



## Doon University, Dehradun

### Sample Paper

#### M. Tech. Environmental Technology

Roll Number				
Programme Name				
Examination Centre				
Date of Examination				
Signatures of Candidate	Name of the Invigilator	Signature of the Invigilator		

*Time Allowed: 2 Hours*

*Maximum Marks: 100*

#### INSTRUCTIONS FOR CANDIDATES

*Candidates must read carefully the following instructions before attempting the Question Paper.*

- (i) Write your Roll Number in the space provided above
- (ii) There are TWO PARTS in the Paper. **PART I** is compulsory. Answer all the 60 Questions in PART-I.
- (iii) In **PART II** select any **Four Sections** out of the **Seven Sections** (Botany, Biotechnology, Chemistry, Geology, Mathematics, Physics and Zoology) and answer all the **10 Questions** in each of the selected Section.
- (iv) Use **ONLY BLUE/BLACK** Ballpoint Pen to tick the correct option. Do not use Pencil.
- (v) Please do not make any stray marks on the Answer Sheet.
- (vi) Please do not do any rough work on the Answer Sheet.
- (vii) Each question carries 1 mark. There will be no negative marking.
- (viii) Pages at the end have been provided for rough work.
- (ix) All answers must be tick marked directly on the question paper. Mark your answer **only inside the box** given against the options as follows.

a.	
b	✓
c.	
d.	

**PART I**  
**ENVIRONMENTAL SCIENCE AND TECHNOLOGY**

**Note:**

1. Answer all the 60 questions
2. Each Question carries 1 mark

**SET I- (Environmental Technology)**  
**Compulsory Answer all the 60 Questions**

1. Which one of the following is the cleanest source of energy?

a. Hydropower	
b. Fossil fuel	
c. Nuclear power	
d. Wind energy	

2. The global warming efficiency of a CFC molecule in relation to a CO<sub>2</sub> molecule is higher by a factor of

a. 125	
b. 25	
c. 500	
d. 2500	

3. Medicine quinine is provided by

a. Eucalyptus plant	
b. Aconite plant	
c. Money plant	
d. Cinchona plant	

4. Basic unit of ecological hierarchy is

a. Ecosystem	
b. Biological community	
c. Populations	
d. Individuals	

5. Ozone of ozonosphere are formed from

a. Nitrogen oxides and oxygen	
b. Chlorine, water and oxygen	
c. Oxygen and oxygen	
d. All the above	

6. Ozone makes the stratosphere

a. Cooler by 17 <sup>0</sup> C	
b. Warmer by 17 <sup>0</sup> C	
c. Warmer by 55 <sup>0</sup> C	
d. Cooler by 50 <sup>0</sup> C	

7. Most abundant noble gas of the atmosphere is

a. Neon	
b. Xenon	
c. Argon	
d. Krypton	

8. Removal of oil and grease from sewage, is known as

a. Screening	
b. Skimming	
c. Filtration	
d. Chlorination	

9. Bacterial decomposition of biological material under anaerobic condition is

a. Fermentation	
b. Fertilization	
c. Composting	
d. Contamination	

10. The most important remedy to avoid negative impact due to industrialization is

a. Industry should be closed	
b. Don't allow new industrial units	
c. Industry should treat all the wastes generated by it before disposal	
d. Industry should shifted far away from human habitats	

11. If a piece of metal weighs 10.2g in air, 8.6g in water and 7.8g in another liquid, then what will be the specific gravity of the liquid?

a. 1	
b. 1.5	
c. 2.0	
d. 3.0	

12. To conserve coral reefs the Govt. of India declared one of the following as Marine Park

a. Gulf of Kutch	
b. Lakshadweep islands	
c. Gulf of Mannar	

d. Andaman Islands	
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13. If waste materials contaminate the source of drinking water which of the following diseases will spread?

a. Scurvy	
b. Malaria	
c. Typhoid	
d. Anaemia	

14 Environmental activist Medha Patkar is known for

a. Chipko movement	
b. Tehri bachao andolan	
c. Narmada bachao andolan	
d. None of above	

15. As per WHO standards the maximum permissible level of coliform organisms per 100 ml of drinking water is

a. 10	
b. 100	
c. 150	
d. 1000	

16. Highest level of biotic interaction is

a. Mutualism	
b. Predation	
c. Parasitism	
d. Amensalism	

17. A porous body of material containing groundwater is called an

a. Egg shell	
b. Aquifer	
c. Aqueduct	
d. None	

18. The widely used aerobic suspension type of liquid waste treatment system is

a. Rotating biological contractor	
b. Percolating filter	
c. Activated sludge process	
d. Septic tanks	

19. "Ring of Fire" surrounds which ocean?

a. Indian Ocean	
b. Atlantic Ocean	
c. Arctic Ocean	
d. Pacific Ocean	

20. Self-cleansing velocity is

a. Velocity at dry weather flow	
b. Velocity of water at flushing	
c. Velocity at which no accumulation remains in the drains	
d. Velocity of water in a pressure filter	

21. The microorganisms which can produce food or organic matter to some extent through oxidation of certain chemicals are called as

a. Photo-autotrophs	
b. Chemo-autotrophs	
c. Heterotrophs	
d. None of above	

22. For the COD test of sewage, organic matter is oxidised by  $K_2Cr_2O_7$  in the presence of

a. $H_2SO_4$	
b. $HNO_3$	
c. $HCl$	
d. None of these	

23. The year declared by UN as International year of forest

a. 2011	
b. 2010	
c. 2009	
d. 2008	

24. The primordial earth's atmosphere was

a. Reducing	
b. With free oxygen	
c. Cooler	
d. All of above	

25. Bio-chemical oxygen demand (BOD) for the first 20 days is generally referred to

a. Initial demand	
b. First stage demand	
c. Carbonaceous demand	
d. All of these	

26. For domestic drinking water supply the total dissolved solids should not exceed

a. 250 ppm	
b. 500 ppm	
c. 600 ppm	
d. 100 ppm	

27. 10 db increase in sound level will increase the loudness of sound by

a. 45 db	
b. 50 db	
c. 55 db	
d. 60 db	

28. In India the commonly used method for sewage treatment is

a. Oxidation ponds	
b. Trickling filters	
c. Activated sludge process	
d. Rotating biological contractors	

29. Anaerobic processes of wastewater treatment are more suitable for

a. Low BOD wastewaters	
b. High BOD wastewaters	
c. Toxic waste waters	
d. Electroplating effluent	

30. Which of the following missions was launched by NASA last year (2014)?

a.	Global Precipitation Measurement (GPM)	
b.	Ocean Surface Topography Mission (OSTM)	
c.	Tropical Rainfall Measuring Mission (TRMM)	
d.	Solar Radiation and Climate Experiment (SORCE)	

31. Environmental impact assessment was first formally established in 1969 in which country

a. United kingdom	
b. United states	
c. France	
d. Germany	

32. The National Committee on Environmental Planning and Coordination (NECPC) was constituted in

a. 1980	
b. 1982	
c. 1972	
d. 1979	

33. The international organization of Standards containing the guidelines and general principles for carrying out an Environmental auditing is

a. ISO 14001	
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b. ISO 14020	
c. ISO 14010	
d. ISO 14040	

34. Leachate is a coloured liquid that comes out of

a. Septic tanks	
b. Sanitary landfills	
c. Compost plant	
d. Aerated lagoons	

35. For rural area most suitable solid waste disposal method is

a. Pyrolysis	
b. Incineration	
c. Land filling	
d. Composting	

36. The biggest source of atmosphere hydrocarbons in the atmosphere is

a. Refuse burning	
b. Petroleum burning	
c. Coal burning	
d. Power generation	

37. When methanol is used as a fuel for automobiles, emission of which pollutant increase significantly

a. NOx	
b. CO	
c. Formaldehyde	
d. PAN	

38. Gas, leaked in Bhopal tragedy, was

a. Methyl isocyanate (MIC)	
b. Potassium isothiocyanate	
c. Ethyl isothiocyanate	
d. Sodium isothiocyanate	

39. For the release of which green house gas Cattle, sheep and termites are responsible?

a. Methane	
b. Carbon dioxide	
c. Nitrous oxide	
d. Helium	

40. For determination of optimum coagulant dosage for coagulation the impurities present in water which test is conducted?

a. Sechi disc test	
b. Jar test	
c. Turbidity test	

d. Settling test	
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41. Ozone layer is situated in

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

42. Central Soil Salinity Research Institute (CSSRI) is situated in?

a. Delhi	
b. Chandigarh	
c. Karnal	
d. Nagpur	

43. The Antarctic Ozone hole was discovered by

a. Dr. Joe C Farman	
b. Hault	
c. E.P. odum	
d. Norman Myres	

44. The species which are confined to a particular country or area is known as

a. Endangered species	
b. Endemic species	
c. Threatened species	
d. Extinct species	

45. Chlorination of water is done for the removal of

a. Bacteria	
b. Suspended solids	
c. Sediments	
d. Hardness	

46. Removal of which of the following impurities from contaminated water requires the use of coagulants

a. Colloidal impurities	
b. Dissolved solids	
c. Microorganisms	
d. All of the above	

47. Methanogens are

a. Obligate anaerobic bacteria	
b. Obligate aerobic bacteria	
c. Aerobic bacteria	
d. Aerobic fungi	

48. The optimum range of wind speeds for power generation is

a. 2-4 m/sec	
b. 1-2 m/sec	
c. 4-12 m/sec	
d. 15-20 m/sec	

49. Spent wash is the effluent produced from which industry?

a. Pulp and paper	
b. Electroplating	
c. Tannery	
d. Distillery	

50. A fuel cell requires fuel and

a. Electric energy	
b. An electrolyte	
c. An oxidant	
d. A metal	

51. Earth's environment is mainly influenced by which forms of solar energy-

a. Light & heat	
b. X-rays & Y-rays	
c. UV radiation	
d. Low & high frequency radiations	

52. Which one of the following is a useful biological indicator of Sulphur-dioxide pollution ?

a. Bryophytes	
b. Algal blooms	
c. Pseudomonas	
d. Lichens	

53. Which of the following conceptual spheres of the environment is having the least storage capacity for matter?

a. Atmosphere	
b. Hydrosphere	
c. Lithosphere	
d. Biosphere	

54. The ultimate stable community during succession is called-

a. Pioneer	
b. Climax	
c. Both	

d.	None	
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55. The darker zone in lakes where light penetration is negligible is called-

a.	Littoral	
b.	Limnetic	
c.	Aphotic	
d.	Profoundal	

56. The tropic level I of any food chain is recognized as-

a.	Herbivores	
b.	Heterotrophs	
c.	Carnivores	
d.	None	

57. The rate at which radiant energy is stored at producer level is known as-

a.	Productivity	
b.	Net productivity	
c.	Primary productivity	
d.	None	

58. The energy transformation of an ecosystem is based on –

a.	I law of thermodynamics	
b.	II law of thermodynamics	
c.	Both	
d.	None	

59. In ecological system solar energy is firstly converted into-

a.	Heat	
b.	Chemical energy	
c.	Mechanical energy	
d.	All	

60. The nutrient enrichment of lakes are known as –

a.	Oligotrophic	
b.	Eutrophication	
c.	Mesotrophic	
d.	None	

## PART II

### Note:

1. Select any **FOUR SECTIONS** out of the following **SEVEN** Sections and answer all the 10 questions in each section.
2. All Questions carry equal marks.

### Section A: BOTANY

1. Which of the following is not part of an older tree's bark:

a.	Cork	
b.	Secondary Xylem	
c.	Cork Cambium	
d.	Secondary phloem	

2. Which of the plant hormones is incorrectly paired with its function?

a.	Auxin - Promotes stem growth through cell elongation	
b.	Cytokinins – Initiate senescence	
c.	Gibberellins – Stimulate seed and bud germination	
d.	Ethylene – Inhibits cell elongation	

3. Causes of water bloom is

a.	Green algae	
b.	Blue green algae	
c.	Bacteria	
d.	Hydrilla	

4. Armoured algae are:

a.	Dinoflagellates	
b.	Euglenoids	
c.	Red Algae	
d.	Cyanobacteria	

5. Sac fungi belong to:

a.	Ascomycetes	
b.	Basidiomycetes	
c.	Phycomycetes	
d.	Deuteromycetes	

6. A. Flemming isolated Penicillin from:

a.	<i>P. chrysogenum</i>	
b.	<i>P. notatum</i>	
c.	<i>Aspergillus flavus</i>	
d.	<i>A. niger</i>	

7. Food reserve in Rhodophyta is:

a.	Floridean starch	
b.	Mannitol	
c.	Leucosin	
d.	All of the above	

8. Sea weeds belong to:

a.	Red algae	
b.	Brown algae	
c.	Green algae	
d.	Blue green algae	

9. Which of the following conditions is needed by almost all seeds to break dormancy?

a.	Exposure to light	
b.	Imbibition	
c.	Abrasion of the seed coat	
d.	Exposure to cold temperature	

10. Plantlike photosynthesis that releases oxygen occurs in:

a.	Cyanobacteria	
b.	Chlamydiae	
c.	Archea	
d.	Actinomycetes	

## Section B: BIOTECHNOLOGY

1. A protein domain

a. Generally consists of two or more layers of secondary structure	
b. Performs multiple functions	
c. Is typically 5- 10 amino acid residues in length	
d. Is maintained solely by disulfide bonds	

2. Which of the following is not an amino acid?

a. Glutamic acid	
b. Aspartic acid	
c. Glutamine	
d. Palmitic acid	

3. Anaerobic metabolism refers to the generation of ATP

a. Without the involvement of ADP	
b. Without the use of glycogen	
c. Without the use of oxygen	
d. By the conversion of pyruvate to lactate	

4. The process of breaking down triacylglycerol into free fatty acids and glycerol is called

a. Beta oxidation	
b. Lipogenesis	
c. Lipolysis	
d. Both (a) and (c) are correct	

5. *Chlorella* sp are widely used in the removal of

a. Organic wastes	
b. Hydrocarbons	
c. Heavy metals	
d. All of these	

6. Which of the following microbe is widely used in the removal of industrial wastes

a. <i>Trichoderma</i> sp	
b. <i>Aspergillus niger</i>	
c. <i>Pseudomonas Putida</i>	
d. All of these	

7. Bacterial plasmid contains

a. RNA	
b. RNA + protein	
c. DNA	
d. Photosynthetic structures	

8. Codons are composed of

a. Triplet sequences of nucleotide bases in mRNA	
b. Triplet sequences of nucleotide bases in DNA	
c. Triplet sequences of amino acids in polypeptide chains	
d. Triplet sequences of deoxyribose sugars in DNA	

9. Which of the following immune functions would not be performed by a neutrophil?

a. Antibody production	
b. Chemotaxis	
c. Phagocytosis	
d. Degranulation	

10. A segment of DNA has 120 adenine and 120 cytosine bases. The total number of nucleotides present in the segment is

a. 120	
b. 240	
c. 60	
d. 480	



## Section C: CHEMISTRY

1. Bragg's law is given by the equation

a.	$n\lambda = 2\theta \sin d$	
b.	$n\lambda = 2d \sin \theta$	
c.	$2n\lambda = 2d \sin \theta$	
d.	$n\lambda = d \sin 2 \frac{d \sin 2\theta}{2}$	

2. Hybridization of  $C_2$  and  $C_3$  of  $H_3C - CH = C = CH - CH_3$  are

a.	sp	
b.	$sp^2$	
c.	$sp^2$	
d.	sp	

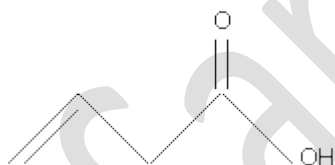
3. The temperature of the system .decreases in an \_\_\_\_\_.

a.	Adiabatic compression	
b.	Isothermal expansion	
c.	Isothermal compression	
d.	Adiabatic expansion	

4. The highest magnetic moment is shown by the transition metal ion with the configuration

a.	$3d^2$	
b.	$3d^5$	
c.	$3d^7$	
d.	$3d^9$	

5. The IUPAC name of is,

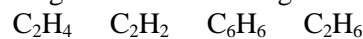


- but-1-enoic acid
- but-3-enoic acid
- prop-2-enoic acid
- pent-4-enoic acid

The maximum number of possible isomers in 1-bromo-2-methyl cyclobutane is

a.	2	
b.	4	
c.	16	
d.	8	

6. Increasing order of carbon-carbon bond length for the following is



a.                      b.                      c.                      d.

a.	$C < B < A < D$	
b.	$B < C < A < D$	
c.	$D < C < A < B$	
d.	$B < A < C < D$	

7. Which one of the following has maximum number of atoms of oxygen?

a.	2 g of water	
b.	2 g of sulphur dioxide	
c.	2 g of carbon dioxide	
d.	2 g of carbon monoxide	

8. Benzene reacts with chlorine in sunlight to give a final product

a.	$C_6H_5Cl$	
b.	$C_6Cl_6$	
c.	$C_6H_6Cl_6$	
d.	$CCl_4$	

9. Chloroacetic acid is a stronger acid than acetic acid. This can be explained using \_\_\_\_\_.

a.	- I effect	
b.	- M effect	
c.	+I effect	
d.	+ M effect	

10. 2 gm of metal carbonate is neutralized completely by 100 ml of 0.1 (N) HCl. The equivalent weight of metal carbonate is

a.	50	
b.	100	
c.	150	
d.	200	

## Section D: GEOLOGY

1. The specific gravity of a powdered mineral can be determined with the help of:

a.	Chemical balance	
b.	Walker's Steel Yard	
c.	Jolly's spring balance	
d.	Pycnometer	

2. The most useful drilling for penetrating hard or abrasive ground is:

a.	Diamond drilling	
b.	Percussion drilling	
c.	Rotary drilling	
d.	Churn drilling	

3. In terms of electric conductivity, granites is:

a.	Good conductors	
b.	Semi-conductors	
c.	Bad conductors	
d.	Moderate conductors	

4. The Geological Mapping undertaken by Geological Survey of India on the scale of:

a.	1:50	
b.	1:40	
c.	1:10	
d.	1:25	

5. Water that is formed at the time of magma consolidation is termed as:

a.	Connate water	
b.	Meteoric water	
c.	Vadose water	
d.	Juvenile water	

6. A dense mass of water on smoke or dust particles in the lower atmospheric layers constitute:

a.	Fog	
b.	Frost	
c.	Blizzard	
d.	Mist	

7. A majority of aquifer consists of:

a.	Porous breccias and conglomerate	
b.	Clay and Sandstones	
c.	Limestones	
d.	Sand and gravels	

8. Which one of the following has the least stiffness?

a.	Limestone	
b.	Sandstone	
c.	Quartz	
d.	Basalt	

9. The oldest rocks in the world are found in:

a.	Australian craton	
b.	Indian craton	
c.	Antarctica	
d.	Greenland	

10. The Tethys was located between:

a.	North America and South America	
b.	North America and Asia	
c.	Eurasia and Africa	
d.	Antarctica and Australia	

## Section E: MATHEMATICS

1. The maximum value of  $\sin(\cos x)$  is equal to

a. $\sin 1$	
b. 1	
c. $\sin\left(\frac{1}{\sqrt{2}}\right)$	
d. $\sin\left(\frac{\sqrt{3}}{2}\right)$	

2. The graph of  $y = f(x)$  is symmetrical about the line  $x = 1$ , then

a. $f(-x) = f(x)$	
b. $f(1+x) = f(1-x)$	
c. $f(x+1) = f(x-1)$	
d. none of these	

3. The function  $L(x) = \int_1^x \frac{dt}{t}$  satisfies the equation

a. $L(x+y) = L(x) + L(y)$	
b. $L\left(\frac{x}{y}\right) = L(x) + L(y)$	
c. $L(xy) = L(x) + L(y)$	
d. none of these	

4. Volume of tetrahedron formed by the planes  $x + y = 0$ ,  $y + z = 0$ ,  $z + x = 0$ ,  $x + y + z - 1 = 0$  is

a. a. 1/6	
b. b. 1/3	
c. c. 2/3	
d. d. none of these	

5. The plane  $x = 0$  divides the join of  $(-2, 3, 4)$  and  $(1, -2, 3)$  in the ratio

a. 2:1	
b. 1:2	
c. 3:2	
d. -4:3	

6. The set of real values of  $x$  satisfying  $||x-1| - 1| \leq 1$  is

a. [-1,3]	
b. [0,2]	
c. [-1,1]	
d. none of these	

7. Using substitution, which of the following equations are solutions to the partial differential equation?

$$\frac{\partial^2 u}{\partial x^2} = 9 \frac{\partial^2 u}{\partial y^2}$$

a. $\cos(3x - y)$	
b. $x^2 + y^2$	
c. $\sin(3x - 3y)$	
d. $e^{3\pi x} \sin(\pi y)$	

8. The purchase cost is 30,000 and the depreciation is 5,000 then the depreciation function is

a. $V = f(t) = 30000 - 5000t$	
b. $V = f(t) = 5000t + 30000$	
c. $V = f(t) = 30000t - 5000t$	
d. $V = f(t) = 30000t + 5000t$	

9. The complexity of Binary search algorithm is

a. $O(n)$	
b. $O(\log n)$	
c. $O(n^2)$	
d. $O(n \log n)$	

10. The point of minimum of the function  $f(x) = 4x^3 - x|x-2|$ ,  $x \in [0, 3]$  is

a. 0	
b. 1/3	
c. 1/2	

## Section F: PHYSICS

d. 2

forward and reverse biased respectively

1. The wave function for a particle must be normalizable because:

a. The particle's charge must be conserved.	
b. The particle's momentum must be conserved.	
c. The particle's angular momentum must be conserved.	
d. The particle must be somewhere.	

2. Which of the following doppler effect can't be measured classically

a. Longitudinal doppler effect	
b. Transverse doppler effect	
c. All of the above	
d. None of the above	

3. Binding energy of deuteron is

a. 2.23 MeV	
b. 4.56 MeV	
c. 10 MeV	
d. 20 MeV	

4. The electron emitted in beta radiation originates from

a. Inner orbits of atoms	
b. Free electrons existing in nuclei	
c. Decay of neutron in a nucleus	
d. Photon escaping from the nucleus	

5. The electromagnetic waves that has highest wavelength is

a. X-rays	
b. Ultraviolet rays	
c. Infra-red rays	
d. Microwaves	

6. In a transistor, the emitter-base junction and the collector-base junction are:

a. Forward and forward biased respectively	
b. Reverse and reverse biased respectively	
c. Reverse and forward biased respectively	

7. A radiation of energy  $E$  falls normally on a perfectly absorbing surface. The momentum transferred to the surface is

a. $\frac{E}{c}$	
b. $\frac{2E}{c}$	
c. $Ec$	
d. $\frac{E}{c^2}$	

8. The current gain of a transistor in common emitter circuit is 40. The ratio of emitter current to base current is

a. 40	
b. 41	
c. 42	
d. 43	

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d. 43	

## Section G: Zoology

1. In a upright pyramid of biomass, herbivores occupy the position

a. 1	
b. 2	
c. 3	
d. 4	

2. Islets of Langerhans are present in

a. Brain	
b. Stomach	
c. Ovary	
d. Pancreas	

3. Common excretory product of insects is

a. NH <sub>3</sub>	
b. Urea	
c. Uric acid	
d. Hippuric acid	

4. Anaerobic process after glycolysis is known

a. TCA cycle	
b. Krebs cycle	
c. Calvin cycle	
d. None of the above	

5. Nissl's granules are made of

a. Ribosomes/RER	
b. SER	
c. DNA	
d. Golgi bodies	

6. Compound squamous epithelium occurs in

a. Stomach	
b. Pharynx	
c. Intestine	
d. Trachea	

7. Blood is

a. Acidic	
b. Alkaline	
c. Neutral	
d. Variable	

8. Gyandromorph is

a. Male with female traits	
b. Female with male traits	
c. Half male and half female	
d. None of the above	

9. Which ones do not have cellular structure

a. PPLO	
b. Rickettsia	
c. Viruses	
d. Archaeobacteria	

10. The disease caused by *Fasciola* is

a. Liver rot	
b. Cysticercosis	
c. Taeniasis	
d. None of the above	