Doon University, Dehradun
Entrance Test

M.Sc. Environmental Science
&
M.Sc. Environmental Science with Specialization in Natural Resource Management

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 40 Questions in PART-I and 60 Questions in PART II.

(iii)   In **PART II** select any **Three Sections** out of the **Six Sections** (Botany, Chemistry, Geology, Mathematics, Physics and Zoology) and answer all the **20 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)   Each question carries 1 mark. There will be no negative marking.

(vii) Please do not do any rough work on the Answer Sheet. Pages <u>at the end</u> have been provided for rough work.

(viii) 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

Note:
1. Answer all the 40 questions
2. Each Question carries 1 mark

1. Tehri Dam is constructed on?

a. Yamuna river	
b. Satluj river	
c. Cauvery river	
d. Bhagirathi river	

2. The process in which a nutrient deficit water body converts into nutrient rich is called as

a. Eutrophication	
b. Bioaccumulation	
c. Bioindicator	
d. Biological magnification	

3. Wind speed is measured by which instrument

a. Psychometer	
b. Anemometer	
c. Manometer	
d. Heliometers	

4. Fluxes of heat, water vapour and momentum are constant in

a. Upper atmosphere	
b. Middle atmosphere	
c. Ekman layer	
d. Surface boundary layer	

5. The planet nearest to the sun is

a. Earth	
b. Mercury	
c. Moon	
d. Jupiter	

6. Pyramid of energy is always

a. Inverted	
b. Upright	
c. Both a. and b.	
d. None of these	

7. Which pesticide was discovered by Paul Mueller?

a. DDT	
b. Aldrin	
c. Endosulfan	
d. HCH	

8. Aerosol is

a. Carbon particles of microscopic size	
b. Dispersion of small solid or liquid particles in gaseous media	
c. Finely divided particles of ash	
d. Diffused liquid particles	

9. Both power and manure is provided by

a. Nuclear plants	
b. Thermal plants	
c. Biogas plant	
d. All of the above	

10. Gobi desert of China is an example of

a. Cold desert	
b. Tropical desert	
c. Temperate desert	
d. None of these	

11. The Satluj −Yamuna Link (SYL) canal dispute is between

a. Bihar and U.P.	
b. Delhi and Haryana	
c. Haryana and Punjab	
d. Karnataka and Tamil Nadu	

12. Biomass energy can be obtained from

a. Energy plantations	
b. Petro crops	
c. Agriculture and urban waste biomass	
d. All of these	

13. Which states of the country are suffered from the Salinity and Water logging problem?

a. Bihar and UP	
b. Himachal and Andhra Pradesh	
c. Madhya Pradesh and Jharkhand	
d. Haryana , Punjab and Rajasthan	

14. How many types of Ecological pyramids are?

a. Three	
b. Two	
c. Four	

d. Eight	

15. To which value of biodiversity "Live and Let Live" is related?

a. Ethical	
b. Fuel	
c. Aesthetic	
d. Productive use	

16. 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. Hetrotrophs	
d. None of these	

17. Which sector has maximum demand for freshwater in India?

a. Industry	
b. Energy	
c. Irrigation	
d. Domestic	

18. Hardness of diamond is due to

a. Coordinate bonding	
b. Covalent bonding	
c. Electrovalent bonding	
d. Vander Waals forces	

19. In which state of India Loktak lake is situated?

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

20. The concept of River networking in India is related to

a. Landslides	
b. Flood control	
c. Waste management	
d. Cyclones	

21. World Ozone day is celebrated on

a. September 10	
b. April 22	
c. June 5	
d. September 16	

22. Who is related to Chipko Movement?

a. Baba Amte	
b. Anna Hazare	
c. Medha Patekar	
d. Sunder Lal Bahuguna	

23. The historic convention on Biological Diversity, which is known as The Earth Summit 1992 was held at

a. Rio de Janerio	
b. Paris	
c. London	
d. Delhi	

24. Biodiversity is the study of

a. Variety and variability among living organisms	
b. Interactions among plant species	
c. Interaction among plant and animal species	
d. Variety and Variability among non-living things	

25. Natural gas is composed primarily of

a. Methane	
b. n-butane	
c. n-octane	
d. A mixture of n-octane and n-butane	

26. Intake of lead may primarily cause the damage of

a. Brain	
b. Lung	
c. Liver	
d. Kidney	

27. The most commonly used method for Salination/desalting of water is

a. Distillation	
b. Reverse osmosis	
c. Electro dialysis	
d. Flash evaporation	

28. The area where two major communities meet and blend together is termed as

a. Ecotype	
b. Biotype	
c. Ecotone	
d. Meeting place	

29. In a polluted lake, the index of pollution is

a. Daphina	
b. Frog	
c. Artemia	
d. None of these	

30. Ocean are often considered as desert, because in them

a. There are no large plants	
b. The biodiversity is low	
c. There is high salinity	
d. The productivity is very low	

31. The energy flows in an ecosystem is

a. Cyclic	
b. Unidirectional	
c. Multidirectional	
d. Square	

32. Climax community results from which major activity

a. Cohabitation	
b. Stratification	
c. Succession	
d. Competition	

33. Salim ali centre for ornithology and natural history is located at

a. Mumbai	
b. Madras	
c. Thiruvananthapuram	
d. Coimbatore	

34. Rachel Carson in her book Silent Spring has raised concern on

a. Economical & social impacts	
b. Deforestation	
c. Climate change	
d. Impacts of agro-chemicals on ecological functions	

35. Biodiesel is produced in India presently from a. *Calotropis* sp

a. Calotropis sp	
b. Catharanthus sp	
c. Jatropha sp	
d. Delonix sp	

36. An earthquake is rated as "major" if its magnitude in Richter scale is in the range of

a. 4.0 – 4.9	
b. 7.0 – 7.9	
c. 6.0 – 6.9	
d. 5.0 – 5.9	

37. Which of the following rivers originates and ends in India?

a. Kaveri	
b. Brahmaputra	
c. Rabi	
d. Beas	

38. The calorific value of a coal sample is high, if its

a. Fixed carbon is high	
b. Moisture content is high	
c. Volatile matter is high	
d. All of the above	

39. The optimum pH for Methane production ranges between

a. 7 to 7.2	
b. 5 to 5.2	
c. 8 to 9.5	
d. 2.3 to 4.5	

40. The nuclear bomb exploded over Nagasaki in second World War contained

a. U-235	
b. Pu-239	
c. U-233	
d. Pu-233	

PART II

Section A: BOTONY

1. The unique feature of bryophyte compared to other green plant group is that:

a.	They produce spores	
b.	They lack vascular tissue	
c.	They lack roots	
d.	There sporophyte is attached to gametophyte	

2. Which of the following is diploid in moss plant:

a.	Spore	
b.	Leaves	
c.	Spore mother cell	
d.	Gamate	

3. Pteridophytes are also called:

a.	Phanerogams	
b.	Vascular cryptogams	
c.	Amphibians of plant kingdom	
d.	Spermatophytes	

4. A gymnospermic plant:

a.	Bear flower	
b.	Exhibit no vascular tissue	
c.	Produce seeds in cones	
d.	Does not produce seeds in cones	

5. Red root is another name of:

a.	Beet root	
b.	Sugarcane root	
c.	Potato root	
d.	None of the above	

6. Bulb is a modification of:

a.	Root	
b.	Stem	
c.	Radical	
d.	Plumule	

7. A spike of unisexual flower is found in :

a.	Wheat	
b.	Onion	
c.	Mulberry	
d.	Fig	

8. A bisexual flower which never opens in its life span is called:

a.	Homogamousl	
b.	Heterogamous	
c.	Polygamous	
d.	Cleistogamous	

9. In flowering plants meiosis occurs at the time of:

a.	Germination of seed	
b.	Formation of buds	
c.	Formation of root primordia	
d.	Formation of pollen grains	

10. One of the best methods for understanding general relationships of plants is:

a.	Cytotaxonomy	
b.	Experimental taxonomy	
c.	Numerical taxonomy	
d.	Cytotaxonomy	

11. The edible portion in Coconut is:

a.	Endosperm	
b.	Mesocarp	
c.	Seed Coat	
d.	Embryo	

12. The intine of pollen grain is composed of:

a.	Lipid and Protein	
b.	Cellulose and Pectin	
c.	Pectin and Lignin	
d.	Lignin and Cutin	

13. The waxy substance associated with the wall of the cork cell is:

a.	Cutin	
b.	Lignin	
c.	Hemicellulose	
d.	Suberin	

14. Which of the following give rise to cork tissue?

a.	Phallogen	
b.	Periderm	
c.	Phellem	
d.	Phalloderm	

15. Bacteria whose genes are used for producing transgenic plants is

a.	Escherichia coli	
b.	Bacillus thuringiensis	
c.	Staphylococcus aureus	
d.	Agrobacterium tumefaciens	

16. Longest phase of meiosis

a.	Prophase I	
b.	Prophase II	
c.	Anaphase I	
d.	Metaphase II	

17. Which one of the following triplet codons is a chain termination codon ?

a.	UGU	
b.	AAU	
c.	UUG	
d.	UAG	

18. Edible part of Mushroom is

a.	Basidiocarp	
b.	Primary mycelium	
c.	Fungal hyphae	
d.	Basidiospores	

19. A plant cell becomes turgid due to

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

20. Ovule integument gets transformed into

a.	Seed	
b.	Fruit wall	
c.	Seed coat	
d.	Cotyledons	

1. In Mn^{2+} ion, the number of unpaired electrons is

a. 3	
b. 6	
c. 7	
d. 5	

2. The formula of compound which gives violet colour in Lassaigne's test for sulphur with sodium nitroprusside is

a. $Na_2[Fe(CN)_5NOS]$	
b. $Na_4[Fe(CN)_5NOS]$	
c. $Na_2[Fe(CN)_5NO]$	
d. $Na_2[Fe(CN)_5S]$	

3. An example of conjugated dienen is

a. 1,4-Pentadiene	
b. 1,5-Hexadine	
c. 1,2-Butadiene	
d. 1,3-Pentadiene	

4. The hemolytic fission of hydrogen results in the formation of

a. Free Radicals	
b. Carbacations	
c. Carbaainons	
d. Carbenes	

5. Which of the following is diamagnetic?

a. Zn^{+2}	
b. Cu^{+2}	
c. Cr^{+3}	
d. Ti^{+3}	

6. If second Ionization potential of helium is 54.4 eV, then the possible excited energy state for an electron in He^+ ion is

a. 13.6 eV	
b. -54.4 eV	
c. -13.6 eV	
d. -3.4 eV	

7. Two electrons present in the same orbital differ in their

a. Principal Quantum Number	
b. Azimuthal Quantum Number	
c. Magnetic Quantum Number	
d. Spin Quantum Number	

8. Which of the following statement is not correct?

a. Helium has the highest ionization energy	
b. Fluorine has the highest electron affinity	
c. Carbon has the highest melting point	
d. Alkali metal are the strongest reducing agents	

9. Which of the following solution has pH = 2?

a. 100 ml of M/40 HCL + 100 ml of M/200 NaOH	
b. 100 ml of M/10 HCL + 100 ml of M/10 NaOH	
c. 100 ml of M/50 HCL + 100 ml of M/50 NaOH	
d. 100 ml of M/50 HCL + 50 ml of water	

10. A ligand can also be regarded as

a. Lewis acid	
b. Bronsted base	
c. Lewis base	
d. Bronsted acid	

11. Cu_2Cl_2 is used as a catalyst in the chemical reaction involving the formation of

a. DDT	
b. PVC	
c. TNT	
d. Glucose	

12. The iron ore magnetite consists of

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

13. The nucleus of an atom consists of

a. electrons and neutrons	
b. electrons and protons	
c. protons and neutrons	
d. All of the above	

14. The number of moles of solute present in 1 kg of a solvent is called its

a. Molality	
b. Molarity	
c. Normality	
d. Formality	

15. The most electronegative element among the following is

a. Sodium	
b. Bromine	
c. Fluorine	
d. Oxygen	

16. The metal used to recover copper from a solution of copper sulphate is

a. Na	
b. Ag	
c. Hg	
d. Fe	

17. The number of d-electrons in Fe^{2+} (Z = 26)
is not equal to that of

a. p-electrons in Ne(Z = 10)	
b. s-electrons in Mg(Z = 12)	
c. d-electrons in Fe(Z = 26)	
d. p-electrons in CI(Z = 17)	

18. The metallurgical process in which a metal
is obtained in a fused state is called

a. Smelting	
b. Roasting	
c. Calcinations	
d. Froth floatation	

19. The molecules of which gas have highest speed ?

a. H_2 at -73^oC	
b. CH_4 at 300 K	
c. N_2 at $1,027^oC$	
d. O_2 at 0^oC	

20. The oldest rocks in the earth's crust were once molten, and came from deep inside the earth. The molten rock, called magma, spewed out in volcanic eruptions during the earth's early life and solidified into hard rock's called

a. Granite	
b. Basalt	
c. Igneous rocks	
d. Sedimentary rocks	

Section C: GEOLOGY

1. Which of the following river is the youngest?

a. Son	
b. Ganga	
c. Damodar	
d. Swarn Rekha	

2. The Earliest theory about the Origin of Earth was proposed by

a. Kant, Chamberline and Moltan (1755)	
b. Kant(1755) and Laplace (1796)	
c. Laplace (1796) and Chamberline and Moltan (1904)	
e. None of above answers are correct	

3. Solar system was formed from;

a. Hot gaseous incandescent nebular rotating in space	
b. Cold liquid nebula rotating in space	
c. Cold solid nebula rotating in space	
d. No clear cut idea is known about the nature of nebula at that time.	

4. In the solar system which planet possess the lowest density

a. Mars	
b. Saturn	
c. Jupiter	
d. Uranus	

5. The diameter of the earth is about

a. 7400 kms	
b. 13800 kms	
c. 12800 kms	
d. 21300 kms	

6. The polar diameter of earth is shorts that the Equatorial diameter by about;

a. 40 kms	
b. 50 kms	
c. 80 kms	
d. 100 kms	

7. Super Nova

a. Constellation	
b. Exploding stars	
c. Stars with superior weight	
d. Stars having heavy mass	

8. The Phenomenon of Radioactivity is associated with

a. Decay of electrons	
b. Decay of nucleus	
c. Fusion of nuclei	
d. None of the above	

9. Out of all tectonic regions of the globe, the maximum heat flow is found in the

a. Subductuon Zone	
b. Flank Province	
c. Mid Oceanic ridge	
d. Island Arcs	

10. The region where three plates meet is;

a. Subduction zone	
b. Mid Oceanic ridge	
c. Triple junction	
d. Benioff junction	

11. The theory of the expanding earth was first proposed by

a. L.Egyed	
b. J.K.E.Halm	
c. Warren Carey	
d. Wine and Mathew	

12. The term" Tethys Sea" was given by

a. Dana	
b. Hall	
c. Suess	
d. Wegner	

13. The theory of plate tectonics was proposed by

a. A.L. Du. Toit	
b. Taylor	
c. Morgan	
d. Wegener	

14. Exfoliation is accomplished when the surface layer of rock pulls off because of

a. Chemical change	
b. Excessive heating	
c. Release in pressure after the overlying layer are removed	
d. Leaching and bacterial action	

15. Himalayas are divided into four major geological sections, choose which is not one of them:

a. Nepal Himalayas between Kali and Testa	
b. Punjab Himalayas between Indus and Sutlaj	
c. Garo-Khasi Himalayas between Testa and Brahmaputra	
d. Kumaun Himalayas between Sutlaj and Kali	
e. Assam Himalayas—between the Testa and the Dihing	

16. The earth's most stable environment is found in/ on

a. High mountains	
b. Deep sea floor	
c. Ionosphere	
d. Polar regions	

17. Himalayan rivers are perennial because

a. They have many tributaries	
b. The region gets rainfalls throughout the year	
c. They are fed by melting of snow fields during summer	
d. All of the above statements are correct	

18. At what rate the delta of Ganga is growing

a. 2 feet/ year	
b. 3 feet/ year	
c. 5 feet/ year	
d. 10 feet/ year	

19. The second largest island in the world, i.e. New Guinea, is located in the

a. Atlantic Ocean	
b. Pacific Ocean	
c. Indian Ocean	
d. Bay of Bengal	

20. length of coastline of Indian mainland is;

a. 4689 Km	
b. 6100 km	
c. 3550 km	
d. 6320 km	
e. 7340 km	

1. If $4a^2 + 9b^2 + 16c^2 = 2(3ab + 6bc + 4ca)$, where a,b,c are non zero numbers, then a,b,c are in

a. AP	
b. GP	
c. HP	
d. None of these	

2. The number of real solutions of the equation $e^x = x$ is

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

3. If $3^{x+1} = 6^{\log_2 3}$ the x is

a. 3	
b. 2	
c. $\log_3 2$	
d. $\log_2 3$	

4. The solution set of $\log_{1/3}(x^2 + x + 1) > 0$ is

a. $(-\infty, -2) \cup (1, +\infty)$	
b. [-1, 2]	
c. $(-2, 1)$	
d. $(-\infty, +\infty)$	

5. In a club election the number contestants is one more than the number of maximum candidates for which a voter can vote. If the total number of ways in which a voter can vote be 62 then the number of candidates is

a. 7	
b. 5	
c. 6	
d. 2	

6. Four couples (husband and wife) decide to form a committee of four members. The number of different committees that can be formed in which no couple finds a place is

a. 10	
b. 12	
c. 14	
d. 16	

7. $\begin{vmatrix} 0 & p-q & p-r \\ q-p & 0 & q-r \\ r-p & r-q & 0 \end{vmatrix}$ is equal to

a. p+q+r	
b. 0	
c. p-q-r	
d. −p+q+r	

8. $\begin{vmatrix} 1+x & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+x \end{vmatrix}$ is equal to

a. $x^2(x+3)$	
b. $3x^3$	
c. 0	
d. x^3	

9. The matrix $\begin{bmatrix} \lambda & 7 & -2 \\ 4 & 1 & 3 \\ 2 & -1 & 2 \end{bmatrix}$ is a singular matrix if λ is

a. 2/5	
b. 5/2	
c. -5	
d. 5	

10. If AB=0 where $A = \begin{bmatrix} cos^2\theta & cos\theta\,sin\theta \\ cos\theta\,sin\theta & sin^2\theta \end{bmatrix}$ and $B = \begin{bmatrix} cos^2\phi & cos\phi\,sin\phi \\ cos\phi\,sin\phi & sin^2\phi \end{bmatrix}$ then $|\theta - \phi|$ is equal to

a. 0	
b. $\frac{\pi}{2}$	
c. $\frac{\pi}{4}$	
d. π	

11. If $sin\theta + cosec\theta = 2$ then the value of $sin^8\theta + cosec^8\theta$ is equal to

a. 2	
b. 2^8	
c. 2^4	
d. 2^6	

12. The value of $tan\frac{\pi}{16} + 2tan\frac{\pi}{8} + 4$ is equal to

a. $cot\frac{\pi}{8}$	
b. $cot\frac{\pi}{16}$	
c. $cot\frac{\pi}{16} - 4$	
d. $cot\frac{\pi}{8} - 4$	

13. The value of $tan20^o + 2tan50^o - tan70^o$ is

a. 1	
b. 0	
c. $cot50^o$	
d. -1	

14. In a ΔABC, a $tan\frac{A}{2}$ and $tan\frac{B}{2}$ satisfy $6x^2 - 5x + 1 = 0$. Then

a. $a^2+b^2>c^2$	
b. $a^2-b^2=c^2$	
c. $a^2+b^2=c^2$	
d. $a^2+b^2<c^2$	

15. The diagonals of a parallelogram PQRS are along the lines x+3y=4 and 6x-2y=7. Then PQRS must be

a. rectangle	
b. square	
c. cyclic quadrilateral	
d. rhombus	

16. The intercept on the line y=x by the circle $x^2+y^2-2x=0$ is AB. The equation of the circle with AB as a diameter is

a. $x^2+y2+x+y=0$	
b. $x^2+y^2=x+y$	
c. $x^2+y^2-3x+y=0$	
d. $x^2+y2-x-y=0$	

17. If $y = cos^{-1}(cos x)$ then $\frac{dy}{dx}$ at $x = \frac{5\pi}{4}$ is equal to

a. 1	
b. -1	
c. $\frac{1}{\sqrt{2}}$	
d. $-\frac{1}{\sqrt{2}}$	

18. Five-rupee coins, 3 two- rupee coins and 2 one-rupee coins are stacked together in a column at random. The probability that the coins of the same denomination are consecutive is

a. 13/9!	
b. 1/210	
c. 1/35	
d. 1/20	

19. White balls and three black balls are placed in a row at random. The probability that no two black balls are adjacent is

a. ½	
b. 7/15	
c. 2/15	
d. 1/3	

20. The value of
$$\begin{vmatrix} 1 & 1 & 1 \\ (2^x + 2^{-x})^2 & (3^x + 3^{-x})^2 & (5^x + 5^{-x})^2 \\ (2^x - 2^{-x})^2 & (3^x - 3^{-x})^2 & (5^x - 5^{-x})^2 \end{vmatrix}$$
is

a. 0	
b. 30^x	
c. 30^{-x}	
d. None of these	

1. A particle has an initial velocity of $3\hat{i} + 4\hat{j}$ and an acceleration of $0.4\hat{i} + 0.3\hat{j}$. Its speed after 10s is

a. 10 units	
b. 7 units	
c. $7\sqrt{2}$ units	
d. 8.5 units	

2. Three particles A,B,C are thrown from the top of a tower with the same speed. A is thrown straight up, B is thrown straight down and C is thrown horizontally. They hit the ground with speeds v_A, v_B, v_C.

a. $v_A = v_B = v_C$	
b. $v_B > v_C > v_A$	
c. $v_A = v_B > v_C$	
d. $v_A > v_B = v_C$	

3. A car is moving in a circular horizontal track of radius 10m with a constant speed of 10m/s. A plumb bob is suspended from the roof of the car by a light rod of length 1m. The angle made by the rod with the vertical is

a. 0	
b. 30°	
c. 45^0	
d. 60°	

4. For a car taking a turn on a horizontal surface, let N_1 and N_2 be the normal reactions of the road on the inner and outer wheels respectively.

a. N_1 is always greater than N_2	
b. N_2 is always greater than N_1	
c. N_1 is equal to N_2	
d. Either a. or b. depending upon the speed of the car and the radius of the curvature of the road.	

5. A disc of mass m and radius R has concentric hole of radius r. Its moment of inertia about an axis through its centre and perpendicular to its plane is

a. $\frac{1}{2}m(R-r)^2$	
b. $\frac{1}{2}m(R^2 - r^2)$	
c. $\frac{1}{2}m(R+r)^2$	
d. $\frac{1}{2}m(R^2 + r^2)$	

6. The rotation of earth about its axis speeds up such that a man on the equator becomes weightless. In such a condition, what would be the duration of one day?

a. $2\pi\sqrt{R/g}$	
b. $\frac{1}{2\pi}\sqrt{R/g}$	
c. $2\pi\sqrt{Rg}$	
d. $\frac{1}{2\pi}\sqrt{Rg}$	

7. A small body of superdense material, whose mass is twice the mass of the earth but whose size is very small compared to the size of the earth, starts from the rest at a height H<<R above the earth's surface, and reaches the earth's surface in time t. The t is

a. $\sqrt{2H/g}$	
b. $\sqrt{H/g}$	
c. $\sqrt{2H/3g}$	
d. $\sqrt{4H/3g}$	

8. The escape velocity for a planet is v_e. A tunnel is dug along the diameter of the planet and a small body is dropped into it at the surface. When the body reaches the centre of the planet, its speed will be

a. v_e	
b. $\dfrac{v_e}{\sqrt{2}}$	
c. $\dfrac{v_e}{2}$	
d. 0	

9. Raindrops of different radii are falling through air. The terminal velocity of a drop of radius r will be proportional to

a. r^3	
b. r^2	
c. r	
d. 1/r	

10. Bernoulli's principle (equation) is a consequence of

a. Conservation of energy only	
b. Conservation of momentum only	
c. Conservation of angular momentum only	
d. More than one of the above	

11. Two metal rods of the same length and area of cross-section are fixed end to end between rigid supports. The materials of the rods have Young modulii Y_1 and Y_2, and coefficients of linear expansion α_1 and α_2. The junction between the rods does not shift if the rods are cooled. Then

a. $Y_1\alpha_1 = Y_2\alpha_2$	
b. $Y_1\alpha_2 = Y_2\alpha_1$	
c. $Y_1\alpha_1{}^2 = Y_2\alpha_2{}^2$	
d. $Y_1{}^2\alpha_1 = Y_2{}^2\alpha_2$	

12. A charged particle moves horizontally without deflection near the earth's surface. In this region,

a. Only electric field is present	
b. Only vertical magnetic field is present	
c. Only horizontal magnetic field is present	
d. Mutually perpendicular electric and magnetic fields are present	

13. A ray of light incident on a slab of transparent material is partly reflected from the surface and partly refracted into the slab. The reflected and refracted rays are mutually perpendicular. The incident ray makes an angle i with the normal to the slab. The refractive index of the slab is

a. $\tan^{-1}(i)$	
b. $\cot^{-1}(i)$	
c. $\sin^{-1}(i)$	
d. $\cos^{-1}(i)$	

14. The light reflected by a plane mirror may form a real image

a. If the rays incident on the mirror are converging	
b. If the rays incident on the mirror are diverging	
c. If the object is placed very close to the mirror	
d. Under no circumstances	

15. A metal string is fixed between rigid supports. It is initially at negligible tension. Its Young modulus is Y, density is ρ and coefficient of thermal expansion is α. If it is now cooled through a temperature $=t$, transverse waves will along it with a speed

a. $Y\sqrt{\alpha t/\rho}$	
b. $\alpha t\sqrt{Y/\rho}$	
c. $\sqrt{Y\alpha t/\rho}$	
d. $t\sqrt{Y\alpha/\rho}$	

16. A sting A has double the length, double the tension, double the diameter and double the density as another string B. Their fundamental frequencies of vibration are n_A and n_B. The ratio of $n_{A/}n_B$ is equal to

a. ¼	
b. ½	
c. 2	
d. 4	

17. A racing car moving towards a cliff sounds its horn. The driver observes that the sound reflected from the cliff has a pitch one octave higher than the actual sound of the horn. If V is the velocity of sound, the velocity of the car is

a. $V/\sqrt{2}$	
b. $V/2$	
c. $V/3$	
d. $V/4$	

18. The root-mean-square (rms) speed of oxygen molecules (O_2) at certain absolute temperature is v. If the temperature is doubled and the oxygen gas dissociates into atomic oxygen, the rms speed would be

a. v	
b. $\sqrt{2}v$	
c. $2v$	
d. $2\sqrt{2}v$	

19. A closed vessel is maintained at constant temperature. It is first evacuated and then vapour is injected into it continuously. The pressure of the vapour in the vessel

a. Increases continuously	
b. First increases and then remains constant	
c. First increases then decreases	
d. None of the above	

20. Each molecule of a gas has f degrees of freedom. The ratio $\frac{C_p}{C_V} = \gamma$ for the gas is

a. $1+\frac{f}{2}$	
b. $1+\frac{1}{f}$	
c. $1+\frac{2}{f}$	
d. $1+\frac{f-1}{3}$	

Section F: ZOOLOGY

1. Cranial capacity was highest in

a. Cro-Magnon man	
b. Neanderthal man	
c. Java man	
d. Peking man	

2. Reorganization of genetic material occurs during

a. Metamorphosis	
b. Organogenesis	
c. Mitosis	
d. Meiosis	

3. Chromosomes can be counted best at the stage of

a. Telophase	
b. Late Anaphase	
c. Metaphase	
d. Late Prophase	

4. A reason for material inheritance is due to genes present in

a. Cytoplasm	
b. Mitochondia	
c. Lysosomes	
d. Nucleolus	

5. For completing its life cycle, Tape worm requires/Intermediate host of Tape worm is

a. Snail	
b. Pig	
c. Dog	
d. Man only	

6. Major protein in the thick filaments of skeletal muscle fibre is

a. Myosin	
b. Actin	
c. Tropomyosin	
d. Troponin	

7. Alligator occurs in

a. India	
b. America and China	
c. Africa	
d. Australia	

8. Bony plates with horny epidermal scales occur in

a. Lizards	
b. Crocodiles	
c. Snakes	
d. Both b and c	

9. Biological oxidation in Kreb's cycle involves

a. N_2	
b. O_2	
c. SO_2	
d. CO_2	

10. Which one is not vestigial in human?

a. Third molar	
b. Coccyx	
c. Segmental abdominal muscles	
d. Finger nails	

11. Origin of life occurred in

a. Carboniferous	
b. Cambrian	
c. Pre-Cambrian	
d. Ordovician	
e. Silurian	

12. Age of evolution of a man is measured by

a. Electron microscope	
b. Chemical reaction	
c. Radioactive dating	
d. Ultraviolet dating	

13. Peaking man was known as

a. *Australopithecus*	
b. *Pithecanthropus*	
c. *Homo sapiens*	
d. *Sinanthropus*	

14. DNA replication takes place during

a. G-Phase	
b. G_2-Phase	
c. S-Phase	
d. Prophase	

15. Gram (-) bacteria differ from Gram (+) bacteria having

a. Thick wall	
b. Complex wall	
c. Simple wall	
d. Absence of wall lipids	

16. Pili are employed by bacteria for

a. locomotion	
b. Sexual contact	
c. Asexual reproduction	
d. Mucopeptide/Peptidoglycan	

17. Product of glycolysis is

a. Citric acid	
b. Dihydroxy acetone	
c. Pyruvic acid	
d. Phosphoenol pyruvate	

18. A treeless biome is

a. Tundra	
b. Grassland	
c. Desert	
d. All the above	

19. Secondary producers are

a. Herbivores	
b. Heterotrophs	
c. Carnivores	
d. Green plants	

20. Rhabdites occur in

a. Planaria/Dugesia	
b. Fasciola	
c. Taenia	
d. Echinococcus	

ROUGH WORK