

ENVIRONMENTAL SCIENCES (November 2017)  
PAPER - III

Note : This paper contains seventy five (75) objective type questions of two (2) marks each.  
All questions are compulsory.

- The sum of the internal energy and product of pressure and volume is known as :
  - Enthalpy**
  - Gibbs free energy
  - Entropy
  - Helmholtz free energy
- If at latitude  $\phi = 30^\circ$ , pressure gradient is 15 mb per 1000 km, the geostrophic wind velocity will be :
  - $\sim 20.54$  m/s
  - $\sim 15.92$  m/s**
  - $\sim 7.96$  m/s
  - $\sim 10.27$  m/s
- In a cloud free weather, there is an atmospheric window, which is transparent to terrestrial radiation in the wavelength band :
  - 1618 nm - 23400 nm
  - 2168 nm - 4610 nm
  - 12500 nm - 17000 nm
  - 7000 nm - 13500 nm**
- If  $\Gamma_{env} < \Gamma_d$ , where  $\Gamma_{env}$  and  $\Gamma_d$  are environmental and dry adiabatic lapse rates respectively, which of the following types of plume emitted from a stack of a thermal power plant is observed ?
  - Fanning**
  - Fumigating
  - Looping
  - Coning
- Out of the following two statements, identify the correct one(s) :
  - An aqueous solution of sodium carbonate is alkaline.
  - An aqueous solution of carbon dioxide is acidic.
  - (a) is correct, (b) is incorrect
  - (a) is incorrect, (b) is correct
  - Both (a) and (b) are incorrect
  - Both (a) and (b) are correct**
- The photodissociation of  $\text{NO}_2$  yields which oxygen species ?
  - $\text{O}(^3\text{P})$**
  - $\text{O}(^1\text{D})$
  - $\text{O}^+$
  - $\text{O}^-$
- The vapour pressure of bromobenzene above its ideal dilute aqueous solution of molality  $0.1 \text{ mol kg}^{-1}$  is 24.0 kPa. Calculate the Henry's law constant of bromobenzene :
  - $240 \text{ kPa kg mol}^{-1}$**
  - $220 \text{ kPa kg mol}^{-1}$
  - $460 \text{ kPa kg mol}^{-1}$
  - $400 \text{ kPa kg mol}^{-1}$

8. In the Spectrophotometric Study, if a sample has transmittance of 50%, then its absorbance is :
- (1) 0.5                      **(2) 0.3**                      (3) 1.0                      (4) 0.7
9. Given below are two statements. One labelled as Assertion (A) and the other labelled as Reason (R) :
- Assertion (A) : Sandy soil helps promote good drainage and aeration.  
Reason (R) : Sandy soil particles have size in the range 0.05 - 2.0 mm. Choose the correct answer :
- (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).**  
(2) Both (A) and (R) are correct and (R) is not the correct explanation of (A).  
(3) (A) is true, but (R) is false.  
(4) (A) is false and (R) is true.
10. Night-time tropospheric chemistry is dominated by which of the following radicals ?
- (1) NO<sub>3</sub>**                      (2) OH                      (3) HO<sub>2</sub>                      (4) O
11. Given below are two statements. One labelled as Assertion (A) and the other labelled as Reason (R) :
- Assertion (A) : Chlorine, which is widely used as an effective and relatively inexpensive disinfectant in water, generates toxic organochlorine compounds in water.  
Reason (R) : Hypochlorous acid reacts rapidly with humic acids and hydroxobenzenes.  
Choose the correct answer :
- (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).**  
(2) Both (A) and (R) are correct and (R) is not the correct explanation of (A).  
(3) (A) is true, but (R) is false.  
(4) (A) is false and (R) is true.
12. In the context of argentometric titration of chloride ions in a water sample, identify the incorrect statement :
- (1) Titrant is silver nitrate solution  
(2) Indicator is potassium chromate  
(3) Colour of the end - point is lemon - yellow  
**(4) pH of water sample should be less than 5**
13. The reaction of OH radicals with which of the following species generates hydrogen atom ?
- (1) CH<sub>4</sub>                      (2) NH<sub>3</sub>                      **(3) CO**                      (4) NO<sub>2</sub>

14. Which of the following statements is true for an ideal dilute solution ?
- (1) Solute and solvent both obey Raoult's law
  - (2) Solute obeys Raoult's law and solvent obeys Henry's law
  - (3) Solute obeys Henry's law and solvent obeys Raoult's law**
  - (4) Solute and solvent both obey Henry's law
15. Given below are two statements. One labelled as Assertion (A) and the other labelled as Reason (R) :
- Assertion (A) : The living components of ecosystems are not immortal.
- Reason (R) : Depending on the biological longevity, all living systems become abiotic constituents.
- Choose the correct answer :
- (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).**
  - (2) Both (A) and (R) are correct and (R) is not the correct explanation of (A).
  - (3) (A) is true, but (R) is false.
  - (4) (A) is false and (R) is true.
16. The movement of energy from primary producers to consumers is effected by :
- (1) The process of eating**
  - (2) The rate of rainfall
  - (3) The rate of evaporation
  - (4) The rate of transpiration
17. The result of removal of primary producers and subsequent reduction in population size leading to change in community attributes is referred to as :
- (1) Top - down cascade
  - (2) Bottom - up cascade**
  - (3) Population decline
  - (4) Community collapse
18. The amount of accumulated dead organic matter in different forest types :
- (1) Decreases from pole to equator.**
  - (2) Increases from tropic of cancer to tropic of Capricorn.
  - (3) Increases from pole to equator.
  - (4) Stabilizes at any point between two poles.
19. Which one of the following termite gut microbe contributes to degradation of cellulose ?
- (1) Trichonympha sp.**
  - (2) Enterococcus sp.
  - (3) Enterobacter sp.
  - (4) Citrobacter sp.

20. Match the List - I and List - II. Identify the correct answer from the code given below :

List - I (Group of Plankton)	List - II (Example)
(a) Macroplankton	(i) Rotifera
(b) Nanoplankton	(ii) Copepoda
(c) Mesoplankton	(iii) Pyrrophyta
(d) Microplankton	(iv) Amphipoda

Code :

- (a) (b) (c) (d)  
(1) (iii) (iv) (i) (ii)  
(2) (ii) (i) (iv) (iii)  
(3) (i) (ii) (iii) (iv)  
**(4) (iv) (iii) (ii) (i)**

21. The size of the Femtoplankton is in the range :

- (1) 0.2 - 2.0  $\mu\text{m}$       **(2) < 0.2  $\mu\text{m}$**       (3) > 5.0  $\mu\text{m}$       (4) 0.5 - 1.0  $\mu\text{m}$

22. As of July 2017, the total number of National Parks existing in India is :

- (1) 127      **(2) 103**      (3) 97      (4) 100

23. Given below are two statements. One labelled as Assertion (A) and the other labelled as Reason (R) :

Assertion (A) : Some infectious particles loose their infectious - ability in territories closer to equator, with high average of daily sunshine hours.

Reason (R) : UV incidence can determine the survival of infectious particles.

Choose the correct answer :

- (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).  
**(2) Both (A) and (R) are correct and (R) is not the correct explanation of (A).**  
(3) (A) is true, but (R) is false.  
(4) (A) is false and (R) is true.

24. An organism that represents both primary producer and primary consumer of an aquatic ecosystem is :

- (1) Phytoplankton      **(2) Bacterioplankton**  
(3) Benthic algae      (4) Zooplankton

25. Given below are two statements. One labelled as Assertion (A) and the other labelled as Reason (R) :
- Assertion (A) : The  $^{18}\text{O}/^{16}\text{O}$  ratio in a natural system can be used as a thermometer.
- Reason (R) : The fractions of  $^{18}\text{O}/^{16}\text{O}$  depend on temperature.
- Choose the correct answer :
- (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).  
(2) Both (A) and (R) are correct and (R) is not the correct explanation of (A).  
(3) (A) is true, but (R) is false.  
(4) (A) is false and (R) is true.
26. Most suitable spectral region for studying Urban Heat Island (UHI) effect is :
- (1) 3 - 5  $\mu\text{m}$                       (2) 8 - 10  $\mu\text{m}$                       **(3) 10 - 12  $\mu\text{m}$**                       (4) 1 - 3  $\mu\text{m}$
27. Which factor(s) may affect species richness on island ?
- (a) Area of the island  
(b) Distance from the mainland  
(c) Shape of the island
- Choose the correct code :
- (1) (a) and (b) only                      (2) (b) and (c) only  
(3) (a) and (c) only                      **(4) (a), (b) and (c)**
28. Delineation of water - nonwater boundary in remote sensing is best done using :
- (1) 0.5 - 0.6  $\mu\text{m}$                       (2) 0.6 - 0.7  $\mu\text{m}$                       **(3) 0.7 - 0.9  $\mu\text{m}$**                       (4) 1 - 3  $\mu\text{m}$
29. Environmentalists oppose the mining of antarctic mineral resources because :
- (1) The demand for minerals is expected to decline as the world's nations become more industrialized.  
**(2) Environment of Antarctica is extremely vulnerable and fragile to the disturbance that would occur with the development.**  
(3) Territorial claims to Antarctica are unresolved.  
(4) Currently known reserves of minerals and metals are considered inexhaustible.
30. Which of the following statements is not true for the solubility of  $\text{CO}_2$  in seawater ?
- (1) It increases with increase in partial pressure of  $\text{CO}_2$ .  
(2) It increases with increase in pH.  
**(3) It increases with increase in temperature.**  
(4) It decrease with increase in salinity.

31. What was the theme for the International Ozone Day (year 2017) ?
- (1) **'Caring for all life under the Sun'**
  - (2) 'Ozone : All there is between you and UV'
  - (3) 'Ozone and Climate : Restored by a World United'
  - (4) '30 years of healing Ozone Together'
32. Given below are two statements. One labelled as Assertion (A) and the other labelled as Reason (R) :
- Assertion (A) : OTEC power plants have low efficiencies.
- Reason (R) : Efficiency is governed by 2<sup>ND</sup> law of thermodynamics. Choose the correct answer :
- (1) **Both (A) and (R) are correct and (R) is the correct explanation of (A).**
  - (2) Both (A) and (R) are correct and (R) is not the correct explanation of (A).
  - (3) (A) is true, but (R) is false.
  - (4) (A) is false and (R) is true.
33. Given below are two statements. One labelled as Assertion (A) and the other labelled as Reason (R) :
- Assertion (A) : The efficiency of a silicon solar cell decreases with increase in temperature.
- Reason (R) : The intrinsic resistance of the solar cell increases with rise in temperature. Choose the correct answer :
- (1) **Both (A) and (R) are correct and (R) is the correct explanation of (A).**
  - (2) Both (A) and (R) are correct and (R) is not the correct explanation of (A).
  - (3) (A) is true, but (R) is false.
  - (4) (A) is false and (R) is true.
34. Given below are two statements. One labelled as Assertion (A) and the other labelled as Reason (R) :
- Assertion (A) : The rotor blades of wind - turbine execute rotational motion when moving air impinges on them.
- Reason (R) : The momentum of the moving air is transferred to the moving blades.
- Choose the correct answer :
- (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).
  - (2) **Both (A) and (R) are correct and (R) is not the correct explanation of (A).**
  - (3) (A) is true, but (R) is false.
  - (4) (A) is false and (R) is true.



41. In the purification of drinking water, the purpose of aeration is not to :
- (1) Remove dissolved gases such as  $H_2S$
  - (2) Remove volatile organic compounds
  - (3) Oxidize soluble  $Fe^{2+}$  to  $Fe^{3+}$
  - (4) Precipitate colloidal particles**
42. Which of the following is an organocarbamate insecticide ?
- (1) Parathion                      (2) Chloropyritos   **(3) Aldicarb**                      (4) Malathion
43. A bag containing a mixed fertilizer is labelled 5 - 10 - 5. It indicates :
- (1) 5% P ; 10% N ; 5% K
  - (2) 5% N ; 10%  $P_2O_5$  ; 5%  $K_2O$**
  - (3) 5%  $N_2O$  ; 10%  $PH_3$  ; 5%  $K_2O$
  - (4) 5% N ; 10%  $PH_3$  ; 5%  $K_2O$
44. The bioremediation technique of a contaminated soil does not require the fulfilment of which of the following conditions ?
- (1) Waste must be present in a physical form that is susceptible to microbes.
  - (2) Waste must be susceptible to biodegradation.
  - (3) Environmental conditions such as pH, temperature and oxygen level must be appropriate.
  - (4) Microbes of any type must be available.**
45. Given below are two statements. One labelled as Assertion (A) and the other labelled as Reason (R) :
- Assertion (A) : Organophosphate insecticides have lower values of partition coefficient,  $K_{OW}$ , than organochlorine pesticides.
- Reason (R) : Organophosphate insecticide molecules have lower ability to form hydrogen bonds with water than organochlorine pesticides.
- Choose the correct answer :
- (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).
  - (2) Both (A) and (R) are correct and (R) is not the correct explanation of (A).
  - (3) (A) is true, but (R) is false.**
  - (4) (A) is false and (R) is true.



46. Given below are two statements. One labelled as Assertion (A) and the other labelled as Reason (R) :

Assertion (A) :  $\text{NO}_x$  and volatile organic compounds (VOCs) are primary precursors in photochemical smog formation.

Reason (R) :  $\text{NO}_x$  and VOCs form oxidants by thermal reactions.

Choose the correct answer :

- (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).  
(2) Both (A) and (R) are correct and (R) is not the correct explanation of (A).  
**(3) (A) is true, but (R) is false.**  
(4) (A) is false and (R) is true.
47. The dominant species, which removes hydroxyl radical in troposphere, is :  
(1)  $\text{CH}_4$                       **(2) CO**                      (3) NO                      (4)  $\text{NO}_2$
48. Match the List - I and List -II. Identify the correct answer from the code given below :

List - I  
(EIA methods)

List -II  
(Features)

- |                          |  |
|--------------------------|--|
| (a) Overlays             | (i) Environmental Evaluation System          |
| (b) Networks             | (ii) Adaptive environmental assessment       |
| (c) Battelle Columbus    | (iii) Environmental Systems as a complex web |
| (d) Simulation modelling | (iv) Composite impact by superimposing maps  |

Code :

- |                 |              |            |             |
|-----------------|--------------|------------|-------------|
| (a)             | (b)          | (c)        | (d)         |
| (1) (i)         | (ii)         | (iii)      | (iv)        |
| (2) (ii)        | (iii)        | (iv)       | (i)         |
| (3) (iii)       | (iv)         | (i)        | (ii)        |
| <b>(4) (iv)</b> | <b>(iii)</b> | <b>(i)</b> | <b>(ii)</b> |
49. The baseline studies in EIA pertain to :  
(1) Collection of demographic data only  
(2) Prediction of significant residual environmental impact  
**(3) Existing environmental setting of the proposed development area**  
(4) Selection of the best project option available

50. Which one of the following steps is NOT included in the scoping process ?
- (1) Baseline descriptions and potential additional data collection needs
  - (2) Description of environmental impacts and creation of contingency plan**
  - (3) Defining a set of criteria to assess the project
  - (4) Setting of experts team that will conduct EIA
51. A company conducted an environmental risk assessment to evaluate the possible impacts of releasing various levels of pollutants from a chemical plant. An environmental risk assessment should focus on :
- (1) Beneficial aspects of the products produced by the plant
  - (2) The legislative requirements related to the human health effects as a result of exposure to the pollutant
  - (3) The quantification of hazards to the local environment from pollutants released
  - (4) Detailed outline of the management process to reduce the health effects related to exposure to the pollutants**
52. In EIA the multi - attribute utility theory is used to describe :
- (1) The identification of the alternatives to be evaluated and structuring of environmental parameters
  - (2) Existing environmental quality of study area**
  - (3) The socio - economic status of the area
  - (4) The risk involved in a development project
53. Under the Air Act, 1981, which body is empowered to set standard for ambient air quality ?
- (1) MOEFCC
  - (2) Ministry of Home Affairs
  - (3) Central Pollution Control Board (CPCB)**
  - (4) State Ministry of Home Affairs
54. What is meant by the doctrine of riparian rights ?
- (1) Prevention is better than cure.
  - (2) One who pollutes the water, must pay for it.
  - (3) Every owner has a right to get unpolluted water without alteration.**
  - (4) All of the above.

55. Which environmental legislation in India makes it compulsory to obtain prior approval of the Central Government for diversion of forest lands for non - forest purposes ?
- (1) Environment (Protection) Act, 1986
  - (2) Indian Forest Act, 1927
  - (3) Forest Conservation Act, 1980**
  - (4) Traditional forest - Dwellers (Forest rights) Act, 2006
56. The Lime stabilization and drying of biosolids ensure :
- (a) Creating unfavourable condition to vector
  - (b) High pH of contents in biosolids
  - (c) Reduction of all toxic elements
- Choose the correct answer :
- (1) (a), (b) and (c)
  - (2) (a) and (c) only
  - (3) (a) and (b) only**
  - (4) (b) and (c) only
57. Which one of the following waste may undergo exothermic self - accelerating decomposition ?
- (1) **Organic peroxides**
  - (2) Arsenic bearing sludges
  - (3) Organo - Chlorines
  - (4) Vinylchlorides
58. According to Plastic Waste (Management and Handling) Rules 2011, recycling of the plastic should be done according to :
- (1) IS/ISO 14852 : 1991
  - (2) IS/ISO 17088 : 2008
  - (3) IS 9833 : 1981
  - (4) IS 14534 : 1998**
59. Which of the following is not a Millennium Development Goal ?
- (1) Ensuring environmental sustainability
  - (2) Eradicating extreme hunger and poverty
  - (3) Developing global partnership for development
  - (4) Achieving universal energy security**
60. The definition of 'air pollutant' as per section 2(a) of Air Act, 1981 includes :
- (1) Liquid and gaseous substances
  - (2) Solid, liquid and gaseous substances including noise**
  - (3) Gaseous substances
  - (4) Solid, liquid and gaseous substances

61. In a population of 210 individuals, 72 are smokers and 138 are non - smokers. If a person is selected with an equal chance to each category, what is the probability of that person being a smoker ?
- (1) 0.25                      (2) 0.50                      **(3) 0.34**                      (4) 0.75
62. If the mean value ( $\bar{X}$ ) of a normally distributed data is 10 and number of observation (n)=36 with an standard deviation (sd) of 0.3, then 90% confidence interval is :
- (1)  $10 \pm 0.08$**                       (2)  $10 \pm 8.23$                       (3)  $10 \pm 0.16$                       (4)  $10 \pm 4.15$
63. Consider a tall stack emitting a pollutant at the rate  $5.0 \text{ gms}^{-1}$  in the atmosphere where wind is blowing in X-direction with an average velocity of  $2.0 \text{ ms}^{-1}$  at the stack height. What will be the maximum ground level concentration if the effective stack height is 30.0 m and the Gaussian plume is assumed with dispersion parameters  $\sigma_Y = 50.0 \text{ m}$  and  $\sigma_Z = 30.0 \text{ m}$  ?
- (1)  $\sim 180 \mu\text{gm}^{-3}$    **(2)  $\sim 320 \mu\text{gm}^{-3}$**    (3)  $\sim 240 \mu\text{gm}^{-3}$    (4)  $\sim 415 \mu\text{gm}^{-3}$
64. Which of the following material(s) are used as land fill liner for the control of gas and leachate movement ?
- (a) Sand                      (b) Bentonite                      (c) Fly ash                      (d) Butyle rubber
- Choose the correct code :
- (1) (a) and (b) only   (2) (a) and (c) only   (3) (c) and (d) only   **(4) (b) and (d) only**
65. Assume that the population (N) of a species follows the logistic growth represented by following equation -
- $$\frac{dN}{dt} = 0.8N - 0.01N^2$$
- At what value of N, the population exhibits maximum growth ?
- (1) 40**                      (2) 80                      (3) 160                      (4) 800
66. Given below are two statements. One labelled as Assertion (A) and the other labelled as Reason (R) :
- Assertion (A) : In regression analysis, smaller the p - values, the more significant is the result of the experiment.
- Reason (R) : The magnitude of p - value is an indicator of the association between the changes in the predictor's value and the changes in the response variable.
- Choose the correct answer :
- (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).  
 (2) Both (A) and (R) are correct and (R) is not the correct explanation of (A).  
**(3) (A) is true, but (R) is false.**  
 (4) (A) is false and (R) is true.



73. Which state in India is pioneer in making rain water harvesting as a compulsory measure in towns to avoid ground water depletion ?
- (1) Kerala (2) Arunachal Pradesh  
**(3) Tamilnadu** (4) Maharashtra
74. Environmental education :
- (a) Increases public awareness  
(b) Provides knowledge of environmental issues  
(c) Does not provide disciplinary focus  
(d) Sensitizes individuals about the necessity of sustainable development
- Choose the correct answer :
- (1) (a), (c) and (d) only **(2) (a), (b) and (d) only**  
(3) (b), (c) and (d) only (4) (a), (b), (c) and (d)
75. The greenhouse gas, ozone, absorbs and emits long wave radiation near the wavelength :
- (1) 9.6  $\mu\text{m}$**  (2) 11.2  $\mu\text{m}$  (3) 6.9  $\mu\text{m}$  (4) 17.3  $\mu\text{m}$

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