

**UGC NET PAPER 3 DECEMBER 27, 2015 SHIFT 1 ENVIRONMENTAL SCIENCES QUESTION PAPER**

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

1. Which one of the following statements is not true in the case of point source Gaussian Plume Model ?
  - (1) Wind speeds are constant in time.
  - (2) Pollutants are conservative
  - (3) Rate of emission of pollutants from the stack is constant
  - (4) The ground level concentration is inversely proportional to effective stack height
2. Consider the simple regression equation  $Y = a + bX$  between the variables Y and X. If the standard deviation  $S_X$  and  $S_Y$  are 3 and 2 respectively and correlation coefficient  $r = 0.75$ , the estimate of b is :
  - (1) 0.25
  - (2) 0.5
  - (3) 1.125
  - (4) 1.5
3. Consider two normal populations with variances of 10 and 20, respectively. If two independent random samples drawn from the two populations are of the sizes 30 and 24 and their variances 10 and 15 respectively, the value of static  $F_{(29,23)}$  is :
  - (1) 1.33
  - (2) 2.50
  - (3) 1.56
  - (4) 3.0
4. A normal population has  $\sigma^2 = 6$ . The sum of squares of deviations of 15 sample values from their mean being 120, what is the  $\chi^2$  (chi-square) value ?
  - (1) 9
  - (2) 48
  - (3) 20
  - (4) 1.33
5. Choose the correct sequence of phases associated with a population growth that exhibits logistic model represented by  $\frac{dN}{dt} = rN \left( 1 - \frac{N}{k} \right)$ .
  - (1) Stationary phase  $\rightarrow$  Exponential phase  $\rightarrow$  Lag phase
  - (2) Lag phase  $\rightarrow$  Stationary phase  $\rightarrow$  Exponential phase
  - (3) Lag phase  $\rightarrow$  Exponential phase  $\rightarrow$  Stationary phase
  - (4) Exponential phase  $\rightarrow$  Stationary phase  $\rightarrow$  Lag phase

6. The toxic substances of special concern emitted during incineration process from waste to energy plants are :

- (a) Carbon monoxide                      (b) Carbon dioxide  
(c) Dioxins                                  (d) Furans

Choose the **correct** answer :

- (1) (a) and (b) only
- (2) (b) and (c) only
- (3) (a) and (d) only
- (4) (c) and (d) only

7. Sanitary land fills have following properties. They :

- (a) reduce trash volume in a short time
- (b) release  $\text{CH}_4$  and  $\text{CO}_2$
- (c) eventually produce leachate which contaminate ground water

Choose the **correct** answer :

- (1) (a) and (b) only
- (2) (b) only
- (3) (a) and (c) only
- (4) (a), (b) and (c)

8. For providing information related to environment to decision makers, policy makers, scientists and environmental engineers all over the country, ENVIS was established in the year belonging to :

- (1) Sixties                      (2) Seventies                      (3) Eighties                      (4) Nineties

9. The total radiative forcing of all major and minor green-house gases in the year 2014 is estimated to be :

- (1)  $\sim 2.51 \text{ W/m}^2$     (2)  $\sim 2.93 \text{ W/m}^2$     (3)  $\sim 1.87 \text{ W/m}^2$     (4)  $\sim 2.7 \text{ W/m}^2$

10. For the range of temperatures observed in the earth's atmosphere, the saturation mixing ratio ( $W_s$ ) and the total pressure are related as :

- $$(1) \quad W_s \propto \frac{1}{p} \quad (2) \quad W_s \propto p \quad (3) \quad W_s \propto p^{3/2} \quad (4) \quad W_s \propto p^{-3/2}$$

11. A thermal power plant based on coal produces 100 MW of electrical power with conversion efficiency of 30%. If the ash content of coal is 5% and net heating value is 30 MJ per kg, how much ash is produced daily ?
- (1) 48 metric tons    (2) 24 metric tons    (3) 90 metric tons    (4) 60 metric tons
12. Under which section of Wildlife (Protection) Act 1972, the state government can declare an area closed to hunting for a specified period ?
- (1) Section 35    (2) Section 27    (3) Section 38 - A    (4) Section 37
13. Which one of the following criteria should **not** contribute to the process of establishing significance of the impact of a developmental project on environment ?
- (1) Sensitivity of surrounding environment  
(2) Probability of the impact occurring  
(3) Views and values of the developer  
(4) Views and suggestions of the public
14. The following benefits may accrue as a result of environmental audit :
- (a) Material audit leads to improvement in the production efficiency and cost  
(b) Pollution monitoring leads to environmental quality improvement  
(c) Approach towards zero discharge and zero emission leads to clean development  
(d) Incentive for pollution abatement in the form of reduction in import tax leads to cleaner environment
- Choose the **correct** answer :
- (1) (a) only  
(2) (b) and (c) only  
(3) (b) and (d) only  
(4) (a), (b), (c) and (d)
15. Environmental Impact Assessment (EIA) was incorporated under which one of the following legislations ?
- (1) Air (Prevention and Control of Pollution) Act 1981  
(2) Wildlife (Protection) Act, 1981  
(3) Indian Forest Act, 1927  
(4) Environmental (Protection) Act 1986

16. A company operating a vehicle Manufacturing plant has developed Environmental Management System (EMS) to enhance its performance and to improve quality of its products. The key aspects of this EMS would include :
- (1) Audit of manufacturing plant safety procedure
  - (2) Maximizing returns to stakeholders of the company
  - (3) The development of an overall framework for environmental affairs of the company
  - (4) The aspects of costs involved in developing an environmental policy.

17. Best practice in scoping requires :

- (a) A site visit
- (b) Relevant experience of other similar developmental projects
- (c) Employing formal scoping techniques

Choose the **correct** answer :

- (1) (a) only
- (2) (a) and (b) only
- (3) (b) and (c) only
- (4) (a), (b) and (c)

18. Match the **List - I** and **List - II**. Identify the **correct** answer from the codes given below :

**List - I**  
(Stages in EIA)

- (a) Screening
- (b) Scoping
- (c) Baseline description
- (d) Mitigation measures

**List - II**  
(Actions in EIA)

- (i) Reduce or avoid the impacts
- (ii) Establish present and future stages of environment
- (iii) Early indication of crucial impacts
- (iv) Narrowing the application of EIA

**Codes :**

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

19. The decision making process in EIA generally **does not** include :

- (1) Cost - benefit analysis
- (2) Procedural information
- (3) Socio - economic aspects
- (4) Operational management

20. Which of the following actions may be recommended for acidified lakes ?

- (1) Ammoniation
- (2) Liming
- (3) Ozonation
- (4) Chlorination

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

**Assertion (A)** : All types of aerosols contribute to radiative forcing.

**Reason (R)** : Aerosol effectively absorb electromagnetic radiations.

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, but (R) is true.

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

**Assertion (A)** : The efficiency of fuel cells is not limited by the second law of thermodynamics.

**Reason (R)** : There is no intermediate heat to work conversion in a fuel cell.

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, but (R) is true.

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

**Assertion (A)** : A wind rose with approximately equal length spokes (or petals) represents great variation of wind direction over a given duration.

**Reason (R)** : The length of the spokes is a measure of wind speeds in a given duration.

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, but (R) is true.

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

**Assertion (A)** : Large scale OTEC development may exacerbate the green-house effect.

**Reason (R)** : Methane is a green-house gas.

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, but (R) is true.

25. In a spectrophotometric cell of 2.0 cm pathlength, the solution of a substance shows the absorbance value of 1.0. If the molar absorptivity of the compound is  $2 \times 10^4 \text{ L mol}^{-1} \text{ cm}^{-1}$ , calculate the concentration of the substance in solution. What is the concentration of the substance in that solution ?
- (1)  $2.5 \times 10^{-5} \text{ mol L}^{-1}$  (2)  $4.0 \times 10^{-4} \text{ mol L}^{-1}$   
(3)  $1.0 \times 10^4 \text{ mol L}^{-1}$  (4)  $5.0 \times 10^{-4} \text{ mol L}^{-1}$
26. In order to obtain useful fusion energy from a thermonuclear fusion reactor, if the confinement time of the D+T Plasma ions is 1  $\mu$  sec, the ion density (per  $\text{m}^3$ ) must be :
- (1)  $\geq 10^{26} \text{ m}^{-3}$  (2)  $\geq 10^{23} \text{ m}^{-3}$  (3)  $\geq 10^{20} \text{ m}^{-3}$  (4)  $\geq 10^{14} \text{ m}^{-3}$
27. Which of the following is **not** a detrivore ?
- (1) Vultures (2) Earthworms (3) Insects (4) *Hydrilla*
28. Secondary succession begins at :
- (1) base rock (2) newly cooled lava  
(3) burnt forest (4) newly created shallow pond
29. Given below are two statements. One labelled as **Assertion (A)** and the other labelled as **Reason (R)** :
- Assertion (A)** : It is generally agreed that life on earth began between 3.5 and 4.5 billion years ago.
- Reason (R)** : The first form of life was the anaerobic bacteria as environment was devoid of oxygen.
- 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, but **(R)** is true.
30. The total number of Sustainable Development Goals (SDGs) announced by UN in 2015 are :
- (1) 15 (2) 17 (3) 19 (4) 21
31. The total area of productive ecosystem required to support the population sustainably is known as :
- (1) Ecological footprint (2) Ecological handprint  
(3) Carrying capacity (4) Ecological services

32. Carrying capacity of a population determines that a particular habitat for a given species can sustain :
- (1) Minimum Population
  - (2) Maximum Population
  - (3) Average Population
  - (4) A Fraction of Migrating Population
33. Which one of the following is the most productive ecosystem ?
- (1) Lakes and Streams
  - (2) Estuaries
  - (3) Continental shelf
  - (4) Open ocean
34. A measure that combines the number of species and their relative abundances compared with one another is termed :
- (1) Species richness
  - (2) Species evenness
  - (3) Species diversity
  - (4) Species relationships
35. The figures of humanity's global footprint (million hectares) for different countries estimated by WWF and Global Footprint Network in 2008 fall in the sequence :
- (1) US > China > European Union > Japan > India
  - (2) China > US > Japan > India > European Union
  - (3) European Union > US > China > Japan > India
  - (4) US > European Union > China > India > Japan
36. A common features of the synoptic and mesoscale motions in the atmosphere is that their :
- (1) Vertical motion component is more in magnitude than the horizontal wind component.
  - (2) Vertical motion component is roughly comparable to horizontal wind component.
  - (3) Vertical motion component is an order of magnitude smaller than the horizontal wind component.
  - (4) Properties can be studied by conventional synoptic networks.
37. The shape of a plume from a tall stack located on a flat terrain is found to be of "fanning" type. It implies that the atmosphere is under the condition of :
- (1) Strong lapse rate
  - (2) Weak lapse rate
  - (3) Inversion
  - (4) Weak lapse rate below inversion

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

**Assertion (A)** : Thunderstorm is a violent convective event accompanied by thunder and lightening.

**Reason (R)** : Thunderstorm is not associated with vertical air movement, humidity and instability.

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, but (R) is true.
39. According to National Ambient Air Quality Standards in India, the permissible 24 hour average concentration of lead in ambient air of an industrial area is :
- (1)  $1.0 \mu\text{g}/\text{m}^3$
  - (2)  $2.0 \mu\text{g}/\text{m}^3$
  - (3)  $3.03 \mu\text{g}/\text{m}^3$
  - (4)  $4.0 \mu\text{g}/\text{m}^3$
40. Peat soils, which have undergone prolonged drought in the forests are prone for :
- (a) ground forest fire
  - (b) underground forest fire
  - (c) tree crown fire

Choose the **correct** code :

- (1) (a) only
  - (2) (b) only
  - (3) (a) and (b) only
  - (4) (a), (b) and (c)
41. Insect pests can be controlled by the use of :
- (a) Insecticide
  - (b) Pheromones
  - (c) Juvenile Hormones
  - (d) Nitrophosphate
- Choose the **correct** answer :
- (1) (a) only
  - (2) (a) and (b) only
  - (3) (a), (b) and (c) only
  - (4) (a), (b), (c) and (d)

42. Dioxins and Furans are two toxic gaseous pollutants which can be measured by :

- (1) GC - MS
- (2) TLC
- (3) ICP - AES
- (4) AAS

43. Based on the pE value for four water samples given below, the concentration of dissolved oxygen shall be highest in :

- (1)  $\text{pE} = -4.1$
- (2)  $\text{pE} = 13.9$
- (3)  $\text{pE} = 1.0$
- (4)  $\text{pE} = 7.0$



49. The form of coal/fuel in the ascending order of heating value can be best represented as :
- (1) Lignite < Peat < Bituminous < Anthracite
  - (2) Bituminous < Lignite < Peat < Anthracite
  - (3) Peat < Lignite < Bituminous < Anthracite
  - (4) Peat < Lignite < Anthracite < Bituminous
50. In India wetland conservation is presently done by the Ministry of Environment, Forest and Climate Change under :
- (1) National Wetland Conservation Programme
  - (2) National Plan for Conservation of Aquatic Ecosystems
  - (3) National Lake Conservation Programme
  - (4) Coastal Regulation Zone
51. Soil salination is **not** caused by :
- (1) Agricultural area with high ground water irrigation
  - (2) Coastal swampy area
  - (3) Flood prone area
  - (4) Upland lateritic area with waste water irrigation
52. Ground water occurs under :
- (a) Unconfined condition in shallow aquifers
  - (b) Semi Confined aquifers
  - (c) Confined aquifers
- Choose the **correct** answer :
- (1) (a) only                      (2) (a) and (b) only    (3) (b) and (c) only    (4) (a), (b) and (c)
53. DEM (Digital Elevation Model) is best represented using :
- (1) Vector Data Models                      (2) Raster Data Models
  - (3) Coverage Data Structure                      (4) Non - Topological Data Structure
54. Delta are classified into six basic types taking cognisance and importance of :
- (a) Rivers                      (b) Waves                      (c) Tides
- Choose the **correct** answer :
- (1) (a) only                      (2) (a) and (b) only    (3) (a) and (c) only    (4) (a), (b) and (c)

55. Large elongated depression with steep walls formed by the downward displacement of a block of the earth surface between nearly parallel faults or fault system :
- (1) Thrust faults      (2) Horst      (3) Grabben      (4) Rift Valley
56. Which form of scattering in visible region in the atmosphere is not dependent on wavelength ?
- (a) Rayleigh      (b) Mie      (c) Non-Selective
- Choose the **correct** answer :
- (1) (a) only      (2) (a) and (b) only      (3) (c) only      (4) (b) and (c) only
57. Best spatial configuration for designing a core natural area is :
- (1) Circular      (2) Rectangular      (3) Square      (4) Triangle
58. Ecosystem resilience is the capacity of an ecosystem to sustain its :
- (a) Fundamental function
- (b) Structure
- (c) Feedbacks in the face of a spectrum of shock and perturbations
- Choose the **correct** answer :
- (1) (a) and (b) only      (2) (b) and (c) only      (3) (a) and (c) only      (4) (a), (b) and (c)
59. With regard to ozone depletion over Antarctica, select the false statement :
- (1) Circumpolar vortex acts as a reaction chamber
- (2) Polar Stratospheric Clouds (PSCs) are formed within the vortex
- (3) There is very low temperature inside the vortex
- (4) The heterogenous reaction
- $$\text{ClONO}_2(\text{s}) + \text{HCl}(\text{g}) \rightarrow \text{Cl}_2(\text{g}) + \text{HNO}_3(\text{s})$$
- takes over PSCs

60. Match the **Lists - I** and **- II**. Choose the **correct** answer from the codes given below :

**List - I**

**(Horizon)**

- (a) A - horizon
- (b) O - horizon
- (c) C - horizon
- (d) B - horizon

**List - II**

**(Type/Characteristics)**

- (i) Subsoil
- (ii) Leaf litter
- (iii) Parent material
- (iv) Top soil

**Codes :**

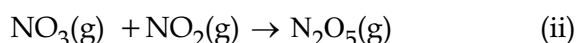
- |     | (a)   | (b)   | (c)   | (d)   |
|-----|-------|-------|-------|-------|
| (1) | (iv)  | (ii)  | (iii) | (i)   |
| (2) | (i)   | (iii) | (iv)  | (ii)  |
| (3) | (ii)  | (iv)  | (i)   | (iii) |
| (4) | (iii) | (i)   | (ii)  | (iv)  |

61. A laboratory analysis of a waste water sample indicated BOD of  $750 \text{ mg L}^{-1}$  with rate constant (K)  $0.20 \text{ day}^{-1}$  at  $20^\circ\text{C}$ . The 5-day BOD at  $20^\circ\text{C}$  is :
- (1)  $675 \text{ mg L}^{-1}$       (2)  $650 \text{ mg L}^{-1}$       (3)  $400 \text{ mg L}^{-1}$       (4)  $600 \text{ mg L}^{-1}$
62. A stream with a flow of  $0.2 \text{ m}^3/\text{sec}$  and a chloride concentration of  $50 \text{ mg/L}$  receives a discharge of mine drainage water with a flow of  $0.05 \text{ m}^3/\text{sec}$  and chloride concentration of  $1500 \text{ mg/L}$ . The downstream concentration of chloride is :
- (1)  $150 \text{ mg/L}$       (2)  $200 \text{ mg/L}$       (3)  $340 \text{ mg/L}$       (4)  $380 \text{ mg/L}$
63. Four students (**List A**) working independently in a chromatographic analysis (**List B**) reported the Retention Factor ( $R_f$ ) values :

| List - A   |   | List - B               |           |
|------------|---|------------------------|-----------|
| (Students) |   | $(R_f \text{ Values})$ |           |
| (a)        | R | →                      | (i) 0     |
| (b)        | S | →                      | (ii) 0.5  |
| (c)        | T | →                      | (iii) 1.3 |
| (d)        | U | →                      | (iv) 1.0  |

The result of which student(s) is (are) definitely **incorrect** :

- (1) R and U      (2) S and T      (3) S, T and U      (4) T
64. The mechanism of the formation of gaseous  $\text{N}_2\text{O}_5$  from  $\text{NO}_2$  and  $\text{O}_2$  gases in the gas phase within clouds is :



The experimentally determined rate law is

$$-d [\text{NO}_2(\text{g})] / dt$$

$$= K [\text{NO}_2(\text{g})] [\text{O}_3(\text{g})]$$

Based on the information provided which of the following statement is **incorrect** ?

- (1) Overall reaction is :  $2\text{NO}(\text{g}) + \text{O}_3(\text{g}) \rightarrow \text{N}_2\text{O}_5(\text{g}) + \text{O}_2(\text{g})$
- (2) The reaction intermediate is  $\text{NO}_3$
- (3) The rate determining step is reaction (i)
- (4) The rate reaction (ii) is slower than the rate of reaction (i)

65. In a rain water sample of pH=8.45, the dominant species of dissolved sulphur dioxide shall be :
- (1)  $\text{SO}_2 \cdot \text{H}_2\text{O}$       (2)  $\text{HSO}_3^-$       (3)  $\text{SO}_3^{2-}$       (4)  $\text{S}_2\text{O}_5^{2-}$
66. An aquifer of sand has a saturated column of cross - sectional area  $0.2 \times 5$  m and a depth of 3 m. If the specific yield of sand is 25% , how much water can be extracted from the aquifer ?
- (1)  $0.5 \text{ m}^3$       (2)  $0.75 \text{ m}^3$       (3)  $1.2 \text{ m}^3$       (4)  $1.5 \text{ m}^3$
67. Atmospheric life times of CFCs is typically in the range :
- (1) 50 - 102 years      (2) 140 - 200 years      (3) 200 - 400 years      (4) 152 - 210 years
68. With respect to  $\text{CO}_2$ , Global Warming Potential (GWP) for  $\text{N}_2\text{O}$  over a time horizon of 100 years is estimated to be :
- (1) 156      (2) 210      (3) 296      (4) 240
69. The green-house gas  $\text{N}_2\text{O}$  strongly absorbs infra-red radiations of wavelength(s) :
- (1)  $\sim 4.5 \mu\text{m}$       (2)  $\sim 7.8 \mu\text{m}$  and  $8.6 \mu\text{m}$   
 (3)  $\sim 9.6 \mu\text{m}$       (4)  $\sim 10.6 \mu\text{m}$
70. By the year 2022, Indian government has set a new target of Solar Power generation of :
- (1) 4 GW      (2) 60 GW      (3) 75 GW      (4) 100 GW

71. Match the **Lists - I** and **- II**. Identify the **correct** answer from the codes given below the lists.

**List - I**

**(Causes)**

- (a) Soil organisms  
 (b) Phosphorous assimilation  
 (c) Water pollution  
 (d) Air pollution

**List - II**

**(Effects)**

- (i) Algal bloom  
 (ii) Chronic obstructive pulmonary diseases  
 (iii) Decomposition  
 (iv) Complexing agent

**Codes :**

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

72. The Wavelengths that are most important in the context of stratospheric ozone depletion are :
- (1) 280 - 320 nm      (2) 400 - 700 nm      (3) 700 - 900 nm      (4) > 900 nm
73. Remote sensing satellites such as RESOURCESAT are usually placed in polar :
- (a) Low Earth Polar orbit  
(b) Sunynchronous orbit  
(c) Geosynchronous orbit
- Codes :**
- (1) (b) and (c) only    (2) (a) and (b) only    (3) (a) and (c) only    (4) (a), (b) and (c)
74. Gills of marine fishes perform the functions of the following :
- (1) Water loss and salt excretion      (2) Water gain and salt excretion  
(3) Water uptake and solute uptake    (4) Water loss and solute uptake
75. The instrument used for determination of soil water loss by percolation, evapotranspiration and run off is called :
- (1) Lysimeter      (2) Rain Gauge  
(3) Soil moisture meter      (4) Soil porosity meter