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/EVEN/SEM-4/CH-401/2015-16



**MAULANA ABUL KALAM AZAD UNIVERSITY OF
TECHNOLOGY, WEST BENGAL**

Paper Code : CH-401

**BASIC ENVIRONMENTAL ENGINEERING &
ELEMENTARY BIOLOGY**

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own
words as far as practicable.*

GROUP - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ten of the
following : $10 \times 1 = 10$

i) The growth rate of population at the population
saturation value is

- a) zero b) negative
c) greater than zero d) none of these.

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ii) Anaerobic digestion of carbon containing material
produces mainly

- a) CH_4 and CO_2 b) CH_4 only
c) CO_2 only d) H_2S .

iii) The unit of BOD reaction rate constant is

- a) Time^{-1} b) ML^{-1}
c) $\text{ML}^{-1}\text{S}^{-1}$ d) $\text{M}^{-1}\text{LS}^{-1}$.

iv) The dry adiabatic lapse rate in the troposphere is
about

- a) -9.8°C/km b) -4.5°C/km
c) -8.9°C/km d) -5.4°C/km .

v) The atmosphere is unstable under the condition of

- a) $\text{ELR} = \text{ALR}$ b) $\text{ELR} > \text{ALR}$
c) $\text{ELR} < \text{ALR}$ d) none of these.

vi) Ozone acts as a protective shield when it resides in

- a) Mesosphere b) Stratosphere
c) Thermosphere d) Troposphere.

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vii) The average annual solar intensity of solar radiation (solar constant, S) is

- a) 1370 W/m^2 b) $1730 \text{ m}^2/\text{W}$
c) 0.31 W/m d) $0.69 \text{ W}^2/\text{m}$.

viii) In the industrial area noise is measured by

- a) $L_{10}(18 \text{ hrs})$ index b) L_{eq}
c) $L_e P_n$ d) none of these

ix) For a sample of waste water containing both biodegradable and non-biodegradable waste is

- a) $\text{BOD} > \text{COD}$ b) $\text{BOD} < \text{COD}$
c) $\text{BOD} = \text{COD}$ d) $\text{BOD} \propto \text{COD}$.

x) The maximum sustainable yield is obtained when the population is

- a) half of the carrying capacity
b) one-fourth of the carrying capacity
c) double of the carrying capacity
d) two-third of the carrying capacity.

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xi) The temperature of magnetosphere is about

- a) 1200°C b) -100°C
c) 0°C d) 34°C .

xii) Thickness of earth crust varies from

- a) 0-10 km b) 20 - 50 km
c) 64 - 96 km d) 100 - 200 km.

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. a) What does the term 'Three-way Catalytic Converter' mean ? Explain the principle of a three-way catalytic converter. 1 + 2
b) Write about nitrogen cycle in nature with the help of a suitable block diagram. 2
3. a) What is the difference between Resource and Reserve ? 2
b) What are volatile organic chemicals (VOC's) ? Briefly discuss their characteristic features with example. 1 + 2

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4. Describe aquifer. Name different types of aquifers. What is hydraulic gradient? State Darcy's law. 1 + 2 + 1 + 1
5. In a work area the noise levels are recorded as follows :
110 dB(A) for 10 min/day, 100 dB(A) for 30 min/day,
90 dB(A) for 45 min/day, 80 dB(A) for 2 hr/day.
Determine whether the combined noise level is within limit.
Given : Noise Threshold limit values of 110 dB(A) is 15 min, 100 dB(A) is 1 hr, 90 dB(A) is 4 hr, 80 dB(A) is 16 hr.
6. Discuss logistic population growth model. Why is logistic population growth more acceptable? 3 + 2

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) What is hardness of water? What ions are responsible for hardness of water? Discuss the principle of lime-soda process for removal of hardness of water. 1 + 1 + 4
- b) A waste water sample has a BOD at 20°C equal to 200 mg/L and ultimate BOD of 400 mg/L. Find the BOD₅ at 35°C. 4
- c) What is meant by hazardous wastes? Mention special care to be taken for their handling and disposal purpose. 2 + 3

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8. a) Consider the sun as a perfect sphere of radius 6.8×10^8 m. Calculate the energy radiated by the sun in 12 hours. Surface temperature of the sun is 6200K and Stefan's constant $\sigma = 5.67 \times 10^{-8} \text{ J m}^{-2} \text{ s}^{-1} \text{ K}^{-4}$. 3
- b) Define food chain. Discuss the grazing food chain with an example. 5
- c) Discuss the energy flow in the ecosystem. 4
- d) Discuss *in-situ* conservation of biodiversity. 3
9. a) What is acid rain? How is it formed? Discuss its effect on environment. 5
- b) The physical stack (chimney) height 500 metre with an inside diameter of 10 metre. The stack gas velocity is 20 m/sec. The stack gas temperature is 200°C and ambient air temperature is 10°C. The atmospheric pressure is 1000 millibar and average wind speed is 5 m/sec. Then calculate the effective stack height. 5
- c) Mention the biochemical effect of toxicity due to As & Cd. 5

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10. a) What is solid waste ? Write a note on land filling as a method of disposal of solid waste. 1 + 2
- b) Name four Ozone Depleting Substances (ODS). How do these substances cause ozone depletion in the stratosphere ? 2 + 3
- c) Deduce the chemical formula for CFC-115. 4
- d) Mention the uses of CFC. 3
11. Write short notes on any *three* of the following : 3 × 5
- a) Conference of parties (COP)-21 Paris
- b) Eutrophication
- c) Energy pyramid
- d) Use of Baghouse filter and ESP for removal of particulate matter
- e) Oil pollution and its effect in marine life and coastal infrastructure.
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