Thomas Tutorials

Date : NEET – 2016 **TEST ID: 05**

Time : 03:00:00 **PCB** **Marks :** 720

: ANSWER KEY :

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

Thomas Tutorials

Date : NEET – 2016 **TEST ID: 05**

Time : 03:00:00 **PCB** **Marks :** 720

: HINTS AND SOLUTIONS :

Single Correct Answer Type

1 **(a)**

Required relative error=power × relative error in x.

2 **(b)**

Least count of screw gauge $= \frac{1}{100} mm = 0.01\ mm$

Diameter = Divisions on circular scale × least count +

$= 52 \times \frac{1}{100} + 0 = 0.52\ mm$

Diameter $= 0.052\ cm$

3 **(b)**

Let v be the speed of boatman is still water.

Resultant of v and u should be along AB.

Components of $\vec{v}_b$ (absolute velocity of boatman)along x and y direction are,

$v_x = u - v\sin\theta$

Further, $\tan 45° = \frac{v_y}{v_X}$

or $1 = \frac{v\cos\theta}{u - v\sin\theta}$

$v = \frac{u}{\sin\theta + \cos\theta} = \frac{u}{\sqrt{2}\sin(\theta + 45°)}$

v is minimum at,

$\theta + 45° = 90°$ or $\theta = 45°$

and $v_{\min} = \frac{u}{\sqrt{2}}$

4 **(a)**

$a = 4\pi^2 n^2 r = 4\pi^2 \left(\frac{1}{2}\right)^2 \times 50 = 493\ cm/s^2$

5 **(a)**

Time of flight $= \frac{2u\sin\theta}{g} = \frac{2u_y}{g} = \frac{2 \times u_{\text{vertical}}}{g}$

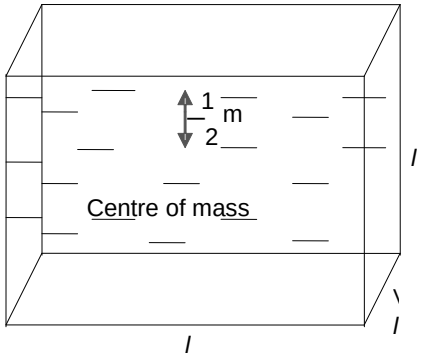
7 **(d)**

We know that,

$\mu = \tan\theta$

$\therefore = \tan 30° = \frac{1}{\sqrt{3}}$

8 **(b)**



$V = I^3 = 1m^3$

$m = 1 \times 1000 = 1000\text{kg}$

$W = mgh = 1000 \times 10 \times \frac{1}{2} = 5000\ \text{J}$

9 **(a)**

$x_1 + x_2 = r$ ...(i)

$m_1 x_1 = m_2 x_2$

From Eqs. (i) and (ii)

$x_1 = \frac{m_2 r}{m_1 + m_2}$

and $x_2 = \frac{m_1 r}{m_1 + m_2}$

$\therefore\ I_{AB} = m_1 x_1^2 + m_2 x_2^2$

$= \frac{m_1 m_2 r^2}{m_1 + m_2}$

10 **(c)**

$\vec{\tau} = \vec{\mathbf{r}} \times \vec{\mathbf{F}} = \left(3\hat{\mathbf{i}} + 2\hat{\mathbf{j}} + 3\hat{\mathbf{k}}\right) \times \left(2\vec{\mathbf{i}} - 3\hat{\mathbf{j}} + 4\hat{\mathbf{k}}\right)$

$= -9\hat{\mathbf{k}} - 12\hat{\mathbf{j}} - 4\hat{\mathbf{k}} + 8\hat{\mathbf{i}} + 6\hat{\mathbf{j}} + 9\hat{\mathbf{i}}$

$= 17\hat{\mathbf{i}} - 6\hat{\mathbf{j}} - 13\hat{\mathbf{k}}$

11 **(c)**

$V_{in} = \frac{-GM}{2R}\left[3 - \left(\frac{r}{R}\right)^2\right], V_{\text{surface}} = \frac{-GM}{R}, V_{out} = \frac{-GM}{r}$

12 **(a)**

$Y = \frac{Fl}{A\Delta l} = \frac{(ml\omega^2)l}{A\,\Delta l}$ or$Y = \frac{ml^2\omega^2}{A\Delta l}$

Or $Y = \frac{1\times1\times1\times20\times20}{10^{-6}\times10^{-3}} = 4 \times 10^{11}\,\mathrm{Nm^{-2}}$

13 **(a)**

$h\rho g = \frac{2S}{r}$ or $h = \frac{2\,S}{r\rho\,g}$

$= \frac{2\times75\times10^{-3}}{\left(\frac{1}{2}\times10^{-3}\right)\times10^3\times10} = 0.03\ \mathrm{m} = 3\ \mathrm{cm}$

14 **(d)**

Surface tension of a liquid is due to force of attraction between like molecules of a liquid *ie* cohesive force between the molecules

15 **(a)**

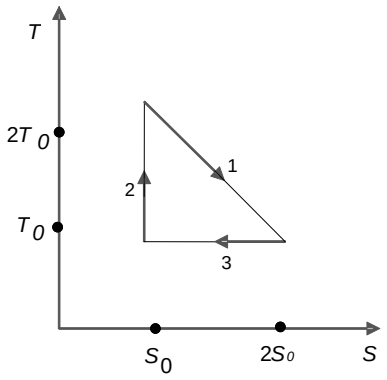
According to Stefan's law

$E \propto T^4$

$\frac{E'}{E} = \left(\frac{3T}{T}\right)^4$ or$E' = 81E$

16 **(c)**

According to the figure



$Q_1 = T_0S_0 + \frac{1}{2}T_0S_0 = \frac{3}{2}T_0S_0$

$Q_2 = T_0(2S_0 - S_0) = T_0S_0$

$Q_3 = 0$

$\eta = \frac{W}{Q_1} = \frac{Q_1 - Q_2}{Q_1}$

$= 1 - \frac{Q_2}{Q_1} = 1 - \frac{2}{3}$

$= \frac{1}{3}$

17 **(a)**

As no work is done and system is thermally insulated from surrounding, it means sum of internal energy of gas in two partitions is constant *ie*, $U = U_1 + U_2$

Assuming both gases have same degree of freedom, then

$U = \frac{f(n_1 + n_2)RT}{2}$

and $U_1 = \frac{fn_1RT_1}{2},\ U_2 = \frac{fn_2RT_2}{2}$

Solving we get,

$T = \frac{(p_1V_1 + p_2V_2)T_1T_2}{p_1V_1T_2 + p_2V_2T_1}$

18 **(d)**

Here, $n = 6$

$C_p = \left(1 + \frac{n}{2}\right)R = \left(1 + \frac{6}{2}\right)R = 4R$

19 **(b)**

As we know$g = \frac{GM}{R^2}$

$\Rightarrow \frac{g_{\text{earth}}}{g_{\text{planet}}} = \frac{M_e}{M_p} \times \frac{R_p^2}{R_e^2} \Rightarrow \frac{g_e}{g_p} = \frac{2}{1}$

Also $T \propto \frac{1}{\sqrt{g}} \Rightarrow \frac{T_e}{T_p} = \sqrt{\frac{g_p}{g_e}} \Rightarrow \frac{2}{T_p} = \sqrt{\frac{1}{2}}$

$\Rightarrow T_p = 2\sqrt{2}s$

20 **(a)**

Time period$T \propto \sqrt{l} \Rightarrow \frac{\Delta T}{T} = \frac{1}{2}\frac{\Delta l}{l} = \frac{1}{2}\alpha\Delta\theta$

Also according to thermal expansion $l' = l(1 + \alpha\Delta\theta)$

$\frac{\Delta l}{l} = \alpha\Delta\theta$

Hence $\frac{\Delta T}{T} = \frac{1}{2}\frac{\Delta l}{l} = \frac{1}{2}\alpha\Delta\theta$

$= \frac{1}{2}\times12\times10^{-6}\times(40-20) = 12\times10^{-5}$

$\Rightarrow \Delta T = 12\times10^{-5}\times86400\ seconds/day$

$\therefore \Delta T \approx 10.3\ seconds/day$

21 **(a)**

In the same phase $\phi = 0$ so resultant amplitude$= a_1 + a_2 = 2A + A = 3A$

22 **(c)**

Total charge $Q = \int_0^r \rho dv = \int_0^r \rho_0\left(\frac{5}{4} - \frac{r}{R}\right)4\pi r^2 dr$

$= 4\pi\rho_0\int_0^r\left(\frac{5r^2}{4} - \frac{r^3}{R}\right)dr = 4\pi\rho_0\left[\frac{5r^3}{12} - \frac{r^4}{4R}\right]$

$E = \frac{KQ}{r^2} = \frac{1}{4\pi\varepsilon_0 r^2}4\pi\rho_0\left[\frac{5}{12}r^3 - \frac{r^4}{4R}\right]$

$= \frac{\rho_0 r}{4\varepsilon_0}\left[\frac{5}{3} - \frac{r}{R}\right]$

23 **(d)**

Frequency or time period of SHM depends on variable forces. It does not depend on constant external force. Constant external force can only

change the mean position. For example, in the given question mean position is at natural length of spring in the absence of electric field. Whereas in the presence of electric field mean position will be obtained after a compression ofx_0. Where $x_0$is given by

$$kx_0 = QE$$

$$x_0 = \frac{QE}{k}$$

24 **(d)**

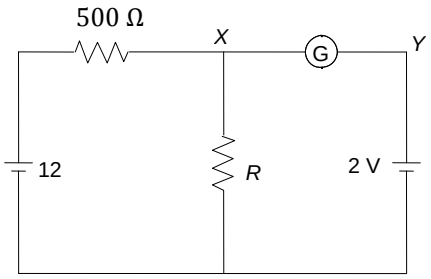
Minimum capacity, $C_s = \frac{5}{10} = 0.5\ \mu F$

Maximum capacity,$C_p = 10 \times 5 = 50\ \mu F$

$$\frac{C_p}{C_s} = \frac{50}{0.5} = 100$$

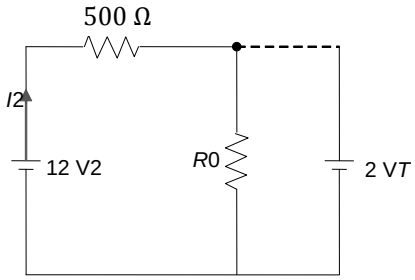
25 **(b)**

The galvanometer shows zero deflection *ie*, current through *XY*is zero.



As a result potential drop across $R$is 2V, circuit can be redrawn as

$$I = \frac{12}{500 + R}$$



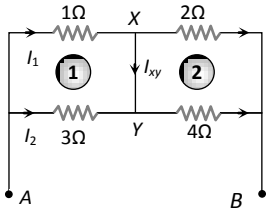
Voltage across $R, V = IR$

$$\Longrightarrow\ 2 = \frac{12}{500 + R} \times R$$

$$\Longrightarrow 1000 + 2R = 12R$$

$$\Longrightarrow R = 100\Omega$$

26 **(c)**



$$-i_1 + 0 \times i_{xy} + 3i_2 = 0\ i.e.\ i_1 = 3i_2 \quad \text{...(i)}$$

Also$-2(i_1 - i_{xy}) + 4(i_2 + i_{xy}) = 0$

$$i.e.\ 2i_1 - 4i_2 = 6i_{xy} \quad \text{...(ii)}$$

Also $V_{AB} - 1 \times i_1 - 2(i_1 - i_{xy}) = 0 \Rightarrow 50 = i_1 + 2(i_1 - i_{xy})$

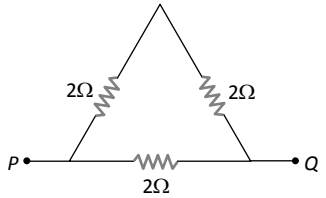
$$= 3i_1 - 2i_{xy} \quad \text{...(iii)}$$

Solving (i), (ii) and (iii), $i_{xy} = 2A$

27 **(a)**

Equivalent resistance of the combination

$$= \frac{(2+2) \times 2}{2+2+2} = \frac{8}{6} = \frac{4}{3}\Omega$$



28 **(c)**

$$r = \frac{mv}{qB} = \frac{6 \times 10^7}{1.7 \times 10^{11} \times 1.5 \times 10^{-2}} = 2.35\ cm$$

30 **(b)**

$B = \mu_0 \mu_r H \Rightarrow \mu_r \propto \frac{B}{H}$ = slope of $B.H$ curve

According to the given graph, slope of the graph is highest at point Q

31 **(c)**

By using $e = \frac{1}{2}Bl^2\omega$

For part $AO;\ e_{OA} = e_O - e_A = \frac{1}{2}Bl^2\omega$

For part $OC;\ e_{OC} = e_O - e_C = \frac{1}{2}B(3l)^2\omega$

$\therefore e_A - e_C = 4\,Bl^2\omega$

32 **(b)**

We know that Q- factor of series resonant circuit is given as

$$Q = \frac{\omega_r L}{R}$$

Here, $L = 8.1$ mH, $C = 12.5\ \mu$F, $R = 10\Omega$, $f =$ 500 Hz

$$\therefore \quad Q = \frac{\omega_r L}{R} = \frac{2\pi f L}{R}$$

$$= \frac{2 \times \pi \times 500 \times 8.1 \times 10^{-3}}{10} = \frac{8.1\pi}{10} = 2.5434$$

33 **(b)**

$P = VI$

$$I = \frac{550}{220} = 2.5\ A$$

35 **(c)**

Magnifying power of a microscope $m \propto \frac{1}{f}$

Since $f_{\text{violet}} < f_{\text{red}}$; $\therefore m_{\text{violet}} > m_{\text{red}}$

36 **(c)**

$P = P_1 + P_2 \Rightarrow P = +2 + (-1) = +1D$

$$f = \frac{+100}{P} = \frac{+100}{1} = 100\ cm$$

37 **(b)**

$B \propto \lambda$

38 **(d)**

The de-Broglie wavelength

$\lambda = \frac{hc}{E} = \frac{1240}{200 \times 10^6}$

$=6.20\times 10^{-6}$ nm $= 6.20$fm

39 **(a)**

By using $\frac{hc}{\lambda} = W_0 + \frac{1}{2}mv^2$

$\Rightarrow \frac{hc}{400 \times 10^{-9}} = W_0 + \frac{1}{2}mv^2$ ... (i)

and $\frac{hc}{250 \times 10^{-9}} = W_0 + \frac{1}{2}m(2v)^2$ ... (ii)

On solving (i) and (ii)

$\frac{1}{2}mv^2 = \frac{hc}{3}\left[\frac{1}{250 \times 10^{-9}} - \frac{1}{400 \times 10^{-9}}\right]$ ... (iii)

From equation (i) and (iii) $W_0 = 2hc \times 10^6 J$

40 **(a)**

Radius of orbit

$r_n = \frac{n^2h^2}{4\pi^2 k^2 m_e^2}$

$r_n \propto n^2$

Energy $E = -Rch\frac{Z^2}{n^2}$

$E \propto \frac{1}{n^2}$

41 **(c)**

$N = N_0 e^{-\lambda t} \Rightarrow \frac{dN}{dt} = -N_0 \lambda e^{-\lambda t}$

$i.e.$, Rate of decay $\left(\frac{dN}{dt}\right)$ varies exponentially with time (t)

43 **(b)**

V_k = knee voltage $= 0.3\ V$

$\therefore$ Resistance $= \frac{\Delta V}{\Delta i} = \frac{(2.3-0.3)}{(10-0)\times 10^{-3}} = 200\Omega = 0.2k\Omega$

44 **(d)**

The virtual height and critical frequency of E-layer is 110 km and 4 MHz

46 **(a)**

Number of atoms in 24 g of C $= \frac{24}{12} \times 6.02 \times 10^{23}$

$=2 \times 6.02 \times 10^{23}$

Number of atoms in

56 g of Fe $= \frac{56}{56} \times 6.02 \times 10^{23}$

Number of atoms in

26 g of Al $= \frac{26}{27} \times 6.02 \times 10^{23}$

$\approx 6.02 \times 10^{23}$

Number of atoms in 108 g of Ag $= \frac{108}{108} \times 6.02 \times 10^{23}$

$= 6.02 \times 10^{23}$

47 **(c)**

$S + O_2 \rightarrow SO_2$

32 g 32 g

1 mole 22.4 L

1 mole of S required volume of $O_2 = 22.4$ L

So, 1.5 mole of S required volume of $O_2 = 22.4 \times 1.5 = 33.60$ L

48 **(d)**

$_{26}Fe = [Ar]3d^6 4s^2$

Fe^{2+}(24 electrons)$=[Ar]3d^6 4s^0$

49 **(b)**

Orbital angular momentum

$= \sqrt{l(l+1)}.\frac{h}{2\pi}$

For $2s$-orbital, $l = o$

$\therefore$ Orbital angular momentum

$= \sqrt{0(0+1)}\frac{h}{2\pi} =$ zero

50 **(a)**

Pauling's electronegativity values for elements are useful in predicting polarity of bonds in molecules.

51 **(d)**

According to Born-Haber cycle the enthalpy of formation (ΔH_f) of an ionic compound may be given as

$\Delta H_f = S + \frac{1}{2}D + I + E + U$

Where, $I =$ ionisation energy

$S =$ sublimation energy

$E =$ electron affinity

$D =$ dissociation energy

$U =$ lattice energy of compound

Born-Haber cycle is used to determine the lattice energy of the compound. It also may be used to calculate electron affinity of an element.

52 **(c)**

Br_2 is a non-polar molecule and hence, its melting point and boiling point depend only upon van der Waals' forces of attraction while all the remaining molecules have dipole moments and hence, their melting points and boiling points depend upon dipole-dipole interactions

54 **(a)**

Isothermally (at constant temperature) and

reversible work.

$W = 2.303\, nRT \log\frac{p_2}{p_1}$

$= 2.303 \times 1 \times 2 \times 300 \log\frac{10}{2}$

$= 2.303 \times 600 \times \log 5 = 965.84$

At constant temperature, $\Delta E = 0$

$\Delta E = q + W, q = -W = -965.84$ cal

55 **(b)**

Step1. P − H bond energy from bond dissociation energy of $PH_3(g)$ containing 3 such P − H bonds $= \frac{228}{3} = 76$ kcal/mol

Step 2. The structure of P_2H_4 is

ie, it contains 4 P − H bonds and one P − P bond, so P − P bond energy can be calculated by 4 × P − H + P − P = bond dissociation energy P_2H_4

∴ P − P bond energy = 335−4(76)

= 31 kcal per mol

56 **(a)**

$[H^+] = C\alpha = \sqrt{K_a.C}$

$pH = -\log(K_a.C)^{1/2}$

$= \frac{1}{2}[-\log K_a - \log C]$

$= \frac{1}{2}[4.74 - \log 10^{-2}]$

$= \frac{1}{2}[4.74 + 2] = 3.37$

57 **(b)**

The oxidation state of Xe in both XeO_2 and XeF_4 is 4.

XeO_2XeF_4

$x + 2(-2) = 0x + 4(-1) = 0$

$x = 4x = 4$

58 **(c)**

The chemical structure of $H_2S_2O_8$ is as follows

$$\begin{array}{c} O \quad\quad O \\ || \quad\quad || \\ H-o-s-o-o-s-o-H \\ || \quad\quad || \\ O \quad\quad O \end{array}$$

$2 \times (+1) + 2 \times x + 6 \times (-2) + 2 \times (-1) = 0$

for H for S for O for O—O

$+2+2x - 12 - 2 = 0$

$2x = +12$

$x = +6$

60 **(b)**

Sodium thiosulphate ($Na_2S_2O_3$) is useful in photography due to its complex formation property. It is used in photography as a fixer since, it dissolves unexposed silver bromide.

62 **(d)**

Generally red lead decompose into PbO and O_2

63 **(d)**

∵ −COOH group is a deactivating group

∴ Benzoic acid is less reactive towards electrophilic substitution.

So, benzoic acid> phenol>*n*-propyl benzene is not arranged correctly.

64 **(a)**

Propyne on passing through red hot iron tube gives mesitylene

65 **(a)**

Terminal alkynes react with ammoniacal $AgNO_3$ to give silver salt as they have acidic hydrogen.

$CH_3 - C \equiv CH + AgNO_3 + NH_4OH \rightarrow$

$CH_3 - C \equiv C.Ag + NH_4NO_3 + H_2O$

67 **(b)**

Doping of silicon with boron leads to p −type semiconductor.

69 **(a)**

Colligative properties depends only upon the number of solute particles. Since, optical activity depends upon the nature of substance (through which plane polarised light is passed), it is not a colligative property.

70 **(d)**

Elevation in boiling point is a colligative property, which depends upon the nmber of particles in solution. $Al(NO_3)_3$ give maximum ions (4 ions) in solution, hence , its elevation in boiling point will be the highest. Hence, boiling point of 0.1 M $Al(NO_3)_3$ solution will be the highest.

71 **(b)**

$Fe^{2+} + 2e^- \rightarrow Fe$

$E_{Fe} = \frac{56}{2} = 28$

$w_{Fe} = E_{Fe} \times$ number of faraday

$= 28 \times 3 = 84$ g

72 **(c)**
The rate of reaction is

$\text{rate} = k[\text{NO}]^2[\text{O}_2]$

When the volume is reduced to $\frac{1}{3}$, the concentration of each reactant is increased by 3 times

$\text{rate}' = k[3\text{NO}]^2[3\text{O}_2]$

$= 27k[\text{NO}]^2[\text{O}_2]$

$\frac{\text{rate}'}{\text{rate}} = \frac{27k[\text{NO}]^2[\text{O}_2]}{k[\text{NO}]^2[\text{O}_2]}$

$\text{rate}' = 27$ rate

73 **(a)**
With increase in temperature reaction rate increases due to increase in number of molecules having threshold energy.

74 **(b)**
When the particles of the adsorbate are held to the surface of the adsorbent by the physical forces, the adsorption is called physical adsorption or physisorption. It is a reversible process and usually occurs at low temperature. The value of adsorption enthalpy is low in this process. It forms multimolecular layers. No activation energy is required in this process.

75 **(d)**
Pyrolusite $-\text{MnO}_2$
Malachite $-\text{CuCO}_3.\text{Cu(OH)}_2$
Diaspore $-\text{Al}_2\text{O}_3.\text{H}_2\text{O}$
Cassiterite $-\text{SnO}_2$

76 **(c)**
Smelting is a process of reducing metal oxide to metal by means of coke or CO
$\text{Fe}_2\text{O}_3 + 3\text{C} \rightarrow 2\text{Fe} + 3\text{CO}$
$\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$

77 **(a)**
$\therefore$ Bondings electrons in white phosphorus $= 6$

78 **(d)**
German silver alloy contains zinc, copper and nickel.

79 **(c)**
German silver is an alloy of copper, zinc and nickel. It is used in utensils and resistance wire.

80 **(d)**
mmol of complex $=30\times0.01 =0.3$ Also, 1 mole of complex $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2$ gives only two moles of chloride ion when dissolved in solution.
$[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \longrightarrow [\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]^{2+} + 2\ \text{Cl}^-$
$\Rightarrow$mmol of Cl^- ion produced from its 0.3 mmol $=0.6$
Hence, 0.6 mmol of Ag^+ would be required for precipitation.
$\Rightarrow$ 0.60 mmol of $\text{Ag}^+ = 0.1\ \text{M} \times V$ (in mL)
$\Rightarrow$ $V = 6$ mL

81 **(c)**

Stability of I>II hence, I is predominant.

84 **(d)**
Clemmensen reduction can be used to convert acetophenone into ethyl benzene as it reduce>C=O group into $> CH_2$

86 **(c)**

Nitration of aniline also gives m-nitro aniline in strong acidic medium because in strong acidic condition protonation of $-NH_2$ group gives anilinum ion ($+NH_3$) which is deactivating in nature and of m-directive nature

89 **(a)**
Caprolactum condenses to form nylon-6.

90 **(c)**
The name of given compound is acetyl salicylic acid which is also known as aspirin, a well known analgesic

91 **(a)**
The correct labelling place on a herbarium sheet is lower corner of page of RHS and generally its size is 7×12 cm

92 **(d)**
In taxonomical hierarchy similarity increases from highest/largest category to lowest categories. Therefore, division has least similar feature as compared to lower categories (species)

93 **(c)**
The first phylogenetic system was proposed by **Eichler**, who is famous for his work entitled 'Bluthen Diagramme' published in two volumes.

94 **(b)**
Fungi is a group of eukaryotic, achlorophyllous, non-photosynthetic heterotrophic organisms of diverse forms, size and mode of reproduction. Fungicause a number of plant and animal diseases, *e*. *g*., black rust of wheat, red rot of sugarcane, late blight of potato, etc.

95 **(a)**
The members of order-Uridinales (Basidiomycetes) are known as rust fungi. Black stem rust of wheat is caused by *Pucciniagraministritici*.

96 **(d)**
Transfusion tissue is present in the leaves of *Cycas*and *Pinus*, made up of horizontally arranged tracheidal cells and is meant for lateral conduction of water and minerals to mesophyll tissue upto margins.

97 **(d)**
All statements are correct

98 **(d)**
Female *Anopheles* feeds on blood of man and large animals, while male *Anopheles* sucks juices of flowers and fruits only. Because of their blood-sucking adaptation, female *Anopheles* causes viral, bacterial and protozoan infections.

99 **(d)**
Generally, cross-fertilization takes place in liver fluke (*Fasciola hepatica*), rarely self-fertilization takes place. Fertilization is internal in liver fluke.

100 **(d)**
Oil of *Chenopodium*, alcopar, bendex, dewormis, meber, etc, are some of the antihelminthic drugs used to exterminate *Ascaris*.

102 **(b)**
Androecium is composed of stamens. Each stamen which represents the male reproductive organ consists of stalk or a filament and an anther

103 **(c)**
Double fertilization is the characteristic features of angiosperms. Double fertilization was discovered by **Nawaschin** (1898) in *Lilium* and *Fritilaria*.

104 **(b)**
In *Sida cordifolia*, the number of carpels is equal to the number of locules.

105 **(a)**
The activity of cambium is under the control of many physiological and environmental factors. In temperate regions, the climatic conditions are not uniform through the year. In the spring season, cambium is very active and produces a large number of xylary elements having vessels with wider cavities. The wood formed during this season is called spring wood or early wood

106 **(d)**
I, II and III (parenchyma tissue,collenchyma tissue and sclerenchyma tissue).
All tissues except epidermis and vascular bundles constitutes ground tissues. It consists of simple tissue such as parenchyma, collenchyma and sclerenchyma

107 **(c)**
The striated or striped or skeletal or voluntary muscles are in the form of bundles of individual muscle fibres. These bundles are called fascicule. These fasciculi are covered by three coverings of connective tissue. These coverings are epimysium (outermost covering), perimysium (middle covering) and endomysium (innermost covering).

108 **(a)**
Erythrocytes (red blood corpuscles) of mammals (man) are round, biconcave and non-nucleated. Life span of mammalian RBC_S is about 120 days (4 months).

109 **(c)**
Each ribosome is formed of two unequal sub units, which join only at the time of protein synthesis. In 70 S type of ribosome, 50S and 30S are larger and smaller subunits respectively.

110 **(a)**
A complete set of chromosomes, or of chromosomal genes, inherited as a unit from one parent is called genome. Human genome contains 3.2×10^9 bp.

111 **(c)**
When enzyme molecules are more than substrate molecules, a progressive increase in the substrate molecules (s), increases the velocity (v) of their conversion to products
However, eventually the rate of reaction reaches a maximum. At this stage, the active sites of all the available enzyme molecules are occupied by the substrate molecules. Therefore, the substrate molecules occupy the active sites vacated by the products and cannot increase the rate of reaction further

112 **(d)**
RUBISCO is the most abundant protein in whole of the biosphere

113 **(c)**
In G_2-phase chromosome number remains same, so the right answer is 12 chromosomes.

114 **(a)**
Homologous chromosomes segregate when a cell undergoes meiosis.

115 **(b)**
Statement I, II and IV are correct III is incorrect

117 **(b)**
It is due to choking of roots by water logging. It is called flopping

118 **(b)**
Due to deficiency of **zinc**, the leaves become distorted, sickle shaped and get clustered to form rosette. This effect is known as **little leaf disease**.

119 **(a)**
About 98% of the mass of every living organism including bacterium and human beings is composed of just six elements, i.e., carbon (C), hydrogen (H), nitrogen (N), oxygen (O), phosphorus (P) and sulphur (S).

120 **(c)**
In CAM-plants, carbon dioxide enters into the leaf and fixed to oxaloacetic acid, which is then converted to malic acid at night when stomata are open. This malic acid is stored in cells during night. So, in CAM-plants, organic acids accumulate (or their concentration increases) in the dark (*i.e.*, at night) in vacuoles.

121 **(a)**
Oxaloacetic acid.
Plants that are adapted to dry tropical regions generally have the C_4 pathway. Though these plants have the C_4-oxaloacetic acid as the first CO_2 fixation product they use the C_3 pathway or the Calvin cycle as the main biosynthetic pathway

122 **(a)**
Chemiosmosis is the diffusion of ions across a selectively permeable membrane. More specifically, it relates to the generation of ATP by the movement of hydrogen ions across a membrane during cellular respiration.
ATP synthase is the enzyme that makes ATP by chemiosmosis. The generation of ATP by chemiosmosis occurs in chloroplasts and mitochondria as well as in some bacteria.

123 **(c)**
An amphibolic pathway is a biochemical pathway that serves both anabolic and catabolic processes. An important example of an amphibolic pathway is the Krebs' cycle, which involves both the catabolism of carbohydrates and fatty acid and the synthesis of anabolic precursors for amino acid synthesis, eg, α-ketogluturate and

oxaloacetate.

124 **(a)**
Richmond and **Lang** (1967) observed that degradation of proteins and chlorophyll was delayed in the detached leaves of *Xanthium* by the application of cytokinin. This effect of cytokinin in delaying the senescence is called as Richmond-Lang effect.

125 **(d)**
Senescence occurs prior to death of an organ or organism. It can be defined as the total sum of deteriorative processes that naturally terminate the functional life of an organism.

126 **(b)**
Cytokinin encounter the apical dominance by promoting the cell division in lateral shoots. It is also used to increase the growth of lateral buds in short plants

127 **(a)**
All lipid digestion takes place in the small intestine. Fatty acids and glycerol are the digestion products of lipids.

128 **(a)**
Fatty acids, glycerol and monoglycerides are in soluble in water so they cannot reach the blood stream directly. In intestinal lumen, they first incorporated into small, spherical, water soluble micelles and then into chylomicrons (very small fat molecules). Chylomicrons release from intestinal cells into the lymph present in the lymph vessels (lacteals) within the villi.

129 **(c)**
I. False, II. True
Respiration is a passive process, which creates a pressure gradient with the lungs and the atmosphere

130 **(b)**
A-97, B-RBC, C-3, D-Plasma

131 **(a)**
A-SA Node, B-AV Node, C-Bundle of His, D-Purkinje fibres

132 **(a)**
Blood Platelets occur only in mammals. They are non-nucleated and colourless. They bud off from the megakaryocytic cells of red bone marrow. That's why they are called blood platelets or cell fragments. They have thromboplastin necessary for blood clotting

133 **(b)**
A – glomerulus
B – filtration
C – 1100 – 1200
D – $\frac{1}{5}$th

134 **(d)**
Hepatopancreas is not an excretory organ. Hepatopancreas is an organ of the digestive track of arthrous, mollusks and fish. It provides function as same on liver and pancreas of mammals.

135 **(b)**
Green glands are excretory organs in **Arthropoda**. The **renal columns of Bertini** is the part of cortex continued inside medulla between pyramids.

136 **(c)**
In the centre of each I-band is an elastic fibre called Z-line which bisects it. The thin filaments are firmly attached to the Z-line. The thick filaments in the A-band are also held together in the middle of this band by thin fibrous membrane called M-line. The A and I-band are arranged alternately throughout the length of myofibrils. The portion of the myofibrils between two successive Z-lines is considered as the functional unit of contraction called sarcomere

137 **(c)**
Actin and myosin polymerise to form myofibrils. Several myofibrils forms muscle fibre and several muscle fibres form muscle fasciculus

138 **(c)**
During contraction and relaxation of muscles, both I-band and H-zone **progressively shorten and disappears.**
Dark A-band (anisotropic) **undergo no** change during contraction and relaxation of muscle fibres.

139 **(b)**
Cones are related with vision in bright light and contain pigment iodopsin. Rods are related with vision in dim light. Rods have pigment rhodopsin.

140 **(d)**
Ependymal cells, are ciliated cells found in the central nervous system in the form of epithelium that lines the **cavities of CNS**

141 **(c)**
Intracellular receptors are mostly nuclear receptors.

Hormones produce their effects on target tissue by binding to specific proteins called hormone receptors which are located in the target tissue only. Hormone receptors present on the cell membrane of the target cells are called membrane bound receptors and receptors present inside the target cell are called intracellular receptors. Intracellular receptors are mostly nuclear receptors (present in the nucleus)

142 **(a)**

Pancreas is the Second Largest Endocrine Gland

Type of cells in islets of Langerhans	Hormones
α – cells	Glucagon
β – cells	Insulin
γ – cells	Gastrin
δ – cells	Somatostatin
f-cells	Pancreatic polypeptides

143 **(c)**

Ant, aphids, cockroaches are unisexual only earthworm have both the sexes (hermaphrodite)

145 **(c)**

A-Chasmogamous-male and female part remain on the same flower but there are modification for ensuring self-fertilisation

B-Cleistogamous (closed flower)

146 **(d)**

Long silky hairs on cob maize are the stigma and style of the maize plant

147 **(a)**

During microsporogenesis, the sporogeneous cells may directly acts as microspore mother cells or pollen mother cells or PMCs. Each PMC, by a meiotic division, gives rise to a group of four haploid microspores, which are combinedly referred to as microspore tetrad.

The first mitotic division in a pollen grain or microspore results into two unequal cels. The large is the vegetative cell, which eventually forms the pollen tube. The smaller one is the generative cells which produce the male gametophyte by another mitosis.

148 **(d)**

There are two types of polar bodies found in oogenesis in meiosis-I the first polar body is formed and in meiosis-II the 2nd type of polar body is formed. Meiosis-I takes place before birth and meiosis-II after birth of female

149 **(a)**

Oxytocin hormone is secreted from neurohypophysis of pituitary. It stimulates the contraction of the smooth muscles of uterus inducing labour pain for child birth.

150 **(a)**

Parturition

(i) The average duration of human pregnancy is about 9 months which is called the gestation period

(ii) The act of expelling the full term foetus from the mother's uterus at the end of gestation period is called parturition

(iii) It is induced by a complex neuroendocrine mechanism

(iv) Parturition signals originates from the fully developed foetus and the palcenta, which induce mild uterine contractions called foetus ejection reflex

(v) This triggers the release of oxytocin from the maternal pituitary

(vi) Oxytocin induces stronger uterine muscle contractions

(vii) Relaxin increases the flexibility of the pubic symphysis and ligaments that helps to dilate the uterine cervix during labour pain

(viii) This leads to the expulsion of baby

151 **(c)**

In mammals, the primary male sex organs, testes are located in the extra-abdominal scrotal sacs. Scrotum maintains a low temperature of $2-4°C$ below the temperature of abdominal cavity. As higher abdominal temperature kills the spermatogenic tissue So, testes in mammals are contained scrotal sacs present outside the abdominal cavity to have the low temperature that is needed for the formation and maturation of functional sperms.

153 **(d)**

MTP is used to get rid of unwanted pregnancy due to

(i) Genetic abnormality

(ii) Failure of contraceptive method

(iii) rapes

154 **(a)**

Man has only one X-chromosome that is inherited to his daughter. Therefore, a hereditary disease, which is X-chromosomal linked, is never passed on from father to son.

155 **(c)**

When there is a loss of one chromosome from the homologous pair, this is called **monosomy** ($2n$-1) and when there is addition of one chromosome to the homologous pair, this called **trisomy** ($2n$+1).

156 **(b)**

A cross between two individuals for studing inheritance of two characters is known as dihybrid cross.the phenotypic ratio in F_2-generation of a dihybrid cross is 9 :3 : 3 : 1, therefore, the maximum number of different phenotypes available are four.

157 **(b)**

Stop codons are three in number.
Non-sense codon is called stop codon. Because they stops the translation they are UAA, UAG, UGA

158 **(a)**

Transcription in Eukaryotes

Transcription in eukaryotes is similar to that in prokaryotes except, *some additional complexities*
(i) It takes place in the nuclear region
(ii) At least three RNA polymerases are used.
There is clear cut division of labour among them

1. **RNA polymerase I** transcribe *r*RNAs (28S, 18S, and 5.8S)
2. **RNA polymerase II** transcribes the precursor of *m*RNA (called heterogeneous nuclear RNA or *hn*RNA)
3. **RNA polymerase III** transcribes *t*RNA 5, S*r*RNA and *Sn*RNAs (Small nuclear RNAs)

Post Transcriptional Modification Before working of transcript, the primary transcript needs some modification. These modification are called post-transcriptional modification

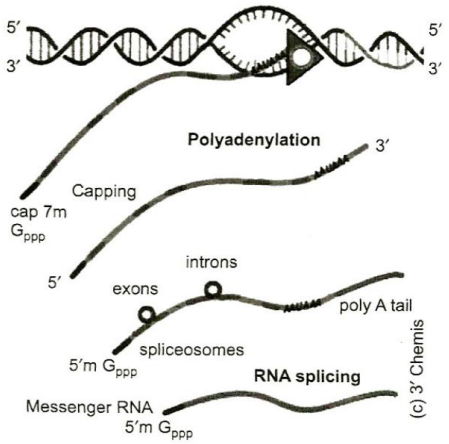
The primary transcripts are non-functional, containing both the coding region, exon and non-coding region, intron, in RNA and are called heterogenous RNA or *hn*RNA.

The *hn*RNA undergoes two additional processes called capping and tailing

In capping an unusual nucleotide methyl guanosine triphosphate, is added to the 5' end of *hn*RNA

In tailing adenylate residues (about 200-300) are added at 3' end in a template independent manner

Now the *hn*RNA, undergoes a process where the introns are removed and exons are joined to from *m*RNA by the process called splicing



159 **(d)**

Homo Sapiens Sapiens The first skeletal remains of *Homo sapiens sapiens* were found in Europe and were named cro-magnon. In the *Homo sapiens* there is final reduction of the jaws, the appearance of the jaws, the appearance of modern man's chin and of the rounded skull. Mean cranial capacity was about 1350 cc modern man is very closely related to cro-magnon.
Homo erectus The cranial capacity of *Homo erectus* which includes Java man and peking man varied from about 775 to nearly 1300 cc. The tool tradition is associated with the *Homo erectus* way of life. The stone tools were largely made of quartz. Bone tools and wooden tools like wooden speaks have also been discovered. There is an evidence of big game hunting which indicates that there must have been collective hunting. The *Homo erectus* seem to be cave-dwellers

160 **(a)**

Almost all modern reptiles, birds and mammals, have forelimbs means, they all have same basic plan of the structure but they perform different functions. This phenomenon is called ancestral homology

161 **(c)**

A typical antibody monomer has four protien chains, *i.e.,*two identical light (L) chains and two

identical heavy (H) chains. The chains are joined by disulphide links and other bonds to from a Y-shaped structure. Both the heavy (H) and light (L) chains have variable regions at the ends of Y arms. The variable region from one light chain (L) and one heavy chain (H)from one antigen binding site. Hence, each antibody has two antigen binding sites.

162 **(c)**
The flower tops, leaves and the resin of cannabis plant are used in various combination to produce marijuana, hashish, charas and ganja. Generally taken by inhalation and oral ingestion these are known for their effects on cardiovascular system of the body

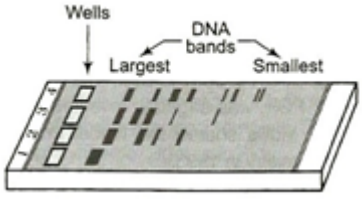
163 **(a)**
The synthetics drugs structurally similar to adrenaline are amphetamines. These are synthetic drugs and act as strong stimulants. These are generally taken by truck drivers and night workers.

165 **(c)**
The term 'totipotency' refers to the development of an organ from a cell in a culture medium

166 **(c)**
An aquatic weed like water hyacinth (*Eichhornia crassipes*) is used as a source of biogas through harvesting, chopping and crushing.

167 **(a)**
Biogas production involves three steps-(a) breakdown of polymers (b) conversion of monomers into organic acids by fermentation microbes (c) generation of methane by methanogenic bacteria (conversion of organic acids into CH_4 and CO_2).

168 **(a)**
Electrophoresis.
A molecule of DNA can be cut into fragments by the enzyme restriction endonucleases. These fragments of DNA can be separated by a technique of gel electrophoresis. In this process the smallest segment of DNA travel towards anode (+ ve electrode), farthest away from the wells



169 **(a)**
EFB – European Federation of Biotechnology
A definition of biotechnology which covers both traditional views and modern molecular biotechnology has been given by European Federation of Biotechnology. According to EFB "Biotechnology is the integrated use of biochemistry, microbiology and engineering sciences in order to achieve technological application of the capabilities of microorganisms, cultured tissues/cells and part there of"

170 **(b)**
Plasmids are used in genetic engineering.

171 **(a)**
Plasmid is an extrachromosomal genetic element of DNA or RNA that is capable of replicating independently of the host chromosome, *e.g., E. coli* plasmid pBR322.

172 **(d)**
By using genetic engineering or recombinant DNA technology, insulin producing genes from human beings have been transferred into E. coli bacteria, which produced insulin called 'humulin' for clinical use. This type of synthetic insulin was produced by an American pharmaceutical firm Eli Lily on 5th July 1983.

173 **(d)**
A lake near a village suffered heavy mortality of fishes within a few days, because lots of urea and phosphate fertilizers were used in the crops in the vicinity and the area was sprayed with DDT by an aircraft.

174 **(b)**
Under favourable conditions many zooplanktons in lakes and ponds are known to enter as diapause, *i.e.,* a stage in suspended development. Infact diapause is stage in the development of certain animals, during which developmental growth is suspended during winter when days are short

175 **(c)**
Decomposers are heterotrophs and saprotrophs, which feeds on dead bodies of organisms and organic wastes of living organisms. These are mainly bacteria and fungi of decay

176 **(c)**
Decomposers (saprotrophs) are the organisms that breakdown complex organic matter into inorganic substances and in doing, so they

carryout the natural process of decomposition

177 **(c)**
Biodiversity Act of India was passed by the Parliament in the year2002.

178 **(a)**
Siberian cranes are regular visitors of Bharatpur sanctuary, Rajasthan.

179 **(c)**
Effect of pollution is observed first on green vegetation.