

Thomas Tutorials

Date : _____
NEET – 2016
TEST ID: 04

Time : 03:00:00
PCB
Marks : 720

: ANSWER KEY :

1)	b	2)	a	3)	c	4)	d	5)	a	6)	c	7)	a
8)	c	9)	a	10)	a	11)	a	12)	b	13)	c	14)	b
15)	c	16)	b	17)	b	18)	d	19)	a	20)	d	21)	d
22)	d	23)	d	24)	b	25)	b	26)	c	27)	a	28)	c
29)	d	30)	d	31)	c	32)	a	33)	b	34)	a	35)	b
36)	b	37)	b	38)	b	39)	c	40)	d	41)	c	42)	a
43)	d	44)	c	45)	a	46)	b	47)	d	48)	d	49)	b
50)	c	51)	c	52)	c	53)	d	54)	b	55)	c	56)	a
57)	c	58)	d	59)	a	60)	d	61)	c	62)	a	63)	a
64)	d	65)	b	66)	b	67)	b	68)	a	69)	b	70)	c
71)	d	72)	c	73)	a	74)	b	75)	a	76)	c	77)	d
78)	d	79)	b	80)	b	81)	d	82)	d	83)	a	84)	c
85)	a	86)	c	87)	d	88)	a	89)	a	90)	c	91)	b
92)	d	93)	b	94)	b	95)	c	96)	b	97)	b	98)	b
99)	a	100)	c	101)	d	102)	d	103)	d	104)	b	105)	c
106)	c	107)	b	108)	c	109)	c	110)	c	111)	a	112)	c
113)	b	114)	b	115)	b	116)	a	117)	c	118)	c	119)	a
120)	a	121)	c	122)	d	123)	b	124)	a	125)	a	126)	b
127)	a	128)	d	129)	c	130)	a	131)	b	132)	b	133)	c
134)	d	135)	c	136)	a	137)	c	138)	b	139)	d	140)	d
141)	c	142)	a	143)	c	144)	c	145)	c	146)	d	147)	b
148)	b	149)	c	150)	b	151)	c	152)	a	153)	c	154)	b
155)	a	156)	d	157)	c	158)	d	159)	c	160)	b	161)	d
162)	c	163)	d	164)	d	165)	d	166)	b	167)	c	168)	d
169)	d	170)	c	171)	c	172)	c	173)	d	174)	d	175)	d
176)	c	177)	a	178)	c	179)	b	180)	b				

: HINTS AND SOLUTIONS :

Single Correct Answer Type

1 (b)

Given, $p = \frac{a-t^2}{bx}$ or $pbx = a - t^2$

By the law of homogeneity of dimensional equation.

Dimensions of $a = \text{dimensions of } t^2 = [T^2]$

Dimensions of $b = \text{dimensions of } \frac{t^2}{px} = [M^{-1}T^4]$

So, dimensions of $\frac{a}{b}$ is $[MT^{-2}]$.

2

(a)

$\frac{L}{R}$ is a time constant of L - R circuit so *Henry/ohm* can be expressed as *second*

3

(c)

From equation of motion, we have

$$s = ut + \frac{1}{2}gt^2$$

Where, u is initial velocity, g the acceleration due to gravity and t the time.

For upward motion

$$h = -ut_1 - \frac{1}{2}gt_1^2 \quad \dots (i)$$

for downward motion

$$h = -ut_2 + \frac{1}{2}gt_2^2 \quad \dots (ii)$$

multiplying Eq. (i) by t_2 and Eq. (ii) by t_1 and subtracting Eq. (ii) by Eq. (i), we get

$$h(t_2 - t_1) = \frac{1}{2}gt_1t_2(t_2 - t_1)$$

$$h = \frac{1}{2}gt_1t_2 \quad \dots (iii)$$

When stone is dropped from rest $u = 0$, reaches the ground in t second.

$$\therefore h = \frac{1}{2}gt^2 \quad \dots (iv)$$

Equating Eqs. (iii) and (iv), we get

$$\frac{1}{2}gt^2 = \frac{1}{2}gt_1t_2$$

$$\Rightarrow t^2 = t_1t_2 \Rightarrow t = \sqrt{t_1t_2}$$

- 4 **(d)**
Maximum tension = $m\omega^2r = m \times 4\pi^2 \times n^2 \times r$
By substituting the values we get $T_{\max} = 87.64 \text{ N}$

- 5 **(a)**
 $v = K(y\hat{i} + x\hat{j})$
 $v_x = Ky$
 $\frac{dx}{dt} = Ky$

Similarly, $\frac{dy}{dt} = Kx$

Hence $\frac{dy}{dx} = \frac{x}{y}$

$\Rightarrow ydy = xdx$, by integrating

$$y^2 = x^2 + c$$

- 6 **(c)**
 $\vec{F}\Delta t = m\Delta\vec{v} \Rightarrow F = \frac{m\Delta\vec{v}}{\Delta t}$

By doing so time of change in momentum increases and impulsive force on knees decreases

- 7 **(a)**

Let R be the reaction of base of lift and g the acceleration due to gravity, acting downwards. Their resultant provides the net acceleration to the lift. Therefore,

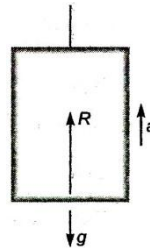
$$R - mg = ma$$

$$\Rightarrow R = m(g + a)$$

$$\text{Also, } R = mg'$$

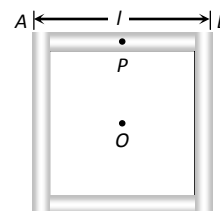
$$\Rightarrow g' = g + a$$

Therefore, net acceleration increases and hence, reading indicated by spring balance will increase.



- 8 **(c)**
As the ball bounces back with same speed so change in momentum = $2mv$
And we know that force = rate of change of momentum
i.e. force will act on the ball so there is an acceleration

- 9 **(a)**
Moment of inertia of rod AB about point P and perpendicular to the plane = $\frac{Ml^2}{12}$



$$\text{M.I. of rod } AB \text{ about point } 'O' = \frac{Ml^2}{12} + M\left(\frac{l}{2}\right)^2 = \frac{Ml^2}{3}$$

(By using parallel axis theorem)
But the system consists of four rods of similar type so by but the symmetry $I_{\text{System}} = 4\left(\frac{Ml^2}{3}\right)$

- 10 **(a)**
Force does not produce any torque because it passes through the centre (Point of rotation) and we know that if $\tau = 0$ then $L = \text{constant}$

- 11 **(a)**
Gravitational force does not depend on the medium.

- 12 **(b)**
For most materials, the modulus of rigidity, G is one third of the Young's modulus, γ
 $G = \frac{1}{3}\gamma$ or $\gamma = 3G$

$$\therefore n = 3$$

13 (c)

$$\begin{aligned} &\text{Relative density of solid} \\ &= \frac{\text{weight in air}}{\text{weight in air} - \text{weight in water}} \end{aligned}$$

$$\Rightarrow \text{Relative density of solid} = \frac{120}{120-80} = \frac{120}{40} = 3$$

$$\begin{aligned} &\text{Relative density of liquid} \\ &= \frac{\text{weight in air} - \text{weight in liquid}}{\text{weight in air} - \text{weight in water}} \end{aligned}$$

$$\begin{aligned} \Rightarrow \text{Relative density of liquid} \\ &= \frac{120 - 60}{120 - 80} = \frac{60}{40} = \frac{3}{2} \end{aligned}$$

14 (b)

The streamlines of air for a ball which is moving and spinning at the same time is as shown in figure below. The ball is moving forward and relative to it the air is moving backwards. Therefore, the velocity of air above the ball relative to it is larger and below it is smaller. The streamlines thus get crowded above and rarified below. This difference in the velocities of air results in the pressure difference between the lower and upper faces and there is a net upward force on the ball. This dynamic lift due to spinning is known as magnus effect

15 (c)

Temperature of liquid oxygen will first increase in the same phase. The phase change (liquid to gas) will take place. During which temperature will remain constant. After that temperature of oxygen in gaseous state will further increase.

16 (b)

First law of thermodynamics is infact, the law of conservation of energy.

17 (b)

$$\begin{aligned} \Delta Q &= \Delta U + \Delta W \\ \Rightarrow \Delta U &= \Delta Q - \Delta W = Q - W \text{ [using proper sign]} \end{aligned}$$

18 (d)

Since $v_{rms} \propto \sqrt{T}$. Also mean square velocity

$$\overline{v^2} = v_{rms}^2$$

19 (a)

$$T = 2 = 2\pi \sqrt{\frac{M}{k}}$$

$$\text{and } 2 + 1 = 2\pi \sqrt{\frac{M+4}{k}}$$

$$\text{or } 3 = 2\pi \sqrt{\frac{k+4}{k}} \text{ so } \frac{4}{9} = \frac{M}{M+4}$$

$$\text{or } 4M + 16 = 9M \text{ or } M = \frac{16}{5} = 3.2 \text{ kg}$$

20 (d)

$$x = x_0 \cos\left(\omega t - \frac{\pi}{4}\right)$$

$$\text{Acceleration, } a = \frac{d^2x}{dt^2}$$

$$= -\omega^2 x_0 \cos\left(\omega t - \frac{\pi}{4}\right)$$

$$= -\omega^2 x_0 \cos\left(\omega t + \frac{3\pi}{4}\right)$$

$$\text{So, } A = \omega^2 x_0$$

$$\text{and } \delta = \frac{3\pi}{4}$$

21 (d)

Speed of sound $v \propto \sqrt{T}$ and it is independent of pressure

22 (d)

As \vec{E} is a vector quantity

23 (d)

At an instants

$$T \cos \theta = mg \quad \dots (i)$$

$$T \sin \theta = F_e \quad \dots (ii)$$

$$= \frac{ka^2}{x^2}$$

From Eqs. (i) and (ii), we have

$$\frac{ka^2}{x^2} = mg \tan \theta$$

$$\Rightarrow q^2 = \frac{mg}{k} \frac{x}{2l} x^2 \left(\tan \theta \approx \frac{a}{2l} \right)$$

$$\Rightarrow q^2 = \frac{mg}{2kl} x^3 \quad \dots (iii)$$

$$\Rightarrow 2q \frac{dq}{dt} = \frac{3mg}{2kl} x^2 \frac{dx}{dt}$$

$$\Rightarrow 2 \left(\frac{mg}{2kl} x^3 \right)^{\frac{1}{2}} \frac{dq}{dt} = \frac{3mg}{2kl} x^2 v$$

$$\left[\because q = \left(\frac{mg}{2kl} x^3 \right)^{\frac{1}{2}} \right]$$

$$\Rightarrow vx^{1/2} = \text{constant}$$

$$\Rightarrow v \propto x^{-1/2}$$

24 (b)

Electric field

$$E = -\frac{dV}{dx}$$

For I region, $V_1 = \text{constant}$

$$\therefore \frac{dV_1}{dx} = 0$$

$$\therefore E_1 = 0$$

For II region,

$$V_2 = +ve = +f(x)$$

$$\therefore E_2 = -\frac{dV_2}{dx} = -ve$$

For III region.

$$V_3 = \text{constant}$$

$$\therefore \frac{dV_3}{dx} = 0$$

$$\therefore E_3 = 0$$

For IV region, $V_4 = -f(x)$

$$\therefore E_4 = -\frac{dV_4}{dx} = +ve$$

From these values, we have

$$E_2 > E_4 > E_1 = E_3$$

25 (b)

$v_d \propto 1/l$. Therefore, drift velocity is halved

26 (c)

$$R_{t_1} = R_1(1 + \alpha_1 t) \text{ and } R_{t_2} = R_2(1 + \alpha_2 t)$$

$$\text{Also } R_{eq} = R_{t_1} + R_{t_2} \Rightarrow R_{eq} = R_1 + R_2 + (R_1\alpha_1 + R_2\alpha_2)t$$

$$\Rightarrow R_{eq} = (R_1 + R_2) \left[1 + \left(\frac{R_1\alpha_1 + R_2\alpha_2}{R_1 + R_2} \right) \cdot t \right]$$

$$\text{So } \alpha_{eff} = \frac{R_1\alpha_1 + R_2\alpha_2}{R_1 + R_2}$$

27 (a)

$$\sigma_i = \frac{\theta}{i} = \frac{\theta}{iG} \cdot G = \sigma_V G \Rightarrow \frac{\sigma_i}{G} = \sigma_V$$

28 (c)

The induction due to AB and CD will be zero. Hence the whole induction will be due to the semicircular part BC . $B = \frac{\mu_0 i}{4r}$

29 (d)

Magnetic susceptibility

$$X_m = \frac{I}{H}$$

For paramagnetic substance X_m is slightly positive.

31 (c)

Lenz's law restates the law of conservation of energy.

32 (a)

In LCR series circuit, impedance Z of the circuit is given by

$$Z = \sqrt{(R)^2 + (X_L - X_C)^2} \text{ where } X_L = \omega L, X_C = 1/\omega C$$

At resonance $X_L = X_C \therefore Z = R$

33 (b)

For purely capacitive circuit $e = e_0 \sin \omega t$

$i = i_0 \sin \left(\omega t + \frac{\pi}{2} \right)$, i. e., current is ahead of emf by $\frac{\pi}{2}$

35 (b)

Because in dispersion of white light, the rays of different colours are not parallel to each other. Also deviation takes place in same direction

36 (b)

$$5 = (\mu - 1)A = (1.5 - 1)A \Rightarrow A = 10^\circ$$

37 (b)

$$A = n\pi d\lambda \Rightarrow nd = \frac{A}{\pi\lambda} = \text{constant}$$

$\Rightarrow n \propto \frac{1}{d}$ (n = number of blocked HPZ) on decreasing d , n increases, hence intensity decreases

38 (b)

Using Einstein's relation for relativistic mass

$$m = \frac{m_0}{\sqrt{1 - V^2/C^2}} \text{ [} m_0 = \text{rest mass]}$$

$$\Rightarrow \frac{m}{m_0} = \frac{1}{\sqrt{1 - V^2/C^2}}$$

$$\text{Given } \frac{m}{m_0} = 2 = \frac{1}{\sqrt{1 - V^2/C^2}}$$

$$\Rightarrow 1 - \frac{V^2}{C^2} = \frac{1}{4} \Rightarrow \frac{V^2}{C^2} = \frac{3}{4}$$

$$\Rightarrow \frac{V}{C} = \frac{\sqrt{3}}{2} \Rightarrow V = \frac{\sqrt{3}}{2} C$$

39 (c)

$$W_0 \propto \frac{1}{\lambda} \Rightarrow \frac{\lambda_1}{\lambda_2} = \frac{(W_0)_2}{(W_0)_1} = \frac{4.5}{2.3} = \frac{2}{1}$$

40 (d)

$$\text{PE} = 2 \times \text{total energy}$$

$$= 2(-1.5)\text{eV} = -3.0 \text{ eV}$$

41 (c)

$$\text{Remaining material } N = \frac{N_0}{2^{t/T}}$$

$$\Rightarrow N = \frac{10}{(2)^{20/15}} = \frac{10}{2.51} = 3.96 \text{ g}$$

$$\text{So decayed material} = 10 - 3.96 = 6.04 \text{ g}$$

44 (c)

In space communication, the sound waves can be sent from one place to another by superimposing it on undamped electromagnetic waves

47 (d)

Given, % of C = 54.55%

% of H = 9.09%

% of O = 36.36%

Element	%	At. no.	Ratio of atoms	Simplest ratio
C	54.5	12	54.55/12 = 4.54	4.54/2.2 7=2
H	9.09	1	9.09/1 = 9.0	9.09/2.2 7=4
O	36.0	16	36.16/16 = 2.27	2.27/2.2 7=1

∴ Empirical formula is C₂H₄O.

49 (b)

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

$$\text{Here, } v = 3600 \text{ km/h} \\ = 10^5 \text{ cm/s}$$

$$m = 1.0 \text{ mg} = 10^{-3}$$

$$\lambda = \frac{6.626 \times 10^{-27}}{10^{-3} \times 10^5}$$

$$= 6.626 \times 10^{-29} \text{ cm}$$

50 (c)

It reflects trends in physical and chemical properties of the elements

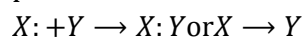
51 (c)

In NaOH, Na⁺ and OH⁻ ions are bonded together

by ionic bond while in OH⁻ ion oxygen and hydrogen atoms are bonded together by covalent bond Na⁺[O - H]⁻.

52 (c)

A coordinate bond is a dative covalent bond in which two atoms form bond and one of them provides both electrons.



54 (b)

The Gibb's-Helmholtz equation is as

$$G = H + T \left(\frac{\partial G}{\partial T} \right)_p$$

Dividing above equation by T²

$$\frac{G}{T^2} = \frac{H}{T^2} + \frac{1}{T} \left(\frac{\partial G}{\partial T} \right)_p$$

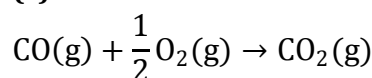
This on arrangement becomes

$$\left[\frac{\partial(G/T)}{\partial T} \right]_p = -\frac{H}{T^2}$$

$$H = T^2 \left[\frac{\partial(G/T)}{\partial T} \right]_p$$

where, H = enthalpy.

55 (c)



$$\therefore q_p = q_v + \Delta nRT$$

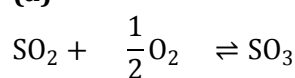
$$\Delta n = 1 - 1\frac{1}{2} = -\frac{1}{2}; R = 2 \text{ cal}, T = 300 \text{ K}$$

$$q_p = q_v + \left(-\frac{1}{2}\right)(2)(300)$$

$$q_p = q_v - 300$$

$$q_p - q_v = -300 \text{ cal}$$

56 (a)



5 mol 5 mol 0 initially

(5 - x) (5 - 1/2 x) x at equilibrium

$$x = \frac{60}{100} \times 5 = 3$$

$$\text{Total number of moles} = (5 - x) + \left(5 - \frac{1}{2}x\right) + x$$

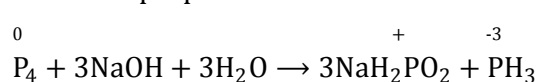
$$= (5 - 3) + \left(5 - \frac{1}{2} \times 3\right) + 3$$

$$= 8.5$$

57 (c)

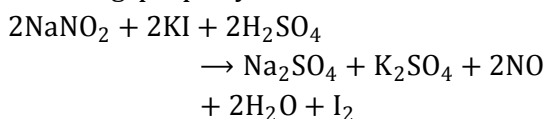
∴ In this reaction phosphorus is simultaneously oxidised and reduced.

∴ It is disproportionation reaction.

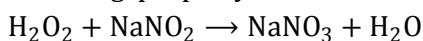


- 58 (d) NaNO_2 (Sodium nitrite) acts both as oxidising as well as reducing agent because in it N-atom is in +3 oxidation state (intermediate oxidation state).

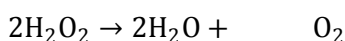
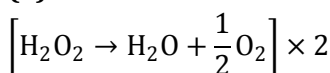
Oxidising property



Reducing property



- 59 (a)



68 g 22.4 L at NTP

\therefore 22.4 L O_2 at NTP is obtained by 68 g of H_2O_2

\therefore 20 L O_2 at NTP will be obtained by H_2O_2

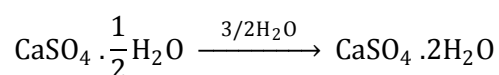
$$= \frac{68}{22.4} \times 20 = 60.7 \text{ g/L}$$

\therefore 1000 mL O_2 at NTP is obtained by $\text{H}_2\text{O}_2 = 60.7 \text{ g}$

$$\therefore \text{Percentage strength} = \frac{60.7 \times 100}{1000} = 6.07 \text{ g}$$

- 60 (d)

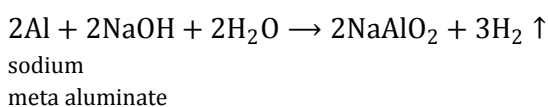
Plaster of Paris absorb water to form monoclinic gypsum which is a hard substance.



monoclinic gypsum

- 61 (c)

Aluminium reacts with caustic soda to form sodium meta aluminate.



- 63 (a)

Chiral carbon atom has all four different groups attached to it.

\therefore It has one asymmetric or chiral carbon atom.

- 66 (b)

Methane gas producing field is paddy field. It is also known as marsh gas

- 67 (b)

In the close packing of 'n' atoms, the number of tetrahedral voids are '2n'. Hence, their number per atom is 2.

- 68 (a)

Mass of one unit-cell (m)

= volume \times density

$$= a^3 \times d = a^3 \times \frac{MZ}{N_0 a^3} = \frac{MZ}{N_0}$$

$$m = \frac{58.5 \times 4}{6.02 \times 10^{23}} \text{ g}$$

\therefore Number of unit cells in 1 g = $\frac{1}{m}$

$$= \frac{6.02 \times 10^{23}}{58.5 \times 4} = 2.57 \times 10^{21}$$

- 69 (b)

$$M = \frac{100 \times k_b \times w}{\Delta T_b \times W}$$

Given, $k_b = 5.2$

w = mass of solute = 6 g

W = mass of solvent = 100 g

ΔT_b = elevation in boiling point = 0.52°C

M = molecular weight = ?

$$\therefore M = \frac{100 \times 5.2 \times 6}{0.52 \times 100} = 60$$

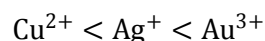
- 70 (c)

$$\text{Molarity} = \frac{\text{moles of solute}}{V \text{ of solution in litre}}$$

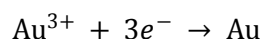
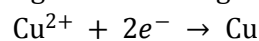
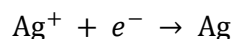
\therefore Molar solution means 1 mole of solute is present in 1 L of solution.

- 71 (d)

The increasing order of deposition of cations at the cathode is



$$E \propto Z$$



3 Faradays liberate 1 mole of Au, 3 moles of Ag and 3/2 moles of Cu. Thus, molar ratio of Ag:Cu:

Au is 3:3/2:1 or 6:3:2.

- 72 (c)

$$N = N_0 \times \left(\frac{1}{2}\right)^n$$

$$\frac{1}{8}N_0 = N_0 \times \left(\frac{1}{2}\right)^n$$

$$N = 3$$

$$T = n \times t_{1/2}$$

$$= 3 \times 14 = 42 \text{ s}$$

- 73 (a)

The temperature coefficient is the ratio of two velocity constants having the difference of 10°C.

Temperature coefficient

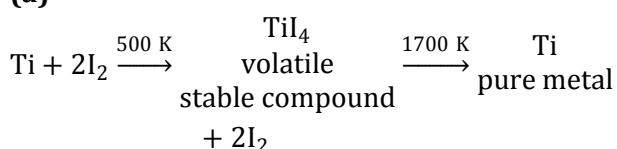
$$= \frac{k_t + 10}{k_t}$$

For most of the reactions its value lies between 2 and 3.

74 (b)

Gold is a lyophobic sol.

75 (a)

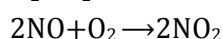
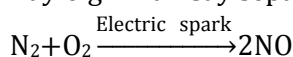


76 (c)

Wolframite is ferrous tungstate (FeWO_4) which is magnetic in nature

77 (d)

Rayleigh -ramsay separation method



78 (d)

Ir does not dissolve in aqua regia as it is much more noble than Au and Pt

79 (b)

Paramagnetism is shown by the positive ions of lanthanides except $\text{La}^{3+}(4f^0)$ and $\text{Lu}^{3+}(4f^{14})$. These ions are diamagnetic

81 (d)

Wurtz's reaction involves the reduction of alkyl halide with Na in ether.

84 (c)

Among the carbonyl compounds, the reactivity decreases with increase in number of alkyl group and size of alkyl group because the positive charge on the carbon atom decreases due to +I effect of alkyl groups.

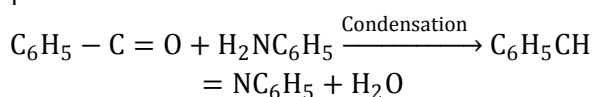
Thus, the correct order reactivity is



86 (c)

Reaction of aniline with benzaldehyde is condensation reaction.

H
|



Benzaldehyde aniline benzylidene aniline

88 (a)

Teflon is a polymer of tetrafluoroethylene. It is used for coating articles and cookware to make them non sticky.

Nylon66 is a polymer of adipic acid and hexamethylenediamine. Glyptal is a polymer of ethylene glycol and phthalic acid. Buna -S is a polymer of butadiene and styrene.

89 (a)

Cellulose acetate has been used in the manufacture of non inflammable pphotographic films.

91 (b)

Mangifera indica, scientific name consists of two words a generic and another specific name. It is binomial system of nomenclature.

The first word denoting the genus start with capital letter, while specific epithets start with small letter

92 (d)

→ A taxon is the taxonomic group of any rank in the system of classification

93 (b)

Binomial system of nomenclature was proposed by Carolus Linnaeus. The system of nomenclature was firsts issued in Species Plantarum. Binomial system approve two name for an organism, i.e., generic and specific name

94 (b)

Some bacteria like *Staphylococcus*, *Micrococcus*, *Salmonella*, *Pseudomonas*, *Escherichia*, *Clostridium*, etc secrete endotoxins which spoil food stuff and cause food poisoning.

95 (c)

Class-Deuteromycetes This class of artificially grouped fungi have no sexual reproduction and are consequently called the fungi imperfecti because their life cycles are imperfect

96 (b)

Though bryophytes are the land plants but water is essential for fertilization. It provides a medium of transport for antherozoids to reach archegonia. Hence, bryophytes are called amphibians of plant kingdom.

97 (b)

In *Spirogyra*, the sexual reproduction involves

the fusion of two morphologically identical isogametes, and physiologically dissimilar anisogametes. This is an advanced feature. In this, the active gamete is known as the male and the passive as the female.

98 (b)

Fishes (super class-Pisces) have two chambered heart (one auricle and one ventricle), with very well developed sinus venosus and conus arteriosus. However lung fishes have three chambered heart (two auricles and one ventricle).

99 (a)

In *Scoliodon* or dog fish, there are present some pores, the ampullary pores on the upper and lower surface of the head, each of which leads into an ampulla (pl. ampullae) called ampulla of Lorenzini. Through these, the fish receives information of the temperature fluctuations in the surrounding water.

100 (c)

While ants are social, colonial and polymorphic insects.

101 (d)

Morphology of Root

(i) They normally constitutes the descending part of plant axis

(ii) They are non-green

(iii) Each functional root is covered by root cap

(iv) Root hairs are present

(v) They are positively hydrotropic

(vi) They don't have nodes and internodes

102 (d)

In mango, coconut, plum, etc., the fruit is known as drupe (stony fruit). They develop from monocarpellary, superior ovaries and are one seeded. In mango, the pericarp is well differentiated into an outer thin Epicarp, a middle fleshy edible mesocarp and an inner stony hard endocarp.

103 (d)

Monocots possess floral parts in multiple of four or five.

104 (b)

Due to vivipary the seeds cannot be stored under normal condition for the next season.

105 (c)

Fusiform initial divided to form secondary phloem on the outer side and secondary xylem on the inner side. With the formation of secondary xylem (tracheary elements) on the inner side, the

vascular cambium moves gradually to the outside by adding new cells. This phenomenon is called dilation.

106 (c)

A-radial, B-conjoint closed, C-conjoint open

1. Radially arranged vascular tissue found in the dicot root

2. When vascular bundle is present in between xylem and phloem it is called open otherwise close-vascular bundle

107 (b)

Red blood cells (RBC_s) or erythrocytes are the most abundant of all the cells in blood. They are devoid of nucleus in most of the mammals and are round or biconcave in shape. It is biconcave because such a shape has increase surface area (for O₂ transfer) and allows easy squeezability of the RBC_s through the blood vessels.

108 (c)

The body of earthworm is divided into hundred short segments, which are similar. The ventral surface is distinguished by the presence of genital openings (pores)

109 (c)

A mitochondria that has its outer membrane removed is called mitoplast.

110 (c)

In eukaryotic cell, a cell wall can have upto three parts-middle lamella, primary wall and secondary wall

111 (a)

All are correct

112 (c)

Such sugars, which give positive tests with Benedict's solution and Tollen's reagent are called reducing sugars. Most monosaccharides and some disaccharides are reducing sugars.

114 (b)

Meiosis occurs in organisms during sexual reproduction

115 (b)

The value of water potential is always negative or less than zero. Water potential of a solution is determined by using pure water as the standard of reference, which has zero water potential at normal temperature and pressure.

The presence of solute particles reduce free energy of the water. Hence, it decreases the water potential in negative value. So, water potential of

a solution is always less than zero

116 (a)

Mineral matter in the soil are responsible for holding the water present in the soil. They are of following 5 types according to their size in ascending order clay, slit, fine sand, coarse sand and gravel. Clay having mineral salt, is more active chemically and shows higher capacity to retain water and ions. A loam soil is made up of ratio 1:2:2 of clay, slit and sand respectively. While sandy soil has little clay matter and shows least retaining capacity and is not fit for plant growth

117 (c)

It is demonstration of transpiration by bell jar experiment. In this experiment a potted plant is placed on a slab and a dry bell jar is inverted over it. Having sealed the edge of jar with wax or Vaseline, the whole apparatus is left undisturbed. After some time the inner surface of bell jar became misty due to transpiration by plant

118 (c)

The technique of growing plants in a nutrient solution is known as hydroponics. Since then, a number of improvised methods have been employed to try and determine the mineral nutrients essential for plants.

The essence of all three methods involves the culture of plants in a soil free, defined mineral solution. These plants in a soil free, defined mineral solution. These methods require purified water and mineral nutrient salts

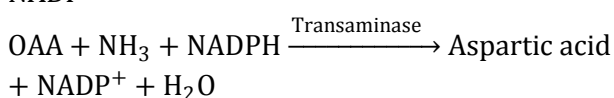
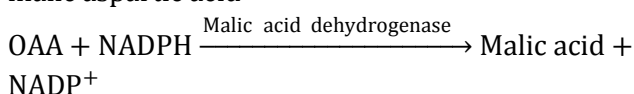
119 (a)

Phosphorus is a constituent of nucleic acids, proteins, NADP⁺, etc. its deficiency causes, poor growth, chlorosis (mottled), necrosis and premature falling of leaves and flowers.

120 (a)

Mesophyll cell.

After the fixing of CO₂ to Oxaloacetic Acid (OAA) in C₄ cycle, the oxaloacetic acid changes into the malic aspartic acid



Both of these reactions occur in mesophyll cell

121 (c)

Triose phosphate isomerase enzyme converts

glyceraldehydes-3 phosphate molecule into dihydroxy acetone phosphate. Then an enzyme **transketolase** comes, which acts on sedoheptulose-7-phosphate molecule and changes it into ribulose-5-phosphate and xylulose-5-phosphate. Then ribulose-5-phosphate isomerase enzyme comes and acts on ribulose-5-phosphate. This reaction has a molecule of ribulose-5-phosphate, while xylulose-5-phosphate molecule is also converted into ribulose-5-phosphate by another enzyme, ribulose-5-phosphate epimerase.

122 (d)

Alcoholic fermentation by yeast causes decarboxylation of pyruvate to acetaldehyde producing CO₂ as byproduct. Acetaldehyde accepts 2H atoms from NADH₂ to produce ethanol.

123 (b)

The TCA cycle starts with the condensation of acetyl group with oxaloacetic acid (OAA) and water to yield citric acid. The reaction is catalyzed by the enzyme citrate synthase and molecule of Co-A is released

124 (a)

Seismonastic movement is a type of nastic movement. It comes in response of touch and this phenomenon is known as seismonasty, e.g., leaflets of *Mimosapudica*.

The nastic movements in response to light, chemical, temperature, etc, are called as photonastic, chemonastic and thermonastic movements respectively.

125 (a)

In coconut, the endosperm is multicellular in the outer part and free nuclear in the centre (i.e., liquid endosperm). The endosperm of coconut contains hormone **cytokinin**.

126 (b)

Geometrical Growth In most system the initial growth is slow (lag phase), and it increases thereafter at an exponential rate (log or exponential phase). Both the progeny cells following mitotic cell division retain the ability to divide and continue to do so. However due to the limited nutrient supply, the growth slows down leading to stationary phase. If we plot the parameter of growth against time, a typical sigmoid curve is obtained.

It has following stages

1. During lag phase, organism adapt themselves to growth conditions. It is the period where the individual organism are maturing and not yet able to divide. During the lag phase of the bacterial growth cycle, synthesis of RNA, enzymes and other molecules occurs
 2. The log phase (sometimes called the logarithmic phase or the exponential phase) is a period characterised by cell doubling. The number of new organism appering per unit time is proportional to the present population.
 3. The stationary phase is often due to a growth-limiting factor such as the depletion of an essential nutrient, and/or the formation of an inhibitory product such as an organic acid. Stationary phase results from a situation in which growth rate and death rate are equal
 4. Death phase, organism run out of nutrients and die
- 127 (a)
A-Oxyntic cells, B-Chief cells, C-Mucous cells, D-Argentaffin cells
- 128 (d)
Cholecystokinin- pancreozymine hormone is secreted by the epithelium of entire small intestine. It stimulates the gall bladder to release bile and pancreas to secrete and release digestive enzymes in the pancreatic juice.
- 129 (c)
A healthy man can inspire or expire approximately 6000 to 8000 mL of air per minute
- 130 (a)
Partial pressure of O₂ is higher in atmosphere as compared to the alveolar air. Due to this pressure gradient, O₂ goes inside the body and same phenomena happens in case of CO₂ but in opposite direction
- 131 (b)
The papillary muscles are attached to the lower portion of the interior wall of the ventricles. They connect to the chordae tendinae, which attach to the tricuspid valve in the right ventricle and the mitral valve in the left ventricle. The contraction of the papillary muscles opens these valves, when the papillary muscles relax, the valves close.
- 132 (b)
Electrocardiograph is not the recording of electrical changes during the cardiac cycle. Rather, it is the graph of electrical activity of the heart
- 133 (c)
The excretory material of bony fishes like *Hippocampus* is ammonia. So, bony fishes are ammonotelic.
- 134 (d)
Reptiles, birds, land snails and insects excrete nitrogenous waste as uric acid in the form of pellet of paste with a minimum loss of water and are called Uricotelic animals.
- 135 (c)
The urine formation includes glomerular filtration. Selective reabsorption and tubular secretion. The glucose is reabsorbed at proximal convoluted tubules.
- 136 (a)
Two f-actins
- 137 (c)
A-Relaxed, B-Contracting, C-Maximally contracted
- 139 (d)
Retina is formed of four layer of cells.
(i) Pigmented epithelium - having melanin pigment granules in cytoplasm.
(ii) Layer of photoreceptors - rods and cones.
(iii) A layer of bipolar neurons - Act as both sensory and conducting neurons.
(iv) Retinal ganglion cells - axons form the optic nerve
- 140 (d)
I, II and III.
Both (a) and (b), *i.e.*, cones and rods
- 141 (c)
Almost all secretion by the pituitary gland are controlled by hormonal signal from hypothalamus
- 144 (c)
Ant, aphids, cockroaches are unisexual only earthworm have both the sexes (hermaphrodite)
- 145 (c)
The period in which the pollen grains remain viable is highly variable. It depends on the temperature and humidity. In some cereals such as rice and wheat, the pollen grains loose viability with in 30 minutes of their release and in some

members of Rosaceae, Leguminosae and Solanaceae, they maintain variability for months

146 (d)

Cleistogamous flowers never open and in them only self-pollination is operated. In *Commelina benghalensis* (kankauoa), the underground flowers are cleistogamous, in which Cleistogamy (a type of self-pollination) occurs.

147 (b)

Boron (B) is an essential micro-element or trace element, which is required for pollen germination, good growth of pollen tube and fertilization.

148 (b)

The cells formed by cleavage are called blastomere.

Implantation

(i) Zygote divides rapidly by mitotic division. This is called cleavage. As a result 2, 4, 8, 16 daughter cells are produced which are termed as blastomeres

(ii) Embryo with 8-16 blastomeres is called a morula

(iii) The morula changes into a large mass of cells called blastocyst, which passes further into the uterus

(iv) Blastomeres in the blastocyst are arranged into an outer layer called trophoblast and an inner group of cells attached to trophoblast called inner cell mass

(v) The trophoblast layer gets attached to the cells of the endometrium and the inner cell mass gives rise to the embryo

(vi) The cells of endometrium divide rapidly and cover the blastocyst

(vii) So, the blastocyst gets embedded in the endometrium of the uterus. This is called implantation, which leads to pregnancy

149 (c)

Fertilized zygote is divided by special type of mitotic divisions, known as **cleavage**. Cleavage increases the number of cells.

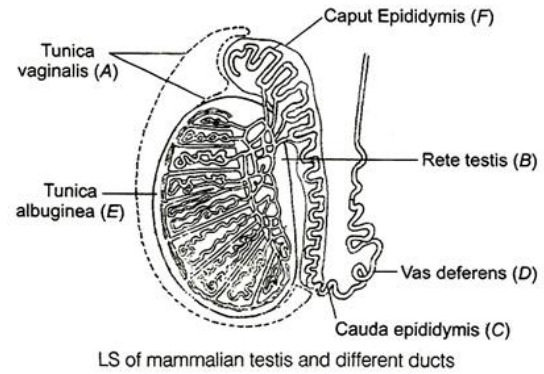
150 (b)

In ovulatory phase, release of ova occurs due to the rapid increase in LH called LH surge. It last for maximum two days

151 (c)

Testis is covered by tough compact fibrous capsule called **tunica albuginea**, which is externally covered by peritoneal layer of flat cells called **tunica vaginalis**; which is supplied by a

network of blood capillaries called **tunica vasculosa**



152 (a)

Oral contraceptive pills increase the risk of intravascular clotting. Therefore, they are not recommended for women with a history of disorders of blood clotting. Administration of oral contraceptives and IUD are effective in 72 hours

153 (c)

Lucknow, India

Research in Reproductive Health It should be encouraged and supported to find out the new methods in reproduction related areas. 'Saheli' a new oral contraceptive for the females was developed by scientists in Central Drug Research Institute (CDRI) in Lucknow

154 (b)

The **Down's syndrome** (Mongolian idiocy) arises due to **trisomy of 21st chromosome**, i.e., total 47 chromosomes will be present in such a person. The main features are mental deficiency, short stature, round face, flaccid muscles, protruding tongue, etc.

155 (a)

If a character is expressed equally in the homozygous and heterozygous conditions, it is called **dominant** and the other character is said to be **recessive**. In the given question, 'Tall' character is dominant over 'dwarf', hence, the cross shows dominance and segregation of traits.

156 (d)

Baldness is not a sex-limited trait. Baldness is a sex-influenced trait.

Linkage is an exception to the principle of independent assortment in heredity.

Galactosemia is a hereditary disease that is caused by the lack of a liver enzyme required to

digest galactose.

Small population size results in random genetic drift in population.

157 (c)

The codon UAA function as stop or termination codon. It does not code for any amino acid and therefore called non sense codon. Hence, the polypeptide synthesis terminated and a polypeptide of 24 amino acids is formed.

Polypeptide chain of 124 amino acids is formed only when the 125th codon works as stop codon.

158 (d)

RNA is genetic material in some viruses like, TMV and Q B bacteriophage

159 (c)

In the first living body, basic organic molecule formed was RNA that served as the genetic material.

Enzymatic activities of RNA molecules are constantly being discovered, but no enzymatic activity has ever been attributed to DNA. Further, ribose is much more readily synthesized than deoxyribose under stimulated prebiotic conditions. A selective advantageous RNA molecule would be one that directs the synthesis of protein that accelerates the replication of particular RNA (*i.e.*, RNA polymerase)

160 (b)

Homologous organs.

Homologous Organs The organs which have the same fundamental structure but are different in functions are called homologous organs. These organs follow the same basic plan of organization during development. But in adult condition, these organs are modified to perform different function as an adaptation to the different environment. Homologous organs are the resultant of divergent evolution

Implants homologous organs may be a those of *Bougainvillea* or a tendril of *Cucurbita*, both arising in the axillary position

161 (d)

When a host is exposed to antigens. Which may be in the form of living or dead microbes or proteins, antibodies are produced in the host body. This type of immunity is called active immunity. All the three options are *via* media through, which an antigen enters into host body

162 (c)

Malaria is widely known human disease caused by infection with pathogenic protozoan, the *Plasmodium*. Female *Anopheles* mosquitoes transmit *Plasmodium* from person to person.

163 (d)

Health is maintained by balanced diet, personal hygiene and regular exercise

165 (d)

Single cell proteins are the dried cells of microorganisms belonging to bacteria, yeasts, moulds, higher fungi and some algae

Bacteria – *Methylophilus methylotrophus*

Yeast – *Candida utilis*

Cyanobacteria - *Spirulina*

166 (b)

Saccharomyces cerevisiae.

Bread is made through fermentation by *Saccharomyces cerevisiae* or commonly called baker's yeast. Yeast species also used in alcoholic fermentation is *S. cerevisiae* (Brewer's yeast)

167 (c)

The starter or inoculum used in preparation of milk products actually contains million of Lactic Acid Bacteria (LAB)

170 (c)

Both statements are corrects.

GEAC was set up by the ministry of environment and forests to regulate research, testing and commercial release of GM crops, food and organisms

The aim and objectives of GEAC are

(i) to permit the use of GM organisms and their products for the commercial applications

(ii) to adopt the procedures for restriction, production a scale, import, export and application of GM organisms

(iii) approval to conduct a large scale field trails and release of transgenic crops in the environment

(iv) to authorise agencies or persons to have large scale production and the release of GM organisms into the environment or curb and take **punitive** action against them

171 (c)

Vector is used to introduce genes into a host cell, where the genes may be amplified or otherwise manipulated, e.g., *A. tumefaciens*.

173 (d)

In accordance to their life style parasite evolved

special adaptation such as loss of digestive systems, loss of unnecessary organs, presence of adhesive organs, origin of suckers and high reproductive capacity accordance to their host

174 **(d)**

Gause's exclusion principle does not always leads to the species exclusion. The competing species may co-exist due to different partitioning like temporal partitioning, spatial partitioning, morphological partitioning.

Darwin found fourteen species of finches to co-exist in Galapagos islands due to development of different feeding habits. Similarly, in Serengeti plains over 20 species of antelopes graze in the same area. Several plants can grow together by sending their roots to various lengths. Therefore, competition does not always result in extinction of species but causes development of larger number of niches

175 **(d)**

The end result of decomposition is the production of dark brown, smelling, humus rich organic matter and inorganic substance like carbon dioxide, water and nutrients

176 **(c)**

Plant → Deer → Python

Plant → Grasshopper → Frog

Plant → Goat → Lion

Plant → Goat → Python

Plant → Deer → Lion

177 **(a)**

The approximate percentage of the earth covered by the terrestrial hot spots is 1.5% (less than 2%)

178 **(c)**

India has nearly 45000 plants and twice as many animals

179 **(b)**

Ecological balance is the maintenance of an equilibrium between living and non-living components of an ecosystem. So, the pollution disturbs the ecological balance.

180 **(b)**

A-diesel, B-petrol, C-42%