

10. Trinitrotoluene (TNT) is
 a. Used in dye manufactures
 b. Used in glycerin manufacture
 c. An explosive
 d. Used in iron ore purification
11. Enamels
 a. Do not contain pigment
 b. Are prepared from non-drying oil
 c. Are same as varnish
 d. Give good glossy finish
12. Gypsum is
 a. Calcium sulphate
 b. Calcium chloride
 c. Potassium sulphate
 d. Sodium sulphate
13. The major constituents of glass are
 a. Silica, alumina and clay
 b. Silica, alumina and soda ash
 c. Lime, clay and soda ash
 d. Sand, lime and soda ash
14. Activated carbon is used for
 a. Disinfection
 b. Removing hardness
 c. Removing odors
 d. Removing corrosiveness
15. Main constituents of Portland cement are calcium aluminate and
 a. Carbonates
 b. Sodium silicate
 c. Silicates
 d. Gypsum
16. Phosphoric acid is prepared from
 a. Rock phosphate
 b. Cryolite
 c. Chalcopyrite
 d. Bauxite
17. Electric bulbs are made of _____ glass.
 a. Pyrex
 b. Crookes
 c. Flint
 d. Jena
18. Common salt is generally not produced by _____ method from brine.
 a. Freeze drying
 b. Electrolytic
 c. Solar evaporation
 d. Vacuum evaporation
19. Production of one ton of cement requires about _____ tons of limestone.
 a. 0.6
 b. 1.2
 c. 2.2
 d. 3.8
20. Which of the following statements are **INCORRECT**?
 a. Conversion of SO_2 to SO_3 in Monsanto-4 pass converter is about 98%
 b. The chemical formula of oleum is $\text{H}_2\text{S}_2\text{O}_7$, which is formed by saturating sulphuric acid with sulphur trioxide
 c. Vitriol oil is nothing but technical sulphuric acid
 d. Decomposition of sulphuric acid on heating does not start before its boiling

KATHMANDU UNIVERSITY
End Semester Examination
June/July, 2023

02 JUL 2023

Level : B.E.
Year : II
Time : 2 hrs. 30 mins

Course : CHEG 210
Semester : II
F.M. : 40

SECTION "B"

[5Q × 8 = 40 marks]

Attempt ALL questions.

1.
 - a. For a BOD test, 75 mL of a river water sample is used in the 300 mL of BOD bottles without seeding with three duplications. The initial DO in three BOD bottles read 8.86, 8.88, and 8.83 mg/L, respectively. The DO levels after 5 days at 20 °C incubation are 5.49, 5.65, and 5.53 mg/L, respectively. Find the 5-day BOD (BOD₅) for the river water. [3]
 - b. Draw flow chart of Portland cement manufacturing process. [3]
 - c. Draw simplified flow diagram of membrane cell process to produce caustic soda and chlorine. [2]
2.
 - a. A municipal wastewater treatment facility operates at a flow rate of 1,500 m³/hr. Residual chlorine reaches the end of the chlorine contact chamber at a concentration of 1.2 mg/l as Cl₂. At what mass rate must NaHSO₃ be added to the effluent to accomplish complete dechlorination. Express your answer in kg/d. [3]
 - b. Explain briefly the production process for CO₂ assuming raw material source from fermenter of brewery with box flow diagram? What are the other two raw material sources of CO₂? [5]
3.
 - a. In a groundwater remediation study, volatile organic carbon removal through the vapor phase, the total hydrocarbons analyzer measured 1,1,1,-trichloroethane. The extraction pump and air stripper combined air flow averaged 0.40 m³/min. The concentration of 1,1,1,-trichloroethane averaged 25 parts per million by volume (ppmv) of air. Determine the amount of 1,1,1,-trichloroethane removed daily. Temperature is 20 °C. [3]
 - b. Explain briefly the production process for urea with box flow diagram. [5]
4.
 - a. A water with low alkalinity of 12 mg/L as CaCO₃ will be treated with the alum-lime coagulation. Alum dosage is 55 mg/L. Determine the lime (CaO) dosage needed to react with alum. (Hint: alkalinity conversion is needed) [4]
[Molecular weight (g/mol): Al-27; S-32; Ca-40.1]
$$\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O} + 3\text{Ca}(\text{HCO}_3)_2 \rightarrow 2\text{Al}(\text{OH})_3 \downarrow + 3\text{CaSO}_4 + 6\text{CO}_2 + 18\text{H}_2\text{O}$$
$$\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O} + 3\text{Ca}(\text{OH})_2 \rightarrow 2\text{Al}(\text{OH})_3 \downarrow + 3\text{CaSO}_4 + 18\text{H}_2\text{O}$$

b. What is green ammonia? How is it different from conventional type? Why is it gaining worldwide interest? Do you think Nepal government should opt it over conventional type? [4]

5.

a. The world is facing phosphorus scarcity. But the excess phosphorus in water bodies is causing eutrophication. How do you think the world should act to address both problems. [4]

b. What is the function of ammonia in Solvay process? [2]

c. Briefly explain two operations involved in annealing of glass object? [2]