Doon University, Dehradun

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

(x) **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

1. The term ecology was introduced by

a. E.P. Odum	
b. A.G. Tansley	
c. Ernst Haeckel	
d. Charles Darwin	

2. Cauvery water dispute is between

a. UP and Haryana	
b. Punjab and Delhi	
c. Tamil Nadu and Karnataka	
d. Punjab and Haryana	

3. The magnitude of Earthquake is measured on

a. Richter scale	
b. Nano scale	
c. Thermo scale	
d. None of these	

4. The first national park of country is?

a. Jim Corbet	
b. Ranthambore	
c. Dudwa	
d. Kaziranga	

5. Activated sludge process used for wastewater treatment is a

a. Physical treatment technique	
b. Biological treatment technique	
c. Chemical treatment technique	
d. None of these	

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

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

7. 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	

8. When succession starts in an area of adequate moisture, it is called as

a. Hydrosere	
b. Xerosere	
c. Halosere	
d. Mesarch	

9. Blue Baby syndrome caused by the contamination of water is due to

a. Nitrates	
b. Phosphate	
c. Sulphate	
d. Mercury	

10. Gas, leaked in Bhopal tragedy, was

a. Methyl isocyannate (MIC)	
b. Potassium isothiocynate	
c. Ethyl isothiocynate	
d. Sodium isothiocynate	

11. Radiosonde is used to study

a. Earth's albedo at surface	
b. Atmospheric moisture content	
c. Upper atmosphere's conditions	
d. Estimates pollutants in air	

12. Sedimentary type of biogeochemical cycle is found in the case of

a. Nitrogen	
b. Sulphur	
c. Carbon	
d. Oxygen	

13. The temperature gradient of ambient air, is called

a. Adiabatic lapse rate	
b. Super adiabatic lapse rate	
c. Environmental lapse rate	
d. Dry adiabatic lapse rate	

14. The biodegradation of plant material is slow because of presence of

a. Cellulose	
b. Xylene	
c. Extension/protein	
d. Lignin	

15. Progressive increase in concentration of xenobiotic compound when it passes through the food chain is called

a. Biomagnification	
b. Hyper accumulation	
c. Bioaccumulation	
d. None of the above	

16. The acidity of normal rain water is due to

a. CO_2	
b. CO	
c. NO_2	
d. SO_2	

17. Walkley and Black rapid titration method is used for the determination of

a. Organic carbon content of soil	
b. Nitrate content of soil	
c. Phosphate content of soil	
d. Fluoride content of soil	

18. Which one is a proven carcinogen?

a. Lignin	
b. Vinyl chloride	
c. Acetic acid	
d. Methyl alcohol	

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

a. Seechi disc test	
b. Jar test	
c. Turbidity test	
d. Settling test	

20. Nalgonda method was developed by Indian scientist to remove which chemical species from water

a. Iron	
b. Chromium	
c. Zinc	
d. Fluoride	

21. Value of Reynolds number less than 500, represents

a. Laminar flow regime	
b. Turbulent flow regime	
c. Transitional flow regime	
d. Sinuoidal flow regime	

22. Weathering of granite rock produces a sedimentary rock known as

a. Greywacke	
b. Arkose	
c. Limestone	
d. Shale	

23. Which one of the following sequence represents increasing order of toxicity of metals?

a. Ca, Zn, Cd, Mn	
b. Ca, Mn, Zn, Cd	
c. Zn, Mn, Cd, Ca	
d. Mn, Cd, Zn, Ca	

24. Which of the following is not required for biological nitrogen fixation?

a. Fe	
b. Mo	
c. ATP	

d. Mn	

25. Coal mine workers are prone to victims of one of the following disease

a. Pneumoconiosis	
b. Byssinosis	
c. Asbestosis	
d. Silicosis	

26. The criteria indicators of water pollution are

a. pH, COD, BOD, DO	
b. pH, coliform, COD, DO	
c. Coliform, COD, BOD	
d. BOD, DO, coliform	

27. 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	

28. Photochemical smog occurs in

a. Cool and Humid climate	
b. Warm, dry and sunny climate	
c. Cool, dry and sunny climate	
d. Warm and humid climate	

29. Hydrazine (N_2H_4) is widely used in boiler feed water in industries to

a. Prevent growth of microorganisms	
b. Prevent corrosion	
c. Increase thermal efficiency	
d. Prevalent scaling	

30. Sodium adsorption ratio (SAR) is often used to predict a potential infiltration problem. Its calculation requires values of concentrations of which chemical species?

a. Ca and Na	
b. Na , K and Ca	
c. Mg and Ca	
d. Na , Ca and Mg	

31. The united states Environmental protection Agency (USEPA) specifies a test called toxicity characteristic leaching procedure (TCLP) to determine the

a. Leaching characteristics of toxic wastes	
b. Toxicity hazard of wastes	
c. Loss of toxicity with leaching	
d. Toxicity of leachate of toxic wastes	

32. Kaoline is an example of which group of minerals

a. Clay	
b. Mica	
c. Felspar	
d. Ferro magnesium	

33. The largest human-made hole in the world at Bingham, Utah, America, is an open pit mine of

a. Coal	
b. Granite	
c. Copper	
d. Gold	

34. World's largest producer of non-fuel mineral resources is

a. Former soviet union	
b. United states of America	
c. China	
d. South Africa	

35. Tsunamis are

a. Sea waves generated by hurricanes	
b. Sea waves generated by earthquakes	
c. Tropical cyclones extremely devastating in nature	
d. Tide associated with hurricanes	

36. The colour of water is measured on

a. Turbidity scale	
b. Threshold scale	

c. Platinum-cobalt scale	
d. Calcium carbonate scale	

37. In rapid sand filters, the ratio of length to diameter should not exceed

a. 10	
b. 20	
c. 15	
d. 25	

38. Water losses in a water supply system are taken as

a. 5-10%	
b. 10-20%	
c. 20-30%	
d. 30-40%	

39. The design period for a water supply project is generally taken as

a. 10 years	
b. 20-30 years	
c. 50 years	
d. 50-100 years	

40. Presence of high algal content in water indicates water is

a. Hard	
b. Soft	
c. Acidic	
d. Alkaline	

41. Copperas is the commercial name for

a. Aluminium sulphate	
b. Ferrous sulphate	
c. Ferric sulphate	
d. Copper sulphate	

42. Ozone layer is situated in

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

43. In which state Nanda Devi biosphere reserve is situated?

a. Punjab	
b. Haryana	
c. Bihar	
d. Uttarakhand	

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

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

45. Fractional distillation is used to purify and refine

a. Coal	
b. Mineral	
c. Crude oil	
d. Metals	

46. The Antartic Ozone hole was discovered by

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

47. Nal Sarovar Bird Sanctuary is situated in?

a. Bihar	
b. Haryana	
c. Gujarat	
d. Punjab	

48. "Reh committee" is related to

a. Deforestation	
b. Mining	
c. Salinity and water logging	
d. Wetlands	

49. Pollution is not caused by the use of

a. Wood	
b. Solar energy	
c. Petrol	
d. Unsaturated hydrocarbons	

50. If waste materials contaminate the source of drinking water which of the following diseases will spread?

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

51. Which of the following substances are commonly used in a filter?

a. Charcoal	
b. Sand	
c. Both a. and b.	
d. Aluminum chloride	

52. Both temporary and permanent hardness of water can be removed on boiling water with

a. Calcium hydroxide	
b. Sodium carbonate	
c. Calcium oxide	
d. Calcium carbonate	

53. From the following sanitizers which one comes under category of surface active agents?

a. Tetra phosphate	
b. Teepol	
c. Meta phosphate	
d. None of these	

54. Ultraviolet radiations are lethal due to inactivation of

a. Proteins, nucleic acids and pigments	
b. Minerals, water and air	
c. Carbohydrates, fats and vitamins	
d. Oxygen , carbon di oxide and water	

55. "Earth provides enough to satisfy every man's need, but not for every man's greed" was said by

a. Mahatma Gandhi	
b. E.P. Odum	
c. Rachel Carson	
d. Sunderlal Bahuguna	

56. The wavelength range of UV-C radiation is

a. 320-400 nm	
b. 280-320 nm	
c. 100-150 nm	
d. 240-280 nm	

57. Forest conservation Act was enforced in

a. 1952	
b. 1980	
c. 1988	
d. 1974	

58. The largest soil group in India is of

a. Red soil	
b. Black soil	
c. Sandy soil	
d. Mountain soil	

59. Environmental information system (ENVIS) was set up by the Ministry of Environment and Forest in

a. 1992	
b. 1988	
c. 1982	
d. 1994	

60. Among the following ozone depleting potential is maximum in case of

a. Halon 1301	
b. HCFC 22	
c. CFC 115	
d. CFC 12	

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. In plant cell, organelle associated with protein synthesis is:

a. Lysosomes	
b. Glyoxysomes	
c. Mesosomes	
d. Ribosomes	

2. Which among following are known as suicidal bags?

a. Lysosomes	
b. Ribosomes	
c. Mitochondria	
d. Chloroplast	

3. The marine animal kept in fresh water burst because of:

a. Exosmosis	
b. Endosmosis	
c. Plasmolysis	
d. Absorption	

4. Transpiration is least in:

a. High atmospheric humidity	
b. Good soil moisture	
c. High wind velocity	
d. Dry environment	

5. Which of the following is an anti-transpirant?

a. PMA	
b. PAN	
c. IAA	
d. Auxin	

6. The final acceptor of electrons in the electron transport chain is:

a. Water	
b. Glucose	
c. IAA	
d. Abscisic acid	

7. Which of the following is active spectrum of transpiration?

a. Orange and red	
b. Green and violet	
c. Blue and red	
d. None of the above	

8. Link between glycolysis, Krab cycle, oxidation of fatty acid or carbohydrate or fat metabolism is:

a. Citric acid	
b. Succinic acid	
c. Acetyl CoA	
d. Oxaloacetic acid	

9. Examples of Archebacteria are:

a. Pseudomonas	
b. Azatobacter	
c. Methanococcus	
d. Rhizobium	

10. Study of fruit crop is called:

a. Pomology	
b. Palynology	
c. Phonology	
d. Phenology	

Section B: BIOTECHNOLOGY

1. The term cistorn, muton and recon were introduced by

a. Watson and Crick	
b. S. Benzer	
c. Meselson	
d. Morgan	

2. The molecular formulae of deoxyribose sugar and ribose sugar respectively are

a. C_5 H_{10} O_4 and $C_5H_{10}O_6$	
b. C_5 H_{10} O_4 and $C_5H_{10}O_5$	
c. C_5 H_{10} O_5 and $C_5H_{10}O_4$	
d. C_5 H_{10} O_5 and $C_6H_{10}O_4$	

3. DNA differs from RNA in

a. Presence of deoxyribose sugar	
b. Presence of thymine base	
c. Property of replication	
d. All the above	

4. The distance between two successive nitrogenous base pairs is

a. 34 Å	
b. 36 Å	
c. 20 Å	
d. 3.4 Å	

5. If the strand of DNA has 35 nucleotide how many phosphodiester bonds would exist

a. 34	
b. 35	
c. 24	
d. 70	

6. Monoclonal antibodies are usually produced from:

a. Myeloma	
b. Hybridoma	
c. Monocytes	
d. Adipocyte	

7. During DNA replication, the reunion or recoiling of separated DNA strand is prevented by

a. Helix destabilizing protein	
b. Single strnad binding protein	
c. Rep protein	
d. Both a. and b.	

8. Which of the following enzyme is required to release the tension imposed by uncoiling of strands?

a. Endonuclease	
b. DNA ligase	
c. DNA gyrase	
d. DNA helicase	

9. Formation of mRNA from DNA is called

a. Transformation	
b. Transduction	
c. Traslation	
d. Transcription	

10. The codons which may present at 3¢ end of mRNA

a. UAA	
b. UAG	
c. UGA	
d. Any one of these	

Section C: CHEMISTRY

1. The high reactivity of fluorine is due to

a. Its high electro negativity	
b. Small size of fluorine atom	
c. Availability of d-orbitals	
d. Strong F - F bond	

2. The iron ore magnetite consists of

a. Fe_2O_3	
b. Fe_3OH_4	
c. $FeCO_3$	
d. $3Fe_2O_3$ $3H_2O$	

3. The ionisation energy of hydrogen atom in the ground state is x KJ. The energy required for an electron to jump from 2nd orbit to 3rd orbit is

a. 5x/36	
b. 5x	
c. 7.2 x	
d. x/6	

4. The major constituent of air is

a. Nitrogen	
b. Carbon dioxide	
c. Oxygen	
d. Hydrogen	

5. The main chemical constituent of clay is

a. Silicon oxide	
b. Aluminium borosilicate	
c. Zeolites	
d. Aluminium silicate	

6. The mineral containing both magnesium and calcium is

a. magnesite	
b. calcite	
c. carnallite	
d. Dolomite	

7. The metal does not give H_2 on treatment with dilute HCL is

a. Zn	
b. Fe	
c. Ag	
d. Ca	

8. The number of g-molecule of oxygen in 6.02 x 10^{24} CO molecules is

a. 1 gram of molecule	
b. 0.5 gram of molecule	
c. 5 gram of molecule	
d. 10 gram of molecule	

9. The most extensive, commercially useful source of thorium as monazite sand occurs in India at

a. Orissa coast	
b. Travancore coast	
c. West Bengal coast	
d. Gujarat coast	

10. The main active constituent of tea and coffee is

a. Nicotine	
b. Chlorophyll	
c. Caffeine	
d. Aspirin	

Section D: GEOLOGY

1. A shooting star is a

a. Comet	
b. Meteoroid	
c. Planet	
d. Astriod	

2. Regarding the continental drift, the Author who totally denied any change of continents and ocean was

a. Edward Forbes	
b. Dana	
c. Wegner	
d. Carey	

3. According to Wegner there was one continent before any drift

a. Two continents; Laurasia and Gondwana	
b. Two super continents; Laurasia in south and Gondwana in north	
c. Pangea	
d. One super continent; Panthelasa	

4. Trenches are the site of

a. Diverging currents	
b. Converging currents	
c. Plate tectonics	
d. Massive folding	

5. Mid oceanic ridges are characterized by

a. Shallow earthquake	
b. Deep earthquake	
c. Intermediate earthquake	
d. Without any earthquake	

6. As the mass of radioactive substances is decreased its half life

a. Increases	
b. Decreases	
c. Remains the same	
d. Depends upon temperature	

7. The first man who stated that the earth is spherical planet

a. Pythagorous	
b. Copuernicus	
c. W.D. West	
d. Aristotle	

8. The thickness of outer core is about

a. 3550 km	
b. 2870 km	
c. 2266 km	
d. 3780 km	

9. The term 'Lost River" has been applied to streams which disappeared completely underground

a. Granitic terrain	
b. Metamorphic terrain	
c. Dolomatic Terrain	
d. Limestone Terrain	

10. Concept of cycle of erosion was the first given by

a. Penk	
b. Hutton	
c. Haug	
d. Thornbury	

Section E: MATHEMATICS

1. If the product of the roots of the equation $x^2 - 5x + 4^{\log_2 \gamma} = 0$ is 8 then γ is

a. $\pm 2\sqrt{2}$	
b. $2\sqrt{2}$	
c. 3	
d. 1	

2. The number of ways in which a couple can sit around a table with 6 guests if the couple takes consecutive seats is

a. 1440	
b. 720	
c. 5040	
d. 360	

3. The equations x+y+z=6, x+2y+3z=10, x+2y+mz=n give infinite number of values of the triplet (x,y,z) if

a. m=3, n$\in$ R	
b. m=3, n$\neq$ 10	
c. m=3, n= R	
d. none of these	

4. The least value of $cos^2\theta - 6sin\theta.cos\theta + 3sin^2\theta + 2$ is

a. $4 + \sqrt{10}$	
b. $4 - \sqrt{10}$	
c. 0	
d. $\sqrt{10}$	

5. In a ΔABC, a=2b and $|A - B| = \frac{\pi}{3}$. The measure of $\angle C$ is

a. $\frac{\pi}{4}$	
b. $\frac{\pi}{3}$	
c. $\frac{\pi}{6}$	
d. $\frac{\pi}{2}$	

6. If $x = e^{y+e^{y+\cdots\infty}}$ then $\frac{dy}{dx}$ is

a. $\frac{x}{1+x}$	
b. $\frac{1}{x}$	
c. $\frac{1-x}{x}$	
d. $\frac{1}{1+x}$	

7. $\int \frac{x^{5/2}dx}{\sqrt{1+x^7}}$ is

a. $\frac{2\log\left(x^{\frac{7}{2}}+\sqrt{x^7+1}\right)+c}{7}$	
b. $0.5log\frac{x^7+1}{x^7-1} + c$	
c. $2\sqrt{x^7+1}$ +c	
d. $\sqrt{x^7+1} + c$	

8. Let $|\vec{a}| = |\vec{b}| = |\vec{a} - \vec{b}| = 1$. Then the angle between $\vec{a}$ and $\vec{b}$ is

a. $\frac{\pi}{6}$	
b. $\frac{\pi}{3}$	
c. $\frac{\pi}{4}$	
d. $\frac{\pi}{2}$	

9. If A be a matrix such that $A\times\begin{bmatrix}1 & -2\\ 1 & 4\end{bmatrix}=\begin{bmatrix}6 & 0\\ 0 & 6\end{bmatrix}$ then A is

a. $\begin{bmatrix}2 & 4\\ 1 & -1\end{bmatrix}$	
b. $\begin{bmatrix}-1 & 1\\ 4 & 2\end{bmatrix}$	
c. $\begin{bmatrix}4 & 2\\ -1 & 1\end{bmatrix}$	
d. $\begin{bmatrix}2 & 3\\ -1 & 1\end{bmatrix}$	

10. A draws two cards at random from a pack of 52 cards. After returning them to the pack and shuffling it, B draws two cards at random. The probability that their draws contain exactly one common card is

a. 25/546	
b. 50/663	
c. 25/663	
d. 50/246	

Section E: PHYSICS

A ball falls from rest from a height h onto floor and rebounds to a height of h/4. The coefficient of restitution between the ball and the floor is

a. $1/\sqrt{2}$	
b. ½	
c. ¼	
d. ¾	

1. A force $\vec{F} = -k(y\hat{i} + x\hat{j})$, where k is a positive constant, acts on a particle moving in the xy plane. Starting from the origin, the particle is taken along the positive a-axis to the point (a,0) and then parallel to the y-axix to the point (a,a). The total work done by the force on the particle is

a. $-2ka^2$	
b. $2ka^2$	
c. $-ka^2$	
d. ka^2	

2. If a particle of mass m is tied to light string and rotated with a speed v along a circular path of radius r. If T= tension in the string and mg=gravitational force on the particle then the actual forces acting on the particle are

a. mg and T only	
b. mg, T and an additional force of mv^2/r directed inwards	
c. mg, T and an additional force of mv^2/r directed outwards	
d. only a force of mv^2/r directed outwards	

3. A particle of mass m is moving in a circular path of constant radius r such that its centripetal acceleration $_{ac}$ is varying with time as $a_c = k^2rt^2$, where k is constant. The power delivered to the particle by forces acting on it is

a. $2\pi mk^2r^2t$	
b. mk^2r^2t	
c. $\frac{1}{3}\pi mk^4r^2t^5$	
d. 0	

4. A cyclist moves along a curved road with a velocity *v*. The road is banked for speed *v*. The angle of banking is θ. Which of the following statements is not true?

a. The cyclist will lean away from the vertical at an angle θ.	
b. The normal reaction of the will pass through the centre of gravity of the 'cycle plus cyclist' system	
c. There will be no force of friction between the tyres and the road.	
d. The cyclist is in equilibrium with respect to the ground.	

5. When a ceiling fan is switched on, it makes 10 rotations in the first 3 seconds. How many rotations will it make in the next 3 seconds?(Assume uniform angular acceleration)

a. 10	
b. 20	
c. 30	
d. 40	

6. If different planets have the same density but different radii then the acceleration due to gravity (g) will depend on its radius (R) as

a. $g \propto \frac{1}{R^2}$	
b. $g \propto \frac{1}{R}$	
c. $g \propto R$	
d. $g \propto R^2$	

7. When α, β *and* γ radiations pass through a gas, their ionizing powers, in decreasing order, are

a. γ, α, β	
b. γ, β, α	
c. α, β, γ	
d. β, γ, α	

8. A cylindrical resonance tube, open at both ends, has a fundamental frequency F in air. Half of the length of the tube is dipped vertically in water. The fundamental frequency of the air column now is

a. 4F	
b. 2F	
c. F	
d. F/2	

9. If water at 0^oC, kept in a container with an open top, is placed in a large evacuated chamber

a. all the water will vaporize	
b. all the water will freeze	
c. part of the water will vaporize and the rest will freeze	
d. ice, water and water vapour will be formed and reach equilibrium at the triple point	

Section G: Zoology

1. Longest 'visceral' muscle occur in

a. Vas deferns	
b. Pregnant uterus	
c. Nprmal uterus	
d. Abdomen	

2. Fire was used for cooking and protection first by

a. Peking Man	
b. Cro-Magnon Man	
c. Neanderthal Man	
d. Modern Man	

3. Trochanters occur in

a. Humerus	
b. Femur	
c. Radio-ulna	
d. Tibio-fibula	

4. Oranelle/ornanoid involved in genetic engineering is

a. Plasmid	
b. Mitocondrion	
c. Golgi apparatus	
d. Lomasome	

5. Lung Fluke is

a. *Hymenolepis nana*	
b. *Paragonimus westermani*	
c. *Schistosoma haematobium*	
d. *Echinococcus granulosus*	

6. DNA parts which can switch their position are

a. Exons	
b. Introns	
c. Cistrons	
d. Transposons	

7. Chelones resembles birds in having

a. Four chambered heart	
b. Beaked toothless jaws	
c. Inelastic lungs	
d. Presence of diaphragm	

8. Pseudometamerism occurs in

a. Turbellaria	
b. Trematoda	
c. Cestoda	
d. None of the above	

9. Evolution of a species and a group can be studies through.

a. Fossils	
b. carbon dating	
c. DNA analysis	
d. All the above	

10. The embryo of taenia present in ripe proglottis is

a.Tetracanth	
b. Hexacanth	
c. Miracidium	
d. Bladderworm	

Rough Work