



PERIODIC ASSESSMENT TEST (PAT)

PAPER BOOKLET

PERIODIC ASSESSMENT TEST (PAT) DETAILS

TARGET EXAMINATION	NEET (UG)
TARGET YEAR	2024
PAPER NO.	ONE
PAPER CODE	1
CLASS	XIII
COURSE NAME	SAARANSH
COURSE CODE	MER
PHASE CODE(S)	MER
BATCH CODE(S)	MER

PERIODIC ASSESSMENT TEST (PAT) SCHEDULE

TEST PATTERN	NEET
TEST TYPE	PART TEST
TEST CODE & SEQUENCE	PT-4
MAX. MARKS	720
TEST DURATION	3 Hrs. 20 Min.
TEST DATE	28 th April 2024
TEST DAY	Sunday
TEST TIME	Start: 02:30 PM End : 5:50 PM
TOTAL NO. OF PAGES IN PAPER BOOKLET	28

PERIODIC ASSESSMENT TEST (PAT) PAPER BOOKLET INFORMATION

TEST PAPER DETAILS					MARKING SCHEME				
Qs. No.	Section No.	Subject Sequence	Type of Qs.*	No. of Qs.	Full Marks Per Qs.	If No Option Chosen	(-ve Marks	Total Marks	Subject Total
1 to 35	1	Physics	MCQ	35	4	0	-1	140	180
36 to 50	2		MCQ	15**	4	0	-1	40	
51 to 85	1	Chemistry	MCQ	35	4	0	-1	140	180
86 to 100	2		MCQ	15**	4	0	-1	40	
101 to 135	1	Biology (Botany)	MCQ	35	4	0	-1	140	180
136 to 150	2		MCQ	15**	4	0	-1	40	
151 to 185	1	Biology (Zoology)	MCQ	35	4	0	-1	140	180
186 to 200	2		MCQ	15**	4	0	-1	40	
TOTAL Qs.				200	MAXIMUM MARKS				720

* Please turn overleaf to understand the meaning of coding for types of Questions.

**you have attempt any 10 Questions. If a student attempts more than 10 questions, then only first 10 questions which he has attempted will be checked.

Please read all the information & instructions related to Test Paper & OMR Sheet before attempting the test paper.

NAME OF THE CANDIDATE: _____ **Roll No.:**

I have read all the instructions and shall abide by them.

(Signature of the Candidate)

I have verified the identity, name and roll number of the candidate.

(Signature of the Invigilator)

INSTRUCTIONS FOR OPTICAL RESPONSE SHEET (ORS)

A. GENERAL INSTRUCTIONS

1. Darken the appropriate bubbles on the original by applying sufficient pressure.
2. The original is machine-gradable and will be collected by the invigilator at the end of the examination.
3. Do not tamper with or mutilate the ORS.
4. Write your name, roll number and the name of the examination centre and sign with pen in the space provided for this purpose on the original.
Do not write any of these details anywhere else. Darken the appropriate bubble under each digit of your roll number.

B. DARKENING THE BUBBLES ON THE ORS :

5. Use a **BLACK BALL POINT** to darken the bubbles in the upper sheet.
6. Darken the bubble **COMPLETELY**.
7. Darken the bubble **ONLY** if you are sure of the answer.
8. The correct way of darkening a bubble is as shown here : ●
9. There is **NO** way to erase or "un-darkened" bubble.
10. The marking scheme given at the beginning of each section gives details of how darkened and **not darkened** bubbles are evaluated.

A. सामान्य निर्देश

1. ऊपरी मूल पृष्ठ के अनुरूप बुलबुलों (BUBBLES) को पर्याप्त दबाव डालकर काला करें।
2. मूल पृष्ठ मशीन-जाँच है तथा यह परीक्षा के समापन पर निरीक्षक के द्वारा एकत्र कर लिया जायेगा।
3. ओ.आर.एस. को हेर-फेर/विकृति न करें।
4. अपना नाम, रोल नं. और परीक्षा केंद्र का नाम मूल पृष्ठ में दिए गए खानों में कलम से भरें और अपने हस्ताक्षर करें। इनमें से कोई भी जानकारी कहीं और न लिखें। रोल नम्बर के हर अंक के नीचे अनुरूप बुलबुले को काला करें।

B. ORS पर बुलबुलों को काला करने की विधि :

5. ऊपरी मूल पृष्ठ के बुलबुलों को काले बॉल पाइन्ट कलम से काला करें।
6. बुलबुले को पूर्ण रूप से काला करें।
7. बुलबुलों को तभी काला करें जब आपका उत्तर निश्चित हो।
8. बुलबुलों को काला करने का उपयुक्त तरीका यहाँ दर्शाया गया है : ●
9. काले किये हुये बुलबुले को मिटाने का कोई तरीका नहीं है।
10. हर खण्ड के प्रारम्भ में दी गयी अंकन योजना में काले किये गये तथा काले न किये गये बुलबुलों को मूल्यांकित करने का तरीका दिया गया है।

TYPE WISE CODES FOR QUESTIONS

SR#	QUESTION TYPE	CODE
1	MULTIPLE CHOICE QUESTION (ONLY ONE CORRECT OPTION)	MCQ
6	COLUMN MATCH QUESTION	CMQ
9	ASSERTION & REASON / STATEMENT TYPE QUESTION	ARQ

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PART-A

Physics

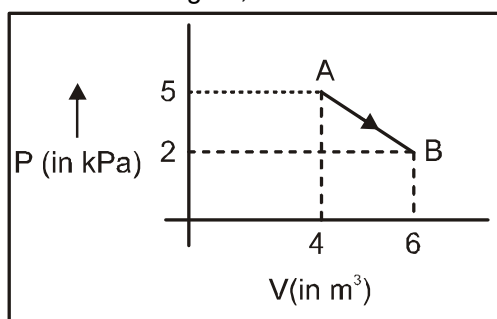
SECTION – A : (Maximum Marks : 140)

- ❖ This section contains **THIRTY FIVE (35)** questions.
- ❖ Each question has **FOUR** options (1), (2), (3) and (4) **ONLY ONE** of these four options is correct
- Marking scheme :
- Full Marks : **+4** If **ONLY** the correct option is chosen.
- Zero Marks : **0** If none of the options is chosen (i.e. the question is unanswered).
- Negative Marks : **-1** In all other cases

1. An electron moving in a circular orbit of radius r makes n rotations per second. The magnetic field produced at the centre has magnitude :

- (1) Zero (2) $\frac{\mu_0 n^2 e}{r}$
 (3) $\frac{\mu_0 n e}{2r}$ (4) $\frac{\mu_0 n e}{2\pi r}$

2. One mole of an ideal diatomic gas undergoes a transition from A to B along a path AB as shown in the figure,



The change in internal energy of the gas during the transition is :

- (1) -20 kJ (2) 20 J
 (3) -12 kJ (4) 20 kJ

3. When two displacements represented by $y_1 = a \sin(\omega t)$ and $y_2 = b \cos(\omega t)$ are superimposed the motion is

- (1) simple harmonic with amplitude $\frac{a}{b}$
 (2) simple harmonic with amplitude $\sqrt{a^2 + b^2}$
 (3) simple harmonic with amplitude $\frac{(a+b)}{2}$
 (4) not a simple harmonic

4. A particle of unit mass undergoes one-dimensional motion such that its velocity varies according to :

$$v(x) = b x^{-2n}$$

where b and n are constants and x is the position of the particle. The acceleration of the particle as a function of x , is given by :

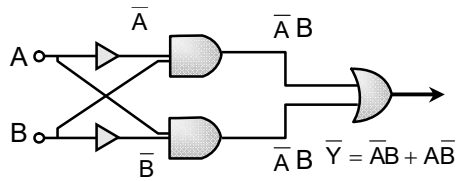
- (1) $-2nb^2 x^{-4n-1}$
 (2) $-2b^2 x^{-2n+1}$
 (3) $-2nb^2 e^{-4n+1}$
 (4) $-2nb^2 x^{-2n-1}$

5. If the radius of the ${}_{12}^{27}\text{Al}$ nucleus is taken to be R_{Al} , then the radius of ${}_{53}^{125}\text{Te}$ nucleus is nearly :

- (1) $\frac{5}{3} R_{\text{Al}}$
 (2) $\frac{3}{5} R_{\text{Al}}$
 (3) $\left(\frac{13}{53}\right)^{1/3} R_{\text{Al}}$
 (4) $\left(\frac{53}{13}\right)^{1/3} R_{\text{Al}}$

Space for Rough Work

6. Which of the following represent correctly the truth table in of the configuration



<table border="1"> <tr><th>A</th><th>B</th><th>Y</th></tr> <tr><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>0</td></tr> <tr><td>1</td><td>0</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>1</td></tr> </table>	A	B	Y	0	0	0	0	1	0	1	0	0	1	1	1	<table border="1"> <tr><th>A</th><th>B</th><th>Y</th></tr> <tr><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>0</td></tr> </table>	A	B	Y	0	0	0	0	1	1	1	0	1	1	1	0
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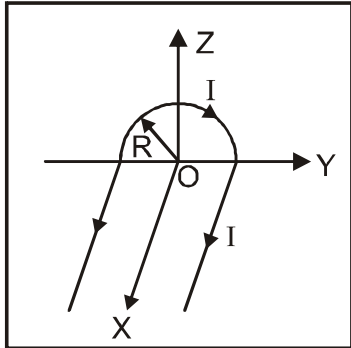
7. Match Column-I with Column- II

Column-I (Type of semiconductor)		Column-II (Properties)	
(a)	Intrinsic semiconductor	(i)	Insulator at Room temperature
(b)	N-type semiconductor	(ii)	$n_h \gg n_e$
(c)	P-type semiconductor	(iii)	$n_e \gg n_h$
		(iv)	$n_e = n_h = n_i$

- (1) a - (i) ; b - (ii) ; c - (iii)
 (2) a - (ii) ; b - (iii) ; c - (iv)
 (3) a - (iii) ; b - (iv) ; c - (i)
 (4) a - (iv) ; b - (iii) ; c - (ii)
8. Across a metallic conductor of non-uniform cross section a constant potential difference is applied. The quantity which remains constant along the conductor is
 (1) current (2) drift velocity
 (3) electric field (4) current density
9. On observing light from three different stars P,Q and R, it was found that intensity of violet colour is maximum in the spectrum of P, the intensity of green colour is maximum in the spectrum of R and the intensity of red colour is maximum in the spectrum in the spectrum of Q. If T_p , T_Q and T_R are the respective absolute temperature of P, Q and R, then it can be concluded from the above observations that :
 (1) $T_p > T_R > T_Q$
 (2) $T_p < T_R < T_Q$
 (3) $T_p < T_Q < T_R$
 (4) $T_p > T_Q T_R$
10. A potentiometer wire has length 4m and resistance 8Ω . The resistance that must be connected in series with the wire and an accumulator of e.m.f 2V, so as to get a potential gradient 1mV per cm on the wire is:
 (1) 40Ω
 (2) 44Ω
 (3) 48Ω
 (4) 32Ω
11. Consider 3rd orbit of He^+ (Helium), using non-relativistic approach, the speed of electron in this orbit will be [given $K = 9 \times 10^9$ constant, $Z = 2$ and h (Plank's constant) = 6.6×10^{-34} J s]
 (1) 1.46×10^6 m/s
 (2) 0.73×10^6 m/s
 (3) 3.0×10^8
 (4) 2.92×10^6 m/s

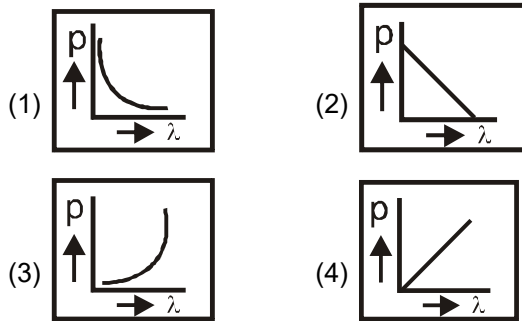
Space for Rough Work

12. A wire carrying current I has the shape as shown in adjoining figure. Linear parts of the wire are very long and parallel to X-axis while semicircular portion of radius R is lying in Y-Z plane. Magnetic field at point O is



- (1) $\vec{B} = -\frac{\mu_0 I}{4\pi R} (\mu\hat{i} \times 2\hat{k})$
 (2) $\vec{B} = -\frac{\mu_0 I}{4\pi R} (\pi\hat{i} + 2\hat{k})$
 (3) $\vec{B} = \frac{\mu_0 I}{4\pi R} (\pi\hat{i} - 2\hat{k})$
 (4) $\vec{B} = \frac{\mu_0 I}{4\pi R} (\pi\hat{i} + 2\hat{k})$

13. Which of the following figures represent the variation of particle momentum and the associated de-Broglie wavelength?



14. A parallel plate air capacitor of capacitance C is connected to a cell of emf V and then disconnected from it. A dielectric slab of dielectric constant K , which can just fill the air gap of the capacitor, is now inserted in it. Which of the following is incorrect?

- (1) The energy stored in the capacitor decreases K times.
 (2) The change in energy stored is $\frac{1}{2}CV^2\left(\frac{1}{K}-1\right)$
 (3) The charge on the capacitor is not conserved.
 (4) The potential difference between the plates decreases K times.

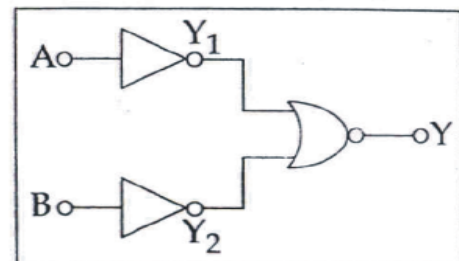
15. The Fundamental frequency of a closed organ pipe of length 20 cm is equal to the second overtone of an organ pipe open at both the ends. The length of organ pipe open at both the ends is:

- (1) 100 cm (2) 120 cm
 (3) 140 cm (4) 80 cm

16. The refracting angle of a prism 'A', and refractive index of the material of the prism is $\cot(A/2)$. The angle of minimum deviation is :

- (1) $180^\circ - 2A$ (2) $90^\circ - A$
 (3) $180^\circ + 2A$ (4) $180^\circ - 3A$

17. Which logic gate is represented by the following combination of logic gate?



- (1) NAND (2) AND
 (3) NOR (4) OR

Space for Rough Work

18. A Carnot engine, having efficiency of $\eta = \frac{1}{10}$ as heat engine, is used as a refrigerator. If the work done on the system is 10 J, the amount of energy absorbed from the reservoir at lower temperature is :

- (1) 99 J
 (2) 90 J
 (3) 1 J
 (4) 100 J

19. A certain metallic surface is illuminated with monochromatic light of wavelength λ . The stopping potential for photo-electric current for this light is $3V_0$. If the same surface is illuminated with light of wavelength 2λ . The stopping potential is V_0 . The threshold wavelength for this surface for photo-electric effect is :

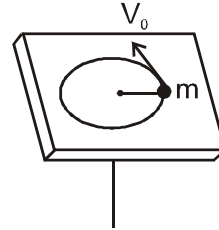
- (1) 4λ
 (2) $\frac{\lambda}{4}$
 (3) $\frac{\lambda}{6}$
 (4) 6λ

20. A radiation of energy 'E' falls normally on a perfectly reflecting surface. The momentum transferred to the surface is

(C = Velocity of light) :

- (1) $\frac{2E}{C}$
 (2) $\frac{2E}{C^2}$
 (3) $\frac{E}{C^2}$
 (4) $\frac{E}{C}$

21. A mass m moves in a circle on a smooth horizontal plane with velocity v_0 at a radius $\frac{R_0}{2}$. The mass is attached to string which passes through a smooth hole in the plane as shown. The tension in the string is increased gradually and finally m moves in a circle of radius R_0 . The final value of the kinetic energy is :



- (1) $\frac{1}{4}mv_0^2$ (2) $2mv_0^2$
 (3) $\frac{1}{2}mv_0^2$ (4) mv_0^2

22. Two identical thin plano-convex glass lenses (refractive index $\times 1.5$) each having radius of curvature of 20 cm are placed with their convex surfaces in contact at the center. The intervening space is filled with oil of refractive index 1.7. The focal length of the combination is :

- (1) -25 cm (2) -50 cm
 (3) 50 cm (4) -20 cm

23. A block A of mass m_1 rests on a horizontal table. A light string connected to it passes over a frictionless pulley at the edge of table and from its other end another block B of mass m_2 is suspended. The coefficient of kinetic friction between the block and the table is μ_k . When the block A is sliding on the table, the tension in the string is :

- (1) $\frac{(m_2 - \mu_k m_1)g}{(m_1 + m_2)}$
 (2) $\frac{m_1 m_2 (1 + \mu_k)g}{(m_1 + m_2)}$
 (3) $\frac{m_1 m_2 (1 - \mu_k)g}{(m_1 + m_2)}$
 (4) $\frac{(m_2 + \mu_k m_1)g}{(m_1 + m_2)}$

Space for Rough Work

24. A particle is executing SHM along a straight line. Its velocities at distances x_1 and x_2 from the mean position are V_1 and V_2 respectively. Its time period is:

(1) $2\pi\sqrt{\frac{x_2^2 - x_1^2}{V_1^2 - V_2^2}}$

(2) $2\pi\sqrt{\frac{V_1^2 + V_2^2}{x_1^2 + x_2^2}}$

(3) $2\pi\sqrt{\frac{V_1^2 - V_2^2}{x_1^2 - x_2^2}}$

(4) $2\pi\sqrt{\frac{x_1^2 - x_2^2}{V_1^2 - V_2^2}}$

25. A ship A is moving Westwards with a speed of 10 km h^{-1} and a ship B 100 km South of A, is moving Northwards with a speed of 10 km h^{-1} . The time after which the distance between them becomes shortest, is:

(1) 5 h (2) $5\sqrt{2} \text{ h}$

(3) $10\sqrt{2} \text{ h}$ (4) 0 h

26. A rod of weight W is supported by two parallel knife edges A and B and is in equilibrium in a horizontal position. The knives are at a distance d from each other. The centre of mass of the rod is at distance x from A. The normal reaction on A is :

(1) $\frac{Wd}{x}$ (2) $\frac{W(d-x)}{x}$

(3) $\frac{W(d-x)}{d}$ (4) $\frac{Wx}{d}$

27. The approximate depth of an ocean is 2700 m . The compressibility of water is $45.4 \times 10^{-11} \text{ Pa}^{-1}$ and density of water is 10^3 kg/m^3 . What fractional compression of water will be obtained at the bottom of the ocean?

(1) 1.0×10^{-2}

(2) 1.2×10^{-2}

(3) 1.4×10^{-2}

(4) 0.8×10^{-2}

28. Two particles of masses m_1, m_2 move with initial velocities u_1 and u_2 . On collision, one of the particles get excited to higher level, after absorbing energy ϵ . If final velocities of particles be v_1 and v_2 then we must have:

(1) $\frac{1}{2}m_1u_1^2 + \frac{1}{2}m_2u_2^2 = \frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2 - \epsilon$

(2) $\frac{1}{2}m_1u_1^2 + \frac{1}{2}m_2u_2^2 - \epsilon = \frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2$

(3) $\frac{1}{2}m_1^2u_1^2 + \frac{1}{2}m_2^2u_2^2 + \epsilon = \frac{1}{2}m_1^2v_1^2 + \frac{1}{2}m_2^2v_2^2$

(4) $m_1^2u_1 + m_2^2u_2 - \epsilon = m_1^2v_1 + m_2^2v_2$

29. Kepler's third law states that square of period of revolution (T) of a planet around the sun, is proportional to third power of average distance r between sun and planet i.e. $T^2 = Kr^3$. here K is constant. If the masses of sun and planet are M and m respectively then as per Newton's law of gravitation force of attraction between them is

$$F = \frac{GMm}{r^2}, \text{ here } G \text{ is gravitational constant}$$

The relation between G and K is described as:

(1) $GK = 4\pi^2$

(2) $K = G$

(3) $K = \frac{1}{G}$

(4) $GK = 4\pi^2$

30. A block of mass 10 kg , moving in x direction with a constant speed of 10 ms^{-1} , is subject to a retarding force $F = 0.1 \times J/m$ during its travel from $x = 20 \text{ m}$ to 30 m . Its final KE will be:

(1) 450 J

(2) 275 J

(3) 250 J

(4) 475 J

Space for Rough Work

31. A wind with speed 40 m/s blows parallel to the roof of a house. The area of the roof is 250 m². Assuming that the pressure inside the house is atmospheric pressure, the force exerted by the wind on the roof and the direction of the force will be : ($P_{\text{air}} = 1.2 \text{ kg / m}^3$)
- (1) $4.8 \times 10^5 \text{ N}$, upwards
 - (2) $2.4 \times 10^5 \text{ N}$, upwards
 - (3) $2.4 \times 10^5 \text{ N}$, downwards
 - (4) $4.8 \times 10^5 \text{ N}$, downwards

32. Two spherical bodies of mass M and $5M$ and radii R and $2R$ released in free space with initial separation between their centres equal to $12R$. If they attract each other due to gravitational force only, then the distance covered by the smaller body before collision is:
- (1) $4.5R$
 - (2) $7.5R$
 - (3) $1.5R$
 - (4) $2.5R$

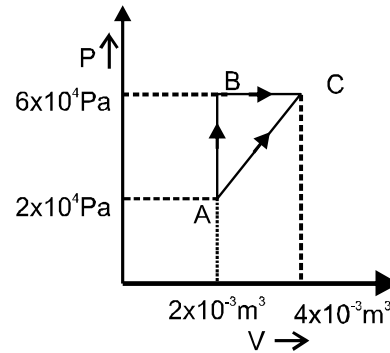
33. A resistance 'R' draws power 'P' when connected to an AC source. If an inductance is now placed in series with the resistance, such that the impedance of the circuit becomes 'Z', the power drawn will be:

- (1) $P\sqrt{\frac{R}{Z}}$
- (2) $P\left(\frac{R}{Z}\right)$
- (3) P
- (4) $P\left(\frac{R}{Z}\right)^2$

34. The ratio of the specific heats $\frac{C_p}{C_v} = \gamma$ in terms of degrees of freedom (n) is given by:

- (1) $\left(1 + \frac{n}{3}\right)$
- (2) $\left(1 + \frac{2}{n}\right)$
- (3) $\left(1 + \frac{n}{2}\right)$
- (4) $\left(1 + \frac{1}{n}\right)$

35. Figure below shows two paths that may be taken by a gas to go from a state A to a state C.



In process AB, 400J of heat is added to the system and in process BC, 100 J of heat is added to the system. The heat absorbed by the system in the process AC will be:

- (1) 500 J
- (2) 460 J
- (3) 300 J
- (4) 380 J

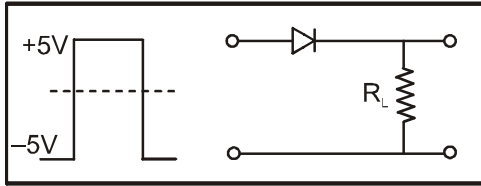
SECTION – B : (Maximum Marks : 40)

- ❖ This section contains **FIFTEEN (15)** questions. **You have attempt any 10 Questions. If a student attempts more than 10 questions, then only first 10 questions which he has attempted will be checked.**
- ❖ Each question has **FOUR** options (1), (2), (3) and (4) **ONLY ONE** of these four option is correct
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 - Full Marks : **+4** If **ONLY** the correct option is chosen.
 - Zero Marks : **0** If none of the options is chosen (i.e. the question is unanswered).
 - Negative Marks : **-1** In all other cases

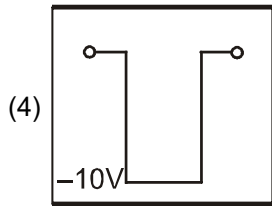
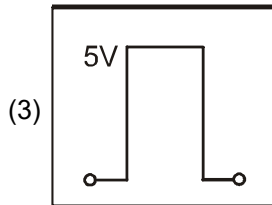
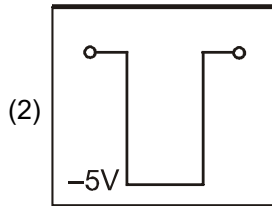
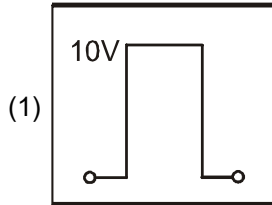
36. If energy (E), velocity (V) and time (T) are chosen as the fundamental quantities, the dimensional formula of surface tension will be:
- (1) $[EV^{-1}T^{-2}]$
 - (2) $[EV^{-2}T^{-2}]$
 - (3) $[E^{-2}V^{-1}T^{-3}]$
 - (4) $[EV^{-2}T^{-1}]$

Space for Rough Work

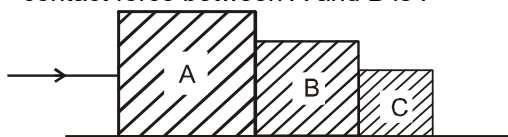
37. If in a p-n junction a square input signal of 10 V is applied, as shown,



then the output across R_L will be :

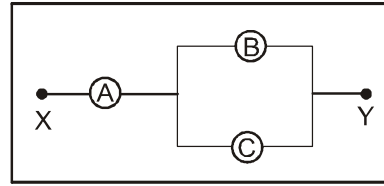


38. Three blocks A, B and C of masses 4 kg, 2 kg and 1 kg respectively, are in contact on a frictionless surface, as shown. If a force of 14 N is applied on the 4 kg block then the contact force between A and B is :

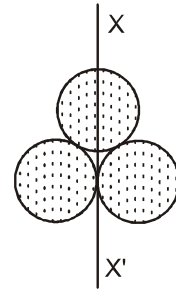


- (1) 6 N
(2) 8 N
(3) 18 N
(4) 2 N

39. A, B and C are voltmeters of resistance R , $1.5R$ and $3R$ respectively as shown in the figure. When some potential difference is applied between X and Y, the voltmeter readings are V_A , V_B and V_C respectively. Then :



- (1) $V_A \neq V_B = V_C$
(2) $V_A = V_B \neq V_C$
(3) $V_A \neq V_B \neq V_C$
(4) $V_A = V_B = V_C$
40. Three identical spherical shells, each of mass m and radius r are placed as shown in figure. Consider an axis XX' which is touching to two shells and passing through diameter of third shell. Moment of inertia of the system consisting of these three spherical shell about XX' axis is :



- (1) $3 mr^2$
(2) $\frac{16}{5} mr^2$
(3) $4 mr^2$
(4) $\frac{11}{5} mr^2$
41. The electric field in a certain region is acting radially outward and is given by $E = Ar$. A charge contained in a sphere of radius 'a' centred at the origin of the field, will given by :

- (1) $A \epsilon_0 a^2$
(2) $4\pi \epsilon_0 Aa^3$
(3) $\epsilon_0 Aa^3$
(4) $4\pi \epsilon_0 Aa^2$

Space for Rough Work

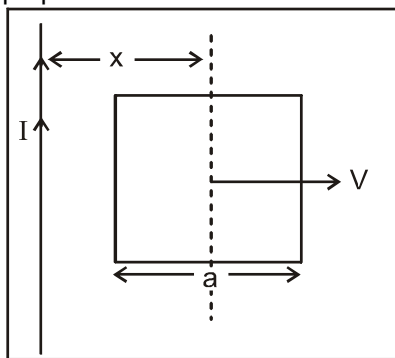
42. The two ends of a metal rod are maintained at temperatures 100°C and 110°C . The rate of heat flow in the rod is found to be 4.0 J/s . If the ends are maintained at temperatures 200°C and 210°C , the rate of heat flow will be :

- (1) 16.8 J/s
- (2) 8.0 J/s
- (3) 4.0 J/s
- (4) 44.0 J/s

43. Two similar springs P and Q have spring constants K_p and K_q , such that $K_p > K_q$. They are stretched, first by the same amount (case a), then by the same force (case b). The work done by the springs W_p and W_q are related as, in case (a) and case (b), respectively :

- (1) $W_p = W_q ; W_p = W_q$
- (2) $W_p > W_q ; W_q > W_p$
- (3) $W_p < W_q ; W_q < W_p$
- (4) $W_p = W_q ; W_p > W_q$

44. A conducting square frame of side 'a' and a long straight wire carrying current I are located in the same plane as shown in the figure. The frame moves to the right with a constant velocity 'V'. The emf induced in the frame will be proportional to :



- (1) $\frac{1}{(2x - a)^2}$
- (2) $\frac{1}{(2x + a)^2}$
- (3) $\frac{1}{(2x - a)(2x + a)}$
- (4) $\frac{1}{x^2}$

45. A particle of mass m is driven by a machine that delivers a constant power k watts. If the particle starts from rest the force on the particle at time is :

- (1) $\sqrt{mkt}^{-1/2}$
- (2) $\sqrt{2mkt}^{-1/2}$
- (3) $\frac{1}{2}\sqrt{mkt}^{-1/2}$
- (4) $\sqrt{\frac{mk}{2}}t^{-1/2}$

46. A force $\vec{F} = \alpha\hat{i} + 3\hat{j} + 6\hat{k}$ is acting at a point $\vec{r} = 2\hat{i} - 6\hat{j} - 12\hat{k}$. The value of α for which angular momentum about origin is conserved is :

- (1) 2
- (2) zero
- (3) 1
- (4) -1

47. A transformer having efficiency of 90 % is working on 200 V and 3 kW power supply. If the current in the secondary coil is 6 A the voltage across the secondary coil and the current in the primary coil respectively are:

- (1) 300 V, 15 A
- (2) 450 V, 15 A
- (3) 450 V, 13.5 A
- (4) 600 V, 15A

Space for Rough Work

48. The amplitude of a particle executing SHM is 4 cm. At the mean position the speed of the particle is 16 cm/sec. The distance of the particle from the mean position at which the speed of the particle becomes $8\sqrt{3}$ cm/s, will be:

- (1) $2\sqrt{3}$ cm
- (2) $\sqrt{3}$ cm
- (3) 1 cm
- (4) 2 cm

49. Match Column-I with Column- II

Column-I		Column-II	
(a)	LED or diode lasers	(i)	Detectors (Demodulator) in optical communication
(b)	Semiconductor photodiode	(ii)	Optical source in optical communication
(c)	Transducer	(iii)	Conversion of light signal into electrical signal
(d)	Photodetectors	(iv)	Conversion of information (Physical quantity) into electrical signal

Code

- | | | | |
|-----|-----|-----|--------|
| (a) | (b) | (c) | (d) |
| (1) | ii | i | iv iii |
| (2) | iv | iii | ii i |
| (3) | iii | ii | i iv |
| (4) | ii | iv | i iii |

50. Work done per mole in an isothermal change is

- (1) $RT \log_{10} \frac{V_2}{V_1}$
- (2) $RT \log_{10} \frac{V_1}{V_2}$
- (3) $RT \log_e \frac{V_2}{V_1}$
- (4) $RT \log_e \frac{V_1}{V_2}$

Space for Rough Work

PART – B

Atomic masses : [H = 1, D = 2, Li = 7, C = 12, N = 14, O = 16, F = 19, Na = 23, Mg = 24, Al = 27, Si = 28, P = 31, S = 32, Cl = 35.5, K = 39, Ca = 40, Cr = 52, Mn = 55, Fe = 56, Cu = 63.5, Zn = 65, As = 75, Br = 80, Ag = 108, I = 127, Ba = 137, Hg = 200, Pb = 207]

SECTION – A : (Maximum Marks : 140)

- ❖ This section contains **THIRTY FIVE (35)** questions.
- ❖ Each question has **FOUR** options (1), (2), (3) and (4) **ONLY ONE** of these four option is correct
- Marking scheme :
- Full Marks : **+4** If **ONLY** the correct option is chosen.
- Zero Marks : **0** If none of the options is chosen (i.e. the question is unanswered).
- Negative Marks : **-1** In all other cases

51. Glycinato ligand is a :
- (1) Symmetrical
 - (2) Unsymmetrical
 - (3) Both (1) and (2)
 - (4) None
52. A brown ring is formed in the ring test for NO_3^- ion. It is due to the formation of
- (1) $[\text{Fe}(\text{H}_2\text{O})_5(\text{NO})]^{2+}$
 - (2) $\text{FeSO}_4 \cdot \text{NO}_2$
 - (3) $[\text{Fe}(\text{H}_2\text{O})_4(\text{NO})_2]^{2+}$
 - (4) $\text{FeSO}_4 \cdot \text{HNO}_3$
53. $\text{Pt} \left| \begin{array}{c} \text{H}_2 \\ (p_1) \end{array} \right| \left| \begin{array}{c} \text{H}^+ \\ (1 \text{ M}) \end{array} \right| \left| \begin{array}{c} \text{H}^+ \\ (1 \text{ M}) \end{array} \right| \left| \begin{array}{c} \text{H}_2 \\ (p_2) \end{array} \right| \text{Pt}$
- (where p_1 and p_2 are pressures) cell reaction will be spontaneous if :
- (1) $p_1 = p_2$
 - (2) $p_1 > p_2$
 - (3) $p_2 > p_1$
 - (4) $p_1 = 1 \text{ atm}$

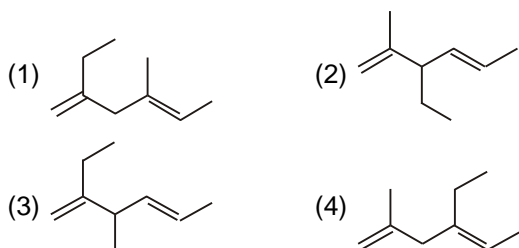
54. Which of the following is a high spin complex?
- (1) $[\text{Co}(\text{NH}_3)_6]^{3+}$
 - (2) $[\text{Fe}(\text{CN})_6]^{4-}$
 - (3) $[\text{Ni}(\text{CN})_4]^{2-}$
 - (4) $[\text{FeF}_6]^{3-}$
55. Cis-trans isomerism is found in square planar complexes of molecular formula ('a' and 'b' are monodentate ligands) :
- (1) Ma_4
 - (2) Ma_3b
 - (3) Ma_2b_2
 - (4) Mab_3
56. The activation energy of the reaction, $\text{A} + \text{B} \longrightarrow \text{C} + \text{D} + 38 \text{ kcal}$ is 20 kcal, what would be the activation energy of reaction $\text{C} + \text{D} \longrightarrow \text{A} + \text{B}$:
- (1) 20 kcal
 - (2) -20 kcal
 - (3) 18 kcal
 - (4) 58 kcal
57. The resistance of 0.1 N solution of formic acid is 200 ohm and cell constant is 2 cm^{-1} . The equivalent conductivity (in $\text{S cm}^2 \text{ eq}^{-1}$) of 0.1 N formic acid is :
- (1) 100
 - (2) 10
 - (3) 1
 - (4) None of these
58. The vapour pressure of a pure liquid 'A' is 70 torr at 27°C . It forms an ideal solution with another liquid 'B'. The mole fraction of 'B' is 0.2 and total vapour pressure of the solution is 84 torr at 27°C . The vapour pressure of pure liquid 'B' at 27°C is :
- (1) 14
 - (2) 56
 - (3) 140
 - (4) 70
59. The oxidation potential of a hydrogen electrode at $\text{pH} = 12$ and $P_{\text{H}_2} = 1$:
- (1) -0.709 V
 - (2) 0.00 V
 - (3) 0.709 V
 - (4) 0.059 V

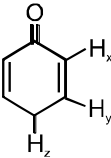
Space for Rough Work

60. In a first order reaction, the concentration of the reactant, decreases from 0.8 M to 0.4 M in 15 minutes. The time taken for the concentration to change from 0.1 M to 0.025 M is :
- (1) 30 min (2) 15 min
(3) 7.5 min (4) 60 min
61. A reaction which is of first order w.r.t. reactant A, has a rate constant 6 min^{-1} . If we start with $[A] = 0.5 \text{ mol L}^{-1}$, when would $[A]$ reach the value of 0.05 mol L^{-1}
- (1) 0.384 min (2) 0.15 min
(3) 3 min (4) 3.84 min
62. Which of the following complex species is not expected to exhibit optical isomerism?
- (1) $[\text{Co}(\text{en})_3]^{3+}$
(2) $[\text{Co}(\text{en})_2 \text{Cl}_2]^+$
(3) $[\text{Co}(\text{NH}_3)_3 \text{Cl}_3]$
(4) $[\text{Co}(\text{en})(\text{NH}_3)_2 \text{Cl}_2]^+$
63. The van't Hoff factor i for a compound which undergoes dissociation in one solvent and association in other solvent is respectively :
- (1) less than one and greater than one.
(2) less than one and less than one.
(3) greater than one and less than one.
(4) greater than one and greater than one.
64. For a reaction $\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3$, the value of K_c depends upon :
- (1) Initial concentration of the reactants
(2) Pressure
(3) Temperature
(4) catalyst
65. The pressure of H_2 required to make the potential of H_2 -electrode zero in pure water at 298 K is :
- (1) 10^{-4} atm (2) 10^{-14} atm
(3) 10^{-12} atm (4) 10^{-10} atm
66. In modern periodic table, the element with atomic number $Z = 118$ will be :
- (1) Uuo ; Ununoctium ; alkaline earth metal
(2) Uno ; Unniloctium ; transition metal
(3) Uno ; Unniloctium ; alkali metal
(4) Uuo ; Ununoctium ; noble gas
67. The correct thermodynamic conditions for the spontaneous reaction at all temperatures is :
- (1) $\Delta H < 0$ and $\Delta S < 0$
(2) $\Delta H < 0$ and $\Delta S = 0$
(3) $\Delta H > 0$ and $\Delta S < 0$
(4) $\Delta H < 0$ and $\Delta S > 0$
68. Insulin contains 3.4% sulphur. The minimum mol. wt. of insulin is –
- (1) 941.176 (2) 944
(3) 945.27 (4) None
69. The volume of oxygen necessary for the complete combustion of 20 litre of propane is :
- (1) 40 litre (2) 60 litre
(3) 80 litre (4) 100 litre
70. Among the following, the **correct** order of acidic nature is :
- (1) $\text{HClO}_4 < \text{HClO}_2 < \text{HClO} < \text{HClO}_3$
(2) $\text{HClO}_3 < \text{HClO}_4 < \text{HClO}_2 < \text{HClO}$
(3) $\text{HClO} < \text{HClO}_2 < \text{HClO}_3 < \text{HClO}_4$
(4) $\text{HClO}_2 < \text{HClO} < \text{HClO}_3 < \text{HClO}_4$

Space for Rough Work

71. The correct structure of 2-Ethyl-3-methylhexa-1, 4-diene is :



72. Molecule  can be enolised by

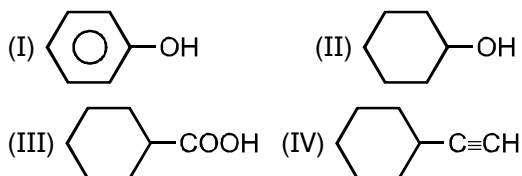
which hydrogen ?

- (1) x-H (2) y-H
(3) z-H (4) None of these

73. The IUPAC name of the $\text{CH}_3\text{CH}=\text{CH}-\text{CH}_2-\underset{\text{NH}_2}{\text{CH}}-\text{CH}_2\text{COOH}$ is:

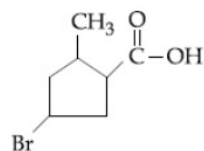
- (1) 3-Aminohept-5-enoic acid
(2) 5-Aminohex-2-enecarboxylic acid
(3) 3-Aminohept-4-enoic acid
(4) 5-Aminohept-2-enoic acid

74. Give the correct order of increasing acidity of the following compounds -



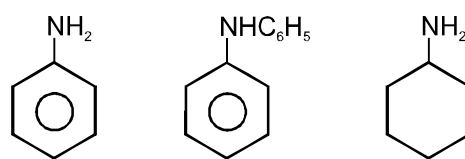
- (1) II < I < IV < III
(2) IV < II < I < III
(3) I < II < IV < III
(4) IV < I < II < III

75. The IUPAC name of the following compound is



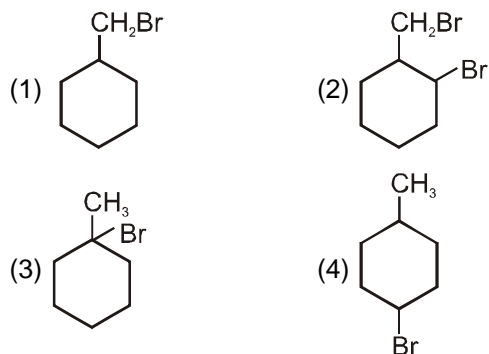
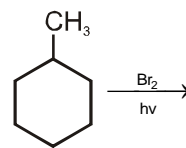
- (1) 3-Bromo-5-methylcyclopentane
(2) 3-Bromo-5-methylcyclopentanoic
(3) 5-Bromo-5-methylcyclopentanoic
(4) 4-Bromo-2-methylcyclopentane carboxylic acid

76. Arrange the following in increasing order of pH value :



- (1) II < I < III (2) III < I < II
(3) III < II < I (4) II < III < I

77. The major product obtained in the reaction, :



Space for Rough Work

78. Of the following pairs, the one containing examples of metalloid elements is :
 (1) B and Al (2) Ga and Ge
 (3) Al and Si (4) As and Sb
79. When 1-butyne is treated with excess of HBr, the expected product is
 (1) 1, 2-Dibromobutane
 (2) 2, 2-Dibromobutane
 (3) 1, 1-Dibromobutane
 (4) All the above
80. Which of the following order of radii is correct :
 (1) $\text{Li} < \text{Be} < \text{Mg}$
 (2) $\text{H}^+ < \text{Li}^+ < \text{H}^-$
 (3) $\text{O} < \text{F} < \text{Ne}$
 (4) $\text{Li} < \text{Na} < \text{K} < \text{Cs} < \text{Rb}$
81. The total number of σ and π bonds in $\text{C}_2(\text{CN})_4$ are :
 (1) 9 σ and 9 π (2) 9 σ and 18 π
 (3) 18 σ and 9 π (4) 18 σ and 18 π
82. Which of the following is most reactive towards nucleophilic addition reactions?
 (1) CH_3COCH_3
 (2) $\text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_3$
 (3) $\text{Ph}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$
 (4) $\text{Ph}-\overset{\text{O}}{\parallel}{\text{C}}-\text{Ph}$
83. The molecule/ion which has trigonal pyramidal shape is :
 (1) PCl_3 (2) SO_3
 (3) CO_3^{2-} (4) NO_3^-

84. Which gives addition reaction with aldehyde and ketone :
 (1) NH_2-NH_2 (2) $\text{NH}_2\text{NHCONH}_2$
 (3) $\text{C}_6\text{H}_5\text{NHNH}_2$ (4) HCN
85. Among the following species, which has the minimum bond length?
 (1) B_2 (2) C_2
 (3) F_2 (4) O_2^-

SECTION – B : (Maximum Marks : 40)

- ❖ This section contains **FIFTEEN (15)** questions. You have attempt any 10 Questions. If a student attempts more than 10 questions, then only first 10 questions which he has attempted will be checked.
 - ❖ Each question has **FOUR** options (1), (2), (3) and (4) **ONLY ONE** of these four option is correct
 - ❖ Marking scheme :
 ➤ Full Marks : **+4** If **ONLY** the correct option is chosen.
 ➤ Zero Marks : **0** If none of the options is chosen (i.e. the question is unanswered).
 ➤ Negative Marks : **-1** In all other cases
86. Which one of the following statements is **correct** when SO_2 is passed through acidified $\text{K}_2\text{Cr}_2\text{O}_7$ solution?
 (1) Green $\text{Cr}_2(\text{SO}_4)_3$ is formed.
 (2) The solution turns blue
 (3) The solution is decolourized.
 (4) SO_2 is reduced.
87. Predict the **correct** order among the following
 (1) lone pair – bond pair > bond pair – bond pair > lone pair – lone pair
 (2) lone pair – lone pair > lone pair – bond pair > bond pair – bond pair
 (3) lone pair – lone pair > bond pair – bond pair > lone pair – bond pair
 (4) bond pair – bond pair > lone pair – bond pair > lone pair – lone pair

Space for Rough Work

88. Two electrons occupying the same orbital are distinguished by :
- (1) Spin quantum number
 - (2) Principal quantum number
 - (3) Magnetic quantum number
 - (4) Azimuthal quantum number
89. The pH value of 10^{-4} M NaOH solution is :
- (1) 4
 - (2) 10
 - (3) 6
 - (4) between 6-7
90. At 100°C the vapour pressure of a solution of 6.5 g of a solute in 100 g water is 732 mm. If $K_b = 0.52$, the boiling point of this solution will be :
- (1) 103°C
 - (2) 101°C
 - (3) 100°C
 - (4) 102°C
91. The pH of 0.01 M sodium acetate solution is : $[K_a(\text{CH}_3\text{COOH})] = 2 \times 10^{-5}$
- (1) 7.25
 - (2) 6.5
 - (3) 8.05
 - (4) 8.35
92. The Vant Hoff factor (i) for a dilute solution of $\text{K}_3[\text{Fe}(\text{CN})_6]$ is :
- (1) 10
 - (2) 4
 - (3) 5
 - (4) 0.25

93. Match the compound given in column I with the hybridization and shape given in column II and mark the correct option.

Column-I	Column-II
(a) XeF_6	(i) distorted octahedral
(b) XeO_3	(ii) square planar
(c) XeOF_4	(iii) pyramidal
(d) XeF_4	(iv) square pyramidal

Code :

- | | | | |
|----------|-------|------|-------|
| (a) | (b) | (c) | (d) |
| (1) (iv) | (i) | (ii) | (iii) |
| (2) (i) | (iii) | (iv) | (ii) |
| (3) (i) | (ii) | (iv) | (iii) |
| (4) (iv) | (iii) | (i) | (ii) |

94. Which of the following has longest C–O bond length ? (Free C–O bond length in CO is 1.128\AA)

- | | |
|--|-------------------------------------|
| (1) $[\text{Mn}(\text{CO})_6]^+$ | (2) $\text{Ni}(\text{CO})_4$ |
| (3) $[\text{Co}(\text{CO})_4]^\ominus$ | (4) $[\text{Fe}(\text{CO})_4]^{2-}$ |

95. The radius of the second Bohr orbit for hydrogen atom is :


(Planck's Const. $h = 6.6262 \times 10^{-34}$ Js; mass of electron = 9.1091×10^{-31} kg; charge of electron $e = 1.60210 \times 10^{-19}$ C; permittivity of vacuum $\epsilon_0 = 8.854185 \times 10^{-12} \text{ kg}^{-1}\text{m}^{-3}\text{A}^2$)

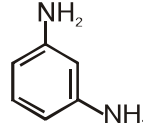
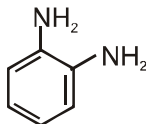
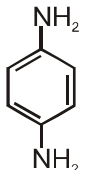
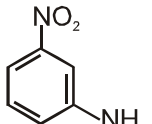
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| (1) 4.76\AA | (2) 0.529\AA |
| (3) 2.12\AA | (4) 1.65\AA |

Space for Rough Work

96. $C_6H_5CHO \xrightarrow{HCN} X \xrightarrow{H^+/H_2O} Y$
 In the above sequence, Y is
 (1) Lactic acid (2) Mandelic acid
 (3) Malic acid (4) Cinnamic acid

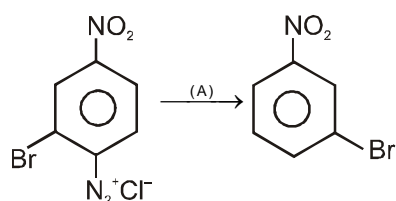
97. Reductive ozonolysis of benzene gives :
 (1) one mole of glyoxal
 (2) two moles of glyoxal
 (3) three moles of glyoxal
 (4) three moles of oxalic acid

98.  $\xrightarrow[100^\circ C]{HNO_3/H_2SO_4}$ Intermediate
 compound $\xrightarrow[Heat]{Sn/HCl}$ Product

- (1) 
 (2) 
 (3) 
 (4) 

99. Phenol + $CHCl_3$ + KOH \longrightarrow product is :
 (1) benzoic acid
 (2) p-chlorophenol
 (3) salicylaldehyde
 (4) salicylic acid

100. In the reaction,



(A) is :

- (1) H_3PO_2
 (2) Cu_2Cl_2
 (3) $HgSO_4 / H_2SO_4$
 (4) H^+ / H_2O

Space for Rough Work

PART-C
Botany

SECTION – A : (Maximum Marks : 140)

- ❖ This section contains **THIRTY FIVE (35)** questions.
- ❖ Each question has **FOUR** options (1), (2), (3) and (4) **ONLY ONE** of these four options is correct
- ❖ Marking scheme :
 - Full Marks : + 4 If **ONLY** the correct option is chosen.
 - Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).
 - Negative Marks : -1 In all other cases

101. The four basic shapes of bacteria are ____ (i) ____ (rod like), ____ (ii) ____ (spherical), ____ (iii) ____ (comma shaped) and ____ (iv) ____ (spiral). They are found respectively in

- (1) (i) - bacillus , (ii) - spirillum, (iii) - vibrio, (iv) - coccus
- (2) (i) - vibrio, (ii) - coccus, (iii) - bacillus, (iv) - spirillum
- (3) (i) - bacillus , (ii) - vibrio, (iii) - spirillum, (iv) - coccus
- (4) (i) - bacillus , (ii) - coccus, (iii) - vibrio, (iv) - spirillum

102. Which confers certain unique phenotypic characters to such bacteria. One such character is resistance to antibiotics.

- (1) Genomic DNA
- (2) Plasmid DNA
- (3) Mesosome
- (4) Slime layer of Glycocalyx

103. Gas vacuoles are found in –

- (1) blue green and purple and green photosynthetic bacteria.
- (2) green algae, brown algae, red algae
- (3) Chemo-heterotrophic bacteria
- (4) All of the above

104. Match the column as per bacteria

Structures	Function
(a) Mesosome	(i) Translation
(b) chromatophore	(ii) Respiration
(c) polysome	(iii) Photosynthesis
(1) a-iii, b-ii, c-i	(2) a-i, b-ii, c-iii
(3) a-ii, b-iii, c-i	(4) a-i, b-iii, c-ii

105. Assertion : Anything less than a complete structure of a cell does not ensure independent living

Reason : Cell is fundamental structural & functional unit of all living organism

- (1) If both Assertion and Reason are true and the Reason is the correct explanation of the Assertion
- (2) If both Assertion and Reason are true but the Reason is not the correct explanation of the Assertion
- (3) If Assertion is true but Reason is false
- (4) If both Assertion and Reason are false

106. Synthesis of tubulin protein takes place in the phase

- (1) G₁
- (2) S
- (3) G₂
- (4) M-phase

107. Inter Phase is also known as _____ stage and it takes about _____ % time of cell cycle.

- (1) Dividing, 95%
- (2) Dividing, 80%
- (3) Resting, 95%
- (4) Resting, 80%

108. 'U' or 'V' or 'J' shaped chromosomes are seen in

- (1) prophase
- (2) interphase
- (3) telophase
- (4) anaphase

109. The significance of meiosis lies in

- (1) Reduction of the diploid number of chromosomes to haploid
- (2) Maintaining constancy in the number of diploid chromosomes during sexual reproduction
- (3) Production of genetic variability in the population of a species
- (4) All the above

110. How many molecules of oxygen (O₂) are used during the glycolysis of one glucose molecule?

- (1) 0
- (2) 1
- (3) 36
- (4) 8

111. What is not common in photophosphorylation and oxidative phosphorylation,
 (1) synthesis of ATP
 (2) Direction of movement of protons
 (3) Requirement of ATP synthase
 (4) Requirement of electron transport chain
112. If one molecule of glucose is completely oxidised in aerobic respiration, then how many molecules of $\text{NADH} + \text{H}^+$ will be formed ?
 (1) 2 (2) 6
 (3) 10 (4) 12
113. How many molecules of $\text{NADH} + \text{H}^+$ are produced if glycolysis occurs twice?
 (1) 2 (2) 4
 (3) 18 (4) 1
114. Which ion is required for the working of pyruvate dehydrogenase?
 (1) Zn^{2+} (2) Mg^{2+}
 (3) Cu^+ (4) Fe^{2+}
115. Which of the following is the final acceptor of hydrogen in electron transport system.
 (1) $\text{F}_0 - \text{F}_1$ complex (2) Cyta-a_3
 (3) Nascent oxygen (4) UbQ
116. Out of all the redox reactions of ETS, The first electron acceptor among cytochromes during ETS.
 (1) Cyt c_1 (2) Cyt C
 (3) Cyt a (4) Cyt b
117. How many molecules of H_2O are released when 3 molecules of glucose enter the aerobic cellular respiration?
 (1) 6 (2) 12
 (3) 18 (4) 36
118. Which element is left when chlorophyll is burnt
 (1) Iron
 (2) Manganese
 (3) Magnesium
 (4) Molybdenum
119. The Assimilatory power in photosynthesis refers to
 (1) ATP
 (2) NADPH_2
 (3) $\text{ATP} + \text{NADPH}_2 + \text{O}_2$
 (4) $\text{ATP} + \text{NADPH}_2$
120. Photolysis of each water molecule in light reaction will yield
 (1) 3 electrons and 4 protons
 (2) 4 electrons and 4 protons
 (3) 4 electrons and 3 protons
 (4) 2 electrons and 2 protons
121. Movement of electrons from electron acceptor through the electron transport system having cytochromes during non-cyclic photophosphorylation can be defined as :
 (1) Uphill transport
 (2) Downhill transport
 (3) Z-Scheme
 (4) Active transport
122. Ethylene is a
 (1) Gaseous hormone
 (2) Gaseous enzyme
 (3) Liquid-gas mixture
 (4) Solid hormone
123. Which one of the following plant hormone is known as a stress hormone
 (1) Gibberellin (2) Kinetin
 (3) Auxin (4) Abscisic acid
124. During light reaction, It does not takes place
 (1) Electron transfer (2) Liberation of O_2
 (3) Photolysis of water (4) Liberation of H_2
125. Which one of the following is growth inhibitor
 (1) Ethylene (2) ABA
 (3) GA (4) IAA
126. What causes RQ to vary
 (1) Resp. substrate (2) Light & O_2
 (3) Resp. product (4) Temperature
127. RQ for carbohydrates is :
 (1) 1 (2) < 1
 (3) > 1 (4) Can't say

- 128.** The first reaction in photorespiration is
 (1) Carboxylation (2) Decarboxylation
 (3) Oxygenation (4) Phosphorylation
- 129.** Parthenocarpy is induced by
 (1) ABA (2) Auxins
 (3) Zeatin (4) Cytokinin
- 130.** The chemical nature of gibberellins is that they are
 (1) Acidic (2) Alkaline
 (3) Proteinaceous (4) Amines
- 131.** 2, 4-D is a synthetic—
 (1) Auxin (2) Gibberellin
 (3) Cytokinin (4) Florigen 2, 4 - D
- 132.** The growth hormones responsible for bolting are
 (1) Auxins (2) Kinetin
 (3) Ethylene (4) Gibberellins
- 133.** Dormancy of seed is broken by
 (1) Auxin
 (2) Gibberellins
 (3) Ethylene
 (4) ABA
- 134.** Cytokinin is a hormone whose main function is
 (1) Induction of cell division and delay in senescence
 (2) To take part in cell division
 (3) Refers to cell movements
 (4) To cause dormancy
- 135.** Match the Column I with Column II.

Column-I	Column-II
A. Dedifferentiation	1. Formation of tracheary element
B. Differentiation	2. Formation of cork-cambium
C. Re-Differentiation	3. Formation of cork

- (1) A-1, B-3, C-2
 (2) A-1, B-2, C-3
 (3) A-2, B-3, C-1
 (4) A-2, B-1, C-3

SECTION – B : (Maximum Marks : 40)

- ❖ This section contains **FIFTEEN (15)** questions. **You have attempt any 10 Questions. If a student attempts more than 10 questions, then only first 10 questions which he has attempted will be checked.**
- ❖ Each question has **FOUR** options (1), (2), (3) and (4) **ONLY ONE** of these four option is correct
- ❖ Marking scheme :
 - Full Marks : **+4** If **ONLY** the correct option is chosen.
 - Zero Marks : **0** If none of the options is chosen (i.e. the question is unanswered).
 - Negative Marks : **-1** In all other cases

- 136.** Reserve material in prokaryotic cells are stored in the cytoplasm in the form of :
 (1) Inclusion bodies – they are membrane less structure
 (2) Inclusion bodies – they are membrane bound structure
 (3) Thylakoid – they are membrane less structure
 (4) None of above
- 137.** Chloroplast contains enzyme for synthesis of –
 (1) Poteins & Fat
 (2) Proteins & Carbohydrate
 (3) Fat
 (4) Protein, Fat & carbohydrate
- 138.** Ribosome first observed under which type of microscope
 (1) Light microscope
 (2) phase contrast
 (3) Electron
 (4) TEM
- 139.** Oxsomes or elementary particles are centre of oxidative phosphorylation are found in-
 (1) Inner membrane of chloroplast
 (2) Outer membrane of mitochondria
 (3) Perimitochondrial space
 (4) Inner membrane of mitochondria

140. "Chromosomes cluster at opposite poles and their identity is lost as discrete elements." This statement belongs to which phase of cell cycle?

- (1) Telophase
- (2) Prophase
- (3) Anaphase
- (4) Metaphase

141. Incorrect about alcoholic fermentation is :

- (1) There is net gain of 2 ATP per molecule of glucose
- (2) Partial break down of glucose occurs
- (3) Rate of oxidation of NADH^+ to NAD^+ is vigorous
- (4) Site is cytoplasm

142. The end products of acetylation are

- (1) ATP and CO_2
- (2) ATP and Co-A
- (3) $\text{NADH} + \text{H}^+$ and CO_2
- (4) CO_2 , $\text{NADH} + \text{H}^+$ and Acetyl-CoA

143. Which among the following is photophosphorylation?

- (1) $\text{AMP} + \text{iPO}_4 \xrightarrow{\text{Light energy}} \text{ATP}$
- (2) $\text{ADP} + \text{iPO}_4 \xrightarrow{\text{Energy from organic food}} \text{ATP}$
- (3) $\text{ADP} + \text{iPO}_4 \xrightarrow{\text{Light energy}} \text{ATP}$
- (4) $\text{ADP} + \text{AMP} \xrightarrow{\text{Light energy}} \text{ATP}$

144. During photosynthesis, the oxygen in glucose comes from

- (1) Water
- (2) Carbon dioxide
- (3) Both from CO_2 and water
- (4) Oxygen in air

145. NADPH_2 is generated through

- (1) Glycolysis
- (2) Cyclic photophosphorylation
- (3) Non-Cyclic photophosphorylation
- (4) Anaerobic respiration

146. Match the following w.r.t the point they enter the respiratory pathway

- | | |
|-------------------|------------------|
| (a) Fatty acids | (i) Pyruvic Acid |
| (b) Glycerol | (ii) Glucose |
| (c) Amino acid | (iii) acetyl CoA |
| (d) Carbohydrates | (iv) PGAL |
- (1) a- iii, b- iv, c- ii, d- i
 - (2) a- iv, b- iii, c- i, d- ii
 - (3) a- iv, b- iii, c- i, d- ii
 - (4) a- iii, b- iv, c- i, d- ii

147. Photosystem-II occurs in

- (1) Stroma
- (2) Grana
- (3) On surface of mitochondria
- (4) On cytochrome

148. The first carbon dioxide fixation in C_4 pathway occurs in chloroplasts of

- (1) Guard cells
- (2) Mesophyll cells
- (3) Bundle sheath cells
- (4) Epidermal cells

149. Synthesis of ATP in mitochondria require

- | | |
|------------|------------------|
| (1) Oxygen | (2) NADP |
| (3) FMN | (4) Pyruvic acid |

150. Select the correct match

- (1) ETS -Outer mitochondrial membrane
- (2) Ubiquinone -Within inner membrane
- (3) 1 molecule of NADH -2 molecules of ATP
- (4) Complex III-Cytochrome C oxidase complex

PART-D Zoology

SECTION – A : (Maximum Marks : 140)

- ❖ This section contains **THIRTY FIVE (35)** questions.
- ❖ Each question has **FOUR** options (1), (2), (3) and (4) **ONLY ONE** of these four option is correct
- ❖ Marking scheme :
 - Full Marks : **+ 4** If **ONLY** the correct option is chosen.
 - Zero Marks : **0** If none of the options is chosen (i.e. the question is unanswered).
 - Negative Marks : **-1** In all other cases

151. Which of the following conditions cause erythroblastosis foetalis?
 (1) Mother Rh^{+ve} and foetus Rh^{-ve}
 (2) Mother Rh^{-ve} and foetus Rh^{+ve}
 (3) Both mother and foetus Rh^{-ve}
 (4) Both mother and foetus Rh^{+ve}
152. Select the incorrect statement regarding synapses.
 (1) Chemical synapses use neurotransmitters
 (2) Impulse transmission across a chemical synapse is always faster than that across an electrical synapse
 (3) The membranes of presynaptic and postsynaptic neurons are in close proximity in an electrical synapse
 (4) Electrical current can flow directly from one neuron into the other across the electrical synapse
- 153 Given below are statements: one is labelled as Assertion A and the other is labelled as Reason R.
Assertion A: Nephrons are of two types: Cortical & Juxta medullary, based on their relative position in cortex and medulla.
Reason R: Juxta medullary nephrons have short loop of Henle whereas, cortical nephrons have longer loop of Henle.
 In the light of the above statements, choose the correct answer from the options given below:
 (1) Both A and R are true but R is NOT the correct explanation of A.
 (2) A is true but R is false.
 (3) A is false but R is true.
 (4) Both A and R are true and R is the correct explanation of A.
154. Uricotelic mode of passing out nitrogenous wastes is found in :
 (1) Reptiles and Bird
 (2) Birds and Annelids
 (3) Amphibians and Reptiles
 (4) Insects and Amphibians

155. Hormone secreted by α -cells of Pancreas?
 (1) Insulin (2) Glucagon
 (3) Somatocrinin (4) Somatostatin
156. The H-zone in the skeletal muscle fibre is due to:
 (1) The central gap between myosin filaments in the A-band.
 (2) The central gap between actin filaments extending through myosin filaments in the A band.
 (3) Extension of myosin filaments in the central portion of the A - band.
 (4) The absence of myofibrils in the central portion of A - band.
157. **Assertion** : Insulin is antagonistic to glucagon.
Reason : It is an anabolic hormone
 (1) Both Assertion and Reason are true and Reason is correct explanation of Assertion.
 (2) Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion.
 (3) Assertion is true, but Reason is false.
 (4) Assertion is false, but Reason is true.
158. Match the following columns and select the correct option.
- | | Column-I | | Column-II |
|-----|-------------|-------|--|
| (a) | Eosinophils | (i) | Immune response |
| (b) | Basophils | (ii) | Phagocytosis |
| (c) | Neutrophils | (iii) | Release histaminase, destructive enzymes |
| (d) | Lymphocytes | (iv) | Release granules containing histamine |
- (a) (b) (c) (d)
 (1) (iv) (i) (ii) (iii)
 (2) (i) (ii) (iv) (iii)
 (3) (ii) (i) (iii) (iv)
 (4) (iii) (iv) (ii) (i)

159. Which part of the brain is responsible for thermoregulation?
- (1) Medulla oblongata
 - (2) Cerebrum
 - (3) Hypothalamus
 - (4) Corpus callosum

160. **Statement I** - Ball and socket joints are the most mobile joints.

Statement II - Synovial fluid is present here.

- (1) Statement I is correct but Statement II is incorrect
- (2) Statement I is incorrect but Statement II is correct
- (3) Both Statement I and Statement II are correct
- (4) Both Statement I and Statement II are incorrect

161. Which of the following structures or regions is *incorrectly* paired with its function?

(1)	Medulla oblongata:	:	controls respiration and cardiovascular reflexes.
(2)	Corpus callosum	:	band of fibers connecting left and right cerebral hemispheres.
(3)	Hypothalamus	:	production of releasing hormones and regulation of temperature, hunger and thirst.
(4)	Limbic system	:	consists of fibre tracts that interconnect different regions of brain; controls movement.

162. Given below are two statements:

Statement I : Ascending limb of loop of Henle is impermeable to water and allows transport of electrolytes actively or passively.

Statement II : Dilution of filtrate takes place due to efflux of electrolytes in the medullary fluid.

In the light of the above statements, choose the correct answer from the options given below:

- (1) Statement I is correct but Statement II is incorrect
- (2) Statement I is incorrect but Statement II is correct
- (3) Both Statement I and Statement II are correct
- (4) Both Statement I and Statement II are incorrect

163. Glenoid cavity articulated :

- (1) scapula with acromion
- (2) clavicle with scapula
- (3) humerus with scapula
- (4) clavicle with acromion

164. Given below are two statements:

Statement I: The coagulum is formed of network of threads called thrombins.

Statement II: Spleen is the graveyard of erythrocytes in the light of the above statements, choose the most appropriate answer from the options given below:

- (1) Statement I is correct but Statement II is incorrect
- (2) Statement I is incorrect but Statement II is correct
- (3) Both Statement I and Statement II are correct
- (4) Both Statement I and Statement II are incorrect

165. Which hormones do stimulate the production of pancreatic juice and bicarbonate?

- (1) Insulin and glucagon
- (2) Angiotensin and epinephrine
- (3) Gastrin and insulin
- (4) Cholecystokinin and secretin

- 166.** Osteoporosis, an age related disease of skeletal system, may occur due to:
- (1) accumulation of uric acid leading to inflammation of joints
 - (2) immune disorder affecting neuromuscular junction leading to fatigue
 - (3) high concentration of Ca^{++} and Na^+
 - (4) decreased level of estrogen
- 167.** Nissl bodies are mainly composed of
- (1) Proteins and lipids
 - (2) Free ribosomes and RER
 - (3) Nucleic acids and SER
 - (4) DNA and RNA
- 168.** Inadequate supply of oxygen to heart muscles leads to a symptom of acute chest pain. This disorder of the circulatory system is identified as :
- (1) Cardiac arrest
 - (2) Heart failure
 - (3) Coronary Heart Disease
 - (4) Angina pectoris
- 169.** During muscular contraction which of the following events occur?
- (a) 'H' zone disappears
 - (b) 'A' band widens
 - (c) 'I' band reduces in width
 - (d) Myosine hydrolyzes ATP, releasing the ADP and Pi
 - (e) Z-lines attached to actins are pulled inwards
- Choose the correct answer from the options given below.
- (1) (a), (b), (c), (d) only
 - (2) (b), (c), (d), (e) only
 - (3) (b), (d), (e), (a) only
 - (4) (a), (c), (d), (e) only
- 170.** Select the correct statements.
- (a) Angiotensin II activates the cortex of adrenal gland to release aldosterone.
 - (b) Aldosterone leads to increase in blood pressure.
 - (c) ANF acts as a check on renin-angiotensin mechanism.
 - (d) ADH causes vasodilation.
 - (e) Vasopressin is released from adenohypophysis.
- Choose the most appropriate answer from the options given below:
- (1) (a), (b) and (e) only
 - (2) (c), (d) and (e) only
 - (3) (b), (c) and (d) only
 - (4) (a), (b) and (c) only

- 171.** Arrange the following formed elements in the decreasing order of their abundance in blood in humans:
- (a) Platelets
 - (b) Neutrophils
 - (c) Erythrocytes
 - (d) Eosinophils
 - (e) Monocytes
- Choose the most appropriate answer from the options given below:
- (1) (c), (a), (b), (e), (d)
 - (3) (d), (e), (b), (a), (c)
 - (2) (c), (b), (a), (e), (d)
 - (4) (a), (c), (b), (d), (e)
- 172.** Which brain structure in rabbit is directly vision related ?
- (1) Corpus albicans
 - (2) Hippocampal lobe
 - (3) Corpus callosum
 - (4) Corpora quadrigemina
- 173.** If Henle's loop were absent from mammalian nephron which of the following is to be expected
- (1) There will be no urine formation
 - (2) There will be hardly any change in the quality and quantity of urine formed
 - (3) The urine will be more concentrated
 - (4) The urine will be more dilute.
- 174.** Stimulation of a muscle fiber by a motor neuron occurs at:
- (1) the neuromuscular junction
 - (2) the transverse tubules
 - (3) the myofibril
 - (4) the sarcoplasmic reticulum
- 175.** Terrestrial adaptations necessitated the production of :
- (1) Lesser toxic nitrogenous wastes like urea and uric acid
 - (2) Lesser toxic nitrogenous wastes like ammonia and urea
 - (3) Highly toxic nitrogenous wastes like ammonia and urea
 - (4) Highly toxic nitrogenous wastes like urea and uric acid

- 176. Assertion :** Medulla oblongata causes reflex actions like vomiting, coughing and sneezing.
Reason : It has many nerve cells which control autonomic reflexes.
 (1) Both Assertion and Reason are true and Reason is correct explanation of Assertion.
 (2) Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion.
 (3) Assertion is true, but Reason is false.
 (4) Assertion is false, but Reason is true.
- 177.** Human urine is usually acidic because:
 (1) excreted plasma proteins are acidic
 (2) potassium and sodium exchange generates acidity
 (3) hydrogen ions are actively secreted into the filtrate.
 (4) the sodium transporter exchanges one hydrogen ion for each sodium ion, in peritubular capillaries.
- 178.** Which of the following is not a function of the skeletal system?
 (1) Storage of minerals
 (2) Production of body heat
 (3) Locomotion
 (4) Production of erythrocytes
- 179.** Select the correct statement:
 (1) Atrial Natriuretic Factor increases the blood pressure.
 (2) Angiotensin II is a powerful vasodilator.
 (3) Counter current pattern of blood flow is not observed in vasa recta.
 (4) Reduction in Glomerular Filtration Rate activates JG cells to release renin.
- 180.** What would be the heart rate of a person if the cardiac output is 5 L, blood volume in the ventricles at the end of diastole is 100 mL and at the end of ventricular systole is 50 mL?
 (1) 125 beats per minute
 (2) 50 beats per minute
 (3) 75 beats per minute
 (4) 100 beats per minute

- 181.** Which of the following statements is correct
 (1) The ascending limb of loop of henle is impermeable to water
 (2) The descending limb of loop of henle is impermeable to water
 (3) The ascending limb of loop of Henle is permeable to water
 (4) The descending limb of loop of Henle is permeable to electrolytes
- 182.** Which of the following is an amino acid derived hormone?
 (1) Epinephrine (2) Estriol
 (3) Estradiol (4) Ecdysone
- 183.** Match the items in Column-I with those in Column - II :
- | Column - I | Column - II |
|--------------------|---------------------------|
| (a) Podocytes | (i) Crystallised oxalates |
| (b) Protonephridia | (ii) Annelids |
| (c) Nephridia | (iii) Amphioxus |
| (d) Renal calculi | (iv) Filtration slits |
- Select the correct option from the following:
 (1) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
 (2) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)
 (3) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)
 (4) (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i)
- 184.** Which of the following statements is correct about node of Ranvier?
 (1) Axolemma is discontinuous
 (2) Myelin sheath is discontinuous
 (3) Both neurilemma and myelin sheath are discontinuous
 (4) Covered by myelin sheath
- 185.** Which of the following factors is responsible for the formation of concentrated urine?
 (1) Hydrostatic pressure during glomerular filtration.
 (2) Low levels of antidiuretic hormone.
 (3) Maintaining hyperosmolarity towards its medullary interstitium in the kidneys
 (4) Secretion of erythropoietin Juxtaglomerular complex.

SECTION – B : (Maximum Marks : 40)

- ❖ This section contains **FIFTEEN (15)** questions. **You have attempt any 10 Questions. If a student attempts more than 10 questions, then only first 10 questions which he has attempted will be checked.**
- ❖ Each question has **FOUR** options (1), (2), (3) and (4) **ONLY ONE** of these four option is correct
- ❖ Marking scheme :
 - Full Marks : **+4** If **ONLY** the correct option is chosen.
 - Zero Marks : **0** If none of the options is chosen (i.e. the question is unanswered).
 - Negative Marks : **-1** In all other cases

- 186.** Hormones stored and released from neurohypophysis are :
- (1) Thyroid stimulating hormone and Oxytocin
 - (2) Oxytocin and Vasopressin
 - (3) Follicle stimulating hormone and Leutinizing hormone
 - (4) Prolactin and Vasopressin

- 187.** Adult human RBCs are enucleate. Which of the following statement (s) is/are most appropriate explanation for this feature?
- (a) They do not need to reproduce
 - (b) They are somatic cells
 - (c) They do not metabolize
 - (d) All their internal space is available for oxygen transport
- (1) only (d) (2) Only (a)
(3) (a), (c) and (d) (4) (b) and (c)

- 188.** Use of an artificial kidney during hemodialysis may result in :
- (a) Nitrogenous waste build-up in the body
 - (b) Non-elimination of excess potassium ions
 - (c) Reduced 'absorption of calcium ions from gastro-intestinal tract
 - (d) Reduced RBC production
- Which of the following options is the most appropriate ?
- (1) (a) and (d) are correct
 - (2) (a) and (b) are correct
 - (3) (b) and (c) are correct
 - (4) (c) and (d) are correct

- 189. Assertion :** Transmission of the nerve impulse across a synapse is accomplished by neurotransmitters.

Reason : Transmission across a synapse usually requires neurotransmitters because there is small space i.e. synaptic cleft, that separates one neuron from another.

- (1) Both Assertion and Reason are true and Reason is correct explanation of Assertion.
- (2) Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion.
- (3) Assertion is true, but Reason is false.
- (4) Assertion is false, but Reason is true.

- 190.** Calcium is important in skeletal muscle contraction because it

- (1) binds to troponin to remove the masking of active sites on actin for myosin.
- (2) prevents the formation of bonds between the myosin cross bridges and the actin filament.
- (3) detaches the myosin head from the actin filament.
- (4) activates the myosin ATPase by binding to it.

- 191.** Match List I with List II.

List I	List II
A. CCK	I. Kidney
B. GIP	II. Heart
C. ANF	III. Gastric gland
D. ADH	IV. Pancreas

Choose the correct answer from the options given below :

- (1) A-III, B-II, C-IV, D-I
- (2) A-II, B-IV, C-I, D-III
- (3) A-IV, B-II, C-III, D-I
- (4) A-IV, B-III, C-II D-I

- 192.** Persons with 'AB' blood group are called as "Universal recipients". This is due to:

- (1) Absence of antigen A and B in plasma
- (2) Presence of antibodies, anti-A and anti-B and anti-B in on RBCs
- (3) Absence of antibodies, anti-A and anti-B, in plasma
- (4) Absence of antigens A and B on the surface of RBCs

193. Which of the following statements are correct regarding skeletal muscle?

- A. Muscle bundles are held together by collagenous connective tissue layer called fascicle.
- B. Sarcoplasmic reticulum of muscle fibre is a store house of calcium ions.
- C. Striated appearance of skeletal muscle fibre is due to distribution pattern of actin and myosin proteins.
- D. M line is considered as functional unit of contraction called sarcomere.

Choose the most appropriate answer from the options given below:

- (1) B and C only
- (2) A, C and D only
- (3) C and D only
- (4) A, B and C only

194. Which of the following are NOT under the control of thyroid hormone?

- A. Maintenance of water and electrolyte balance
- B. Regulation of basal metabolic rate
- C. Normal rhythm of sleep-wake cycle
- D. Development of immune system
- E. Support the process of R.B.Cs formation

Choose the correct answer from the options given below:

- (1) B and C only
- (2) C and D only
- (3) D and E only
- (4) A and D only

195. Gout is a type of disorder which leads to:

- (1) Inflammation of joints due to accumulation of uric acid crystals
- (2) Weakening of bones due to decreased bone mass
- (3) Inflammation of joints due to cartilage degeneration
- (4) Weakening of bones due to low calcium level

196. Match the items given in Column I with those in Column II and select the *correct* option given below:

Column I	Column II
a. Tricuspid valve	i. Between left atrium and left ventricle
b. Bicuspid valve	ii. Between right ventricle and pulmonary artery
c. Semilunar valve	iii. Between right atrium and right ventricle

	a	b	c
(1)	iii	i	ii
(2)	ii	i	iii
(3)	i	ii	iii
(4)	i	iii	ii

197. Given below are two statements:

Statement I: Parathyroid hormone acts on bones and stimulates the process of bone resorption.

Statement II: Parathyroid hormone along with Thyrocalcitonin plays a significant role in carbohydrate metabolism.

In the light of the above statements, choose the correct answer from the options given below:

- (1) **Statement I** is correct but **Statement II** is false
- (2) **Statement I** is incorrect but **Statement II** is true
- (3) Both **Statement I** and **Statement II** are true
- (4) Both **Statement I** and **Statement II** are false

198. During the propagation of a nerve impulse, the action potential results from the movement of

- (1) K^+ ions from extracellular fluid to intracellular fluid
- (2) Na^+ ions from intracellular fluid to extracellular fluid
- (3) K^+ ions from intracellular fluid to extracellular fluid
- (4) Na^+ ions from extracellular fluid to intracellular fluid

199. Which of the following is a correct match for disease and its symptoms?

- (1) Myasthenia gravis Genetic disorder resulting in weakening and paralysis of skeletal muscle
- (2) Muscular dystrophy - An auto immune disorder causing progressive degeneration of skeletal muscle
- (3) Arthritis - Inflamed joints
- (4) Tetany – high Ca^{2+} level causing rapid spasms.

200. The pericardium and the pericardial fluid help in—

- (1) Protecting the heart from friction and shocks
- (2) Pumping the blood
- (3) Receiving the blood from various parts of the body
- (4) None of above

