling tower is smaller, the height of the packed section will

A) be less
B) be more
C) remain unaffected
D) be zero.

36. Antimony oxide is an example of

A) anodic inhibitor
B) cathodic inhibitor
C) anodic accelerator
D) cathodic accelerator.

37. Reduction of moisture content of air to such an extent that the amount of water condensed on metal is too small to cause corrosion. This is known as

A) Deaeration
B) Neutralization
C) Dehumidification
D) Deactivation.

38. The function of addition of sodium sulphide in cathodic inhibitors, in natural solution, is

A) to eliminate oxygen
B) to introduce oxygen
C) oxidation
D) none of these.

39. Antimony and arsenic oxides are used as inhibitors in cathodic inhibitors, because they

A) decrease hydrogen overvoltage

B) increase hydrogen overvoltage

C) increase & decrease hydrogen overvoltage

D) none of these.

40. Cathodic coatings are obtained by coating

A) a more noble metal

B) metal having lower electrode potential

C) a more active metal

D) none of these.

41. The caustic embrittlement corrosion at high pressure is due to

A) sodium sulphate B) sodium carbonate

C) tannin D) lignin.

42. Which of the following is sandwiched between two layers if 99·5% pure aluminium in Alclad ?

A) Duralumin B) Copper

C) Zinc D) Nickel.

43. The process of coating iron or steel sheets with a thin coat of zinc to prevent from rusting is known as

A) tinning B) galvanizing

C) metal cladding D) none of these.

44. In cathodic inhibitor, corrosion may be reduced by

A) slowing down the diffusion of hydrated H^+ to the cathode

B) increasing the diffusion of hydrated H^+ to the cathode

C) increasing the diffusion to cathodic area

D) aeration.

45. Zinc chloromate in primary coating of paints is a powerful

A) accelerator B) retarder

C) inhibitor D) none of these.

46. Rusting of iron is

A) prevented by zinc coating

B) prevented if the article is connected with a wire of Mg

C) enhanced by wet air

D) retarded by the presence of dissolved salts.

47. Chemical corrosion always takes place at

A) anodic areas

B) cathodic aveas

C) anodic and cathodic areas

D) in the interior of metal.

48. During galvanic corrosion, the more noble metal acts as

A) an anode

B) anode as well as cathode

C) cathode

D) a corroding metal.

49. The corrosion will be rapid at

A) pH = 7

B) pH < 7

C) pH > 7

D) none of these.

50. Corrosion is an example of

A) oxidation

B) reduction

C) combination reaction

D) erosion.

51. What is the effect of dissolved carbon dioxide on rate of rusting of iron ?

A) Decreases

B) No effect

C) Increases & decreases

D) Increases.

52. A pure metal rod half-immersed vertically in water starts corroding at the bottom, due to

A) the rod above & closely adjacent to water line becomes anode

B) the lower part of rod immersed in water is more oxygenated

C) the lower part of rod becomes cathodic

D) differential aeration.

53. The addition of copper sulphate to zinc placed in 1N H_2SO_4 will

A) enhance the corrosion rate

B) reduce the corrosion rate

C) increase & decrease the corrosion rate

D) none of these.

54. In aerated atmosphere and elevated temperatures which of the following metals will have lowest rate of oxidation ?

A) Nickel B) Chromium

C) Tungsten D) None of these.

55. Which of the following anions in a medium results to the formation of insoluble reaction products, that inhibits further corrosion ?

A) Chloride ion B) Ammonium salts

C) Traces of copper D) Silica gel.

56. If anodic area is smaller than cathodic area, then

A) cathodic current density is greater than anodic current density

B) cathodic current density is equal to anodic current density

C) anodic current density is greater than cathodic current density

D) none of these.

57. In non-passivating type of corrostion, the corrosion rate may be decreased by

A) maximizing flow velocity
B) minimizing flow velocity
C) enhancing the diffusion rate
D) none of these.

58. In designing corrosion control, when two dissimilar metals are to be in contact, then

A) those metals should be as far as possible to each other in the electrochemical series
B) the anodic material should have small area
C) anodic material should have as large area as possible
D) none of these.

59. Mercaptan is an

A) Inorganic cathodic inhibitor
B) Inorganic anodic inhibitor
C) Organic cathodic inhibitor
D) Organic anodic inhibitor.

60. What is the reduction range in corrosion rate observed during the transition from the active to the passive film ?

A) 10^{-3} to 10^{-4} mpy
B) 10^{-2} to 10^{4} mpy
C) 10^{5} to 10^{9} mpy
D) 10^{3} to 10^{6} mpy.

61. Deterioration of metal due to the activity of living organism is called

A) pitting corrosion
B) passivity
C) biological corrosion
D) both (A) and (B).

62. Depolarization is the result of interaction between the oxidizing agent and

A) nitrogen gas on the surface
B) neon gas on the surface
C) helium gas on the surface
D) hydrogen gas on the surface.

63. 'Season cracking' is a term applied to

A) intergranular corrosion

B) caustic embrittlement

C) stress corrosion of copper alloys, mainly brass

D) pitting corrosion.

64. The function of amine in protecting corrosion in iron is by keeping

A) high $[H^+]$ in solution

B) low $[H^+]$ in solution

C) low $[OH^-]$ in solution

D) neutral.

65. Which of the following metal oxides is volatile ?

A) AgO

B) Fe_2O_3

C) Al_2O_3

D) MoO_3.

66. The chemical formula for rust is

A) $FeO.xH_2O$

B) $NaO.FeO.xH_2O$

C) $Fe_2O_3.xH_2O$

D) $Fe_2(SO_4)_3.Fe_2O_3.xH_2O$.

67. Which of the following statements is not correct ?

A) Aluminium corrodes faster than iron

B) Iron corrodes faster than aluminium

C) Impure metal corrodes faster than pure metal under identical condition

D) wire mesh corrodes faster at the joints.

68. In which of the following metals, specific volume of their oxide is less than that of the metal ?

A) Aluminium

B) Chromium

C) Potassium

D) Copper.

69. The particle shape, size and distribution of a pigment influence the

A) lattice structure B) crystalline structure

C) rheological properties D) coefficient of dispersion.

70. Choice of the pigments are dependent upon

A) the dispersing resin B) main resin type and structure

C) both (A) and (B) D) none of these.

71. Any heat exchangers for vehicle like car radiators surface pretreatment is required because of

A) anti-corrosion property

B) water splash proof property

C) deodorizing and anti-bacterial property

D) all of these.

72. For emulsion polymerization normally the viscous grade is of

A) high density B) low viscous

C) high viscous D) low density.

73. Cementation process is classified according to

A) nature of alloy of iron only

B) nature of alloy of iron with coating metal

C) nature of coating metal

D) none of these.

74. The properties of acrylic acid methacrylic ester polymers depend mainly on

A) acid used B) ester used

C) alcohol used D) ether used.

75. If tin is coated on iron, this process is called

A) Thinning B) Tanning

C) Tinning D) Thickening.

76. Coatings of Zn, Al, Cd on steel are anodic because of their higher value of ..... over steel.

A) cathode potential B) electrode potential

C) overpotential D) anode potential.

77. Prussian blue is also known as

A) ferric blue B) manganese blue

C) iron bronze D) bronze.

78. Opacity in organic pigment is dependent on

A) dispersion condition and formulation

B) inorganic mutual mixing

C) toners

D) suspension conditions.

79. The chemical removal of a scale is called

A) solvent cleaning B) abrasive cleaning

C) pickling D) mill scale.

80. Mechnical surface preparation includes

A) hand-tool cleaning B) flame cleaning

C) abrasive blast cleaning D) all of these.

81. Pigments consist of powder like crystalline particles which are

A) soluble in organic solvents only

B) insoluble in organic solvents only

C) soluble either in organic solvents or in water

D) soluble in water only.

82. Tag open-cup apparatus is used for

A) the solute allowed to diffuse in dry air

B) the solute allowed to diffuse in ambient air

C) the solvent vapours allowed to diffuse in the ambient air

D) the solvent vapours allowed to diffuse in dry air.

83. Anodised coating is performed on non-ferrous metals and their alloys by

A) Cathodic process B) Anodic process

C) Anodic oxidation process D) None of these.

84. Luminescent paints fluoresce under the influence of

A) sunlight source B) artificial light source

C) ultraviolet source D) none of these.

85. The relative solvent power of hydrocarbon solvents or diluents are an indicator of

A) Aniline point B) Mixed aniline point

C) Heptane number D) Kauri-butanol value.

86. Crude titanium tetrachloride is purified by

A) liquor filtration B) fractional distillation

C) wet treatment D) oxidation.

87. The better flow and lap-in properties in solvent systems may be obtained by using solvent blends with

A) higher volatility B) lower volatility

C) higher density D) higher viscosity.

88. Non-drying oil contains

A) high percentage of conjugated fatty acid esters

B) low percentage of conjugated fatty acid esters

C) only saturated fatty acid esters

D) none of these.

89. In solvent systems for spray applications, the percentage of low boiling point is (Based on total solvent composition)

A) 90% – 95% B) 50% – 55%

C) 25% – 40% D) 1% – 10%.

90. The most efficient method of cleaning cement surfaces is

A) brush coating B) sandblasting and acid-etching

C) dip coating D) air-knife coating.

91. The saponification value of linseed oil is

A) 130 – 140 B) 110 – 120

C) 188 – 195 D) 175 – 193.

92. Glyceryl monolaurate surfactant is

A) Amphoteric B) Anionic

C) Cationic D) Non-ionic.

93. The number of milligrams of potassium hydroxide required to neutralize completely the free acid present in one gram of an oil is known as

A) saponification value B) acid value

C) ester number D) iodine value.

94. Which of the following combinations is commonly known as varnish ?

A) Binder and additive B) Additive and volatile liquid

C) Binder and solvent D) Binder and volatile liquid.

95. The viscosity of cellulose based lacquers is measured by

A) Ubbelohde viscometer B) Ostwald viscometer

C) Gel permeation chromatography D) falling ball viscometer.

96. When the varnished finish is exposed to sunlight and coloured, then it is known as

A) baked enamel B) brushed enamel

C) varnish D) paint.

97. The usual ratio of cellulose to resin ratio in lacquers is

A) 5 : 1 B) 1 : 3

C) 3 : 1 D) 1 : 4.

98. Collodion is a solution of

A) cellulose in ether-alcohol solvent

B) cellulose-ester in ether-alcohol solvent

C) cellulose in acetone

D) cellulose ester in acetone.

99. Paint is

A) baked enamel

B) brushed enamel

C) dispersion of a pigment in a varnish

D) solution of resin in a volatile solvent.

100. If a fluid is stirred, brushed or otherwise worked and become less viscous, it is referred to as

A) application B) conversion

C) thixotropic D) autotropic.

101. The drying oil which is used in varnish is

A) Groundnut oil B) Soybean oil

C) Sunflower oil D) Gingelly oil.

102. The ease of polymerization of the given set of monomers is

A) ethylene > propylene > isobutylene

B) propylene > ethylene > isobutylene

C) isobutylene > ethylene > propylene

D) isobutylene > propylene > ethylene.

103. Silica modulus in manufacture of good cement clinker is defined as

A) SiO_2 / ($MgO + Al_2O_3$)

B) $CaO/(MgO + SiO_2)$

C) SiO_2 / ($CaO + Al_2O_3$)

D) SiO_2 / ($Al_2O_3 + Fe_2O_3$).

104. Waterproof cement contains which of the following, in addtion to normal constituents ?

A) Calcium stearate, oleic and lauric acids

B) Calcium silicate

C) Iron silicate

D) Calcium and magnesium silicate.

105. The essential component of a acrocrete cement is

A) sodium and potassium oxides B) aluminium and sodium oxides

C) sodium and potassium powder D) aluminium powder.

106. The composition of kaolinite is

A) $K_2O.MgO.Al_2O_3.SiO_2.H_2O$ B) $Al_2O_3.2SiO_2.2H_2O$

C) $Al_2O_3.5SiO_2.n\,H_2O$ D) $Fe_2O_3.Al_2O_3.2SiO_2.2H_2O$.

107. Which one of the following is acid refractory ?

A) Magnesite B) Silicon carbide

C) Silica D) Chromite.

108. The increasing fusion temperature of the refractories is

A) Kaolinite > Silica Brick > Magnesia Brick > Zirconia

B) Silica Brick > Kaolinite > Zirconia > Magnesia Brick

C) Kaolinite > Magnesia Brick > Silica Brick > Zirconia

D) Zirconia > Magnesia Brick > Kaolinite > Silica Brick.

109. The chromite contains

A) Cr and Fe B) Cr and Sn

C) Cr and Zn D) Cr and Cu.

110. The ore of Nickel, pentlandite contains

A) (Fe.Ni.Cu) S B) (Ni.Mg) $SiO_2.x\,H_2O$

C) (Fe, Co, Ni) As D) (Ni, As).

111. The anode mud in refinery of nickel contains

A) Cu, Ag, Fe B) Ag, Pb, Cu

C) Hg, Ag, Cu D) Hg, Au, Pb.

112. The compostion of cartridge brass is

A) Cu = 70% : Zn = 20% : Al = 10%

B) Cu = 70% : Zn = 30%

C) Cu = 60% : Zn = 10% : Co = 10% : Al = 20%

D) Cu = 50% : Zn = 20% : Co = 10% : Al = 20%.

113. The hardest of all artificial abrasives is

A) Alundum B) Carborundum

C) Boron norbide D) None of these.

114. The function of metal in high refractory ceramic particles is

A) suspending agent B) dissolution agent

C) binder D) solubilizer.

115. The approximate composition of ordinary glass sodalime glass is

A) $Na_2O.PbO.Al_2O_3$ B) $Na_2O.CaO.6SiO_2$

C) $K_2O.PbO.6SiO_2$ D) $Na_2CO_3.CaO.6SiO_2$.

116. Flint glass should contain which one of the following ?

A) Red lead B) Soda

C) Potash D) Borate.

117. If the interfacial boundary energy of the adhesive and adherent surface is lower than the sum of the surface charges of the adhesive and adherent, then the adhesion results in

A) permanent B) temporary

C) weak D) none of these.

118. The addition of small amount of maleic acid to polyvinyl chloride results in

A) reduction in adhesive strength

B) enhancement of the adhesive strength

C) no change in adhesive strength

D) no adhesion.

119. Which of the following adhesives is used for bonding non-porous surfaces ?

A) Shellac resin B) Soya bean glue

C) Casein glue D) Polyvinyls.

120. Glues of protein-origin exhibit better strength by

A) addition of alkali B) addition of acid

C) maintaining neutral pH D) none of these.

121. Which of the following polymers has the highest glass transition temperature ?

A) Polystyrene B) Polyethylene

C) Polyester D) Polycarbonate.

122. The polydispersity of a polymer is given by

A) $\bar{M}_w / \bar{M}_m$ B) $\bar{M}_m / \bar{M}_w$

C) $\frac{\Sigma N_i M_i}{\Sigma N_i}$ D) $\frac{\Sigma N_i M_i^2}{\Sigma N_i M_i}$

123. In Ziegler-Natta polymerization, the reason for stereo-specificity of polymerization is due to coordination of

A) Monomer with atom B) Polymer chain with atom

C) Hydrogen D) Oxygen.

124. The catalysts used in cationic polymerization are compounds with pronounced

A) electron donors
B) electron acceptors
C) neutral
D) complex.

125. Thermosetting polyester resins are used in paints and surface coatings to provide a tough resistant finish. Which of the following reactions takes place during drying ?

A) Oxidation and degradation
B) Reduction and degradation
C) Oxidation and cross linking
D) Reduction and cross linking.

126. High density polyethylene is prepared by

A) low pressure polymerizaion
B) high pressure polymerizaion
C) high pressure with high temperature
D) none of these.

127. The swelling behaviour of an elastomer can be predicted by

A) Boltzmann distribution
B) Flory-Huggins treatment
C) Arrhenius equation
D) Mark-Houwink equation.

128. The chief flux-forming components of the mix in the cement manufacture are

A) alumina and iron oxide
B) silica and iron oxide
C) alumina and silica
D) none of these.

129. Metallic glass was discovered by

A) Duwez
B) Young
C) Tassios
D) Kevlar.

130. Among the following, which one retards the rate of hydration ?

A) Sugar
B) $CaCl_2$
C) Both (A) and (B)
D) None of these.

131. Steel and concrete have

A) similar coefficients of thermal expansion

B) different coefficients of thermal expansion

C) similar fracture strain

D) same density.

132. Photochromic silicate glasses possess

A) optical darkening property B) optical bleaching property

C) thermal bleaching property D) all of these.

133. The gradual cooling of glass products is called

A) tempering B) annealing

C) quenching D) galvanising.

134. The setting and hardening of cement is

A) an oxidation process B) a reduction process

C) a decomposition process D) a hydration process.

135. Phosphate adhesives are made by reacting phosphoric acid with

A) Zinc oxide B) Copper oxide

C) Aluminium oxide D) Lead oxide.

136. An example of a popular adhesive is

A) cyanoacrylite B) acrylonitrile

C) polyamide D) epoxy resin.

137. Which of the following is an example for adhesive ?

A) Epoxy resin B) Amberlite

C) Copper sulphate D) Deolite.

138. An engineering plastic is

A) Polystyrene

B) LDPE

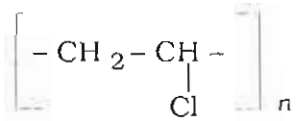
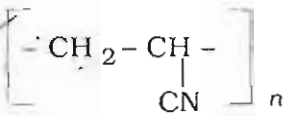
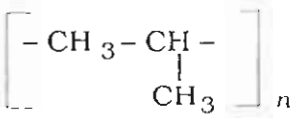
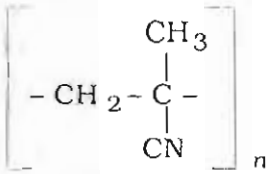
C) HDPE

D) Acrilonitrile-butadiene-styrene (ABS).

139. In rubber. the role of sulphur is as a/an

A) accelerator
B) vulcanising agent
C) softener
D) antioxidant.

140. The repeat unit of polymer in acylonitrile fibre is

A) 
B) 
C) 
D) 

141. The degree of polymerization in radical polymerization by termination by coupling is (with usual notation)

A) R_p / R_i
B) $2R_p / R_i$
C) $R_p / 2R_i$
D) $2R_p / R_t$.

142. The kinetic chain length in the radical polymerization is (with usual notation)

A) R_p / R_i
B) R_i / R_p
C) R_t / R_p
D) $R_i / (R_p + R_t)$.

143. The polymerization of methyl methacrylate in water is an example of

A) solution polymerization
B) emulsion polymerization
C) precipitation polymerization
D) bulk polymerization.

144. In the polymerization of styrene. benzoquinone acts as

A) retarder
B) initiator
C) co-monomer
D) inhibitor.

145. The kinetic chain length for thermal generation of free radicals in the absence of an added initiator involving two molecules of monomer is

A) $(k_i) / (k_p / k_t)^{1/2}$ B) $(k_p) / (k_i / k_t)^{1/2}$

C) $(k_d) / (k_i / k_t)^{1/2}$ D) $(k_p) / \left(\frac{k_i}{k_t}\right)^{1/2}$.

146. The polymerization of styrene initiated by azo-bis-isobutyronitrile (AIBN) proceeds normally at a rate proportional to

A) square root of initiator concentration

B) initiator concentration

C) independent of initiator concentration

D) inverse of initiator concentration.

147. What is the role of polyvinyl alcohol in the suspension polymerization of vinyl chloride ?

A) Retarder B) Agglomerator

C) Suspension agent D) Macro-initiator.

148. Terylene is a

A) polyamide B) polyester

C) polyglycol D) polycarbonate.

149. Nylon 6, 6 is

A) polyamide B) polyester

C) polyether D) polyacrylate.

150. The principle mechanism involved in adhesion is

A) mechanical interlocking only B) diffusion theory only

C) electrostatic theory only D) all of these.

151. Porosity and roughness of the surface will lead to

A) weaker adhesion
B) stronger adhesion
C) significantly lesser adhesion
D) none of these.

152. The joint strength will be proportional to the film strength of the adhesive when the adherent is

A) stronger than adhesive
B) weaker than adhesive
C) equal to the adhesive
D) significantly lesser than the adhesive.

153. Car wind shield is made of

A) polystyrene
B) polyacrylic acid
C) polycarbonate
D) polymethacrylic acid.

154. A natural polymer is

A) starch
B) polystyrene
C) polysulfone
D) polyamide.

155. If the monomer molecular weight is 100, and if the polymer molcular weight is 10000 then the degree of polymerisation is

A) 50
B) 100
C) 1000
D) 10.

156. The amorphous polymer is a conglomeration of badly packed interlocking chains and the extra empty space caused by the random molecular arrangement is called

A) Matrix
B) Chain coupling
C) Free volume
D) none of these.

157. The solubility of polymer decreases with

A) increase in molecular weight of the polymer
B) decrease in molecular weight of the polymer
C) increase in melting point of the polymer
D) decrease in melting point of the polymer.

158. Natural rubber is mainly

A) Polybutadiene B) Polystyrene

C) Polychloroprene D) Polyisoprene.

159. Branched chain polymer possesses

A) low density and high melting point

B) low density and low melting point

C) high density and low melting point

D) high density and high tensile strength.

160. The monomer which is used in the production of polystyrene plastics is

A) Butadiene B) Styrene

C) Chloroprene D) Acrylonitrile.

161. Butyle rubber is mainly used in tubeless tyres because

A) impermeable to air B) permeable to air

C) impermeable to water D) impermeable to light.

162. Which one of the following compounds reduces the time required for rubber vulcanization ?

A) Mercaptobenzothiazole B) Carbon black

C) Thiophenols D) Benzoic acid.

163. Dacron is a

A) fibrous polymer B) rough polymer

C) soft polymer D) strong polymer.

164. Polytetrafluoroethylene (PTFE) is known as

A) Dacron B) Teflon

C) Nylon D) Perspex.

165. Lubricants are used particularly in

A) Granulation B) Cold-molding

C) Extrusion D) Zone melting.

166. In America, latex is obtained from the tree

A) Bully tree
B) *Haveabrasiliensis*
C) Kok-saghir
D) Gutta Parcha.

167. Epoxy resins are obtained by the condensation of

A) ketone
B) aldehyde
C) phenol
D) alkanes.

168. Among the following, which one offers more efficiency ?

A) Venturi scrubber
B) Spray tower
C) Wet cyclone scrubber
D) Gravitational settler.

169. 'Fumigation' is the term used to indicate ..... behaviour.

A) plume
B) smog
C) fog
D) smoke.

170. Gaseous sampling may be carried out by

A) adsorption
B) distillation
C) vaporization
D) desorption.

171. The air to cloth ratio of fabric filter for fly ash emissions is around

A) 20 : 30
B) 8 : 10
C) 2 : 20
D) 2.

172. Separation of particulates from an air stream by abrupt collision against a flat surface forms a basis of

A) Impingement
B) Centrifugal
C) Thermal precipitation
D) Filtration.

173. Collector in sedimentation process is constructed of

A) Aluminium
B) Cement
C) Polyethylene glycol
D) Polyethylene.

174. London smog is mainly contributed by

A) NO_2 from thermal power plant
B) SO_2 from thermal power plant
C) CO_2 from thermal power plant
D) CO from thermal power plant.

175. Among the following, which one is not a primary air pollutant ?

A) Sulphur dioxide B) Nitrogen dioxide

C) Hydrogen sulphide D) Smog.

176. A statistically derived figure indicating the concentration of a material that could be expected to kill 50% of test animals under a particular condition or upon exposure for a specified period of time is known as

A) LD_{50} B) LC_{50}

C) TLV D) TWA.

177. Solid or liquid particles suspended in air or some other gas with diameters of less than ..... µm are called aerosols.

A) 1 µm B) 500 µm

C) 2 µm D) 1000 µm

178. The air pollution detection and analysis device is

A) dust fall bucket B) paper-tape sampler

C) high volume sampler D) all of these.

179. The equation, which relates efficiency to particle size with respect to electrostatic precipitator is

A) $\eta = 1 - \exp - \frac{AW}{Q}$ B) $\eta = 1 - \exp \frac{AW}{Q}$

C) $\eta = 1 - \exp \frac{Q}{AW}$ D) $\eta = 1 - \exp \frac{AQ}{W}$,

where

A = area of the collection plates, m^2

W = drift velocity, m/s of the charged particles

Q = flow rate.

180. Centrifugal field consists of

A) inertial force B) sweeping force

C) both (A) and (B) D) van der Waals force.

181. Cyclone separator works based on the principle of

A) centrifugal force B) centripetal force

C) gravitational force D) electrostatic force.

182. Low voltage two-stage electrostatic precipitators operate at a voltage range of

A) 30,000 – 1,00,000 V B) 15,000 – 20,000 V

C) 1,000 – 5,000 V D) 6,000 – 12,000 V.

183. The secondary air pollutant from the following is

A) O_3 B) NO

C) SO_2 D) CO.

184. The important climatic factor not affecting the response of vegetation to air pollutants is

A) light quality B) light intensity

C) temperature D) pressure.

185. Carbon monoxide is commonly found in city airs at a concentration of up to about

A) 25 ppm B) 35 ppm

C) 45 ppm D) 55 ppm.

186. Which one is true for cyclone separator ?

A) Requires large floor area

B) Very high collection efficiency even for very small particles (< 10 μm)

C) Ability to operate at high temperature

D) High capital cost.

187. Ozone Day is celebrated on

A) 16th September every year B) 16th November every year

C) 16th June every year D) 16th August every year.

188. Photochemical oxidants are produced in

A) Troposphere B) Stratosphere

C) Ionosphere D) Mesosphere.

189. Pick out the wrong one :

I. Acidic oxidising solution is employed in solution impingers

II. Impingement devices are mainly for collection of aerosols

III. Centrifugal method is not used for particle size greater than 5µm

IV. Plastic bags are not used for grab sampling.

Of the statements :

A) I alone B) II alone

C) II and III D) III and IV.

190. Which type of filters are inert to both acids and organic solvents ?

A) Millipore B) Teflon

C) Palliflex D) Acrapor.

191. The equipment which cannot be used at temperature where the liquid is easily to freeze or evaporate too rapidly is

A) wet scrubber B) fabric filter

C) mechanical collector D) cyclone separator.

192. Pollution caused by SO_2 in sulphuric acid can be reduced effectively by using

A) double catalyst double absorption technique

B) single catalyst single absorption technique

C) single catalyst double absorption technique

D) double catalyst single absorption technique.

193. The method which is used to collect hydrocarbons & radioactive gases is

A) adsorption sampling B) absorption sampling

C) grab sampling D) condensation sampling.

194. The equipment which collects particulate matter by gravity or centrifugal force, but which do not depend upon a vortex is

A) electrostatic precipitator
B) cyclone separator
C) mechanical collector
D) wet scrubber.

195. Which one of the secondary meteorological parameters influences air pollution ?

A) Atomspheric stability
B) Wind direction & speed
C) Mixing height
D) Humidity.

196. Pexoxyacetylnitrate (PAN) in photochemical smog is measured by

A) ultravisible spectrophotometer
B) gas chromatography
C) infrared spectroscopy
D) gas chromatography and infrared spectroscopy.

197. Poisoning of catalyst in catalytic converter is mainly due to

A) Olefins
B) Paraffins
C) Lead compounds in fuel
D) Alkenes.

198. Which one of the following is the foul smelling gas ?

A) SO_2
B) H_2S
C) H_2O_2
D) Hydrogen fluoride.

199. Which one of the following is major contributor to the smog forming potential ?

A) Alkanes
B) Alkenes
C) Olefins
D) Paraffins.

200. The change of temperature with height in the troposphere is called

A) Lapse rate
B) Thermal rise
C) Inversion
D) Plume.

[SPACE FOR ROUGH WORK]

[SPACE FOR ROUGH WORK]