SATISH SCIENCE ACADEMY
DHANORI PUNE - 411015

Mhtcet pcb 5
ENTRANCE EXAM - MHT - CET

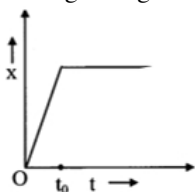**Time Allowed:** 3 hours   **Maximum Marks :** 200

General Instructions:
- All questions are compulsory.
- There are two sections.
- Section A has 100 questions from Physics and Chemistry.
- Section B has 100 questions from Biology.

Section - A (Physics)

1) Figure shows the displacement - time graph of a particle moving along x - axis.

[1]

   a) The velocity increases upto time t_0 and then becomes constant.
   b) The particle is continuously going in positive x - direction.
   c) The particle moves at a constant velocity upto a time t_0 and then stops.
   d) The particle is at rest.

2) Two bodies of masses m_1 and m_2 are separated by a distance R. The distance of the centre of mass of the bodies from the mass m_1 is **[1]**

   a) $\frac{m_2 R}{m_1 + m_2}$
   b) $\frac{m_1 \ m_2}{m_1 + m_2} R$
   c) $\frac{m_1 R}{m_1 + m_2}$
   d) $\frac{m_1 + m_2}{m_1} R$

3) The gravitational force on a body of mass 5 kg at the surface of the earth is 50 N. If earth is a perfect sphere, the gravitational force on a satellite of mass 200 kg in a circular orbit of radius same as diameter of the earth is **[1]**
   a) 400 N   b) 500 N
   c) 800 N   d) 200 N

4) A solid ball of metal has a spherical cavity inside it. If the ball is heated, then volume of the cavity will _____. **[1]**

   a) Decrease
   b) Remain same
   c) Increase
   d) Initially increase and finally decrease.

5) The observer is moving with velocity 'v_0' towards the stationary source of sound and then after crossing moves away from the source with velocity 'v_0'. Assume that the medium through which the sound waves travel is at rest. If 'v' is the velocity of sound and 'n' is the frequency emitted by the source then the difference between apparent frequencies heard by the observer is **[1]**

   a) $\frac{2nv_0}{v}$ b) $\frac{v}{nv_0}$
   c) $\frac{v}{2nv_0}$ d) $\frac{nv_0}{v}$

6) For thin prism angle of minimum deviation (δ) is given by **[1]**

   a) $\delta = A(1 - \frac{n}{2})$
   b) $\delta = A(n - 1)$
   c) $\delta = A(1 - n)$
   d) $\delta = A(\frac{n}{2} - 1)$

7) A student measures the focal length of a convex lens by keeping an object pin at a distance u from the lens and measuring the distance v of the image pin. The graph between v versus u plotted will look like **[1]**
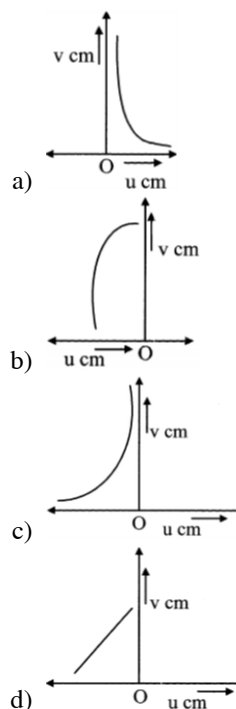
8) An optical instrument, in general, extends our range of vision by **[1]**

   a) Making the incident rays subtend a smaller angle at the eye.
   b) Producing real image.
   c) Producing inverted image.
   d) Making the incident rays subtend a larger angle at the eye.

9) Figure shows the electric lines of force emerging from a charged body. If the electric field at A and B are E_A and E_B respectively and if the displacement between A and B is r then
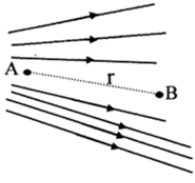
[1]

a) $E_A < E_B$ b) $E_A > E_B$
c) $E_A = \frac{E_B}{r}$ d) $E_A = \frac{E_B}{r^2}$

10) The moment of inertia of a body about a given axis is 3.6 kg m^2. Initially, the body is at rest. In order to produce a rotational K.E. of 800 J, an acceleration of 15 rad s^{-2} must be applied about that axis for [1]
   a) 2.1 s   b) 0.7 s
   c) 1.4 s   d) 2.8 s

11) A weightless spring of length 60 cm and force constant 200 N/m is kept straight and unstretched on a smooth horizontal table and its ends are rigidly fixed. A mass of 0.25 kg is attached at the middle of the spring and is slightly displaced along the length. The time period of the oscillation of the mass is [1]

   a) $\frac{\pi}{\sqrt{200}}$ s
   b) $\frac{\pi}{20}$ s
   c) $\frac{\pi}{5}$ s
   d) $\frac{\pi}{10}$ s

12) The equation of motion of a particle is $\frac{d^2y}{dt^2} + Ky = 0$, where K is positive constant. The time period of the motion is given by [1]

   a) $\frac{2\pi}{\sqrt{K}}$
   b) $2\pi K$
   c) $\frac{2\pi}{K}$
   d) $2\sqrt{\frac{\pi}{b}}$

13) Two simple harmonic motions are represented by the equations $y_1 = 0.1 \sin\left(100\pi + \frac{\pi}{3}\right)$ and $y_2 = 0.1 \cos \pi$ t. The phase difference of the velocity of particle 1 with respect to the velocity of particle 2 is [1]
   a) $\frac{\pi}{3}$ b) $\frac{\pi}{6}$
   c) $\frac{-\pi}{3}$ d) $\frac{-\pi}{6}$

14) **Statement 1:** A capacitor blocks d.c.
   Statement 2: This is because capacitive reactance of condenser is $X_C = \frac{1}{\omega C} = \frac{1}{2\pi v C}$, and for d.c. $\nu = 0$.
   [1]

   a) Statement 1 is true, statement 2 is true but statement 2 is not correct explanation of statement 1.
   b) Statement 1 is true, statement 2 is false.
   c) Statement 1 is false, statement 2 is true.
   d) Statement 1 is true, statement 2 is true and statement 2 is correct explanation of statement 1.

15) In a surface tension experiment with a capillary tube, water rises upto 0.1 m. If the same experiment is repeated in an artificial satellite which is revolving around the earth, water will rise in the capillary tube upto a height equal to [1]

   a) 0.98 m
   b) Full length of the tube
   c) 0.1 m
   d) 0.2 m

16) The equation of a wave is x = 5 $\sin\left(\frac{t}{0.04} - \frac{x}{4}\right)$ cm. The maximum velocity of the particles of the medium is [1]

   a) 2 m/s   b) 1.25 m/s
   c) 1.5 m/s   d) 1 m/s

17) If the speed of the wave shown in the figure is 330 m/s in the given medium, then the equation of the wave propagating in the positive x - direction will be (all quantities are in M.K.S. units)

[1]
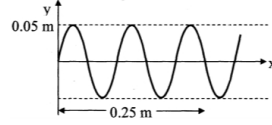
   a) Y = 0.05 sin 2π (3300x - 10t)
   b) Y = 0.05 sin 2π (3300 t - 10 x)
   c) Y = 0.05 sin 2π (4000t - 122.5x)
   d) Y = 0.05 sin 2π (4000t - 12.5x)

18) A student is performing the experiment of Resonance Column. The diameter of the column tube is 4 cm. The frequency of the tuning fork is 512 Hz. The air temperature is 38°C in which the speed of sound is 336 m/s. The zero of the metre scale coincides with the top end of the Resonance column tube. When the first resonance occurs, the reading of the water level in the column is [1]
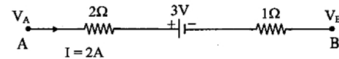   a) 16.4 cm   b) 14.0 cm
   c) 15.2 cm   d) 17.6 cm

19) S.I. unit of emissive power is [1]
   a) J/s   b) W/m
   c) J/m^2 d) J/s m^2

20) If i_p is the polarizing angle, then the refractive index (n) of the reflecting material is given by [1]

   a) Sin i_p
   b) Cos i_p
   c) $\frac{\sin i_p}{\cos i_p}$
   d) Cot i_p

21) The potential difference (V_A - V_B) between the points A and B in the given figure is

[1]

   a) +9 V   b) +3 V
   c) +6 V   d) - 3 V

22) Shunt wire should be _____. [1]
   a) Thin and long   b) Thick and short
   c) Thick and long   d) Thin and short

23) In a metrebridge, when R_1 and X are the resistances in left gap and right gap respectively, the null point is obtained at 40 cm from the left. Now, when the resistance R_2 is in left gap and X in right gap, then the null point is obtained at 60 cm from the left. When the resistance in left gap is changed to (R_1 + R_2), the null point will be at [1]
   a) 31.6 cm from left   b) 25.6 cm from left
   c) 68.4 cm from left   d) 74.4 cm from left

24) Two unknown resistances are connected in two gaps of a metrebridge. The null point is obtained at 40 cm from left end. A 30Ω resistance is connected in series with the smaller of the two resistances, the null point shifts by 20 cm to the right end. The value of smaller resistance in Ω is [1]
   a) 48   b) 24
   c) 12   d) 36

25) A long straight wire carrying current of 30 A is placed in an external uniform magnetic field of induction 4×10^{-4} T. The magnetic field is acting parallel to the direction of current. The magnitude of the resultant magnetic induction in tesla at a point 2.0 cm away from the wire is **[1]**
   a) 6×10^{-4} b) 5×10^{-4}
   c) 10^{-4} d) 3×10^{-4}

26) An electron is moving with a velocity of 3×10^{6} m/s perpendicular to a straight wire, carrying current of 5 A. What is the force acting on electron, if the electron is at a distance of 10 cm from the wire? [$\mu_0 = 4\pi \times 10^{-7}$ SI unit, e = 1.6×10^{-19} C]**[1]**
   a) 3.2×10^{-18} N   b) 9.6×10^{-18} N
   c) 4.8×10^{-18} N   d) 8×10^{-18} N

27) A particle with 10^{-11} coulomb of charge and 10^{-7} kg mass is moving with a velocity of 10^8 m/s along the y - axis. A uniform static magnetic field B = 0.5 tesla is acting along the x - direction. The force on the particle is **[1]**

   a) 5×10^{-11} N along $\hat{i}$
   b) 5×10^{-11} N along $-\hat{j}$
   c) 5×10^{-3} N along $\hat{k}$
   d) 5×10^{-4} N along $-\hat{k}$

28) For a given perimeter in plane, following are some shapes mentioned. Choose the shape for the loop such that which when placed inside magnetic field will have maximum torque acting on it. **[1]**
   a) Rectangle   b) Sphere
   c) Circle   d) Square

29) Iron is ferromagnetic _____. **[1]**
   a) Above 1100 °C   b) Below 770 °C
   c) Above 770 °C   d) At all temperature

30) The property of retentivity of a material is useful in the construction of **[1]**

   a) Non - magnetic substances.
   b) Transformers.
   c) Permanent magnets.
   d) Electromagnets.

31) Which of the following is represented by the area enclosed by a hysteresis loop (B - H curve)? **[1]**

   a) Permeability.
   b) Heat energy lost per unit volume in the sample.
   c) Susceptibility.
   d) Retentivity.

32) When a ferromagnetic material is heated to temperature above its Curie temperature, the material **[1]**

   a) Behaves like a diamagnetic material.
   b) Behaves like a paramagnetic material.
   c) Remains ferromagnetic.
   d) Is permanently magnetized.

33) Two coils A and B have mutual inductance 2×10^{-2} henry. If the current in the primary is i = 5 sin $(10\pi$ t) then the maximum value of e.m.f. induced in coil B is **[1]**
   a) $\frac{\pi}{3}$ volt   b) $\frac{\pi}{4}$ volt
   c) π volt   d) $\frac{\pi}{2}$ volt

34) In mutual induction, the main current remains same because **[1]**

a) Induced current is produced in primary coil.
b) Induced current is produced in both primary and secondary coil.
c) Induced current is not produced.
d) Induced current is produced in secondary coil.

35) A 220 V input is supplied to a transformer. The output circuit draws a current of 2.0 A at 440 V. If the ratio of output to input power is 0.8 then, the current drawn by primary windings is **[1]**
   a) 5.0 A   b) 2.8 A
   c) 2.5 A   d) 3.6 A

36) Particle wave has wavelength of the order of **[1]**
   a) 10^{-15} m   b) 10^{-13} m
   c) 10^{-7} m   d) 10^{-10} m

37) The energy of the em waves is of the order of 15 keV. To which part of the spectrum does it belong? **[1]**
   a) Infra - red rays   b) γ - rays
   c) X - rays   d) Ultraviolet rays

38) If a metal surface is exposed to electromagnetic radiation of frequency $\nu > \nu_0$, then **[1]**

   a) Photoelectric emission will take place.
   b) Photoelectric emission will not take place.
   c) Photons will be emitted from it.
   d) Thermionic emission will take place.

39) Energy equivalence of one unified atomic mass is **[1]**
   a) 931.5 MeV   b) 1.007×10^3 eV
   c) 231 MeV   d) 187 MeV

40) If the radius of the innermost Bohr orbit is $0.53\overset{o}{A}$, the radius of the 4th orbit is **[1]**
   a) $8.48\overset{o}{A}$ b) $81\overset{o}{A}$
   c) $16\overset{o}{A}$ d) $4\overset{o}{A}$

41) Age of a tree is determined by using radio - isotope of **[1]**
   a) Cobalt   b) Phosphorus
   c) Carbon   d) Iodine

42) An electron jumps from the 4th orbit to the 2nd orbit of hydrogen atom. Given the Rydberg's constant R = 10^5 cm^{-1}. The frequency in Hz of the emitted radiation will be **[1]**

   a) $\frac{3}{4} \times 10^{15}$
   b) $\frac{9}{16} \times 10^{15}$
   c) $\frac{3}{16} \times 10^5$
   d) $\frac{3}{16} \times 10^{15}$

43) The ratio of energy of orbital electron in the third and fifth orbit will be **[1]**
   a) $\frac{16}{9}$ b) $\frac{9}{25}$
   c) $\frac{9}{16}$ d) $\frac{25}{9}$

44) For sustained chain reaction during the fission of uranium, the most essential particle is **[1]**
   a) Electron   b) Positron
   c) Neutron   d) Meson

45) The sodium nucleus $^{23}_{11}$ Na contains **[1]**
   a) 11 electrons   b) 23 protons
   c) 2 protons   d) 12 neutrons

46) If the electron in hydrogen atom jumps from second Bohr orbit to ground state and difference between energies of the two states is radiated in the form of photons. If the work function of the material is 4.2 eV then stopping

potential is

[Energy of electron in n^{th} orbit $= -\frac{13.6}{n^2} - eV$][1]

a) 4 eV
b) 6 eV
c) 2 eV
d) 8 eV

47) The brightness of LED can be controlled by [1]

a) By changing the value of parallel resistance.
b) By changing the value of series resistance.
c) Applied potential differences.
d) By changing the value of resistance.

48) The current gain α of a transistor is 0.94. The change in collector current corresponding to a change of 0.5 mA in the base current in a common emitter arrangement is [1]

a) 1.52 mA
b) 2.38 mA
c) 3.45 mA
d) 7.83 Ma

49) In the three parts of a transistor, 'Emitter' is of [1]

a) Moderate size and heavily doped.
b) Large size and moderately doped.
c) Thin size and heavily doped.
d) Large size and lightly doped.

50) A Zener diode has a breakdown voltage of 5 V with a maximum power dissipation of 240 mW. The maximum current the diode can handle will be [1]

a) 44 mA
b) 50 mA
c) 46 mA
d) 48 mA

Section - A (Chemistry)

51) 1 mole atoms = _____ atoms. [1]

a) 6.051×10^{15}
b) 6.021×10^{21}
c) 6.024×10^{24}
d) 6.022×10^{23}

52) Neutrons are present in all atoms EXCEPT _____. [1]

a) ^1_1H
b) ^3_1H
c) ^9_4Be
d) $^{12}_6C$

53) In a conjugate pair of reductant and oxidant, the oxidant has _____. [1]

a) Lower oxidation number
b) Either lower or same oxidation number
c) Same oxidation number
d) Higher oxidation number

54) Which of the following statements is INCORRECT?

i. NaCl is an ionic compound.
ii. LiCl has some covalent character.
iii. Lithium iodide is the least covalent in nature among alkali halides.
iv. Lithium reacts slowly while sodium reacts vigorously with water

[1]

a) Option (d)
b) Option (c)
c) Option (a)
d) Option (b)

55) Which of the following is INCORRECT regarding London dispersion forces?

i. In nonpolar molecules and inert gases, only dispersion forces exist.
ii. In general, all atoms and molecules experience London dispersion forces.
iii. London dispersion forces are stronger in a long chain of atoms where molecules are not compact.

iv. The predominant force of attraction in HF is London dispersion force.

[1]

a) Option (C)
b) Option (A)
c) Option (B)
d) Option (D)

56) The stability of lyophilic colloids is due to _____. [1]

a) Charge on their particles
b) The large size of their particles
c) A layer of dispersion medium on their particles
d) The smaller size of their particles

57) In a reaction, if half of the double bond is broken and two new bonds are formed, this is a case of _____. [1]

a) Addition
b) Displacement
c) Elimination
d) Substitution

58) The most common reactions of benzene (aromatic hydrocarbon) and its derivatives are _____. [1]

a) Nucleophilic addition reactions
b) Electrophilic substitution reactions
c) Electrophilic addition reactions
d) Nucleophilic substitution reactions

59) In which of the following, homolytic bond fission takes place? [1]

a) Nitration of benzene
b) Free radical chlorination of methane
c) Addition of HBr to double bond
d) Alkaline hydrolysis of ethyl chloride

60) Iron exhibits bcc structure at room temperature. Above 900 °C, it transforms to fcc structure. The ratio of the density of iron at room temperature to that at 900 °C (assuming molar mass and atomic radii of iron remains constant with temperature? [1]

a) $\frac{4\sqrt{3}}{3\sqrt{2}}$
b) $\frac{\sqrt{3}}{\sqrt{2}}$
c) $\frac{1}{2}$
d) $\frac{3\sqrt{3}}{4\sqrt{2}}$

61) A semiconductor of Ge can be made p - type by adding _____ impurity. [1]

a) Divalent
b) Tetravalent
c) Trivalent
d) Pentavalent

62) If α is the degree of dissociation of Na_2SO_4, the van't Hoff's factor (i) used for calculating the molecular mass is _____. [1]

a) $1 + \alpha$
b) $1 - \alpha$
c) $1 + 2\alpha$
d) $1 - 3\alpha$

63) During osmosis, the flow of water through a semipermeable membrane is _____. [1]

a) Unpredictable
b) Bidirectional
c) Unidirectional
d) Multidirectional

64) If the heat of combustion of solid benzoic acid at constant volume is - 321.30 kJ at 27 °C, the heat of combustion at constant pressure will be _____. [1]

a) (- 321.30 - 150 R) kJ
b) (- 321.20 + 30 R) kJ
c) (- 321.30 - 300 R)kJ
d) (- 321.30 + 900 R)kJ

65) At constant pressure, ΔH and ΔU are related as: [1]

a) $\Delta H = \frac{\Delta U}{P \Delta V}$
b) $\Delta H = \Delta U + P \Delta V$
c) $\Delta H = \Delta U - P \Delta V$
d) $\Delta H = \frac{-\Delta U}{P \Delta V}$

66) While charging the lead storage battery, _____. [1]

   a) $PbSO_4$ on cathode is oxidised to Pb
   b) $PbSO_4$ on anode is reduced to Pb
   c) $PbSO_4$ on anode is oxidised to Pb
   d) $PbSO_4$ on cathode is reduced to Pb

67) During electrolysis of molten $CaCl_2$, 0.005 A current is passed through the cell for 200 s. The mass of product formed at cathode (molar mass of Ca = 40 g mol^{-1}) will be _____. [1]
   a) 0.0007357 g of Cl_2 b) 0.0004145 g of Ca
   c) 0.0003678 g of Cl_2 d) 0.0002073 g of Ca

68) For the Reaction $2A + B \rightarrow C$, the values of the initial rate at different reactant concentrations are given in the table below. The rate law for the reaction is _____.

[A](mol L^{-1})	[B](mol L^{-1})	Initial rate (mol L^{-1} s^{-1})
0.05	0.05	0.045
0.10	0.05	0.090
0.20	0.10	0.72

[1]
   a) Rate = k $[A]^2[B]^2$ b) Rate = k $[A][B]$
   c) Rate = k $[A]^2[B]$ d) Rate = k $[A][B]^2$

69) The rate law for a reaction between the substances A and B is given by, rate = $k[A]^n[B]^m$. On doubling the concentration of A and halving the concentration of B, the ratio of the new rate to the earlier rate of the reaction will be _____. [1]
   a) $2^{(n-m)}$ b) $\frac{1}{2^{(m+n)}}$
   c) $(n - m)$ d) $(m + n)$

70) The pOH of a buffer solution made by mixing 25 mL of 0.02 M NH_4OH and 25 mL of 0.2 M NH_4Cl at 25 °C is _____. [pK_b of NH_4OH = 4.8][1]
   a) 5.8   b) 2.8
   c) 3.8   d) 4.8

71) Match the buffer solutions to their uses.

Buffer solution	Use
I. Sodium citrate	A. To stabilize penicillin
Ii. Sodium benzoate	B. In a qualitative analysis of group IIIA radicals
Iv. NH_4OH/NH_4Cl	C. To maintain blood PH
V. HCO_3^- /H_2CO_3	D. To preserve jams and jellies

[1]

   a) (i) - (a), (ii) - (d), (iii) - (b), (iv) - (c)
   b) (i) - (a), (ii) - (b), (iii) - (d), (iv) - (c)
   c) (i) - (b), (ii) - (a), (iii) - (d), (iv) - (c)
   d) (i) - (d), (ii) - (a), (iii) - (c), (iv) - (b)

72) If acetic acid is 1.3 % dissociated in 0.1 M solution, the equilibrium concentration of H^+ ions is mol L^{-1}. [1]

   a) 1.3×10^{-2} b) 1.3×10^{-4}
   c) 1.3×10^{-1} d) 1.3×10^{-3}

73) ____exists as a liquid at room temperature. [1]
   a) Hydrogen fluoridea   b) Hydrogen iodide
   c) Hydrogen chloride   d) Hydrogen bromide

74) Which of the following is the most electronegative element in the periodic table? [1]
   a) Chlorine   b) Oxygen
   c) Fluorine   d) Sulfur

75) Which of the following is highly acidic in nature? [1]
   a) H_2Te b) H_2Se
   c) H_2S d) H_2O

76) Gadolinium belongs to 4f series. Its atomic number is 64. Which of the following is the CORRECT electronic configuration of gadolinium? [1]
   a) $[Xe]4f^7\ 5d^1\ 6s^2$ b) $[Xe]4f^6\ 5d^2\ 6s^2$
   c) $[Xe]4f^8\ 6d^2$ d) $[Xe]4f^9\ 5s^1$

77) The following statements are CORRECT, EXCEPT _____. [1]

   a) All d block elements are electropositive metals
   b) Most d - block elements are efficient catalyst
   c) All d block elements are lustrous
   d) All d block elements are soft metals

78) The CORRECT order of the stoichiometries of AgCl formed when $AgNo_3$ in excess is treated with the complex: $CoCI_3.6NH_3$, $CoCI_3.5NH_3$, $CoCI_3.4NH_3$, respectively is _____. [1]

   a) 2 AgCl, 3 AgCl, 1 AgCl
   b) 1 AgCl, 3 AgCl, 2 AgCl
   c) 3 AgCl, 2 AgCl, 1 AgCl
   d) 3 AgCl, 1 AgCl, 2 AgCl

79) $[Fe(H_2O)_6]^{2+}$ and $[Fe(CN)_6]^{4-}$ differ in _____. [1]

   a) Geometry, hybridization
   b) Geometry, magnetic moment
   c) Magnetic moment only
   d) Hybridization, number of unpaired electrons

80) In the compound $[Co(NH_3)_6]Cl_3$; there are _____. [1]

   a) 3 chloride ions in coordination sphere, 6 ammonia molecules in ionization sphere
   b) 3 ammonia and 3 chloride in coordination sphere, 3 ammonia in ionization sphere
   c) 6 ammonia molecules and 3 chloride ions in the coordination sphere
   d) 6 ammonia molecules in coordination sphere, 3 chloride ions in ionization sphere

81) For a given alkyl group, the boiling points of alkyl halides follow the order: [1]
   a) RCl > RBr > RI   b) RI > RBr > RCI
   c) RI > RCl > RBr   d) RBr > RI > RCl

82) If starting compound is laevo rotatory, after the S_N1 reaction, the product is _____ [1]

   a) Racemic mixture
   b) Partially optically active
   c) Dextro rotatory
   d) Laevo rotatory

83) IUPAC name of $(CH_3)_3C - CH_2 - CHI - CH_3$ is _____. [1]

   a) 2 - iodo - 4,4 - dimethylbutane

b) 2 - iodo - 4,4 - dimethylpentane

c) 3 - iodo - 4,4 - dimethylpentane

d) 4 - iodo - 2,2 - dimethylpentane

84) The IUPAC name of C_2H_5 - O - CH_2 - $CH(CH_3)_2$ is _____. **[1]**

a) 3 - Ethoxy - 2 - methylpropane

b) L - Ethoxy - 2 - methylpropane

c) 1 - Ethoxy - 1 - butane

d) 2 - Ethoxy - 2 - butane

85) Phenol is treated with bromine water and the product obtained is 2,4,6 - Tribromophenol. What is the ratio of the quantity of phenol reactant to Br_2 water reactant? **[1]**

a) 1 : 4   b) 1 : 3

c) 1 : 2   d) 1 : 1

86) CH_2CICH_2OH is stronger acid than CH_3CH_2OH because _____.

i. + I effect of Cl disperses - ve charge on O atom to produce more stable anion

ii. - I effect of Cl disperses - ve charge on O atom to produce more stable anion

iii. - I effect of Cl increases - ve charge on O atom of alcohol

iv. + I effect of Cl increases - ve charge on O atom of alcohol

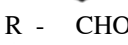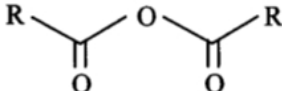**[1]**

a) Option (b)   b) Option (c)

c) Option (a)   d) Option (d)

87) Dry ice + X $\xrightarrow[ii.\ H_3O^+]{i.\ Dry\ ether}$ Benzoic acid Identify 'X' **[1]**

a) N - propyl magnesium bromide

b) Benzyl magnesium chloride

c) Ethyl magnesium chloride

d) Phenyl magnesium bromide

88) Find the suitable product for the following reaction.

R - CO_2H $\xrightarrow[ii.\ H_2O/H^+]{i.\ B_2H_6}$ **[1]**

a) R - CH2 - OH

b) R - CHO

c) R - CO - O - CO - R
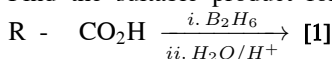
d) R - CO_2R

89) Which of the following is least reactive towards nucleophilic addition reactions? **[1]**

a) Benzaldehyde   b) Acetaldehyde

c) Acetone   d) Benzophenone

90) Identify the simple 3° amine from the following. **[1]**

a) Trimethylamine

b) Ethylmethyln - propylamine

c) Ethyldimethylamine

d) Dimethylamine

91) Secondary amine(s) from the following is/are _____. **[1]**

a) Both $CH_2 = CHCH_2NHCH_3$ and $C_6H_5NHC_6H_5$

b) $C_6H_5NHC_6H_5$

c) $CH_2 = CHCH_2NHCH_3$

d) $CH_3CH_2CHCH_3$
   |
   NH_2

92) In amines, the hybridisation state of N is _____. **[1]**

a) Sp^2 b) Sp

c) Sp^3 d) Sp^2d

93) α - D - glucose and β - D - glucose differ from each other due to difference in one of the carbons with respect to its _____. **[1]**

a) Configuration   b) Atomic mass

c) Number of OH groups   d) Functional group
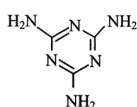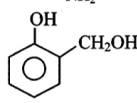
94) Identify the INCORRECT statement from the following.
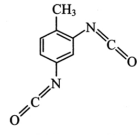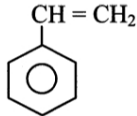
i. The most commonly used sugar is obtained from sugarcane or sugar beet.

ii. Maltose is the sugar present in milk.

iii. Sucrose can be represented by the formula $C_{12}(H_2O)_{11}$.

iv. Starch can be represented by the formula $(C_6H_{10}O_5)_n$.

[1]

a) Option (d)   b) Option (b)

c) Option (c)   d) Option (a)

95) Which of the following represents structure of melamine? **[1]**

96) The copolymer obtained on condensation reaction between glycine and $\in$ - aminocaproic acid is _____. **[1]**

a) Nylon 6, 6   b) Glyptal

c) PHBV   d) Nylon 2 - nylon 6

97) Polymerization of ethylene glycol with terephthalic acid occurs by _____. **[1]**

a) Condensation polymerization

b) Ring opening polymerization

c) Free radical polymerization

d) Addition polymerization

98) Match the following.

Reaction	Catalyst employed
I. Commercial preparation phenol	A. Anhydrous $AlCl_3$
Ii. Friedel Craft's reaction	B. Platinised asbestos
Iii. Manufacture HDP polymer	C. Co - naphthenate
Iv. Manufacture H_2SO_4 by contact process	D. Ziegler - Natta catalyst

[1]

a) (i) - (c), (ii) - (a), (iii) - (d), (iv) - (b)

b) (i) - (b), (ii) - (d), (iii) - (a), (iv) - (c)

c) (i) - (d), (ii) - (a), (iii) - (b), (iv) - (c)

d) (i) - (d), (ii) - (c), (iii) - (b), (iv) - (a)

99) Which of the following is believed to contain phthalates that interfere with hormonal development? [1]
   a) HDPE
   b) PVC
   c) PETE
   d) PS

100) X - ray diffraction gives all the information regarding nanoparticles EXCEPT the _____. [1]
   a) Particle size
   b) Binding nature
   c) Crystal structure
   d) Geometry

Section - B (Biology)

101) Select the group of fat - soluble vitamins from the followings: [1]

   a) Vitamins A, D, E, and K
   b) Vitamins A, B, C and D
   c) Vitamins B, C, D and K
   d) Vitamins B, C and E

102) The molecular formula of haemoglobin is: [1]

   a) $C_{3032}H_{872}O_{872}N_{780}S_8Fe_4$
   b) $C_{3032}H_{168}O_{872}N_{745}S_6Fe_2$
   c) $C_{3242}H_{132}O_{943}N_{795}S_6Fe_2$
   d) $C_{3032}H_{564}O_{542}N_{785}S_8Fe_4$

103) The chemical compounds undergo changes in shape without the breakdown of bonds are called as: [1]

   a) Physical process
   b) Inorganic chemical process
   c) Chemical process
   d) Biological process

104) The process of guttation takes place: [1]

   a) When the root pressure is low and the rate of transpiration is high.
   b) When the root pressure as well as rate of transpiration are high.
   c) When the root pressure equals the rate of transpiration.
   d) When the root pressure is high and the rate of transpiration is low.

105) When rajma seeds are soaked in water overnight, they swell. What gives the explanation for this? [1]
   a) Active Transport
   b) Diffusion
   c) Osmosis
   d) Imbibition

106) Which one of the following organism help in the absorption of phosphorus from the soil by plants? [1]
   a) Frankia
   b) Glomus
   c) Rhizobium
   d) Anabaena

107) Which enzyme is secreted by the liver? [1]
   a) Chymotrypsin
   b) Pepsin
   c) No enzyme
   d) Trypsin

108) Absorption of fats takes place through: [1]
   a) Intestinal villi
   b) Blood capillaries
   c) Intestinal mucosa
   d) Lymphatic ducts

109) Which of the following is a recessive trait of the garden pea plant? [1]

   a) Inflated form of ripe pods
   b) Terminal flower position
   c) Purple flower colour
   d) Green pod colour

110) Mating of an organism to a double recessive in order to determine whether it is homozygous or heterozygou character under consideration is called: [1]
   a) Dihybrid cross
   b) Reciprocal cross
   c) Back cross
   d) Test cross

111) Mendel's principle of segregation means that the germ cells always receive: [1]

   a) One pair of alleles
   b) One of paired alleles
   c) Any pair of alleles
   d) One quarter of genes

112) State the use of molecular genetics. [1]

   a) Used to understand several diseases like Alzheimer's Parkinsons diseases, etc.
   b) Used as gene therapy
   c) Improves diagnosis of diseases
   d) All of these

113) The 3' - 5' phosphodiester linkages inside a polynucleotide chain serve to join: [1]

   a) One DNA strand with the other DNA strand.
   b) One nucleoside with another nucleoside.
   c) One nitrogenous base with pentose sugar.
   d) One nucleotide with another nucleotide.

114) If Meselson and Stahl's experiment is continued for four generations in bacteria, the ratio of N^{15}/N^{15}: N^{15}/N^{14}: N^{14}/N^{14} containing DNA in the fourth generation would be: [1]
   a) 1:1:0
   b) 0:1:3
   c) 0:1:7
   d) 1:4:0

115) During DNA replication in prokaryotes DNA is anchored to: [1]
   a) Chromosome
   b) Mesosome
   c) Nucleolus
   d) Ribosome

116) Who amongst the following scientists had no contribution in the development of the double helix model for the structure of DNA? [1]
   a) Meselson and Stahl
   b) Erwin Chargaff
   c) Rosalind Franklin
   d) Maurice Wilkins

117) Genetic material of virus is: [1]
   a) Either DNA or RNA
   b) DNA only
   c) RNA only
   d) Both RNA and DNA

118) In which of the following linear polymeric biomolecule, the two ends are described as **reducing and non - reducing ends**? [1]
   a) Amylose
   b) RNA
   c) Protein
   d) DNA

119) EtBr fluoresces in UV light because: [1]

   a) It leads to overhangs formation.
   b) It gets intercalated between the two strands of DNA.
   c) It leads to frame shift mutation.
   d) It causes mutations.

120) A bacterial cell was transformed with a recombinant DNA molecule that was generated using a human gene. However, the transformed cells did not produce the desired protein. Reasons could be: [1]

   a) Human gene may have intron which bacteria cannot process.
   b) Human protein is formed but degraded by bacteria.
   c) All of these

d) Amino acid codons for humans and bacteria are different.

121) Molecular scissors are: **[1]**

a) Helicase
b) Ligase
c) DNA polymerase
d) Restriction endonuclease

122) Lysine rich Maize variety is: **[1]**
a) Kalayansona
b) IR - 10
c) Sonalika
d) Shakti

123) Protoplast is: **[1]**

a) A plant cell without a cell wall
b) An animal cell
c) A plant cell
d) Another name for protoplasm

124) Gene banks are part of: **[1]**

a) Both ex - situ and in situ conservation
b) Tribal diet
c) In situ conservation
d) Ex - situ conservation

125) In order to obtain disease - free plants through tissue culture techniques, the best method is: **[1]**
a) Protoplasm culture
b) Anther culture
c) Embryo rescue
d) Meristem culture

126) The purity of seed is guaranteed by: **[1]**

a) IAIR
b) National seed corporation
c) NBPGR
d) ICAR

127) Methanogenic bacteria are not found in: **[1]**

a) Gobar gas plant
b) Activated sludge
c) Rumen of cattle
d) Bottom of water - logged paddy fields

128) One of the free - living anaerobic nitrogen - fixer is: **[1]**
a) Rhodospirillum
b) Beijerinckia
c) Azotobacter
d) Rhizobium

129) Mycorrhiza does not help the host plant in: **[1]**

a) Enhancing its phosphorus uptake capacity
b) Enhancing its resistance to root pathogens
c) Increasing its tolerance to drought
d) Increasing its resistance to insects

130) Which one of the following can fix nitrogen? **[1]**
a) Nostoc
b) Streptococcus
c) Oscillatoria
d) Spirogyra

131) Crop rotation is used by farmers to increase: **[1]**

a) Soil fertility
b) Nitrogenous content of soil
c) Breeding
d) Organic content of soil

132) Large - holes in**Swiss - Cheese** are due to **[1]**

a) Acetobacter aceti
b) Propionibacterium sharmanii
c) Penicillium chrysogenum
d) Saccharomyces cerevisiae

133) First hormone produced artificially by culturing bacteria is : **[1]**
a) Adrenaline
b) Testosterone
c) Thyroxine
d) Insulin

134) Photorespiration in C_3 plants begins from: **[1]**
a) Glycine
b) Phosphoglycerate
c) Glycerate
d) Phosphoglycolate

135) The response of the different organism to environment rhythms of light and darkness is called: **[1]**
a) Phototaxis
b) Photoperiodism
c) Phototropism
d) Vernalization

136) When and where anaerobic respiration does occur in man and yeast? **[1]**

a) Muscle in man and submergence in sugary solution in yeast
b) Muscle in man and salt solution in yeast
c) Bone in man and yeast in normal condition
d) Muscle in man and yeast in adverse condition

137) During fermentation which is another product other than ethanol? **[1]**
a) CO_2
b) Oxaloacetic acid
c) Lactic acid
d) H_2O

138) Which of the following occupies a central position in flower? **[1]**
a) Pistil
b) Stamen
c) Pedicel
d) Sepal

139) The phenomenon observed in some plants wherein parts of the sexual apparatus is used for forming embryos without fertilization is called: **[1]**

a) Vegetative propagation
b) Parthenocarpy
c) Apomixis
d) Sexual reproduction

140) Anemophily refers to pollination by: **[1]**
a) Wind
b) Animals
c) Water
d) Insects

141) Which part of the embryo sac receives the male gamete: **[1]**
a) Egg
b) PEN
c) Antipodals
d) Synergid

142) Removal of anthers from a flower during hybridization process is known as: **[1]**
a) Emasculation
b) Isolation
c) Crossing
d) Sterilization

143) Which of the following plant contain unisexual flower: **[1]**
a) Rose
b) Papaya
c) Hibiscus
d) Lotus

144) Embryo developed from the somatic cells are called: **[1]**
a) Callus
b) Embryoids
c) Hybrids
d) Cybrids

145) From among the situations given below, choose the one that prevents both autogamy and geitonogamy. **[1]**

a) Monoecious plant bearing unisexual flowers.
b) Monoecious plant with bisexual flowers.
c) Dioecious plant with bisexual flowers.
d) Dioecious plant bearing only male or female flowers.

146) Which one of the following pairs of plant structures has a haploid number of chromosomes? **[1]**

a) Nucellus and antipodal cells
b) Megaspore mother cell and antipodal cell
c) Egg and antipodal cells
d) Egg nucleus and secondary nucleus

147) Study the following diagram of Transverse Section of a young anther of an angiosperm:
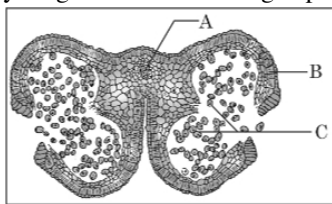
Select the option where parts **A, B** and **C** are correctly identified. **[1]**

a) A - Connective, B - Endothecium, C - Pollen grain.
b) A - Endothecium, B - Pollen grain, C - Connective.
c) A - Pollen grain, B - Connective, C - Endothecium.
d) A - Endothecium, B - Connective, C - Pollen grain.

148) Total biodiversity hot spots in world is **[1]**
a) 34
b) 25
c) 24
d) 36

149) To attain maximum diversity and niche specialization, biotic succession needs: **[1]**

a) Transitional community
b) Pioneer community
c) Interspecific competition
d) Climax community

150) Select the correct match:
   i. Nitrosomonas - Nitrite to nitrate
   ii. Thiobacillus - Denitrification
   iii. Nostoc - Free living N_2 - fixer
   iv. Azotobacter - Anaerobic N_2 fixer
[1]
a) A & B
b) B & C
c) C & D
d) B & D

151) During process of succession, a step that renders environment of an area unsuitable for existing species is: **[1]**
a) Invasion
b) Reaction
c) Ecesis
d) Aggregation

152) Chipko movement originated in **[1]**

a) Panchmari in M.P
b) Silent valley of H.P.
c) Kangra valley of H.P.
d) Tehri Garwal of U.P.

153) In a food chain, herbivores are: **[1]**
a) Decomposers
b) Secondary consumers
c) Primary producers
d) Primary consumers

154) As per geological time scale, hominids evolved during: **[1]**
a) Pliocene
b) Miocene
c) Oligocene
d) Pleistocene

155) The origin of life according to the early Greek philosophers was transfer of unit of life from outer space to the different planets in the form of: **[1]**

a) Seeds
b) Gemmules
c) Gametes
d) Spores

156) The first human - like creature being the hominid was called: **[1]**
a) Ramapithecus
b) Homo sapience
c) Homo erectus
d) Homo habilis

157) The first cellular form of life evolved **[1]**
a) On land
b) In air
c) In water environment
d) In deep soil

158) Palaentological evidences for evolution refer to the: **[1]**

a) Analogous organs
b) Homologous organs
c) Fossils
d) Development of embryo

159) First amphibian evolved from: **[1]**

a) Tortoise
b) Both Turtle and Tortoise
c) Turtle
d) Lobe finned fishes

160) Antibodies resemble with which of the following shape? **[1]**
a) X
b) Y
c) O
d) Z

161) Which of the following conditions correctly describes the manner of determining the sex in the given example? **[1]**

a) XO type of sex determines male sex in grasshopper.
b) XO condition in humans as found in Klinefelter's syndrome determines female sex.
c) Homozygous sex chromosome XX produces male in Drosophila.
d) Homozygous sex chromosome ZZ determines female sex in birds.

162) Genetic disorder due to trisomy of chromosome 21 in humans is: **[1]**

a) Turner's syndrom
b) None of these
c) Down's syndrome
d) Klinefelter's syndrome

163) Haemophilia is due to: **[1]**
a) Factor - VIII
b) Factor - VI
c) Factor - IX
d) Factor - VII

164) In a certain taxon of insects some have 17 chromosomes and the others have 18 chromosomes. The 17 and 18 chromosome - bearing organisms are: **[1]**

a) All females
b) All males
c) Females and males, respectively
d) Males and females, respectively

165) DNA probes used in fingerprinting are: **[1]**

a) Highly sensitive electron microscope
b) UV beams
c) X - ray scanners
d) DNA segments having radioactive isotopes

166) An enzyme produced commercially from Saccharomyces cerevisiae is: **[1]**
a) Amylase
b) Maltase
c) Invertase
d) Lactase

167) Rosie's milk is enriched nutritionally as it has: **[1]**

    a) Beta lactalbumin
    b) Human gene alpha lactalbumin
    c) Lactose
    d) Vitamin A

168) AIDS testing on normal individuals is done by: **[1]**

    a) Identification of antibodies
    b) Reduction in immunity of the individuals
    c) Identification of antigen - toxin
    d) Separation by virus

169) Hashish and charas are obtained from **[1]**
    a) Cannabis sativus
    b) Papaver somniferum
    c) Rauwolfia serpentina
    d) Claviceps purpurea

170) AIDS is caused by Human immunodeficiency virus (HIV) which is a member of a group of virus called: **[1]**
    a) Retrovirus
    b) Mono virus
    c) Miso virus
    d) Micro virus

171) The diagnostic test that confirms typhoid in humans is: **[1]**
    a) ELISA
    b) Amniocentesis
    c) MRI
    d) Widal

172) ELISA is: **[1]**

    a) Enzyme likes Immunity sex assay
    b) Enzyme - linked immunosorbent assay
    c) Enzyme - linked ions assay
    d) Enzyme linked inductive assay

173) Cannabis plant is used in the production of: **[1]**
    a) Marijuana
    b) All of these
    c) Charas
    d) Ganja

174) Tobacco consumption is known to stimulate secretion of adrenaline and nor - adrenaline. The component causing this could be: **[1]**
    a) Tannic acid
    b) Curamin
    c) Catechin
    d) Nicotine

175) AIDS day is: **[1]**
    a) June 1
    b) December 1
    c) May 1
    d) December 20

176) Formation of antibodies within our body is called: **[1]**
    a) Acquired immunity
    b) Active immunity
    c) Innate immunity
    d) Passive immunity

177) Infective stage of Plasmodium in man is: **[1]**
    a) Metamerozoite
    b) Sporozoite
    c) Gametocyte
    d) Merozoite

178) Multiple Ovulation Embryo Transfer Technology is used for: **[1]**

    a) Release of growth hormone
    b) Successive production of hybrids
    c) To improve the chances of high yield
    d) Faster release of ovum

179) Which one of the following is a marine fish? **[1]**
    a) Hilsa
    b) Rohu
    c) Catla
    d) Common Carp

180) One of the common symptoms observed in people infected with Dengue fever is: **[1]**

    a) Significant decrease in WBC count
    b) Significant decrease in platelets count
    c) Significant increase in platelets count
    d) Significant decrease in RBC count

181) When blood clot starts contracting, a pale yellow fluid starts oozing out. Its name and composition are: **[1]**

    a) Serum = dissolved fibrin - [plasma + blood corpuscles]
    b) Serum = plasma - [thrombin + blood corpuscles]
    c) Serum = plasma - [fibrinogen + blood corpuscles]
    d) Sera = blood corpuscles - [thrombin + fibrin]

182) What is the normal leukocyte count in human? **[1]**

    a) 4300 - 10000 per cubic mm
    b) 5000 - 7000 per cubic mm
    c) 4000 - 6000 per cubic mm
    d) 7000 - 9000 per cubic mm

183) What is the name of the node between two myelin sheaths? **[1]**
    a) Nodes of Ranvier
    b) Crowton cell
    c) Schwan cell
    d) Nissl's Granules

184) Which of the following is not involved in Knee - jerk reflex? **[1]**
    a) Interneurons
    b) Muscle spindle
    c) Brain
    d) Motor neuron

185) Non - cleodoic eggs occur in: **[1]**
    a) Fishes
    b) Birds
    c) Platypus
    d) Reptiles

186) First menstruation in human female is called: **[1]**

    a) Menopause
    b) Menarche
    c) Both Menopause and Menarche
    d) Oogenesis

187) Spermatogenesis is promoted by: **[1]**
    a) Oxytocin
    b) Testosterone
    c) Estrogens
    d) Progesterone

188) Which hormone level reaches peak during luteal phase of menstrual cycle? **[1]**
    a) LH
    b) FSH
    c) Progesterone
    d) Estrogens

189) After spermiogenesis, the sperm heads get embedded in which of the following cells? **[1]**
    a) Seminal vesicle
    b) Sertoli cells
    c) Germinal epithelium
    d) Leydig cells

190) Acrosomal reaction of the sperm occurs due to: **[1]**

    a) Reactions within the uterine environment of the female
    b) Androgens produced in the uterus
    c) Reactions within the epididymal environment of the male
    d) Its contact with zona pellucida of the ova

191) A change in the amount of yolk and its distribution in the egg will affect: **[1]**

    a) Formation of zygote
    b) Pattern of cleavage
    c) Number of blastomeres produced
    d) Fertilization

192) Acrosome of sperm is found in: **[1]**
    a) Head
    b) Tail
    c) Neck
    d) Middle piece

193) In humans, the secondary oocyte completes meiotic division when: [1]

    a) It is released from the matured Graafian follicle.
    b) It is penetrated by the sperm cell.
    c) Acrosomal enzymes break down the zona pellucida.
    d) It gets implanted in the uterine endometrium.

194) Hormones released in human females only during pregnancy are [1]

    a) HPL, Thyroxine, hCG
    b) HCG, hPL, Oxytocin
    c) HCG, hPL, Progesterone
    d) Relaxin, hCG, hPL

195) Which of the following soil is transported by air ? [1]
    a) Glacial   b) Elluvial
    c) Alluvial   d) Aeolian

196) The equation $\log S = \log C + Z \log A$ is based on the principle put forward by: [1]

    a) Robert May
    b) Alexander van Humboldt
    c) David Tilman
    d) Edward Wilson

197) The filtration fraction is the ratio of GFR to RPF where both the values are in ml/min and FF is expressed in percentage. Calculate FF for a normal adult human being, if RPF= 600ml/min: [1]
    a) 2.08%   b) 10.38%
    c) 20.73%   d) 20.83%

198) Which hormone maintains the volume of urine produced by kidneys? [1]

    a) Atrial Natriuretic factor
    b) Testosterone
    c) Adrenal hormone
    d) Anti Diuretic hormone

199) Phytochrome is sensitive to: [1]

    a) Blue light
    b) Yellow light
    c) Red and far - red light
    d) Green light

200) A farmer grows cucumber plants in his field. He wants to increase the number of female flowers in them. Which plant hormones can be applied to achieve this? [1]
    a) Gibberellins   b) Auxins
    c) Ethylene   d) Abscisic acid