No. of Printed Pages: 02

[76/A-46] ( ) SARDAR PATEL UNIVERSITY

M.Sc. (Chemistry) IVth Semester Examination (CBCS)

April-2017

Tuesday, Date: 18.04.2017

Time: 2.00 p.m. to 5.00 p.m., Paper: PS04ECHE05

Subject: Environmental Chemistry, **Max. Marks:** 70

N.B.: i). The numbers of the marks carried by each question is indicated at the end of the question

ii) Assume suitable data if considered necessary and indicate the same clearly.

Q.1 Attempt the following MCQs [08]

i) Transpiration is a key component of_____
   a) Oxygen cycle   b) Nitrogen cycle
   c) Hydrological cycle   d) Sulfur cycle

ii) Which among the following is/are physical weathering agent(s)?
   a) Water   b) Ice
   c) Temperature   d) All

iii) A sample of air 99.9 % dried contains element(s) such as___
   a) Oxygen   b) Nitrogen
   c) Argon   d) All

iv) An ideal temperature for pyrolysis of solid waste is around.....
   a) 1000 °C   b) 550 °C
   c) 700 °C   d) 910 °C

v) A conversion '$N_{2(g)} \rightarrow NH_4^+$' mediated by soil bacteria is called
   a) Nitrogen fixation   b) Nitrification
   c) Nitrate reduction   d) De-nitrification

vi) Which of the following is not a water quality parameter?
   a) COD   b) SOMG
   c) DO   d) BOD

vii) Which of the following is known to confer odor to water?
   a) TON   b) TOM
   c) TNO   d) TDS

viii) The first component of sampling train is_____
   a) Collector   b) Vacuum source
   c) Metering device   d) None

O.2 Attempt any **Seven** [14]

i) State 'pathway of pollutant' giving a suitable example.

ii) Introduce in brief 'biosphere' and 'ecosystem'.

iii) State chemical and other solid wastes, with suitable examples.

iv) What is bio-drying process? State the mechanism of this process.

v) Describe in brief phosphate cycle, giving its importance.

vi) State 'PAN' and 'PHS'.

vii) What do you mean by acid rain? Describe mechanism of acid rain.

viii) A water sample is reported to have 5.0 ppb of $CaCO_3$. Calculate this concentration in molarity [Ca = 40, C = 12, O = 16].

ix) Illustrate the term 'particulate matters'.

(1)

Q.3 Attempt the following
a) Discuss common features and composition of the soil, describing key processes of soil formation. [06]
b) What do you understand by hydrosphere? Outline microbially-mediated redox processes. Discuss typical features of iron and manganese bacteria in the water. [06]

OR

b) What do you understand by 'NOx'? Give key reactions which are associated to sources and the sink of NOx.

Q.4
a) Describe in brief [06]
i) Texture and permeability of the soil.
ii) Alkalinity analysis of water
b) List key roles of atmosphere. Write a note on atmospheric structure. [06]

OR

b) Outline : i) Incineration of MSW   ii) Humic substances

Q.5
a) Give significance of air pollution analysis. Discuss analysis of SO_2, NO-NO_x, O_3 and CO in the air sample. [06]
b) Attempt the following [06]
i) Discuss key sources of air pollution.
ii) Write a note on ozone depletion.

OR

b) Discuss the DOAS for air sample. A 26 L of air sample was collected and used for O_3 analysis. If the $I_2(g)$ librated from this air sample, after it was passed through KI solution, consumed 42.18 mL of 0.0978 M $Na_2S_2O_3$ in the titration, calculate concentration of O_3 in ppm and ppb, both.

Q.6
a) Give notes on BOD and COD, in detail. Calculate theoretical COD value (in mg/mL) of a solution which contains 450 mg of ethyl alcohol in 500 mL. [06]
b) Attempt the following [06]
i) Give an account of major components of water, and methods to analyze them, emphasizing on their significant effects.
ii) A 200 mL water sample was treated with hydroxime hydrochloride, to reduce Fe(III) to Fe(II), and then with 1,10-phenanthroline in excess, to receive colored solution at appropriate buffer pH. The solution was diluted to 250 mL with distilled water; the % T of which was 63.1 measured at 533 nm. 1L of another solution was prepared–dissolving 72.5 mg of pure Fe wire in acid–and treated in the same way. A 10 mL aliquot of this solution was diluted to 100 mL, and the absorbance of diluted solution when measured employing the same cell had showed value 0.288. Calculate concentration of Fe in ppm in the water sample.

OR

b) List key parameters for physical examination of water, and discuss them in detail.

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(2)