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**CAS 554**

**IV Semester M.Sc. Degree Examination, September/October 2022**  
**ANALYTICAL CHEMISTRY**  
**Environmental Chemistry**  
**(CBCS – 2016-2017 Syllabus)**

Time : 3 Hours

Max. Marks : 70

**Instructions :** 1) Answer Part – A and **any four** questions from Part – B.  
2) Figures to the **right** indicate marks.

**PART – A**

1. Answer **all** the following sub-questions : **(9×2=18)**
- “Soil does not have any efficient ion exchanger site”. Comment on this statement.
  - Explain buffer capacity of a soil.
  - What is knocking ? Give its mechanism.
  - “The concentration of air pollutants in automobile exhaust depends on air : fuel ratio”. – Justify the statement.
  - What do you mean by ‘black snow’ ?
  - Describe the flame ionization method for analysis of hydrocarbons.
  - How CO is analyzed through NDIR method ?
  - What is desulphurization of gases ?
  - Explain the role of wet scrubber in the removal of particulates.

**PART – B**Answer **any four full** questions :

2. a) Soil becomes very often deficient in nutrients  $K^+$ ,  $NO_3^-$  and  $HPO_4^{2-}/H_2PO_4^{2-}$ . Justify the statement.
- What are clay materials ? How they are analyzed ?
  - Explain Coal beneficiation and Blending of Coal. **(5+4+4)**

P.T.O.



3. a) Describe the determination of  $\text{Ca}^{2+}$  in soil samples by flame photometry.  
b) How is producer gas manufactured ? What are its advantages and disadvantages ?  
c) Define Calorific value. In an experiment 4.5 kg of a fuel was completely burnt. The heat produced was measured to be  $1.8 \times 10^5$  kJ. Calculate the calorific value of the fuel. **(5+4+4)**
4. a) What are the adverse effects of photochemical smog on human health, vegetation and materials ?  
b) Discuss the principles of analysis of the air pollutants :  
i)  $\text{SO}_2$  ii) VOCs.  
c) Explain the ozone depletion mechanism by  $\text{NO}_x$  and  $\text{ClO}_x$ . **(5+4+4)**
5. a) Discuss the fate of CO in atmosphere. Show how atmosphere cycle relates the species CO, OH and  $\text{CH}_4$ .  
b) What do you mean by air pollution ? Give the common units to express the air pollutant concentration.  
c) Give the working principle for analysis of  $\text{O}_3$  and  $\text{NO}_x$  by chemical chemiluminescent analyzer. **(5+3+5)**
6. a) Discuss the working principle of electrostatic precipitator (ESP).  
b) How is Sulphur dioxide emission controlled ? Explain.  
c) Why are two catalytic reactors necessary to control all major automotive exhaust pollutants ? **(5+4+4)**
7. a) Which devices are used for control of gaseous pollutants ? Explain the working principles of any three devices.  
b) Write notes on :  
i) Gravitational Settling Chambers and  
ii) Incineration. **(7+6)**
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