

Unique Paper Code : 32181102  
Name of Paper : **Physics and Chemistry of Environment**  
Name of Course : **B.Sc. Hons. Environmental Sciences -Core**  
Semester : **I**

Duration: **3 hours**

Maximum marks: **75**

Attempt any *four* questions.

*All* questions carry *equal* marks

1. Describe the four main laws that deal with black body radiation. Explain how one of these laws lead to a ‘catastrophe’? Please also explain how classical physics failed to explain black body radiation?
2. In the laboratory, you are asked to prepare a series of dilute NaCl solutions from a 100 mM stock solution. Solution A is prepared by pipetting 10 mL of the stock solution into a 250-mL volumetric flask and diluting to volume. Solution B is prepared by pipetting 25 mL of solution A into a 100-mL volumetric flask and diluting to volume. Solution C is prepared by pipetting 20 mL of solution B into a 500-mL volumetric flask and diluting to volume. **Explain how you would prepare a 100 mM stock solution from NaCl salt and what is the molar concentration of NaCl in solutions A, B and C?**
3. At place ‘A’, the government has sanctioned an industrial unit, and there is a vast cluster of human settlement at place ‘B’, which is 10 km south-east (SE) of place ‘A’. In this region, the wind flows from NW to SE for most of the year. Residents of place ‘B’ are protesting against the industrial unit sanctioned at place ‘A’. **Explain how these human settlements will be affected by industrial emissions. Discuss the mechanisms involved in the dispersal of emissions. Also, elaborate on why it is easier to monitor the emissions from the industrial unit.**
4. Explain the role of free radicals in atmospheric chemistry, citing air pollution in Delhi and thinning of ozone layer over Antarctica. How do you think anthropogenic activities are responsible for the thinning of the ozone layer?

5. Recently, a new housing society got established in Rajasthan, which has huge deposits of limestone and is heavily dependent on the groundwater reservoir. After a few months of living in that society, residents found that some of their electrical equipment, like water heaters, have reduced their efficiency. The water pipes showed either clogging or scaling. **What do you think is the reason behind these abnormalities? Explain the phenomenon in detail. Also, suggest all the possible methods to alleviate the problem. Is it possible to understand the alkalinity of the water by measuring just its pH? Explain.**
  
6. Soil is an essential component of the environment that determines ecosystem productivity, and the ions on soil particles affect nutrient availability, soil fertility, and biogeochemical cycles. **Discuss.**