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**NEET  
PRELIMINARY ROUND  
2023**

**SOLUTION**

(with explanation)

Date: 22.04.2023 Saturday

**NEET PERSONAL BATCH BY  
EXPERT @206 Gangotri Icon,  
Nilamber Circle, Vasna -Bhayali  
Road, Vadodara Gujarat**

**Neelesh Upadhyay 9898966050**

[https://youtu.be/rcO\\_Zb6oUMY](https://youtu.be/rcO_Zb6oUMY)

**(Click on the link#SOURAV GANGULI talks about EDify Study Center)**



**Neelesh Sir (9898966050)**



**EDify Study Center**

Build your character

**Neelesh Upadhyay**  
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**CENTERS in VADODARA**

- 132 VIP VIEW, Near AMIT NAGAR CIRCLE VADODARA (AIRPORT AREA)
- 206, GANGOTRI ICON, Near NILAMBER CIRCLE VADODARA (VASNA BHAYLI AREA)



Neelesh Sir (9898966050)

**Answer key**

Physics			
Section A		Section B	
1	2	36	2
2	4	37	4
3	2	38	1
4	1	39	2
5	1	40	2
6	2	41	4
7	2	42	3
8	2	43	3
9	4	44	3
10	4	45	3
11	3	46	4
12	2	47	4
13	3	48	2
14	1	49	2
15	4	50	4

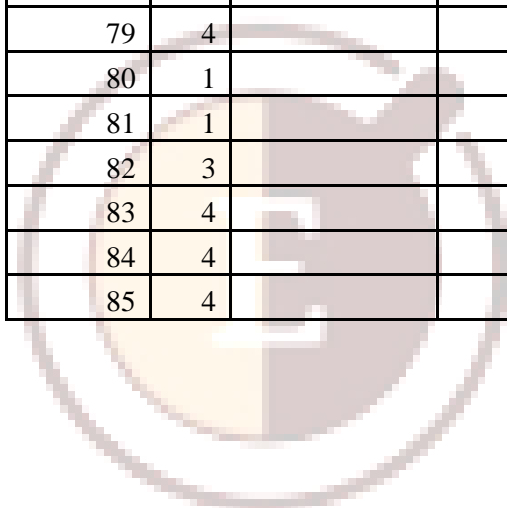
**Neelesh Sir (9898966050)**

16	1		
17	1		
18	3		
19	2		
20	3		
21	1		
22	1		
23	1		
24	3		
25	2		
26	2		
27	1		
28	3		
29	2		
30	4		
31	2		
32	3		
33	3		
34	3		
35	3		

chemistry			
Section A		Section B	
51	1	86	2
52	4	87	2
53	4	88	1
54	2	89	2
55	2	90	2
56	3	91	1
57	4	92	3
58	1	93	1
59	3	94	3
60	2	95	2
61	1	96	1
62	1	97	3
63	2	98	1
64	4	99	2
65	2	100	3
66	4		
67	2		

**Neelesh Sir (9898966050)**

68	4		
69	2		
70	2		
71	4		
72	1		
73	3		
74	1		
75	4		
76	1		
77	1		
78	3		
79	4		
80	1		
81	1		
82	3		
83	4		
84	4		
85	4		



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Botany			
Section A		Section B	
101	3	136	2
102	2	137	1
103	4	138	2
104	4	139	1
105	4	140	3
106	4	141	1
107	1	142	1
108	3	143	1
109	3	144	3
110	1	145	1
111	2	146	4
112	4	147	3
113	1	148	3
114	2	149	4
115	2	150	3
116	3		
117	3		
118	4		
119	3		
120	1		
121	2		
122	1		
123	2		
124	4		
125	4		
126	1		
127	2		
128	4		
129	2		
130	1		
131	2		
132	1		
133	3		
134	1		
135	2		

zoology			
Section A		Section B	
151	4	136	2
152	2	137	2
153	1	138	3
154	1	139	4
155	1	140	3
156	3	141	4
157	2	142	4
158	1	143	2
159	3	144	1
160	4	145	3
161	4	146	3
162	2	147	2
163	4	148	1
164	1	149	2
165	4	150	1
166	2		
167	3		
168	2		
169	2		
170	3		
171	1		
172	1		
173	4		
174	4		
175	4		
176	1		
177	3		
178	1		
179	1		
180	2		
181	3		
182	1		
183	1		
184	3		
185	2		

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**Physics solution**  
**SECTION : A**

1(2)

Angular Momentum = Angular Velocity  $\times$  Moment of Inertia . . . . (1)

Since, Angular Velocity = Angular displacement  $\times$  [Time]<sup>-1</sup> = [M<sup>0</sup>L<sup>0</sup>T<sup>0</sup>] [T]<sup>-1</sup>

$\therefore$  The dimensional formula of Angular Velocity = M<sup>0</sup>L<sup>0</sup>T<sup>-1</sup> . . . . . (2)

And,

Moment of Inertia, M.O.I = Mass  $\times$  (Radius of Gyration)<sup>2</sup>

$\therefore$  The dimensional formula of

M.O.I = M<sup>1</sup> L<sup>2</sup> T<sup>0</sup> . . . . . (3)

On substituting equation (2) and (3) in equation (1) we get,

Angular Momentum = Angular Velocity  $\times$  Moment of Inertia

Or, M = [M<sup>0</sup>L<sup>0</sup>T<sup>-1</sup>]  $\times$  [M<sup>1</sup>L<sup>2</sup>T<sup>0</sup>]<sup>-1</sup> = M<sup>1</sup>L<sup>2</sup>T<sup>-1</sup>.

2(4)

- => Radio wave  $\approx 10^2$ m
- => Microwave  $\approx 10^{-2}$ m
- => Infrared radiations  $\approx 10^{-4}$ m
- => X-ray (i) =  $10^{-10}$  m

3(2)

If The half distance (x) covered with the speed v<sub>1</sub> in t<sub>1</sub> time.

Using formula of speed,  $v_1 = \frac{x}{t_1}$

so,  $t_1 = \frac{x}{v_1}$

And another half distance (x), covered with speed v<sub>2</sub> in time t<sub>2</sub>.

so,  $v_2 = \frac{x}{t_2}$

$t_2 = \frac{x}{v_2}$

Average Velocity =  $\frac{\text{total distance}}{\text{total time}}$

Total time =  $t_1 + t_2 = \frac{x}{v_1} + \frac{x}{v_2} = \frac{(v_2 * x + v_1 * x)}{v_1 v_2}$

Total distance = x+x=2x

On putting the values of total distance and total time in the formula of average speed, we get

Average speed =  $\frac{2x}{\left(\frac{v_2 * x + v_1 * x}{v_1 v_2}\right)}$

$V = \frac{2v_1 v_2}{v_1 + v_2}$

4(1)

$v = \sqrt{5gr}$  for lowest point of vertical loop.  $v \propto m^0$  i.e. it does not depend on the mass of the body.

5(1)

Tension in the cord is maximum (for a given average speed of rotation) when the mass, m, is at the bottom points B, as the gravitational force is in the downward direction and tension of the cord is directly opposing it.

6(2)

$$\begin{aligned} \omega &= \omega_0 + \alpha t \\ \alpha &= \frac{\omega - \omega_0}{t} \\ &= \frac{(3120 - 1200)}{16s} \text{rpm} \\ &= \frac{1920}{16} \times \frac{2\pi}{60} \text{rad/s}^2 \\ &= 4\pi \text{rad/s}^2 \end{aligned}$$

7(2)

When a thermodynamic system undergoes a change in such a way that no exchange of heat takes place between it and the surroundings, the process is known as adiabatic process. Graph 4 is isobaric process, 1 is isochoric. Of 2 and 3, 2 has the smaller slope (magnitude) hence is isothermal. Remaining process is adiabatic.

8(2)

Mass of rocket m=5000Kg

Acceleration a=20m/s<sup>2</sup>

Speed v=800m/s

g=10m/s<sup>2</sup>

Now, thrust force on the rocket

$$F_t = v_r \left( \frac{-dm}{dt} \right)$$

Net force on the rocket

$$F_{\text{net}} = F_t - W$$

$$ma = v_r \left( \frac{-dm}{dt} \right) - mg$$

$$\left( \frac{-dm}{dt} \right) = \frac{m(g+a)}{v_r}$$

Rate of gas ejected per second

$$\left( \frac{-dm}{dt} \right) = \frac{5000(10+20)}{800}$$

$$\frac{-dm}{dt} = 187.5 \text{kg/s}$$

Hence, the amount of gas ejected per second is 187.5 kg/s

9(4)

Mass of the body  $m=1 \text{ kg}$   
 Velocity of the body,  $v=20 \text{ ms}^{-1}$   
 Height,  $h=18 \text{ m}$   
 acceleration due to gravity,  $g=10 \text{ ms}^{-2}$

The energy lost due to the air friction will be equal to the difference in the kinetic energy K.E. and the potential energy P.E.

Therefore, the energy lost,  
 $E = \text{K.E.} - \text{P.E.}$

$$E = \frac{1}{2}mv^2 - mgh$$

$$E = \frac{1}{2} \times 1 \times 20 \times 20 - 1 \times 10 \times 18$$

$$E = 20$$

10(4)

For a rectangular lamina, moment of inertia about a line passing through centre and parallel to longer side is minimum.

Hence, momentum of inertia about EG will be minimum.

11(3)

$$\text{K.E.} = \frac{L^2}{2I}$$

$\therefore$  From angular momentum conservation about centre.

$L \rightarrow \text{constant}$

$$I = mr^2$$

$$\text{K.E.}' = \frac{L^2}{2mr'^2} \quad r' = 2r$$

$$\text{K.E.}' = 4 \text{ K.E.}$$

K.E. is increased by a factor of 4.

12(2) For the body to escape Earth's gravitation and reach infinity, the initial kinetic energy has to be just higher than the Gravitational potential energy of the body on the surface.

Total energy of the body just after projecting is:

$$E = \frac{1}{2}mv^2 - \frac{GMm}{R_e}$$

Now this total energy has to be just greater than zero, so the minimum speed is achieved when kinetic energy is equal to gravitational potential energy.

$$\Rightarrow \frac{1}{2}mv^2 = \frac{GMm}{R_e}$$

$$\Rightarrow \frac{1}{2}v^2 = \frac{GM}{R_e}$$

$$\Rightarrow v = \sqrt{\frac{2GM}{R_e}}$$

13(3)

Mass of the satellite =  $m$

Height =  $6.4 \times 10^6$

We know,

Potential energy is given as

$$= -\frac{GMm}{r}$$

$$= -\frac{GMm}{R_e + h}$$

$$= -\frac{GMm}{2R_e}$$

[As  $h=R_e$ (given)]

Or we can write

$$\therefore \text{Potential energy} = -\frac{gR_e^2m}{2R_e}$$

$$= -0.5 mgR_e \quad [\text{As } GM=gR_e^2]$$

Hence the potential energy is  $-0.5mgR_e$

14 (1) Formula for compressibility

$$\beta = -\frac{\Delta v}{vP}, \quad \text{Here } P=100 \text{ atm}$$

$$\beta = 4 \times 10^{-5} / \text{atm}$$

$$v = 100 \times 10^{-6} \text{ m}^3$$

$$\text{Hence, } \Delta v = 0.4 \text{ cm}^3$$

15(4)

In (a) & (c) circuits, both the junctions are in same biasing conditions so offers equal resistances. Since both are in series, therefore equal potential will drop across the junction.

16(1)

$$\text{From } \eta = 1 - \frac{T_2}{T_1}$$

$$\frac{T_2}{T_1} = 1 - \eta = 1 - \frac{40}{100} = \frac{3}{5}$$

$$\text{Therefore } T_2 = \frac{3}{5} T_1 = 35 \times 500 = 300 \text{ K}$$

Again

$$\frac{T_2}{T_1} = 1 - \eta$$

$$\text{or } \frac{300}{T_1} = 1 - \frac{50}{100} = \frac{1}{2}$$

$$\text{or } T_1 = 600 \text{ K}$$

17(1)

$$dU_1 = dU_2 = dU_3$$

$$Q_1 > Q_2 > Q_3$$

Because

$$\Delta Q = \Delta W + dU$$



Change in internal energy independent of path and work depends on path and the heat required increases as the work done increases.

$$\therefore \Delta Q_1 > \Delta Q_2 > \Delta Q_3$$

18(3)

$$x = a \sin \omega t$$

$$\text{and } y = b \sin(\omega t + \pi) = -b \sin \omega t.$$

$$\text{or } \frac{x}{a} = -\frac{y}{b} \text{ or } y = -\frac{b}{a} x$$

It is an equation of a straight line

19(2)

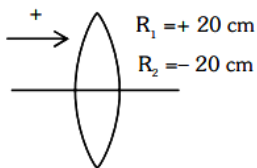
In forced vibration, the resonance wave becomes very sharp when damping force is small (i.e., negligible)

20(3)

$$R_1 = R_2 = 20 \text{ cm} = 0.2$$

$$\mu = \frac{3}{2}$$

$$P = \frac{1}{f} = (\mu - 1) \left( \frac{1}{R_1} - \frac{1}{R_2} \right)$$



$$\begin{aligned} P &= \left( \frac{3}{2} - 1 \right) \left( \frac{1}{0.2} + \frac{1}{0.2} \right) \\ &= \frac{1}{2} \left( \frac{0.2}{0.2} \right) \\ &= \frac{10}{2} \\ &= +5D \end{aligned}$$

21(1)

Time required for a point to move from maximum displacement to zero displacement is

$$t = \frac{T}{4} = \frac{1}{4n}$$

$$\Rightarrow n = \frac{1}{4t} = \frac{1}{4 \times 0.170} = 1.47 \text{ Hz}$$

22(1)

$$\text{As } v = \frac{1}{2L} \sqrt{\frac{T}{\mu}}$$

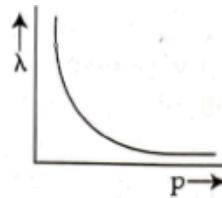
$$\frac{\Delta v}{v} = \frac{1}{2} \frac{\Delta T}{T}$$

$$\frac{\Delta T}{T} = 2 \frac{\Delta v}{v} = 2 \times \frac{6}{600} = 0.02$$

23(1)

$$\lambda = \frac{h}{p}$$

Graph will be hyperbolic



24(3)

For conductors  $\alpha$  is (+)ve

For semiconductors & Insulators  $\alpha$  is (-)ve

25(2)

$$H = i^2 R t$$

$$80 = (2)^2 \times R \times 10$$

$$R = \frac{80}{40} = 2 \Omega$$

26(2)

Using the relation  $[m = Z \times i \times t]$

where  $Z$  is its electrochemical equivalent,  $i$  is current,  $t$  is time and  $m$  is the mass deposited or liberated.

Amount of mass deposited or liberated at an electrode is directly proportional to amount of charge.

27(1)

Kirchhoff's first law of electrical circuit is based on conservation of charge and Kirchhoff's second law of electrical circuit is based on conservation of energy.

28(3)

$$R = \frac{pl}{A} = \frac{pl^2}{Al} = \frac{pl^2}{V} \text{ (V - volume of the wire)}$$

Due to elongation, the length of the wire will increase, its area of cross-section will decrease, but its volume will remain constant.

$$\Rightarrow R \propto l^2$$

$$\Rightarrow \frac{R}{R'} = \frac{l^2}{(2l)^2}$$

$$R' = 4R$$

$$\therefore R' = 4 \times 4 = 16 \Omega$$

29(2) placed inside an iron can

30(4)

Self-inductance of solenoid =  $\mu n^2 A l$

n = number of turns per unit length

$\therefore$  Self-induction  $\mu n^2$

So, inductance becomes 4 times when n is doubled.

31(2)

Initially speed is zero, then increases & after some time it becomes constant. Acceleration (slope of v/t curve) of ball first decreases and after some time it becomes zero.

32(3)

Order of wavelength from shortest to longest :

Gamma rays < X-rays < Green light < Orange light < Microwaves

Thus Microwaves has the longest wavelength.

33(3)

For a thin prism [Assumed to be small]

$i + e = A + \delta(i)$

for minimum deviation since it emerges normally,

$i = 0$

$\delta = (\mu - 1)A(ii) \therefore i + A + \delta$

Using (i) and (ii)

$i = A + (\mu - 1)A$

$i = A + \mu A - A$

$i = \mu A$

34(3)

Given that refractive index of liquid is equal to refractive index of lens.

$\Rightarrow n_{\text{lens}} = n_{\text{liquid}}$

Let the focal length be f.

From lens maker's formula,

we get  $\frac{1}{f} = \frac{(n_{\text{lens}} - n_{\text{liquid}})}{n_{\text{liquid}}} \left( \frac{1}{R_1} - \frac{1}{R_2} \right)$

Here  $n_{\text{lens}} = n_{\text{liquid}}$

$\Rightarrow \frac{1}{f} = 0$

Therefore the focal length will be infinite.

35(3)

Wavelength of blue light,  $\lambda_b = 4360 \text{ \AA}$

Wavelength of green light,  $\lambda_g = 5460 \text{ \AA}$

Center distance of fourth bright fringe  $y_4^{\text{th}} = n \lambda \frac{D}{d}$ ,

So, for constant D & d,  $y \propto \lambda$

As we know,  $\lambda_b < \lambda_g$ ,

therefore  $y_b < y_g$

**SECTION : B**

36(2)

Work function =  $\frac{hc}{\lambda_0}$ ; where  $\lambda_0$  is threshold wavelength.

$$\therefore \frac{w_{01}}{w_{02}} = \frac{\lambda_{02}}{\lambda_{01}} = \frac{2}{1}$$

37(4)

Power of the source  $P_0=5W$

Power at the distance  $r$  from source,

$$P = \frac{P_0}{4\pi r^2} \quad \dots(1)$$

Each photon emits one electrons.

Also,  $P \propto N$  .....(2)

$N$  is the number of photons (or photo electrons).

From (1) and (2) we get, number of photo

electrons  $N \propto \frac{1}{r^2}$

$$\Rightarrow \frac{N_2}{N_1} = \frac{r_1^2}{r_2^2}$$

Given :  $r_1=0.5m$        $r_2=1m$

$$\frac{N_2}{N_1} = \frac{0.5^2}{1^2} = \frac{1}{4}$$

38(1)

As  $r \propto n^2$ , therefore, radius of 2nd Bohr's orbit =  $4a_0$ .

39(2)

$$\frac{h}{c} = eV_0 + \phi_0$$

$$= 10eV + 2.75eV = 12.75eV$$

$$\text{But } \frac{hc}{\lambda} = 13.6 \left[ \frac{1}{12} - \frac{1}{n^2} \right] eV$$

$$\Rightarrow 1 - \frac{1}{n^2} = \frac{12.75}{13.6}$$

$$\Rightarrow \frac{1}{n^2} = 0.0625$$

$$\Rightarrow n^2 = \frac{10000}{625} = 16$$

$$\Rightarrow n=4$$

40(2)

From binding energy curve, the curve reaches peak for  ${}^{56}_{26}Fe$ .

41(4)

Solar energy is mainly caused due to the fusion of protons during the synthesis of heavier elements as the core of the sun is full of hydrogen, and with the help of temperature fusion takes place, and helium is produced which releases a large amount of heat

that causes hotness of sun and hence solar energy produces.

42(3)

As,  $E = mc^2$

$$1000 * 10^3 * 3600 = m (3 * 10^8)^2$$

(we took  $1000 \times 10^3$  since KW)

Therefore, by solving the above calculation we get,

$$m = 40 \text{ microgram}$$

43(3)

$[MLT^{-2}A^{-2}] = \text{Magnetic permeability}$

44(3)

$$\frac{I_C}{I_E} = 0.96$$

$$\Rightarrow I_C = 0.96 I_E \quad \dots(i)$$

Also, we know,

$$I_E = I_B + I_C$$

$$\Rightarrow I_E = I_B + 0.96 I_E \quad \dots\dots\dots[\text{from (i)}]$$

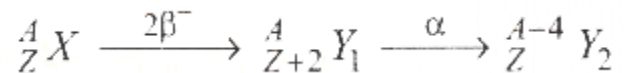
$$\Rightarrow I_B = 0.04 I_E \quad \dots(ii)$$

Current gain for common emitter amplifier,

$$\beta = I_C / I_B = 0.96 I_E / 0.04 I_E$$

$$= 24$$

45(3)



The resultant daughter is an isotope of the original parent nucleus.

46(4)

finding total energy

Total energy =  $1/2 CV^2 = \text{energy density} \times \text{volume}$ ,

$$\text{where } C = \frac{\epsilon_0 A}{d}, V = Ed \quad U = \left(\frac{1}{2} \epsilon_0 E^2\right)(Ad)$$

47(4)

In forward bias, p-side is at higher potential and n-side is at lower potential.

48(2)

For an electron accelerated through a potential  $V$ ,

$$\lambda = \frac{12.27}{\sqrt{v}} \text{ \AA}$$

$$= \frac{12.27 \times 10^{-10}}{\sqrt{1000}}$$

$$= 12.27 \times 10^{-12} \text{ m}$$

49(2)

At thermal equilibrium with heavy water,  $E_k = 3/2 kT$

momentum,  $p = \sqrt{2mE_k}$

$$p = \sqrt{2m \frac{3}{2} kT}$$

and  $\lambda = h/p$

$$\lambda = \frac{h}{\sqrt{3mkT}}$$

50(4) Number of turns,  $n = 100$

Radius,  $r = 0.01 \text{ m}$

Resistance,  $R = 10\pi^2 \Omega$

As we know,

$$\epsilon = -N \frac{d\phi}{dt}$$

$$= \frac{\epsilon}{R} = -\frac{N}{R} \frac{d\phi}{dt}$$

$$\Delta I = -\frac{N}{R} \frac{d\phi}{dt}$$

$$\frac{\Delta}{\Delta t} = -\frac{N}{R} \frac{\Delta\phi}{\Delta t}$$

$$\Rightarrow \Delta q = -\left[\frac{N}{R} \frac{\Delta\phi}{\Delta t}\right] \Delta t$$

-ve sign shows that induced emf opposes the change in flux

$$\Delta q = \frac{\mu_0 n i \pi r^2}{R}$$

$$\Delta q = \frac{4\pi \times 10^{-7} \times 100 \times 4 \times \pi \times (0.01)^2}{10\pi^2} = 32 \mu\text{C}$$



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## Chemistry solution

### Section : A

51(1)

1 mole  $\text{CCl}_4$  vapours =  $12 + 4 \times 35.5 = 154\text{g}$

At STP, volume of 1 mole of a gas =  $22.4\text{L}$

Thus,  $154\text{g} = 22.4\text{L}$

$$\therefore \text{Density of } \text{CCl}_4 \text{ vapours} = \frac{154}{22.4} \text{gL}^{-1}$$

$$= 6.87 \text{gL}^{-1}$$

52(4)

$$\text{Average atomic mass} = \frac{A_1 \times X_1 + A_2 \times X_2 + A_3 \times X_3}{100}$$

Where,

A = Isotopic mass

X = Percentage of occurrence

$$\text{Average atomic mass} = \frac{200 \times 90 + 199 \times 8 + 202 \times 2}{100}$$

$$\text{Average atomic mass} = 199.96$$

53(4)

Total number of subshells =  $(2l+1)$

$\therefore$  Maximum number of electrons in the subshell

$$= 2(2l+1)$$

$$= 4l+2$$

54(2)

Electronic configuration of element within atomic number 118 will be  $[\text{Rn}]5f^4 6s^2 6p^6$ .

Since its electronic configuration in the outermost orbit ( $ns^2 np^6$ ) resembles with that of inert or noble gases, therefore it will be a noble gas element.

55(2)

Li, Be, B, C - these elements belong to the same period. Generally the value of 1st ionisation potential increases in moving from left to right in a period, since the nuclear charge of the elements also increase in the same direction. But the ionisation potential of boron ( $\text{B} \rightarrow 2s^2 p^1$ ) is lower than that of beryllium ( $\text{Be} \rightarrow 2s^2$ ), since in case of boron, 2p1 electron have to be removed to get  $\text{B}^+$  [ $\text{B} (2s^2 p^1) \rightarrow \text{B}^+ (2s^2) + e^-$ ], while in case of Be, 2s2 electron have to be removed to get  $\text{Be}^+ (2s^1)$ . p electron can be removed more easily than s electron so the

energy required to remove electron will be less in case of boron. The order will be  $\text{Li} < \text{B} < \text{Be} < \text{C}$ .

56(3)

Polarity of the bond depends upon the electronegativity difference of the two atoms forming the bond. Greater the electronegativity difference, more is the polarity of the bond.

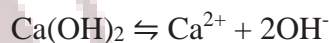
N - F

3.04-4.0

57(4)

Like  $\text{O}_2$  molecule, sulphur (atomic number = 16) exists as  $\text{S}_2$  molecule in a vapour state and it is paramagnetic due to the presence of two unpaired electrons in antibonding  $\pi$  molecule orbitals.

58 (1)



$$\text{pH} = 9$$

Hence

$$\text{pOH} = 14 - 9$$

$$= 5$$

$$[\text{OH}^-] = 10^{-5} \text{M}$$

$$\text{Hence } [\text{Ca}^{2+}] = \frac{10^{-5}}{2}$$

$$\text{Thus, } K_{\text{sp}} = [\text{Ca}^{2+}][\text{OH}^-]^2$$

$$= \frac{10^{-5}}{2} \times (10^{-5})^2$$

$$= 0.5 \times 10^{-15}$$

59 (3)

$$k = \frac{2.303}{t} \log \frac{[A]_0}{[A]_t}$$

99 % completed reaction,

$$k = \frac{2.303}{t} \log \frac{100}{1}$$

$$= \frac{2.303}{t} \log 10^2$$

$$= \frac{2.303}{t} \times 2 \log 10$$

$$t = \frac{2.303}{k} \times 2 \log 10$$

$$= \frac{2.303}{k} \times 2$$

$$= \frac{4.606}{k}$$

60(2)

IUPAC nomenclature

119 → Ununennium → Uue

61(1) Thermosetting polymers are NOT reusable.

62(1)

SRP :  $E_{Zn^{2+}/Zn}^0 < E_{Fe^{2+}/Fe}^0 < E_{Cu^{2+}/Cu}^0 < E_{Ag^+/Ag}^0$

Reactivity order : Zn > Fe > Cu > Ag

In case of displacement reaction, more reactive metals (lower SRP) can displace less reactive metals (higher SRP) from their salt solution.

$CuSO_4(aq.) + 2Ag(s) \rightarrow Cu(s) + Ag_2SO_4(aq.)$

63(2)

$CuS \Rightarrow S^2 = 10^{-37} \Rightarrow S = 3.16 \times 10^{-19}$

$Ag_2S \Rightarrow 4S^3 = 10^{-44} \Rightarrow S = 1.357 \times 10^{-15}$

$HgS \Rightarrow S^2 = 10^{-54} \Rightarrow S = 1.0 \times 10^{-27}$

Order of Solubility is:

$Ag_2S > CuS > HgS$

64(4)

Buffer solutions achieve their resistance to pH change because of the presence of an equilibrium between the acid and its conjugate base or the base and its conjugate acid.

From the given list, NaOH is a strong base and HCl and HNO<sub>3</sub> are strong acids. So they cannot be used as buffers. HNO<sub>2</sub> is weak acid and NaNO<sub>2</sub> is a salt formed by the combination of weak acid HNO<sub>2</sub> and a strong base NaOH. So HNO<sub>2</sub> and NaNO<sub>2</sub> can be used as buffer.

65(2)

Temporary hardness is due to presence of bicarbonates of calcium and magnesium and permanent hardness is due to the sulphates or chlorides of both of calcium and magnesium.

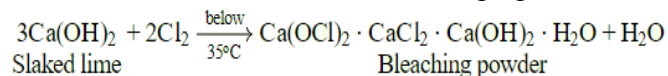
66(4)

The thermal stability of hydrides of alkali metals decreases down the group as the size of the alkali metals increase, they can be decomposed easily. Smaller is the size of the cation and larger is the size of the anion, stronger is the covalent bond (Fajan's Rule).

So, the correct order of thermal stability of hydrides of alkali metals is LiH > NaH > KH > RbH > CsH.

67(2)

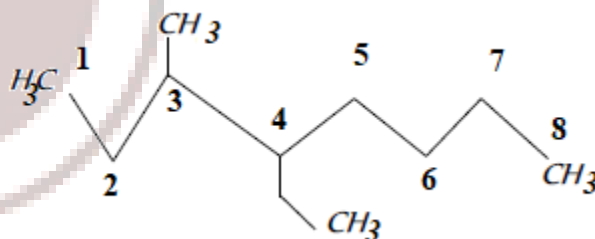
Calcium hypochlorite is an inorganic compound with formula Ca(OCl)<sub>2</sub>. It is the main active ingredient of commercial products called bleaching powder, chlorine powder, or chlorinated lime, used for water treatment and as a bleaching agent



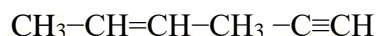
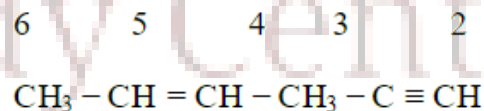
68(4)

In aromatic system all the carbon and hydrogen atoms are present in one plane and all C-C bond lengths are same due to resonance and all carbon atoms have sp<sup>2</sup> hybridisation, so the bond angle is 120°.

69(2)



70(2)



We have been asked to find out the hybridization of carbon as 1, 3 and 5, just count the no. of sigma (σ) bonds to decide the state of hybridization of the Carbon

1<sup>st</sup> carbon: → 2σ bonds and 2π bonds

∴ sp hybridized

3<sup>rd</sup> carbon: → 4σ bonds and no π bonds.

∴ sp<sup>3</sup> hybridized

5<sup>th</sup> carbon: → 3σ bonds and 1π bond

sp<sup>2</sup> hybridized

∴ the correct answer is option D. — sp (1<sup>st</sup> carbon), sp<sup>3</sup> (3<sup>rd</sup> carbon) and sp<sup>2</sup> (5<sup>th</sup> carbon).

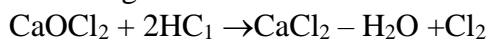
71(4)



or cellophane membrane while the ions of the electrolyte can pass through it.

80(1)

When bleaching powder reacts with HCl, it forms chlorine gas

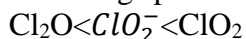


81(1)

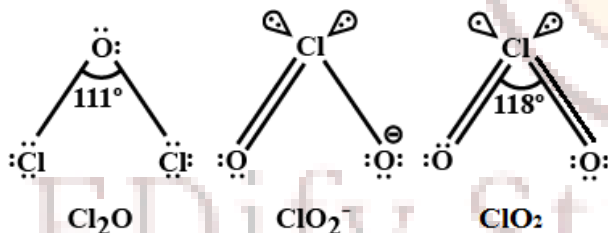
$\text{XeF}_2$  has the maximum number of lone pairs of electrons. Number of lone pair of electrons for  $\text{XeF}_2$  is 3.

82(3)

The correct order of increasing bond angles in the following species is



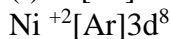
This is because, in  $\text{ClO}_2^-$  there are two lone pairs of electrons which repel each other due to which two oxygen atoms come closer leading to decrease in bond angle. Therefore the bond angle in  $\text{ClO}_2^-$  is less than  $118^\circ$  which is bond angle in  $\text{ClO}_2$  which has less number of electrons on chlorine.



83(4)

All actinides show different oxidation states such as +2, +3, +4, +5 and +7. However, +3 oxidation state is most common among all the actinides. The wide range of oxidation states of actinides is attributed to the fact that the 5f, 6d and 7s energy levels are of comparable energies. Therefore, all these three subshells can participate.

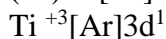
84(4)



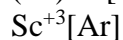
2 unpaired  $e^-$   $s \rightarrow$  paramagnetic.



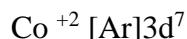
0 unpaired  $e^-$   $s \rightarrow$  diamagnetic.



1 unpaired  $e^-$   $s \rightarrow$  paramagnetic.



0 unpaired  $e^-$   $s \rightarrow$  diamagnetic.



3 unpaired  $e^-$   $s \rightarrow$  paramagnetic.

Ions which are paramagnetic show colour in aqueous solution.

85(4)

In diamond each carbon is bonded with four other carbon atoms. So hybridisation of carbon atom is  $sp^3$ .

In graphite each carbon is bonded with three other carbon atoms. So hybridisation of carbon atom is  $sp^2$ .



## SECTION : B

86(2)

i) Statement-1 is correct because in point defects of ionic solid electrical neutrality is essential condition (given question is example of metal deficiency defect)

(ii) Statement-2 is correct because In Frenkel defect cation dislocate from lattice site to interstitial position.

(iii) Both statement are correct but statement-2 is not correct explanation of statement-1

87(2)

The quantitative determination of active hydrogens in a chemical substance by means of adding methylmagnesium iodide in pentyl ether to the solution of substrate and quantitatively measuring the volume of gaseous methane evolved is generally known as the Zerewitinoff determination.

88(1)

It is the most stable among the above compound. The stability of the above compound is due to the -I effect of three chlorine atom.

89(2)

Acetaldehyde reacts only with nucleophiles. Since the mobile n-electrons of carbon oxygen double bond are strongly pulled towards oxygen, carbonyl carbon is electron-deficient and carbonyl oxygen is electron-rich. Thus, the electron deficient carbonyl carbon is most susceptible to attack by electron rich nucleophilic reagent, i.e. by base

90(2)

The Rosenmund reaction is a hydrogenation process where molecular hydrogen reacts with acyl chloride in the presence of palladium or barium sulfate catalyst.

Barium sulfate reduces the activity of palladium due to its low surface area, thereby preventing over reduction.

91(1)

Li - Electrochemical cells

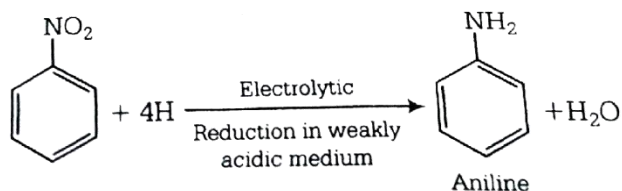
Na - Coolant in fast breeder reactors

KOH - absorbent for CO<sub>2</sub>

Cs - Photoelectric cell.

92(3)

Electrolytic reduction of nitrobenzene in a weakly acidic medium gives aniline but in a strongly acidic medium, it gives p-aminophenol through the acid-catalyzed rearrangement of the initially formed phenylhydroxylamine.



93(1)

Product	Molecule	ATP
Glycolysis	2 ATP 2NADH	8ATP
Krebs cycle NADH	3 (in two cycle)	18 ATP
FADH <sub>2</sub>	4 (in two cycle)	4 ATP
GTP	2 (in two cycle)	2ATP
Oxidative decarboxylation	2 NADH (in two cycle)	6ATP
Total		38

94(3)

Thyroxine or T<sub>4</sub> is produced by the thyroid gland. It is secreted in blood and reaches organs such as the liver, kidneys by travel.

Here it is converted into its active form. The active form of thyroxine is triiodothyronine.

95(2)

Electron deficient hydride → Less than 8e (B<sub>2</sub>H<sub>6</sub>)

Electron precise hydride → having 8e- without l.p. (GeH<sub>4</sub>)

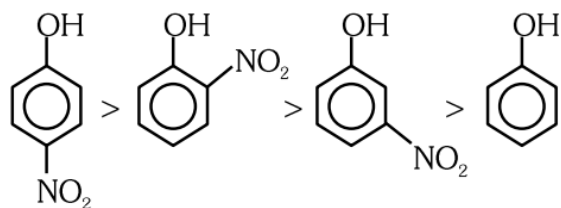
Electron rich hydride → having 8e- with l.p. (HF)

Ionic → MgH<sub>2</sub>

96 (1)

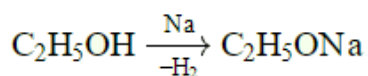
Acidic strength of phenolic group increases due to electron withdrawing groups.

Order of acidic strength

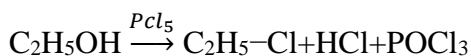


97(3)

The compound A is ethanol C<sub>2</sub>H<sub>5</sub>OH. The compound A on treatment with Na gives sodium ethoxide (C<sub>2</sub>H<sub>5</sub>ONa) which is compound B.



The compound A on treatment with PCl<sub>5</sub> gives ethyl chloride (C<sub>2</sub>H<sub>5</sub>-Cl) which is compound C.



B and C react together to give diethyl ether.



A, B and C are in the order C<sub>2</sub>H<sub>5</sub>OH, C<sub>2</sub>H<sub>5</sub>ONa, C<sub>2</sub>H<sub>5</sub>Cl.

98(1)

PbF<sub>4</sub> and SnF<sub>4</sub> are ionic in nature.

99(2)

Atomic mass of Li=7

$$\text{No. of atoms of O}_2(\text{g}) = \frac{1}{32} \times 2 \times N_A$$

$$\text{No. of atoms of Li(s)} = \frac{1}{7} \times N_A$$

$$\text{No. of atoms of Ag(g)} = \frac{1}{108} \times N_A$$

$$\text{No. of atoms of Mg(s)} = \frac{1}{24} \times N_A$$

∴ 1 g of Li has maximum number of atoms.

100(3)

Steam distillation is the most suitable method of separation of 1:1 mixture of ortho and para nitrophenols as there is intramolecular H-bonds in ortho nitrophenol.

**Solutions**  
**Botany**  
**Section : A**

101 (3)

In sweet pea (*Pisum sativum*), the placentation is marginal, in which, the placenta develops along the junction of two carpels, in a unilocular ovary. In basal placentation, the ovules are few or reduced to one and are borne at the base of ovary e.g. *Compositae*.

In axial placentation, margins of carpels fold inwards, fusing together in center of the ovary to form a single central placenta. The ovary is divided into as many locales, as there are carpels, e.g. *Hibiscus*, *Asphodelus*. Free-central placentation possesses a placenta arises as a central upgrowth from ovary base, e.g. *Stellaria*.

102(2)

In opposite phyllotaxy, two leaves are borne on the opposite sides of a single node. It is of two types; (a) opposite and superposed, (b) opposite and decussate. *Ocimum*, guava and *Calotropis* have opposite decussate phyllotaxy.

103 (4)

Tracheids are non-perforated. They have only pit pairs, at the regions of union with other tracheids. Conduction of water and minerals is not as efficient as in vessels. Tracheids are found in pteridophytes, most of the gymnosperms.

104 (4)

*Acetabularia* used in Hammerling's nucleocytoplasmic experiment is unicellular uninucleate green algae. Hammerling's experiment of *Acetabularia* involved exchanging rhizoid and stalk. Presence of hereditary information in the nucleus was proved by the work of Hammerling on single celled alga *Acetabularia*.

105(4)

A prokaryotic flagellum is not surrounded by any membrane. It consists of a single thread. The thread is made up of numerous identical spherical protein sub-units called flagellin. Each subunit is about  $40^0$  A in a diameter. The flagellin subunits are arranged in helical spirals and form a hollow cylinder. Each flagellum is about  $120-150^0$  A thick.

106 (4)

Cytochromes are iron-containing protein. It helps in the generation of ATP by electron transport chain. It helps in the transfer of electrons by oxidation and reduction. The iron present in the cytochrome gets converted into  $Fe^{2+}$  into  $Fe^{3+}$ . It also transfers electrons between complex III and complex IV during electron transport chain. Cytochrome oxidase is a metalloprotein, integral to the mitochondrial membrane, which contains copper and iron.

107. (1)

Gobar gas contains mainly  $CH_4 + CO_2$ .

108. (3) Methanogens like *Methanobacterium* are found in the rumen (a part of the stomach) of cattle. A lot of cellulosic material is also available in the rumen. In rumen, these bacteria help in the breakdown of cellulose and play an important role in nutrition of cattle.

109. (3)

Historically it was believed that 38 ATP is produced from 38 ADP. But the current estimate is that about 30 molecules of ATP are formed when glucose is completely oxidised to  $CO_2$ .

110 (1)

B-DNA is helical structure with  $20 \text{ \AA}$  diameter and the distance between the two base pairs is  $3.4 \text{ \AA}$  and there are 10 base pairs in each turn or pitch (one round). Hence, one turn of the helix is approximately  $34 \text{ \AA}$  or  $3.4 \text{ nm}$  ( $10 \text{ \AA} = 1.0 \text{ nm}$ ). Z-DNA (in comparison to B-DNA) is left handed double helical structure in which double helix winds to left in zig-zag pattern (instead of right, like B-DNA).

111(2)

During S phase or synthetic phase the replication of DNA takes place. For replication of DNA histone proteins are required so they are also synthesized during this phase. It takes about 30%- 50% of the total cell cycle. Prophase and telophase are stages involved in mitosis or meiosis. During  $G_2$  phase division of centrioles, mitochondria and chloroplasts occurs.

112(4)

Stomata are present on the lower side of the plant leaf, an adaptation for better gaseous exchange so that these stomata remain protected from direct sun rays there can be gaseous exchange without transpiration.

So, the correct answer is 'Stomata on lower surface away from direct sun rays'.

113(1)

Minerals absorbed by roots move to the leaf through xylem. Xylem plays an important role in conduction of water. Hence, when water moves upward through xylem, minerals are also absorbed by the roots and move towards leaves through xylem only. This is known as ascent of sap.

114 (2)

Frankia, is a nitrogen fixing symbiotic bacteria. It induces root nodules just like Rhizobium. It is associated symbiotically with the root nodules of several non-legume plants like Casuarina, Alnus, Rubus etc. It cannot fix nitrogen in free state.

115 (2)

Rate of yield is dependent of light as photosynthesis is dependent on light. Maximum rate of photosynthesis occur when light is brightest. But during monsoon, the light is dim and so this reduces rate of photosynthesis and hence yield.

116 (3)

The fixation of one  $\text{CO}_2$  molecule through the Calvin cycle requires 3 ATP molecules and two  $\text{NADPH}_2$  molecules.

- At the end of each Calvin cycle, the net increase is 9ATP and 6  $\text{NADPH}_2$ . In each Calvin cycle, 3  $\text{CO}_2$  particles are fixed with RuBP to make 2 molecules of 3PGA in the 1st step. Far ahead two molecules of 3PGA through a series of reactions renew 2RuBP in the third stage. So, for the fixation of one  $\text{CO}_2$  through the Calvin cycle needs 3ATP and 2 $\text{NADPH}_2$

117(3)

- Photoperiodism can also be defined as the developmental responses of plants to the relative lengths of light and dark periods.

- A plant that flowers regardless of the length of the period of light it is exposed to is called as day neutral plant.

- For example, Rice, corn and cucumber, tobacco.

- This was first studied in tobacco plants which were grown on long or short photoperiods followed by 5 minutes of red or far red radiation each day.

118 (4) During aerobic oxidation of pyruvic acid, first of all there is activation of pyruvic acid in which NAD and coenzyme react with pyruvic acid and oxidative decarboxylation takes place leading to the formation of acetyl Co-A. In this process, lipoic acid amide (LAA), thiamine pyrophosphate (TPP) and NAD are essential to perform this reaction.

119 (3)

Phytochrome is a chromoprotein (photosensitive pigment) that exists in two states, pr (red) or P660 and Pfr, (far red) or P730. Phytochrome is involved in photomorphogenetic responses, seed germination, bud dormancy, synthesis of gibberellin and ethylene and photoperiodism.

120 (1) Generative cell was destroyed by laser but a normal pollen tube was still formed because vegetative cell is not damaged. Vegetative cell determines and helps in growth of pollen tubes.

121 (2) In angiosperms, triple fusion is required for the formation of endosperm. Triple fusion refers to the vegetative fertilisation, i.e. the fusion of nucleus of a male gamete with the two polar nuclei or the diploid secondary (fusion) nucleus. Triple fusion converts central cell into triploid primary endosperm cell which forms the endosperm a nutritive tissue.

122(1)

Some plants such as Viola (common pansy), Oxalis, and Commelina produce two types of flowers- chasmogamous flowers which are similar to flowers of other species with exposed anthers and stigma, and cleistogamous flowers which do not open at all. In such flowers, the anthers and stigma lie close to each other. When anthers dehisce in the flower buds, pollen grains come in contact with the stigma to effect pollination. Thus, cleistogamous flowers are invariably autogamous as there is no chance of cross-pollen landing on the stigma. Cleistogamous

flowers produce assured seed-set even in the absence of pollinators.

123 (2)

An octamer of 4 histones complexed with DNA forms nucleosome. The association of histones with DNA is very characteristic. It involves the formation of linear array of spherical structures called nucleosomes. These structures contains four pairs of histones (H<sub>2</sub>A, H<sub>2</sub>B, H<sub>3</sub> and H<sub>4</sub>) in a ball; around which is wrapped a stretch of about 150 base pairs of DNA.

124 (4)

A nucleosome is an octamer of histone proteins and has a core of 8 molecules of histone proteins (two each of H<sub>2</sub>A, H<sub>2</sub>B, H<sub>3</sub> and H<sub>4</sub>) wrapped by two turns of DNA

125 (4)

Gene mapping is a powerful tool used to identify and record the location of genes and the distances between genes on a chromosome. The salivary gland chromosomes in the dipteran larvae are very useful in gene mapping because they have endoreduplicated chromosomes. These chromosomes are formed due to the process of endoduplication or endopolyploidy or endomitosis. In this process, the nuclear membrane does not rupture but chromosomes become double and they do not separate from each other. Thus the endoreduplicated chromosomes serve the best for gene mapping.

126 (1)

The increased vigour displayed by the offspring from a cross between genetically different parents is called heterosis. Hybrids from crosses between different crop varieties (F<sub>1</sub> hybrids) are often stronger and produce better yields than the original varieties.

127 (2)

Translation is the process of protein synthesis in which the triplet base sequences of mRNA molecules is converted into a specific sequence of amino acids in a polypeptide chain, this occurs on ribosomes.

128 (4)

Genome refers to the total sets of chromosomes carried by each cell of the organism. In prokaryotes the genetic material is circular and single stranded DNA. It has no association of histones. The eukaryotic genetic material is linear and double stranded DNA. It is associated with histone proteins to form nucleosome unit.

129(2)

Bordeaux mixture is prepared by dissolving copper sulphate, and calcium hydroxide in water. Bordeaux mixture was discovered as a fungicide to treat the downy mildew appeared in a severe form in 1885. Pierre marie alexis millardet discovered the bordeaux mixture as a fungicide.

130(1)

Vegetative reproduction is the process of multiplication in a small part or portion of the plant body which functions as a propagule and develops into a new individual. Thus, vegetative reproduction does not involve meiosis; hence, recombination and no loss of heterozygosity

131 (2)

The ripe banana is the most suitable medium for the culture of *Drosophila melanogaster*. It has high sugar content which acts as a great source of sugar for the microorganisms. Moist bread is used for the fungus *Rhizopus* as a culture medium and agar-agar is a tissue culture medium.

132 (1)

Diversification in plant life appeared due to long periods of evolutionary changes. Initially plants were thalloid. There were no differentiation among root, stem and leaves. Vascular tissues were absent. By the evolutionary changes occurred for longer period, diversification in plants were appeared.

133(3)

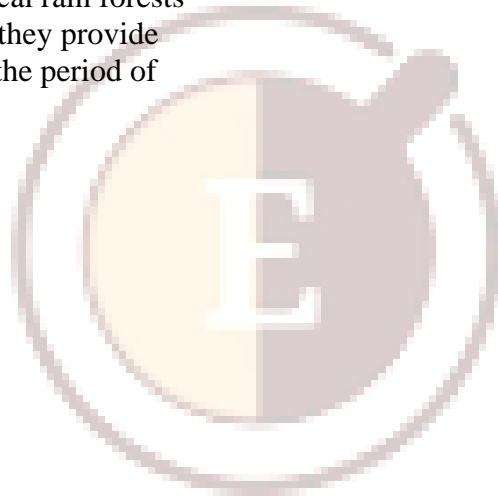
*E.coli* is the most common indicator of water pollution. It naturally occurs in the intestines of human beings and animals. They are commonly found in sewage and if *E.coli* are detected in water then it indicates fecal contamination. So if *E.coli* are detected in drinking water it indicates a serious health risk and that water should not be used for drinking.

134(1)

Non-symbiotic bacteria are also called free-living nitrogen fixing bacteria e.g. Azotobacter. They are agriculturally important

135 (1)

Keystone species is a species which has significant and disproportionately large influence on the community. Removal or decrease in number of keystone species causes disruption in structure and function of community. For example in intertidal regions star fish feeds on mussels. Removal of star fish leads to dominance of mussels that excludes algae and browsing species. In tropical rain forests fig functions as keystone species as they provide fruit to a number of animals during the period of food scarcity.



EDify Study Center

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**Neelesh Sir (9898966050)**



## Section : B

136 (2)

Klinefelter syndrome is a sex chromosome disorder in boys and men that results from the presence of an extra X chromosome in cells. People typically have 46 chromosomes in each cell, two of which are the sex chromosomes. Females have two X chromosomes (46,XX), and males have one X and one Y chromosome (46,XY). Most often, boys and men with Klinefelter syndrome have the usual X and Y chromosomes, plus one extra X chromosome, for a total of 47 chromosomes (47,XXY). Boys and men with Klinefelter syndrome have an extra copy of multiple genes on the X chromosome. The activity of these extra genes affects many aspects of development, including sexual development before birth and at puberty.

137 (1)

Ecology is the branch of science which deals with the study of inter relationship between organisms and their environment. The scope of ecology is very vast as it treats the organisms at the level of population, community and ecosystem. Ethology is the study of evolution significant behaviour of people in their natural surroundings. Phytogeography is the branch of biogeography that is concerned with the geographic of plant species.

138 (2)

Since A and B genes are linked, the parental genotypes "AB/ab" and "ab/ab" will produce only non-cross over gametes. Recombinant gametes are not produced here; the genotype AAbb is product of fusion of recombinant gametes (Ab x Ab) which makes option A wrong. Since the second parent does not have "AB" gamete, AABB genotype cant be obtained from a cross between AB/ab and ab/ab.

Parent generation "AB/ab" x "ab/ab"

Gametes :		
AB/ab -->	AB	ab
ab/ab		
ab	AaBb	aabb
ab	AaBb	aabb

Offspring genotypic ratio = 1 AaBb: 1 aabb.

139 (1)

Trophic structure of ecosystem is a type of producer-consumer arrangement, in which each food level is called trophic level and the graphical representation of trophic structure of ecosystem constitutes ecological pyramids. The green plants are producers and represent the first trophic level (T1). So bamboo plant is the first trophic level (T1).

140(3)

Fresh weight of organisms and their body parts comprises of water content along with the actual dry weight. The fresh weight is deviating w.r.t metabolism and availability in the same organism or different organisms taken under observation. This makes the standard comparison difficult. Hence, fresh weight is not used for the construction of the ecological pyramid.

141 (1)

Biomass is organic material formed by the decomposition of dead plants and animals. The living forms such as plants and animals can be replenished by reproduction. Hence, biomass is a renewable and sustainable source of energy. It is used to generate electricity or other forms of energy.

142 (1)

Diversification in plant life appeared due to long periods of evolutionary changes. Initially plants were thalloid. There were no differentiation among root, stem and leaves. Vascular tissues were absent. By the evolutionary changes occurred for longer period, diversification in plants were appeared.

143 (1)

Biofuels are the substances which are of biological origin and can be used as a source of energy. Jatropha has been used as a biofuel in India. The seeds of Jatropha contain an inedible oil which can be converted to biodiesel. The seed cake (residue left after extraction of oil from seeds) can be used as fertilizer or food for cattle. The biodiesel of Jatropha oil emits 80% less carbon dioxide on burning than other fuels. So, the correct answer is 'Jatropha'.

144 (3)

According to the Central Pollution Control Board (CPCB), particulate size 2.5 micrometres or less in diameter (PM<sub>2.5</sub>) are responsible for causing the greatest harm to human health. These fine particles can be inhaled deep into lungs and can cause breathing and respiratory symptoms, irritation and inflammation, damage to lungs and premature deaths.

145(1)

1. A growth curve represents population growth over a period of time.
2. Asymptote in a logistic curve is obtained when carrying capacity(K) is equal to the number of individuals in the population(N).
3. The line of the graph will be constant up to a point when there is an increase in population or decrease in resources (due to various reasons).

146(4)

There are three types of Archaeobacteria. These are methanogens, halophiles, and thermoacidophiles. Halophiles (salt-loving) are the extremophile organisms that can survive in extreme saline conditions.

147(3)

=> There are four types of chromosomes based on the position of centromere. These are metacentric, submetacentric, acrocentric and telocentric. Submetacentric chromosomes are L-shaped as in these chromosomes one arm is short and other arm is long.

=> Lampbrush chromosomes are special type of chromosomes that are found in the immature eggs of many animals like amphibian oocytes but not in mammals. These are formed during the diplotene

stage of meiotic prophase I. They are bivalent, that is made up of two conjugating homologues.  
=> Polytene chromosomes are giant chromosomes. They are commonly seen in two-winged flies. They result due to repeated rounds of DNA replication without any cell division.  
=> Chromosomes are of two types, allosomes and autosomes. Allosomes are sex chromosomes. In human, these are of two types, X and Y.

148. (3)

All the four statements are correct.

149(4)

Any organisms that live off or feed on other dead, decaying or decomposed organic matter are called saprophytes.

Parasites are plants or animals that live in or on another living thing, getting their food from it while it is still alive. The organisms that they live on are called hosts. Hosts never benefit from parasites.

A lichen is not a single organism; it is a stable symbiotic association between a fungus and algae and/or cyanobacteria. Like all fungi, lichen fungi require carbon as a food source; this is provided by their symbiotic algae and/or cyanobacteria, that are photosynthetic.

Mycorrhizae are symbiotic relationships that form between fungi and plants. The fungi colonize the root system of a host plant, providing increased water and nutrient absorption capabilities while the plant provides the fungus with carbohydrates formed from photosynthesis.

150. (3)

In male frog the sperms will move from Testes → Vasa efferentia → Kidney → Bidder's canal → Urinogenital duct → Cloaca.



**ZOOLOGY SOLUTION**  
**SECTION : A**

151(4)

Gambusia is a species of freshwater fish. It is remarkably hardy, surviving in waters of very low oxygen saturations, high salinities and high temperatures. For these reasons, this species may now be the most widespread freshwater fish in the world, having being introduced as a biocontrol in certain countries to control mosquitoes. It feeds on larval and pupal stages of mosquitoes.

152(2)

Organisms that give rise to young ones are called viviparous and organisms that lays egg are called oviparous. Mammals generally give birth to young ones. Oviparous mammal is platypus and echidna.

153(1)

Radial symmetry is a basic body plan in which the organism can be divided into similar halves by passing a plane at any angle along a central axis, characteristic of sessile and bottom-dwelling animals, as the sea anemone and starfish.

154(1)

Platyhelminthes are acoelomate animals, characterized by the absence of coelom while annelids are true coelomate having a well-developed schizocoelous coelom. The acoelomate animals lack the body cavity between body walls and the digestive tract.

155(1)

All pulses belong to family Fabaceae. This family is known for protein rich pulses.

156(3)

Involuntary smooth muscles are those muscles that are not under the control of our will and are without any striations (stripes). Iris has involuntary smooth muscle. Biceps of upper arm have striated muscle fibres and abdominal wall has involuntary smooth muscles. Heart wall has involuntary striated muscle.

157(2)

During prolonged fasting, the body undergoes several biochemical and hormonal changes to make up for the lack of food and hence energy so as to be able to continue the vital processes needed for

existence. The glycogen and glucose stored in the body last for a short time. After these, the body moves onto the adipose tissues or the fat accumulated in the body so that the store of vital proteins in the body gets spared or is utilized at last.

158(1)

Carbon dioxide is transported from tissues to respiratory surface by only plasma and erythrocytes. Carbon dioxide (CO<sub>2</sub>) transportation by blood is much easier than oxygen due to the high solubility of CO<sub>2</sub> in water. During transport of CO<sub>2</sub>, 7% of CO<sub>2</sub> is dissolved in plasma, 23% as carbaminohaemoglobin and 70% transported as bicarbonates (HCO<sub>3</sub><sup>-</sup>).

159(3) A and O

160(4)

=> Leucocytes or White blood cells (WBCs) can squeeze out through capillary walls into the tissue and reach the site of injury. This process is known as diapedesis.

=> Sudden fall in number of leucocytes is called leucopenia and this increases the chances of infection. Cancer is caused when the number of leucocytes is increased abnormally and this condition is called leukemia (the cancer of white blood cells).

=> Leucocytes are produced in bone marrow. B cells which are a type of lymphocytes (agranular leucocytes) are also produced in spleen and lymph nodes.

=> Leucocytes contain a nucleus and hence they are nucleated.

161(4)

Fibrinogen is a plasma protein involved in the coagulation of blood. During any tissue injury, it is converted by thrombin into fibrin. Fibrin forms blood clots and helps to stop bleeding.

Albumins are involved in maintaining the osmotic pressure of blood.

A small amount of amylase in the blood is called serum amylase.

Globulins include immunoglobins which are involved in maintaining immune system of the body.

162(2)

Osmoregulators use physiological mechanisms to maintain a more or less constant internal osmolarity.

Terrestrial animals must osmoregulate since evaporation and excretion are unavoidable sources of water loss, and replacement water is not always readily accessible.

Hence, the terrestrial animals must conserve water in order to maintain the osmolarity of their body fluids.

163(4)

Usually, there are 12 pairs of ribs, but occasionally these may be 11, 13 or even 14 pairs. The first seven pairs of ribs are known as true ribs. Pairs 8, 9, 10 are false ribs, they are attached indirectly to sternum by means of cartilages. Last two pairs (11 and 12) do not reach to the sternum and are known as 'floating ribs'.

164(1)

Vagus nerve is Xth cranial nerve. It is mixed in nature having both sensory and motor fibres.

165(4)

During the transmission of nerve impulse through a nerve fibre, the potential on the inner side of the plasma membrane is the First negative, then positive and again back to negative.

166(2)

Nicotine is found in the leaves of tobacco. It acts as both stimulant as it mimics the acetylcholine and also as the depressor. It stimulates passage of nerve impulses causes muscles to relax.

167(3)

Parkinsonism is caused by degenerations of neurons in Substantia Nigra tract which are essentially dopaminergic. This striatum controls muscle tones and coordinates movements. An imbalance is caused by deficiency of dopamine (an inhibitory neurotransmitter) vis a vis. Epinephrine (cholinergic which is an excitatory neurotransmitter) results in motor deficits. Hence to restore a balance central anticholinergics are given. Parkinson's disease is a clinical picture characterized by tremor, rigidity, slowness of movement, and postural instability. The commonest symptom is tremor, which often affects one hand, spreading first to the leg on the same side and then to the other limbs. The patient has an expressionless face, an unmodulated voice, an increasing tendency to stoop, and a shuffling walk.

168(2)

In meroblastic cleavage zygote divides partially. This type of cleavage is found in mesolecithal and centrolecithal eggs like eggs of reptiles, birds, insects and egg-laying mammals.

169(2)

Each spermatogonium is produced from the premordial germ cell then actively grows to a larger primary spermatocyte. Each primary spermatocyte divides meiotically and produces haploid secondary spermatocytes.

170(3)

Spermatogenesis is the process by which haploid spermatozoa develop from germ cells in the seminiferous tubules of the testis.

So the correct option is 'Spermatogonia, Spermatocyte, Spermatid, Spermatozoa'.

171(1)

Biogeography is the study of the geographical distribution of life forms on earth. Darwin undertook a voyage on the ship HMS Beagle. The ship traversed the Southern hemisphere where life is most abundant and varied. Along the way, Darwin found different forms of life very different from those in England. As he sailed southward along the South America, he found that similar species replaced each other. He thought that related species could have been modified according to the environment. His views got confirmed on Galapagos islands (small group of Volcanic islands of the Western coasts of South America). Darwin found different modified forms of finches which seemed to have descended from mainland finches as a result of the natural selection.

172(1)

The origin of human races is a much-debated point among scientists studying human evolution. Many scientists argued that different race evolved from Homo erectus independently and that each adapted to a different place-Orientals in Asia, Caucasians in Europe, Aborigines in Australia and so on. Recently Scientists studying mitochondrial DNA from living human all over the world have argued that their research shows that all human races originated from one Homo sapiens ancestor in Africa.

173(4)

The most significant trend in the evolution of modern man (Homo sapiens) from the ancestors is

increasing brain capacity. The human species developed a much larger brain than that of other primates-typically 1,330cm<sup>3</sup> in modern humans, over twice the size of that of a chimpanzee or gorilla.

174(4)

The symptoms of red sickness are ulcerated skin, nausea and loss of hair.

175(4) *Glossina palpalis* - Sleeping sickness

176(1)

Common cold is not cured by antibiotics because they are only effective against bacteria, and not viruses,

Thus antibiotics are usually ineffective against colds because it is caused by viruses.

Sometimes a cold may lead to a bacterial infection, though.

In that case, antibiotics would have a benefit if they were able to prevent that kind of infection.

177(3)

The enzyme-linked immunosorbent assay (ELISA) is a biochemical technique used mainly in immunology to detect the presence of an antibody or an antigen in a sample.

ELISA can be applied to the determination of serum antibody concentrations in a virus test.

In this test antigen coated well is interact with antigen-specific antibody after incubation it is bind with the enzyme linked antibody and then colour containing substrate is added to detect the reaction by colour formation. In this method horse reddish peroxidase and alkaline phosphatase are used.

178(1)

The immune response depends on B and T cells interacting with each other to provide an effective defence. T cells are the coordinators and they stimulate B cells to divide and secrete antibodies into the blood - these antibodies destroy on the antigenic pathogens and the T cells then seek out and kill any of the body's own cells.

179(1)

Lathyrism is caused by excessive consumption of khesari dal. Lathyrism gets its name from scientific

name of khesari dal which is *Lathyrus sativus*. The symptom of the disease is paralysis of both the lower limbs.

180(2)

The infective stage of *Plasmodium* is a minute organism called sporozoite. When the mosquito bites man, sporozoites present in the salivary gland of female *Anopheles* mosquito are injected into the blood of the man. These sporozoites are spindle-shaped or sickle-shaped uninucleate organisms capable of wriggling (worm-like) movements. Each sporozoite consists of elastic pellicle, cytoplasm and nucleus.

181(3)

The phenomenon of sperm activation by which the sperm develops the ability to fertilize ova in mammals is called as capacitation. The secretions of the female reproductive tract remove the coating substances deposited on the surface of the sperms particularly those on the acrosome, thus exposing the receptor sites and making the sperm active to penetrate the egg.

182(1)

Artificial selection to obtain cow yielding higher milk output will shift the peak to one direction, hence, will be an example of Directional selection. In stabilizing selection, the organisms with the mean value of the trait are selected. In disruptive selection, both extremes get selected.

183(1)

The skeletal muscle contraction is caused by calcium ions. These calcium ions bind to the protein complex troponin in order to remove the masking of active site on actin. This results in the exposure of the active-binding sites on the actin for myosin. Once exposed, myosin binds to the actin and Pi is released from the ATP molecule which is bound to myosin. Upon this, myosin comes back to a lower energy state.

184(3)

Nissl bodies or nissl granules or tigroid substances are found in neurons of nerve cells and are made of free ribosomes and rough endoplasmic reticulum (RER).

Neurons are fundamental units of the brain and nervous system its function is to transmit information to other muscle, nerve cells, or gland cells.

185(2)

Statin is obtained from a yeast (Fungi) called *Monascus purpureus*

It acts by competitively inhibiting the enzyme responsible for synthesis of cholesterol.



# EDify Study Center

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**Neelesh Sir (9898966050)**

## SECTION : B

186 (2)

The small intestine is the principal organ for absorption of nutrients. Amino acids like glycine, monosaccharides like glucose absorbed into the blood by active absorption. Fructose is absorbed by facilitated absorption while  $\text{Na}^+$  is by active absorption in the small intestine. Bile acids are absorbed in ileum region by active absorption. Fatty acids, cholesterol are absorbed as chylomicrons by lacteals and then drain into bloodstream. Maltose is broken down into glucose by maltase then that glucose is absorbed by simple diffusion in the small intestine

187 (2)

Collateral glands are present in female cockroach as part of reproductive system. These glands are branched tubular glands opening independently on the dorsal side of the genital chamber. The secretion produced by these glands forms the oothecal case of ootheca

188.(3) Head louse is an obligate ectoparasite of human scalp and as well as laying egg on human hair.

189 (4)

Salmonella Typhi (S. Typhi) are bacteria that infect the intestinal tract and the blood. The disease is referred to as typhoid fever. S. Paratyphi bacteria cause a similar, but milder illness, which comes under the same title.

*Salmonella typhi* is the causative agent.

Confirmatory test = Widal test, it's based on antigen antibody reaction.

190(3)

The colleterial glands open into the vestibulum and secrete most of the protein and tanning agent. The protein may not be directly concerned with ootheca formation, while the latter probably secretes the alkali-resistant outer layer of the ootheca.

The anterior and posterior parts of cockroach secreting the structural protein which produces most of the material used in the formation of the ootheca. So the correct answer is "Colleterial gland".

191(4)

A decrease in pH (increase in  $\text{H}^+$  ion concentration) shifts the standard curve to the right, while an increase shifts it to the left. This occurs because at greater  $\text{H}^+$  ion concentration. So, with increased acidity, the haemoglobin binds less  $\text{O}_2$  for a given  $\text{PO}_2$  (and more  $\text{H}^+$ ). This is known as the Bohr effect.

192(4)

- The sperms develop at a lower temperature than the internal body temperature which is 37 degree Celsius.
- To maintain a lower temperature during spermatogenesis the testis descends in the scrotal sac outside of the abdominal cavity.
- So, the correct option is 'Maintaining the scrotal temperature lower than the internal body temperature'.

193(2)

1. Malignant tertian malaria is a severe form of malarial disease in humans.
2. The symptoms of the disease recur every 48 hours and induce acute cerebral, renal, or gastrointestinal malfunctioning.
3. It is caused by the one of species of plasmodium called *Plasmodium falciparum*.

194(1)

Industrial Melanism is an example of natural selection as due to the darkening of trees, dark-winged moths became fitter for the environment.

195(3)

Cortical nephrons lie in the renal cortex. They have short loop of Henle and no vasa recta. Hence, they are not involved in concentration of urine. They control plasma volume when water supply is normal

196(3)

Protein - Peptide bonds

Unsaturated fatty acid - has  $\text{C}=\text{C}$  double bonds

Nucleic acid - Phosphodiester bonds

Polysaccharide - Glycosidic bonds

197(2)

Each organised skeletal muscle in our body is made up of a number of muscle bundles or fascicles held together by a common collagenous connective tissue layer called fascia. Each muscle bundle

contains a number of muscle fibres. Each muscle fibre is lined by sarcolemma enclosing the sarcoplasm.

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

199(2)

A steroid hormone is a steroid that acts as a hormone. Steroid hormones can be grouped into two classes : Corticosteroids and sex steroids.

Within those two classes are the five types according to the receptors to which they bind : glucocorticoid, mineralocorticoids, androgens, estrogens and progesterone.

So the correct option is "Estrogen".

200(1)

Cardiac output = stroke volume  $\times$  Heart rate

$\Rightarrow$  Cardiac output = 5L or 5000 ml

$\Rightarrow$  Blood volume in ventricles at the end of diastole = 100 ml

$\Rightarrow$  Blood volume in ventricles at the end of systole = 50 ml

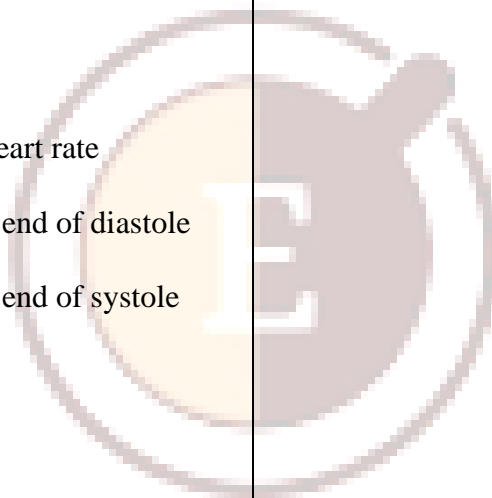
Stroke volume = 100 - 50

= 50 ml.

So,

5000 ml = 50 ml  $\times$  Heart rate

So, Heart rate = 100 beats per minute.



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