SATISH SCIENCE ACADEMY
DHANORI PUNE - 411015

Mhtcet pcb 1
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) The ratio of the numerical values of the average velocity and average speed of a body is always **[1]**
   a) Unity b) Less than unity
   c) Unity or more d) Unity or less

2) A ball of mass M_1 collides elastically and head on with another ball of mass M_2 initially at rest. In which of the following cases the transfer of momentum will be maximum? **[1]**
   a) $M_1 = M_2$
   b) $M_1 > M_2$
   c) $M_1 < M_2$
   d) Data is insufficient to predict it.

3) The critical velocity of a satellite of mass 100 kg is 20 km/hr. The critical velocity of another satellite of mass 200 kg in the same orbit is **[1]**
   a) 14.14 km/hr b) 20 km/hr
   c) 10 km/hr d) 72 km/hr

4) One mole of gas occupies a volume of 100 ml at 50 mm pressure. The volume occupied by 3 moles of the same gas at 100 mm pressure and at the same temperature is **[1]**
   a) 150 ml b) 100 ml
   c) 200 ml d) 50 ml

5) A passenger is sitting in a fast moving train. The engine of the train blows a whistle of frequency**n**. If the apparent frequency of sound heard by the passenger is n', then **[1]**
   a) N' = n b) N' > n
   c) N' ≥ n d) N' < n

6) An infinitely long rod lies along the axis of a concave mirror of focal length 'f' the nearer end of the rod is at a distance, u (u > f) from the mirror. Its image will have length **[1]**
   a) $\frac{f^2}{u-f}$
   b) $\frac{f^2}{u+f}$
   c) $\frac{uf}{u+f}$
   d) $\frac{uf}{u-f}$

7) In an astronomical telescope in normal adjustment, a straight black line of length L is drawn on inside part of objective lens. The eye - piece forms real image of this line. The length of this image is I. The magnification of the telescope **[1]**
   a) $\frac{L}{I}$ b) $\frac{L}{I}$ - 1
   c) $\frac{L}{I}$ + 1 d) $\frac{L+I}{L-I}$

8) When a light is incident at one end of the fibre at a small angle, then refracted light falls on the wall of the fibre at an angle **[1]**
   a) Equal to 0°.
   b) Equal to critical angle.
   c) Greater than critical angle.
   d) Greater than 90°.

9) A region surrounding a stationary electric dipole has **[1]**
   a) Magnetic field only.
   b) Both electric and magnetic field.
   c) Electric field only.
   d) No electric and magnetic fields.

10) The difference between angular speed of minute hand and second hand of a clock is **[1]**
   a) $\frac{59\pi}{2400}$ rad/s
   b) $\frac{59\pi}{1800}$ rad/s
   c) $\frac{59\pi}{900}$ rad/s
   d) $\frac{59\pi}{3600}$ rad/s

11) The displacement of a particle along the X - axis is given by x = a $\sin^2\omega$ t. The motion of the particle corresponds to **[1]**
   a) Simple harmonic motion of frequency $\frac{\omega}{\pi}$.
   b) Non simple harmonic motion.
   c) Simple harmonic motion of frequency $\frac{3\omega}{2\pi}$.
   d) Simple harmonic motion of frequency $\frac{\omega}{2\pi}$.

12) If the superpositions of two SHM is given by, $x_1 = A_1 \cos(\omega_1 t)$ and $x_2 = A_2 \cos(\omega_2 t + \delta_2)$ along X - axis, identify the wrong option.
   i. If $A_1 = A_2$ and $\delta_2 = \pi$, the particle is always at rest.
   ii. If $\delta_2 = 0$, $A_1 = A_2$ and $\omega_1 \neq \omega_2$ then the resultant motion is harmonic with frequency $\omega = \frac{\omega_1+\omega_2}{2}$.
   iii. If $A_1 = A_2$, $\omega_1 \neq \omega_2, \delta_2 = 0$ and $A_1 = A_2$ then the particle is at origin at time $'t' = \frac{3\pi}{\omega_1-\omega_2}$.
   iv. If $A_1 = A_2$, $\omega_1 = \omega_2$ and $\delta_2 = 0$ then the amplitude of resultant S.H.M. is $2A_1$.

   [1]
   a) Option (a) b) Option (d)
   c) Option (c) d) Option (b)

13) In resonance,
   i. The energy released by the vibrating body is maximum.
   ii. Energy absorbed by the vibrating body is maximum.
   iii. Neither energy is absorbed by the vibrating body nor energy is released.
   iv. Energy absorbed by vibrating body is minimum.

[1]

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

14) In a series LCR circuit R = 300Ω , L = 0.9 H, C = 2 μ F, ω = 1000 rad/s. The impedance of the circuit is _____. [1]

a) 400Ω
b) 1300Ω
c) 500Ω
d) 900Ω

15) Critical velocity is given by [1]

a) $v_C = \frac{R_n \eta}{\rho D}$
b) $v_C = \frac{R_n \eta \rho}{D}$
c) $v_C = \frac{R_n}{\eta \rho D}$
d) $v_C = \frac{R_n \eta D}{\rho}$

16) A steel rod 100 cm long is clamped at its mid - point. The fundamental frequency of longitudinal vibrations of the rod is given to be 2.53 kHz. What is the speed of sound in steel? [1]

a) 5.06 km/s
b) 8.06 km/s
c) 7.06 km/s
d) 6.06 km/s

17) The equation of sound wave travelling along negative X - direction is given by, y = 0.04 sinπ (500t + 1.5x) m. The shortest distance between two particles having phase difference of π at the same instant is [1]

a) 0.66 m
b) 0.2 m
c) 0.5 m
d) 0.33 m

18) A progressive wave is represented by y = 12 sin (5t - 4x) cm. On this wave, how far away are the two points having phase difference of 90°? [1]

a) $\frac{\pi}{2}$ cm
b) $\frac{\pi}{16}$ cm
c) $\frac{\pi}{4}$ cm
d) $\frac{\pi}{8}$ cm

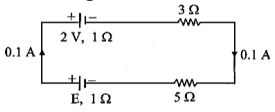
19) A spherical blackbody with a radius of 20 cm radiates 440 W power at 500 K. If the radius were halved and the temperature doubled, the power radiated in watt would be [1]

a) 1760
b) 980
c) 225
d) 450

20) In Young's double slit experiment, red light of wavelength 6000$\mathring{A}$ is used and the nth bright fringe is obtained at a point 'P' on the screen. Keeping the same setting, the source of light is replaced by green light of wavelength 5000 $\mathring{A}$ and now (n + 1)th bright fringe is obtained at the point 'P' on the screen. The value of n is [1]

a) 3
b) 6
c) 5
d) 4

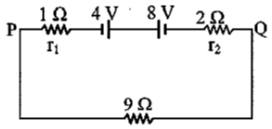
21) In the given circuit, the emf 'E' of the cell is



[1]

a) 2 V
b) 1 V
c) 3 V
d) 0 V

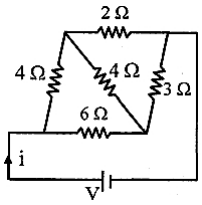
22) Two batteries of e.m.f. 4 V and 8 V with internal resistances 1Ω and 2 Ω are connected in a circuit with a resistance of 9 Ω as shown in figure. The current and potential difference between the points P and Q are respectively



[1]

a) $\frac{1}{3}$ A and 9 V
b) $\frac{1}{6}$ A and 4 V
c) $\frac{1}{3}$ A and 3 V
d) $\frac{1}{2}$ A and 12 V

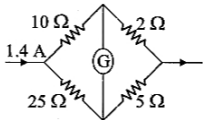
23) For the network shown in the figure, the value of the current i is



[1]

a) $\frac{18 \text{ V}}{5}$
b) $\frac{5 \text{ V}}{18}$
c) $\frac{5 \text{ V}}{9}$
d) $\frac{9 \text{ V}}{35}$

24) In the circuit shown in the figure, the current flowing in 2Ω resistance is



[1]

a) 1.0 A
b) 0.4 A
c) 1.2 A
d) 1.4 A

25) The ratio of periods ofα - particle and proton moving on circular path in uniform magnetic field is _____. [1]

a) 2 : 1
b) 1 : 4
c) 1 : 2
d) 4 : 1

26) A wire carrying current I and other carrying 2I in the same direction produce magnetic field at the mid - point. What will be the field, when 2I wire is switched off? [1]

a) 2B
b) 4B
c) $\frac{B}{2}$
d) B

27) Two long parallel wires P and Q are both perpendicular to the plane of the paper with distance 5 m between them. If P and Q cany current of 2.5 A and 5 A respectively in the same direction, then the magnetic field at a point half way between the wires is [1]

a) $\frac{\mu_0}{\pi}$
b) $\frac{3\mu_0}{2\pi}$
c) $\frac{\mu_0}{2\pi}$
d) $\frac{\sqrt{3}\mu_0}{2\pi}$

28) A long straight wire carrying current 16 A is bent at 90° such that half of the wire lies along the positive x - axis and other half lies along the positive y - axis. What is the magnitude of magnetic field at the point$\vec{r}$ = (- 2$\hat{i}$ + 0$\hat{j}$) mm? (Assume $\frac{\mu_0}{4\pi}$ = 10^{-7} Hm^{-1}) [1]

a) 1.6 mT
b) 0.8 mT
c) 1.2 mT
d) 3.2 mT

29) An iron rod is placed parallel to magnetic field of intensity 2000 A/m. The magnetic flux through the rod is 6× 10^{-4} Wb and its cross - sectional area is 3 cm^2. The magnetic permeability of the rod in Wb/A - m is [1]

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

30) If a diamagnetic substance is brought near north or south pole of a bar magnet, it is **[1]**

a) Repelled by the north pole and attracted by the south pole.
b) Repelled by the poles.
c) Attracted by the poles.
d) Attracted by the north pole and repelled by the south pole.

31) A small piece of unmagnetised substance gets repelled, when it is brought near a powerful magnet. The substance can be _____. **[1]**

a) Paramagnetic b) Diamagnetic
c) Ferromagnetic d) Non - magnetic

32) Which of the following represents correct formula for circulating current? **[1]**

a) $I = \frac{ev}{2\pi r}$
b) $I = \frac{2\pi r}{v}$
c) $I = \frac{\pi rev}{2}$
d) $I = \frac{\pi rv}{2e}$

33) A coil of resistance 400Ω is placed in a magnetic field. If the magnetic flux ϕ (Wb) linked with the coil varies with time t(s) as $\phi = 50t^2 + 4$, the current in the coil at t = 2 s is **[1]**

a) 1 A b) 2 A
c) 0.1 A d) 0.5 A

34) In an A.C. generator, when the plane of the amature is perpendicular to the magnetic field **[1]**

a) Both magnetic flux and e.m.f. are zero
b) Magnetic flux is maximum and e.m.f. is zero
c) Both magnetic flux and e.m.f. are half of their respective maximum values
d) Both magnetic flux and e.m.f. are maximum

35) Magnetic flux of 10 micro weber is linked with a coil. When current of 2.5 mA flows through it, the self inductance of the coil is **[1]**

a) 4 kH b) 4 H
c) 4 mH d) 4μ H

36) If an electron has energy such that its de Broglie wavelength is $5500\overset{o}{A}$, then the energy value of that electron is
(h = 6.6 × 10^{-34} Js, m_c = 9.1 × 10^{-31} kg) **[1]**

a) 8×10^{-20} J b) 8 J
c) 8×10^{-10} J d) 8×10^{-25} J

37) Choose the INCORRECT statement. **[1]**

a) The maximum velocity of photoelectrons increases with increase in the wavelength of the light.
b) The number of photoelectrons emitted is proportional to the intensity of light.
c) The number of photoelectrons emitted is zero, if incident wavelength is greater than threshold wavelength.
d) The maximum velocity of photoelectrons increases with decrease in the wavelength of the light.

38) The momentum of a photon is 2×10^{-16} gm - cm/sec. Its energy is **[1]**

a) 6×10^{-8} erg
b) 2.0×10^{-26} erg
c) 6×10^{-6} erg
d) 0.61×10^{-26} erg

39) The radiation corresponding to 3→ 2 transition of hydrogen atoms falls on a metal surface to produce photoelectrons. These electrons are made to enter a magnetic field of 3×10^{-4} T. If the radius of the largest circular path followed by these electrons is 10.0 mm, the work function of the metal is close to **[1]**

a) 0.8 eV b) 1.8 eV
c) 1.1 eV d) 1.6 eV

40) For Balmer series, wavelength of first line is '1λ ' and for Brackett series, wavelength of first line is '2 λ ' then their ratio is **[1]**

a) 0.238 b) 0.162
c) 0.081 d) 0.198

41) In the reaction $^2_1H + ^3_1H \rightarrow ^4_2He + ^1_0n$. If the binding energies of $^2_1H, ^3_1H$ and ^4_2He are respectively a, b and c (in MeV), then the energy (in MeV) released in this reaction is **[1]**

a) A + b + c b) C + a - b
c) C - a - b d) A + b - c

42) Which of the statements is correct as regards to hydrogen spectrum?

i. There are finite lines in Lyman series.
ii. There are finite lines in Balmer series.
iii. There are infinite lines in microwave region.
iv. There are infinite lines in ultraviolet region.

[1]

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

43) If the binding energy of the electron in a hydrogen atom is 13.6 eV, the energy required to remove the electron from the first excited state of Li^{++} is **[1]**

a) 3.4 eV b) 30.6 eV
c) 13.6 eV d) 122.4 eV

44) In the process of nuclear fission of 1 g uranium, the mass lost is 0.90 milligram. The efficiency of power station run by it is 10%. To obtain 200 megawatt power from the power station, the uranium required per hour is (c = 3×10^8 m/s) **[1]**

a) 49 g b) 68 g
c) 24 g d) 89 g

45) Magnetic moment by virtue of the orbital motion of an electron in an atom when orbital angular momentum = one quantum unit is **[1]**

a) 9.2×10^{-24} Am^2 b) 9.2×10^{-20} Am^2
c) 2.9×10^{-20} Am^2 d) 2.9×10^{-26} Am^2

46) The activity of a radioactive sample is measured as N_0 counts per minute at t = 0 and $\frac{N_0}{e}$ counts e per minute at t = 5 minutes. The time (in minutes) at which the activity reduces to half its value is **[1]**

a) $\log_e \frac{2}{5}$
b) $5 \log_{10} 2$
c) $5 \log_e 2$
d) $\frac{5}{\log_e 2}$

47) Zener diode is used as **[1]**

a) Dc voltage stabilizer.
b) Full - wave rectifier.
c) Ac voltage stabilizer.
d) Half - wave rectifier.

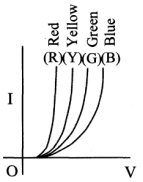
48) Photocurrent in a photodiode depends upon **[1]**

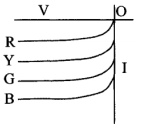
a) Density of diode material.
b) Intensity of incident radiation.
c) Biasing of junction.
d) Number of electron holes.

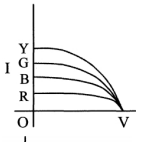
49) In a transistor, the value ofα is always **[1]**

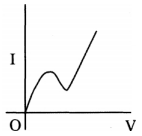
a) Greater than 1 b) Unpredictable
c) Equal to 1 d) Less than 1

50) The I - V characteristic of an LED is **[1]**

a) 

b) 

c) 

d) 

Section - A (Chemistry)

51) The weight of a molecule of the compound $C_{60}H_{122}$ is _____. **[1]**

a) 1.4×10^{-21} g b) 1.09×10^{-21} g
c) 5.025×10^{23} g d) 16.023×10^{23} g

52) Match the following:

	Column I		Column I
I.	Heisenberg's equation	A.	$\lambda = \frac{h}{mv}$
Ii.	De Broglie's equation	B.	$\hat{H}\Psi = E\Psi$
Iii.	Bohr's frequency rule	C.	E = hv
Iv.	Planck's equation	D.	$v = \frac{E_1 - E_2}{h}$

[1]

a) I - d, ii - b, iii - a, iv - c
b) I - b, ii - c, iii - d, iv - a
c) I - b, ii - a, iii - d, iv - c
d) I - c, ii - a, iii - b, iv - d

53) In a reaction between zinc and iodine, zinc iodide is formed as the product, what is being oxidized? **[1]**

a) Iodide ions b) Zinc atom
c) Iodine d) Zinc ions

54) The nucleus of a tritium$\left({}^{3}_{1}H\right)$ atom would contain _____ neutron(s). **[1]**

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

55) 16 g of oxygen and 3 g of hydrogen are mixed and kept at 760 mm of Hg pressure and 0°C. The total volume occupied by the mixture will be nearly _____. **[1]**

a) 448 litres b) 22.4 litres
c) 44800 mL d) 33.6 litres

56) A catalyst is a substance which when added to a reacting system _____. **[1]**

a) Increases the rate of a reaction by itself undergoing permanent chemical change
b) Decreases the rate of a reaction without itself undergoing any permanent chemical change
c) Increases the rate of a reaction without itself undergoing any permanent chemical change
d) Decreases the rate of a reaction by itself undergoing permanent chemical change

57) Which one is an m - directing group during substitution reactions on the benzene ring? **[1]**

a) - COOH b) - CH_3
c) - OCH_3 d) - NH_2

58) Which of the following is capable of exhibiting geometrical isomerism? **[1]**

a) But - 2 - ene b) Ethene
c) Methane d) Propene

59) $C_nH_{2n+2}O$ is the general formula of _____. **[1]**

a) Alkanals b) Alkanols
c) Lkanones d) Alkyl alkanoates

60) Atoms of element X form an hcp lattice and those of element Y occupy 75% of tetrahedral voids. What is the formula of the compound formed by elements X and Y? **[1]**

a) X_2Y_3 b) X_3Y_4
c) X_4Y_3 d) X_3Y_2

61) If the number of atoms is$\frac{N}{2}$, the number of tetrahedral voids is _____. **[1]**

a) N b) 2N
c) $\frac{N}{2}$ d) $\frac{N}{4}$

62) Which of the following statement is CORRECT for the boiling point of a solvent, containing a dissolved solid substance? **[1]**

a) Boiling point of the liquid is lowered.
b) Boiling point of the liquid is elevated.
c) There is no effect on the boiling point.
d) Boiling point of the liquid becomes equal to the boiling point of water.

63) The molar mass of the solute using depression of freezing point may be calculated using the formula, _____. **[1]**

a) $M_2 = \frac{K_f W_2 1000}{\Delta T_f W_1}$
b) $M_2 = \frac{K_f W_1 1000}{\Delta T_f W_2}$
c) $M_2 = \frac{\Delta T_f W_2 1000}{K_f W_1}$
d) $M_2 = \frac{K_f W_2 1000}{\Delta T_f m}$

64) Two moles of an ideal gas expand spontaneously into a vacuum. The work done is _____ Joule. **[1]**

a) Zero b) Infinite
c) 2 d) 4

65) For which reaction from the following,Δ S will be positive? **[1]**

a) $CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_2(g)$
b) $Ca_{(s)} + \frac{1}{2} O_{2(g)} \rightarrow CaO_{(s)}$
c) $2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O(l)$
d) $N_{2(g)} + O_{2(g)} \rightarrow 2NO_{(g)}$

66) Which of the following is CORRECT regarding the electrolysis of molten NaCl? **[1]**

a) A molten silvery - white sodium is formed at anode.
b) NaCl is converted to NaOH.
c) A pale green CI_2 gas is released at cathode.
d) Decomposition of NaCl into metallic sodium and $Cl_{2(g)}$ is nonspontaneous.

67) For how much time, 10 A electric current should be passed through a dilute aqueous $NiSO_4$ solution during electrolysis using an inert electrode, in order to get 5.85 g Nickel?
[At. mass of Ni = 58.5 u **[1]**
a) 9650 s b) 3860 s
c) 965 s d) 1930 s

68) The study of the rate of chemical reactions and factors affecting its rate is known as _____. **[1]**
a) Chemical kinetics b) Thermodynamics
c) Ionic equilibrium d) Electrochemistry

69) The straight line graph with a negative slope for the integrated rate equation, kt = $\ln[A]_0$ - $\ln[A]_t$ is obtained by plotting a graph of _____. **[1]**
a) $Ln[A]_0$ vs t
b) $Ln[A]_0$ vs $\frac{1}{t}$
c) $Ln[A]_t$ vs t
d) $Ln[A]_t$ vs $\frac{1}{t}$

70) Which of the following is added to commercial jams and jellies to increase their shelf life? **[1]**
a) Magnesium hydroxide b) Sodium acetate
c) Tartaric acid d) Sodium benzoate

71) The pH of a 0.1 molar solution of the acid HQ is 3. The value of the ionization constant, K_a of the acid is _____. **[1]**
a) 3×10^{-1} b) 1×10^{-5}
c) 1×10^{-7} d) 1×10^{-3}

72) The CORRECT relationship between molar solubility (S) and solubility product (K_{sp}) for salt, $Cr(OH)_3$ is _____. **[1]**
a) $K_{sp} = 4S^3$ b) $K_{sp} = 27S^3$
c) $K_{sp} = 27S^4$ d) $K_{sp} = 27S^5$

73) $NaOH + SO_2 \longrightarrow X + H_2O$
$X + H_2O + SO_2 \longrightarrow Y$
Identify Y. **[1]**
a) Na_2SO_3 b) SO_3
c) $NaHSO_3$ d) $Na_2S_2O_3$

74) $MnO_2 + HCl \xrightarrow{\Delta} A_{(g)}$
$A_{(g)} + F_{2(excess)} \xrightarrow{573K} B_{(g)}$
$B_{(I)} + U_{(s)} \longrightarrow C_{(g)} + D_{(g)}$
The gases A, B, C and D are respectively _____. **[1]**
a) Cl_2, ClF, UF_6, ClF_3 b) Cl_2, ClF_3, UF_6, ClF
c) O_2, OF_2, U_2O_3, O_2F_2 d) O_2, O_2F_2, U_2O_3, OF_2

75) Which of the following hydride is least acidic? **[1]**
a) HF b) HBr
c) HI d) HCl

76) The number of impaired electrons in Ni (atomic number = 28) are: **[1]**
a) 8 b) 0
c) 4 d) 2

77) The most basic hydroxide from following is _____. **[1]**
a) $Pr(OH)_3$ (Z = 59) b) $Ho(OH)_3$ (Z = 67)
c) $La(OH)_3$ (Z = 57) d) $Sm(OH)_3$ (Z = 62)

78) Which of the following names are CORRECT for $K_4[Fe(CN)_6]$?
i. Potassium hexacyanoferrous(II)
ii. Potassium hexacyanoferrate(II)
iii. Potassium ferrocyanide
iv. Hexacyanoferrate(III) potassium
[1]
a) Only (ii) and (iii) b) Only (i) and (ii)
c) Only (ii) and (iv) d) Only (i) and (iii)

79) Crystal field theory assumes that interaction between the metal ion and ligand is _____. **[1]**
a) Electrostatic
b) Polar covalent
c) Purely coordinate covalent
d) Purely covalent

80) The complex compound $[Co(NH_3)_3NO_2ClCN]$is named as _____. **[1]**
a) Nitrochlorocyanotriammine cobalt (III)
b) Cyanonitrochlorotriammine cobalt (III)
c) Triamminechlorocyanonitrito - N cobalt (III)
d) Triamminenitrochlorocyano cobalt (III)

81) The property by virtue of which, a compound can rotate the plane of polarization of light is known as _____. **[1]**
a) Phosphorescence b) Photolysis
c) Polarization d) Optical activity

82) The compound obtained as the major product on heating 2 - chloro - 2 - methylbutane with alcoholic KOH solution is _____. **[1]**
a) $(CH_3)_2 - \underset{\underset{OH}{|}}{C} - CH_2 - CH_3$
b) $(CH_3)_2C = CHCH_3$
c) CH_3 - $CH = CHCH_3$
d) $CH_3CH_2 - \underset{\underset{CH_3}{|}}{C} = CH_2$

83) The functional group present in westrosol is _____ group. **[1]**
a) Iodo b) Fluoro
c) Chloro d) Bromo

84) Ethyl methyl ether on treating with hot concentrated HI gives _____. **[1]**
a) CH_3I b) $C_2H_5I + CH_3OH$
c) C_2H_5OH d) $CH_3I + C_2H_5OH$

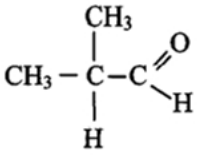
85) Phenol in presence of sodium hydroxide reacts with chloroform to form salicylaldehyde. The reaction is known as _____. **[1]**
a) Stephen reaction
b) Reimer - Tiemann reaction
c) Etard reaction
d) Kolbe's reaction

86) In _____ alcohols, the - OH group is attached to a sp^2 hybridised carbon atom. **[1]**
a) All of these b) Benzylic
c) Vinylic d) Allylic

87) Arrange the following acids in order of their decreasing acidity.
i. CH_3COOH
ii. $CH_3CH(Cl)CH_2COOH$,
iii. CCl_3CH_2COOH
[1]
a) Iii > ii > i b) Iii > i > ii
c) I > ii > iii d) Ii > iii > i

88) $CH_3(CH_2)_4COOH$ is commonly known as _____. [1]
a) Valeric acid b) Caproic acid
c) Palmitic acid d) Mellitic acid

89) IUPAC name of the compound is ____.



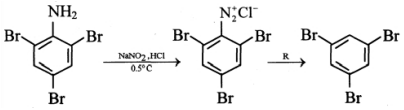
[1]

a) 2 - methylpropanal
b) 2 - methylpropan - 2 - al
c) 2 - methylpropan - 2 - one
d) 1 - methylpropan - 1 - al

90) Indicate which nitrogen - containing compound amongst the following would undergo Hofmann's reaction (i.e., reaction with Br_2 and conc. KOH) to furnish the primary amine (R - NH_2). [1]

a) $R-\overset{\overset{O}{\|}}{C}-NHOH$
b) $R-\overset{\overset{O}{\|}}{C}-NH_2$
c) $R-\overset{\overset{O}{\|}}{C}-NHCH_3$
d) $R-\overset{\overset{O}{\|}}{C}-ONH_4$

91) The reagent 'R' in the given sequence of chemical reaction is _____.



[1]
a) CuCN/KCN b) H_2O
c) HI d) CH_3CH_2OH

92) Phthalimide $\xrightarrow{Alc.KOH}$ P $\xrightarrow{CH_3CH_2Br}$ Q $\xrightarrow{Aq.NaOH}$ R + S
R and S in the sequence are _____. [1]

a) Sodium salt of phthalic acid + ethylamine
b) Sodium salt of phthalic acid + aniline
c) Sodium salt of benzoic acid + ethylamine
d) Sodium salt of benzoic acid + benzylamine

93) Which of the following can be considered as basic amino acid? [1]

a) Me_2CH - CH_2 - $CH(NH_2)COOH$
b) $HN=C(NH_2)$ - NH - $(CH_2)_3$ - $CH(NH_2)COOH$
c) HOOC - CH_2 - $CH(NH_2)COOH$
d) CH_3 - CH_2 - CH(Me) - $CH(NH_2)COOH$

94) Ketohexoses do NOT contain _____. [1]

a) $>C=O$ group
b) - OH group
c) - CHO group
d) - CH_2OH group

95) Match the polymers in column I with its use in column II

	Polymers		Uses
I.	Urea - formaldehyde resin	A	Rain coats and flooring
Ii.	Polyvinyl chloride	B	Paints and lacquers
Iii.	Perspex	C	Unbreakable crockery
Iv.	Glyptal	D	LCD screen

[1]

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

96) The compound(s) that undergo ring - opening polymerization is/are _____. [1]
a) Lactones b) All of these
c) Lactams d) Cyclic ethers

97) SBR is obtained by mixing butadiene and styrene in the ratio _____. [1]
a) 3 : 1 b) 3 : 2
c) 2 : 3 d) 1 : 3

98) All the following statements are CORRECT, EXCEPT:
i. The synthesis of nanoparticles by colloidal dispersion involves a bottom - up approach.
ii. Sols are dispersions of colloidal particles in a gas.
iii. In the top - down approach, nanomaterials are synthesized from bulk material by breaking the material.
iv. Sol - gel process is widely employed to prepare oxide materials.
[1]
a) Option (b) b) Option (d)
c) Option (a) d) Option (c)

99) Nanomaterial - based catalysts _____. [1]

a) Show decreased catalytic activity
b) Have smaller surface area as compared to bulk form
c) Can be recycled
d) Are homogeneous catalysts

100) Identify the INCORRECT statement from the following.
i. ZWT stands for zero water treatment.
ii. Waste product of one system can be used as the raw material for other system.
iii. Prevention of waste is more important rather than cleaning up and treating waste after it has been created.
iv. Effluent coming out from cleansing of machinery parts may be used as coolant water in thermal power station.
[1]
a) Option (d) b) Option (c)
c) Option (a) d) Option (b)

Section - B (Biology)

101) When we homogenize any tissue in acid the acid - soluble pool, it represents what? [1]
a) Cell membrane b) Cytoplasm
c) Mitochondria d) Nucleus

102) Which one is the cofactor for the proteolytic enzyme carboxypeptidase? **[1]**
a) Mercury b) Copper
c) Zinc d) Magnesium

103) Base pairs found in 5 turns of DNA spirals are ____. **[1]**
a) 50 b) 100
c) 10 d) 20

104) The instrument used for measuring the rate of transpiration is: **[1]**
a) Potometer b) Manometer
c) Osmometer d) Porometer

105) What is the role of calcium in plants? **[1]**
a) Formation of dead tissues
b) Formation of phloem fibres
c) Formation of cell wall
d) Formation of xylem fibres

106) The form of sugar transported through phloem is: **[1]**
a) Sucrose b) Glucose
c) Ribose d) Fructose

107) Gastric ulcers are formed in which part of the alimentary canal? **[1]**
a) Small intestine b) Oesophagus
c) Stomach d) Large intestine

108) Which is the longest portion of the alimentary canal? **[1]**
a) Stomach b) Oesophagus
c) Large Intestine d) Small Intestine

109) A woman with blood group**O** has a child with blood group **O**. If she claims a friend of hers with blood group **A** as father of the child the genotype of father should be: **[1]**
a) I^BI^O
b) I^OI^O
c) I^AI^O
d) I^BI^B

110) The genotypes of a husband and wife areI^AI^B and $I^\wedge$ i. Among the blood type of their children, how many different genotypes and phenotypes are possible? **[1]**
a) 4 genotype; 4 phenotype
b) 3 genotype; 4 phenotype
c) 4 genotype; 3 phenotype
d) 3 genotypes; 3 phenotypes

111) Which of the following statements are true for complementary genes?
i. Both the genes interact to produce complementary new trait
ii. Pair of non - allelic genes
iii. The F_2 ratio is generally 9 : 7
iv. The F_2 ratio is generally 9 : 3 : 4
[1]
a) (a), (b) and (c) are true
b) (b) and (c) are true
c) (c) and (d) are true
d) (a) and (b) are true

112) RNA polymerase I transcribes eukaryotic ribosome which does not consist of: **[1]**
a) 28 S rRNA b) 5.8 S rRNA
c) 5 S rRNA d) 18 S rRNA

113) Formation of both peptide and glycosidic bonds involves: **[1]**
a) Esterification b) Acidification
c) Hydration d) Dehydration

114) DNA replication takes place during: **[1]**
a) S - phase b) G_1 phase
c) G_2phase d) Prophase

115) Gel electrophoresis is used for ____. **[1]**
a) Isolation of DNA molecule
b) Cutting of DNA into fragments
c) Separation of DNA fragments according to their size
d) Construction of recombinant DNA by joining with cloning vectors

116) DNA gyrase, the enzyme that participates in the process of DNA replication is a type of: **[1]**
a) Reverse transcriptase
b) DNA topoisomerase
c) DNA polymerase
d) DNA ligase

117) Transgenic plants are produced by: **[1]**
a) Deleting sex chromosomes
b) Introduction of foreign genes
c) Arresting spindle fibre formation
d) Inducing gene mutation

118) An analysis of chromosomal DNA using the southern hybridisation technique does not use: **[1]**
a) Autoradiography b) Blotting
c) PCR d) Electrophoresis

119) The particles used to coat with DNA in Biolistic gun is of: **[1]**
a) Helium b) Tungsten
c) Quartz d) Zinc

120) Significance of 'heat shock' method in bacterial transformation is to facilitate: **[1]**
a) Expression of the antibiotic resistance gene.
b) Binding of DNA to the cell wall.
c) Uptake of DNA through transient pores in the bacterial cell wall.
d) Uptake of DNA through membrane transport proteins.

121) In agarose gel electrophoresis, DNA molecules are separated on the basis of their: **[1]**
a) Charge only b) Size only
c) All of these d) Charge to size ratio

122) One of the alternate sources of proteins for animal and human nutrition is: **[1]**
a) Fortified protein b) Single germ protein
c) Single - cell protein d) Hybrid protein

123) Several South Indian states raise 2 - 3 crops of rice annually. The agronomic feature that makes this possible is because of: **[1]**
a) Disease resistant rice variety
b) Shorter rice plant
c) Better irrigation facilities
d) Early yielding rice variety

124) The vector for**T - DNA** is: **[1]**
a) Escherichia coli
b) Bacillus thuringiensis
c) Thermus aquaticus
d) Agrobacterium tumefaciens

125) The thousands of plants obtained through micropropagation called soma clones because: **[1]**

a) These plants are grown together
b) These plants are taller than the usual plant
c) These plants are wild
d) These plants will be genetically identical

126) The capacity to generate a whole plant from any cell or ex - plant is called _____. [1]
a) Totipotency b) Pluripotency
c) Tissue culture d) Cell cloning

127) Mycorrhizal association occurs in Pinus, Fucus and: [1]
a) Azadirachta b) Utricularia
c) Eucalyptus d) Legumes

128) Green manure plants used by farmer mainly belong to: [1]
a) Poaceae b) Compositae
c) Solanaceae d) Leguminosae

129) A major component of gobar gas is : [1]
a) Butane b) Ethane
c) Methane d) Ammonia

130) Bt - cotton is resistant against: [1]
a) Herbicide b) Salt
c) Drought d) Insect

131) Heterocysts that take part in nitrogen fixation occur in: [1]
a) Polysiphonia b) Ulothrix
c) Nostoc d) Fucus

132) An example of endomycorrhiza is : [1]
a) Glomus b) Nostoc
c) Agaricus d) Rhizobium

133) Microbial biocontrol agent for butterfly caterpillar is: [1]
a) Saccharomyces
b) Cyanobacteria
c) Bacillus thuringiensis
d) Lactobacillus

134) Pigment of PS - I occurs in: [1]
a) Appressed parts of granal thylakoids
b) Both Appressed parts of granal thylakoids and Stromal thylakoids
c) Stromal
d) Stromal thylakoids and non - appressed parts of granal thylakoids

135) Scientist awarded noble prize in 1960 for tracing the path of carbon is [1]
a) Calvin b) Hatch
c) Huber d) Blackmann

136) Acetyl CoA combines with oxaloacetate in the presence of condensing enzyme citrate synthetase to form a 6 - C compound called ____. [1]
a) Tartaric acid b) Citric acid
c) Pyruvic acid d) Malic acid

137) Which one is known as the energy currency of the living cells? [1]
a) ADP b) ATP
c) UTP d) GTP

138) Many ovules are present in ovary of: [1]
a) All of these b) Orchid
c) Papaya d) Watermelon

139) Which one of the following represents an ovule, where the embryo sac becomes horse - shoe shaped and funiculus and micropyle are close to each other? [1]
a) Circinotropous b) Atropous
c) Amphitropous d) Anatropous

140) A type of reproduction, where fusion of gametes occurs is called: [1]
a) Vegetative reproduction
b) Asexual reproduction
c) Sexual reproduction
d) Parthenogenesis

141) Male gametes in angiosperms are formed by the division of: [1]
a) Generative cell
b) Microspore
c) Microspore mother cell
d) Vegetative cell

142) The female gametophyte in angiosperm is: [1]
a) Ovule b) Carpel
c) Embryo sac d) Egg

143) A particular species of the plant produces light, non - sticky pollen in large numbers and its stigmas are long and feathery. These modifications facilitate pollination by: [1]
a) Animals b) Wind
c) Water d) Insects

144) The flower is the site of: [1]
a) Vegetative reproduction
b) Sexual reproduction
c) Artificial reproduction
d) Asexual reproduction

145) Anemophily type of pollination is found in: [1]
a) Salvia b) Coconut
c) Vallisneria d) Bottle brush

146) Insect pollinated flowers are known as: [1]
a) Anemophilous b) Hydrophilous
c) Entomophilous d) Ornithophilous

147) Tapetum in pollen grains help in: [1]
a) Provide nourishment to the young microspore mother cell
b) Help in pollen grain germination
c) Provide protection to the microspore mother cell
d) Help in the dispersal of pollen grain

148) In which year did the scientists report largest ozone hole in the atmosphere? [1]
a) 2002 b) 2010
c) 2006 d) 1994

149) The major source of noise pollution worldwide is due to: [1]
a) Oil refineries and thermal power plants
b) Office equipment
c) Transport system
d) Sugar, textile and paper industries

150) Transition zone between two distinct communities is known as: [1]
a) Ecosphere b) Ecotone
c) Rhizosphere d) Ecocline

151) In a grazing food chain, carnivores may also be referred to as: [1]
a) Secondary producers b) Primary consumers
c) Secondary consumers d) Primary producers

152) Which one of the following pairs is correctly matched?

- Rhizobium - Parasite in the roots of leguminous plants
- Mycorrhizae - Mineral uptake from soil
- Yeast - Production of biogas
- Myxomycetes - The disease ringworm

[1]

a) Yeast - Production of biogas.
b) Mycorrhizae - Mineral uptake from soil.
c) Rhizobium - Parasite in the roots of leguminous plants.
d) Myxomycetes - The disease ringworm.

153) The decomposition of organic matter is brought about by: **[1]**

a) Plants
b) Protozoans
c) Both Protozoans and Plants
d) Micro - organisms

154) Links between organisms that show branching pattern of evolutionary relationships are shown by: **[1]**

a) Living fossils
b) Two fossil layers
c) Comparative embryology
d) Phylogenetic trees

155) Which of the following is an example for link species? **[1]**

a) Chimpanzee b) Dodo bird
c) Sea weed d) Lobe fish

156) The single - step large mutation is called: **[1]**

a) Regeneration b) Saltation
c) Organization d) Evolution

157) **Hot dilute soup** was stated by: **[1]**

a) Reptiles b) Haldane
c) Urey d) Oparin

158) Darwin in his**Natural selection** theory did not believe in any role of which of the following in organic evolution? **[1]**

a) Survival of the fittest
b) Discontinuous variations
c) Parasites and predators as natural enemies.
d) Struggle for existence

159) According to the theory of mutation by Hugo de Vries: **[1]**

a) Only small mutations take part in evolution.
b) Both small and large mutations cause variations in species.
c) Only large mutations take part in evolution.
d) Only moderate mutations take part in evolution.

160) A heredity disease, which is never passed on from father to son is : **[1]**

a) None of these
b) Y - chromosomal linked disease
c) X - chromosomal linked disease
d) Autosomal linked disease

161) Gene for colourblindness is located on : **[1]**

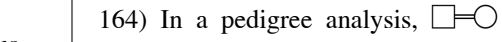
a) Y chromosome b) 21^{st} chromosome
c) X chromosome d) 13^{th} chromosome

162) The pairs of chromosomes present in human beings somatic cells are: **[1]**

a) 45 b) 46
c) 22 d) 23

163) Klinefelter's syndrome is due to: **[1]**

a) One X only b) Two X and one Y
c) One Y only d) One X and two Y

164) In a pedigree analysis,  represents: **[1]**

a) Affected individuals
b) Non - identical twins
c) Consanguineous mating
d) Unrelated mating

165) Using a DNA template, how many new DNA molecules would be generated after 10 cycles of amplification in PCR? **[1]**

a) 256 b) 2048
c) 512 d) 1024

166) The DNA molecule to which gene of interest is integrated for cloning is called: **[1]**

a) Carrier b) Template
c) Vector d) Transformer

167) Which out of the following is advantage of chemical safety testing on transgenic animals? **[1]**

a) Obtain results in less time
b) Testing is long process.
c) Testing can be performed easily.
d) Testing is very cost effective.

168) Immuno - deficiency syndrome could develop due to: **[1]**

a) Defective thymus b) Weak immune system
c) AIDS virus d) Defective liver

169) Normal cells are transformed into cancerous cells by: **[1]**

a) Bacteria b) Viruses
c) Retroviruses d) Plasmids

170) Lymphoid tissue is found in: **[1]**

a) Lymph nodes b) Tonsils
c) All of these d) Thymus

171) Which one of the following is not a live vaccine? **[1]**

a) BCG vaccine b) OPV
c) Cholera vaccine d) Measles vaccine

172) Transformation of normal cells into cancerous neoplastic cells may be induced by chemical, physical or biological agents called: **[1]**

a) Carcinogens b) Megacinogen
c) Cancer agents d) Retrovirus agents

173) A protein secreted by virus - infected cells is called: **[1]**

a) Mucilage b) Prothalimic
c) Carcinogens d) Interferons

174) Athlete's foot disease is caused by: **[1]**

a) Candida albicans b) Rickettsia
c) Tinea pedis d) Tinea capitis

175) Which of the following is the unit of immune system? **[1]**

a) Erythrocyte b) Chondrocyte
c) Parasite d) Lymphocyte

176) Aedes mosquito is a vector of: **[1]**

a) Cholera b) Malaria
c) Dengue d) Filariasis

177) What is the name of complex formed at the time of action of T - cells? **[1]**
a) STD - antigen complex
b) HLA - antigen complex
c) MHC - antigen complex
d) HLA

178) A group of animals related by descent and similar characters like appearance, size, and configuration is known as: **[1]**
a) Family
b) Breed
c) Class
d) Variety

179) Agricultural practices of breeding and raising livestock is called _____. **[1]**
a) Animal husbandry
b) Life Science
c) Apiculture
d) Biological strategies

180) Which of the following organisms has an open circulatory system? **[1]**
a) Crocodile
b) Fish
c) Frog
d) Hydra

181) Rh incompatibility develops when : **[1]**
a) Foetus is Rh+ve and mother is Rh - ve
b) Foetus is Rh - ve and mother is Rh+ve
c) Foetus is Rh+ve and mother is Rh+ve
d) Foetus is Rh - ve and father is Rh - ve

182) Which artery supplies blood to the heart muscle? **[1]**
a) Carotid artery
b) Coronary artery
c) Pulmonary artery
d) Systemic artery

183) Chemicals which are released at the synaptic junction are called: **[1]**
a) Cerebrospinal fluid
b) Neurotransmitters
c) Hormones
d) Lymph

184) Blood vessels are found to be present in which region of an eye? **[1]**
a) Blind spot
b) Cornea
c) Pupil
d) Choroid

185) Testes descend into scrotum in mammals for: **[1]**
a) Fertilization
b) Spermatogenesis
c) Development of sex organs
d) Development of visceral organs

186) Select the options which is/are incorrect statement(s) with respect to T - lymphocytes in the human body.
i. They are a type of white blood cells.
ii. They are produced in bone marrow.
iii. They remain active at all times in the body.
iv. They mature in the bone marrow.
[1]
a) (iv) only
b) (i) and (iv) only
c) (iii) and (iv) only
d) (iii) only

187) In man, the sperms are produced in: **[1]**
a) Rete testis
b) Seminiferous tubules
c) Vasa efferentia
d) Vas deferens

188) Interstitial cells are also called: **[1]**
a) Sertoli cells
b) Testicular lobules
c) Both Leydig's cells and Sertoli cells
d) Leydig's cells

189) Blastula of frog is: **[1]**
a) Coeloblastula
b) Superficial blastula
c) Stereoblastula
d) Discoblastula

190) Which part of ovary in mammals acts as an endocrine gland after ovulation? **[1]**
a) Graafian follicle
b) Vitelline membrane
c) Germinal epithelium
d) Stroma

191) What is site of fertilization in mammals? **[1]**
a) Uterus
b) Cervix
c) Fallopian tube
d) Vagina

192) Fertilization in humans is practically feasible only if : **[1]**
a) Sperms are transported into cervix within 48 hours of release of ovum.
b) Ovum and sperms are transported simultaneously to ampullary - isthmic junction of the fallopian tube.
c) Sperms are transported into vagina just after the release of ovum in the fallopian tube.
d) Ovum and sperms are transported to ampullary - isthmic junction of the cervix.

193) Capacitation occur in: **[1]**
a) Rete testis
b) Epididymis
c) Vas deferens
d) Female Reproductive tract

194) The persistence of corpus luteum during pregnancy is due to a hormone known as: **[1]**
a) Estrogens
b) LH
c) Progesterone
d) Chorionic gonadotropin

195) Threatened species list includes: **[1]**
a) Only critically endangered and endangered species.
b) Only vulnerable and lower risk species.
c) Only critically endangered species.
d) Critically endangered, endangered, vulnerable.

196) Niche is **[1]**
a) Physical space where an organism lives.
b) Functional role played by the organism where it lives.
c) Range of temperature that the organism needs to live.
d) All the biological factors in organism's environment.

197) Dialysing unit (artificial kidney) contains a fluid which is almost same as plasma except that it has: **[1]**
a) No urea
b) High uric acid
c) High urea
d) High glucose

198) Urea cycle operates in: **[1]**
a) Liver
b) Lungs
c) Skin cells
d) Sweat glands and sebaceous glands

199) Short day plants are also called long night plant because they require a continuous: **[1]**
a) Uninterrupted season period
b) Interrupted night period
c) Critical dark period
d) Critical light period

200) Ethylene is a: **[1]**

a) Carotenoids
b) Adenine derivatives
c) Gaseous hormone
d) Terpenes