

2018

CHEMISTRY

CHM 303

ENVIRONMENTAL CHEMISTRY

Full Marks: 80

Time: 3 hours.

*The figures in the margin indicate full marks for the questions*

1. Answer the following question (any one) : 10
- (a) (i) What are the five stages of the water cycle. What are the implications of pollution of river water. 1+2=3
- (ii) Name environmental disasters which attracted worldwide attention and write in brief on any one of them. 7
- (b) Define Green Chemistry. Mention any two principles of green chemistry and discuss how application of these two principles may lead to better environmental management. 2+8=10
2. Answer the following questions (any six) : 5X6=30
- (a) What are the four zones of the atmosphere? Comment on the temperature and pressure variations in the different zones of the atmosphere.
- (b) Discuss what contribute to the Antarctic and arctic ozone hole formation and comment on its possible consequences.
- (c) Hydroxyl radical is the key player in atmospheric reaction during day time. – Discuss the generation and reactions of hydroxyl radical in the atmosphere.

- (d) What is greenhouse effect? Why nitrogen and oxygen cannot act as greenhouse gases. What are the possible outcomes of greenhouse effect?
- (e) What are photochemical and classical smog? Write in brief on them.
- (f) Write short notes on:
- SONOX process
  - Acid rain
- (g) What are hydrocarbon pollutants? How do they affect the environment and human health?

**3. Answer the following question (any four) : 5X4=20**

- (a) What are humic materials? Distinguish between terrestrial and humic materials.
- (b) Humic materials act as scavenger for metal ions and many organic pollutants- illustrate this statement with suitable examples.
- (c) Discuss the principle of coagulation effect of alum. A spherical particle of clay of 0.002mm size in diameter falls in water in a tank at normal pressure and at 20°C, calculate the time required for the particle to settle down at the bottom of the tank 4 meter in depth. Particle density =  $2.65 \times 10^3 \text{ Kg m}^{-3}$  and viscosity of water =  $1 \times 10^{-3} \text{ kg m}^{-1} \text{ sec}^{-1}$ . **3+2=5**
- (d) What are chemical coagulants? Name a few chemical coagulants. Discuss a method of treatment of water containing excessive iron.
- (e) Name the different sulphur species present in water. The  $pE^\circ$  for the equilibrium reaction between  $\text{SO}_4^{2-}$  and  $\text{HS}^-$  is 4.204. What is the relation between pE and pH for the reaction.

**4. Answer the following questions (any four) : 5X4=20**

- (a) Define soil. Write briefly about composition of soil. What is humus? **1+3+1=5**
- (b) What is chemical weathering of soil? Write briefly about different steps of chemical weathering of soil. **1+4=5**
- (c) Write short notes on (any two) **2 $\frac{1}{2}$ x2=5**
- Soil pH.
  - Cation exchange capacity.
  - Acid mine drainage.
  - Soil micro nutrients.
- (d) What do you mean by incineration? Point out the objective of incineration of solid waste. **3+2=5**
- (e) What is sewage sludge? What is its impact on soil quality and fertility? **2+3=5**

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