PROCESS TECHNOLOGY-INORGANIC-II

51. The problem of atmospheric pollution in a nitric acid plant is due to the presence of –
(a) nitric acid mist in the tail gases, (b) ammonia in the tail gases,
(c) unabsorbed nitrogen oxides, NOx, in the tail gases, (d) none of the above,

52. Which of the following acids is used to the greatest extent for metal pickling ?
(a) sulfuric acid, (b) hydrochloric acid,
(c) nitric acid, (d) phosphoric acid,

53. Synthesis process for hydrogen chloride production uses as raw materials –
(a) sodium chloride and sulfuric acid, (b) sodium chloride and nitric acid,
(c) benzene and dry chlorine, (d) hydrogen and chlorine,

54. Which of the following is known as "Rochelle salt" /
(a) silver cyanide (AgCN), (b) nickel sulphamate [$Ni(SO_3NH_2)_2 . 4 H_2O$]
(c) sodium potassium tartarate [$KNa C_4H_4O_6 . 4 H_2O$], (d) None of the above,

55. Rochelle salt is used in –
(a) copper plating, (b) in the preparation of baking powders,
(c) all of the foregoing, (d) in pharmaceutical preparations,

56.Antimony oxide occurs in nature as –
(a) azurite, (b) phenacite,
(c) valentinite, (d) sylvanite,

57. Israel Mining Industries Process for manufacture of phosphoric acid uses as raw materials
(a) rock phosphate and sulfuric acid,
(b) rock phosphate and hydrochloric acid,
(c) rock phosphate and ammonium sulfate,
(d) phosphorous and ammonium sulfate,

58. In Israel Mining Industries Process hydrochloric acid instead of sulfuric acid is used to digest rock phosphate. The concentration of hydrochloric acid employed is –
(a) 10 %, (b) 15 %, (c) 22 %, (d) 30 %,

59. Rock phosphate, on being digested with hydrochloric acid, give a mixture of phosphoric acid and calcium chloride from which phosphoric acid is separated by solvent extraction. Commonly used solvent is –
(a) ethanol (b) n – propanol,
(c) mixture of n-butanol and isoamyl alcohol, (d) n – octanol,

60. Phosphoric acid is usually recovered from its alcoholic solution by –
(a) fractional distillation, (b) absorption onto molecular sieves,
(c) solvent extraction using water as a solvent,

(d) separation through fast reaction,

61. In the Israel Mining Industries Process rock phosphate is digested with –
(a) a stoichiometrically equivalent amount of hydrochloric acid,
(b) an excess of hydrochloric acid,
(c) a stoichiometrically deficient amount of hydrochloric acid,
(d) any of (a), (b), (c) depending on the P_2O_5 content in rock phosphate,

62. In the Israel Mining Industries Process rock phosphate is digested with an excess of hydrochloric acid in order to –
(a) achieve high reaction rates,
(b) prevent formation of mono-calcium phosphate which is soluble in organic solvents,
(c) extract as much P_2O_5 as possible from the rock,
(d) none of the above,

63. The most recent development in the chlor-alkali industries for manufacture of chlorine and caustic soda is the use of --
(a) diaphragm cell process, (b) mercury cell process,
(c) membrane cell process,

64. Of the three processes mentioned in question no. (63), the one that uses the most electric energy is –
(a) diaphragm cell process, (b) mercury cell process,
(c) membrane cell process,

65. In the membrane-cell process the caustic soda leaving the cell contains around –
(a) 5 to 10 % caustic soda, (b) 15 to 20 % caustic soda,
(c) 30 to 35 % caustic soda, (d) 50 to 55 % caustic soda,

66. Of the different manufacturing process for production of chlorine and caustic soda, the consumption of electric energy is the lowest for the membrane – cell process and is approximately --
(a) 5 % less than that for the mercury-cell process,
(b) 10 % less than that for the mercury-cell process,
(c) 25 % less than that for the mercury-cell process,
(d) 50 % less than that for the mercury-cell process,

67. In the mercury – cell process fresh brine enters the cell at a concentration of 310 9/L sodium chloride and depleted brine leaves the cell at a concentration of –
(a) 270 9/L sodium chloride, (b) 225 9/L sodium chloride,
(c) 175 9/L sodium chloride, (d) 100 9/L sodium chloride,
(e) 50 9/L sodium chloride,

68. Mercury cell process produces caustic solution containing around –
(a) 10 % caustic soda, (b) 20 % caustic soda,

(c) 35 % caustic soda, (d) 50 % caustic soda,

69. Purest caustic soda solution is obtained from –

(a) diaphragm – cell process, (b) mercury – cell process,
(c) membrane – cell process,

70. Present day mercury cells almost always employ –

(a) graphite anode, (b) activated carbon anode,
(c) activated titanium anode, (d) copper anode,

71. In the mercury – cell process, the concentration of the Na-Hg amalgam is maintained at --

(a) 0.01 to 0.05 wt % sodium, (b) 0.2 to 0.4 wt % sodium,
(c) 1 to 2 wt % sodium, (d) 10 to 12 wt % sodium,

72. Compared to the membrane-cell process, the major disadvantages of the mercury-cell process are –

(a) higher electric energy requirement,
(b) environmental pollution due to mercury,
(c) large floor space requirement,
(d) all of the foregoing,

73. Present day mercury cells employ titanium anodes coated with –

(a) ruthenium-titanium active coating, (b) MnO_2 coating,
(c) copper + zinc coating, (d) TiO_2 coating,

74. Total concentration of calcium + magnesium in the brine feed to the membrane cell must be less than

(a) 20 mg / kg. (b) 10 mg / kg.
(c) 3 mg / kg. (d) 0.05 mg / kg.

75. Which of the following chlor-alkali processes requires brine of the highest purity ;?

(a) diaphragm-cell process, (b) membrane – cell process,
(c) mercury – cell process, (d) I have doubts about the question; all the processes in (a), (b) and (c) use brine of the same purity,

76. Mercury-based plants (typically) operate most economically for a production range of –

(a) 10 to 50 tons per day chlorine, (b) 50 to 100 tons per day chlorine,
(c) 150 to 200 tons per day chlorine, (d) 200 to 450 tons per day chlorine,

77. The caustic solution from a mercury-cell process typically contains around –

(a) 50 ppm NaCl, (b) 100 ppm NaCl,
(c) 170 ppm NaCl, (d) 230 ppm NaCl,

78. The caustic solution from a diaphragm cell process typically contains around –

(a) 600 ppm NaCl, (b) 1000 ppm NaCl,
(c) 1300 ppm NaCl, (d) 1800 ppm NaCl,

79. For the same production capacity of caustic soda and chlorine the brine flow rate for membrane cells will be, approximately –
(a) twice that for mercury cells, (b) half of that for mercury cells,
(c) quarter of that for mercury cells, (d) none of the above,

80. In the diaphragm-cell process, the diaphragm (made of asbestos fibers supported on an iron screen)
(a) prevents diffusion of sodium hydroxide towards the anode,
(b) prevents passage of sodium ions towards the cathode,
(c) allows for the slow passage of solution,
(d) both (a) and (c),

81. The membranes employed in the membrane-cell (for chlorine and caustic soda production) are basically –
(a) perfluorinated polymers with occasional sulfonate and/or carboxylate groups,
(b) nylon 6, 6, (c) polyvinyl acetate,
(d) high density polyethylene,

82. Among electrolytic industries aluminum manufacture is the largest consumer of electricity. Manufacture of caustic soda is –
(a) the second largest consumer, (b) the third largest consumer,
(c) the fourth largest consumer, (d) none of the above,

83. In the diaphragm-cell process, the liquid level in the anode compartment is –
(a) lower than that in the cathode compartment,
(b) equal to that in the cathode compartment,
(c) higher than that in the cathode compartment,
(d) may be any one of the foregoing, because the liquid level does not have any influence on the working of the cell,

84. Which of the following chemicals is formed as a byproduct of the Solvay process ?
(a) sodium sulfate, (b) magnesium nitrate,
(c) potassium chloride, (d) calcium chloride,

85. Below are given a number of industrial processes where lime is used. Highest use of lime is in –
(a) steel making, (b) chemical manufacture,
(c) water treatment, (d) pulp and paper,

86. Common temperatures used in converting limestone into lime are –
(a) 300 – 400 ^{0}C, (b) 1200 – 1300 ^{0}C,
(c) 1900 – 2000 ^{0}C, (d) 2800 – 3000 ^{0}C,
Note: Lime is a very energy – intensive product.

87. Titanium dioxide has become the most important and useful white pigment in the world because of the following properties :

(a) high refractive index, stability and non-toxicity
(b) lack of absorption of visible light,
(c) ability to be produced in the correct size range,
(d) all of the foregoing,

88. Titanium dioxide pigments are produced in two forms. They are –

(a) anatase or rutile (b) brookite,
(c) rutile, (d) none of the above,

89. Basic raw materials in the manufacture of titanium pigments are –

(a) perovskite, (b) ilmenite,
(c) titanite, (d) rutile,

90. Ilmenite is ideally –

(a) lithium dititanite ($Li_2\ Ti_2O_5$) (b) sodium pentatitanate ($4\ Na_2O,\ 5\ TiO_2$)
(c) ferrous titanate ($Fe\ TiO_3$), (d) potassium metatitanate ($K_2\ TiO_3$),

91. There are two basic processes for industrial production of TiO2 : chloride process and sulfate process. In India the process (es) which is/are mostly employed is –

(a) chloride process, (b) sulfate process,
(c) both (a) and (b), (d) none of the above; TiO_2 is not produced at all in India, it is entirely imported from USA.

92. Raw material for the production of titanium dioxide by chloride process is –

(a) rutile mineral, (b) ilmenite,
(c) titanium trichloride, (d) butyl titanate,

93. More than 75% of the total TiO2 pigment production in USA occurs by –

(a) sulfate process, (b) chloride process,
(c) a new process which is a combination of both sulfate and chloride processes.

94. TiO2 pigments of superior quality is produced by –

(a) chloride process, (b) sulfate process,
(c) the question has been wrongly posed because both processes produce pigment of the same quality starting from different raw materials.

95. In the "Clause process" elemental sulfur is produced –

(a) by oxidation of hydrogen sulfide obtained from "sour' natural gas well or petroleum refineries,
(b) by solvent extraction from iron pyrites,
(c) by reduction of sulfur dioxide in presence of hydrogen,

(d) none of the above; in chemical technology there is no process called "clean processes'. The question has been set to confuse the students.

96. Sulfur is one of the few materials whose quantity is often expressed in –

(a) metric tons (2204.6 lb), (b) long tons (2240 lb),
(c) short tons (2000 lb), (d) none of the above,

97. 20 % oleum is –

(a) 20 % SO_3 in 80% H_2SO_4 (no water), (b) 20 % SO_3 in 100% H_2SO_4
(c) 80 % SO_3 in 100% H_2SO_4 (d) none of the above,

98. The largest use of sulfuric acid is in –

(a) iron and steel pickling, (b) petroleum refining,
(c) copper leaching, (d) fertilizer manufacture,

99. A good indicator of economic strength of a product is a high percentage of capacity being utilized. If production is 70% of capacity, it usually means that –

(a) the product is in appropriate demand,
(b) there is a diminishing trend in the demand of the product,
(c) there is no demand for the product and production should be stopped immediately.
(d) The plant is operating with a faulty technology,

100. Most sulfuric acid plants in USA manufacture between –

(a) 50 to 100 tons per day, (b) 200 to 400 tons per day,
(c) 200 to 1000 tons per day, (d) 200 to 2400 tons per day,

51c,	52b,	53d,	54c,	55d,	56c,	57b,	58d,	59c,	60c,	61b,
62b,	63c,	64b,	65c,	66c,	67a,	68d,	69b,	70c,	71b,	72d,
73a,	74d,	75b,	76d,	77d,	78b,	79c,	80d,	81a,	82a,	83c,
84d,	85a,	86b,	87d,	88c,	89a,	90d,	91b,	92a,	93b,	94a,
95a,	96c,	97a,	98d,	99a,	100d					

❖ For Further details, corrections and information. You may contact at:

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