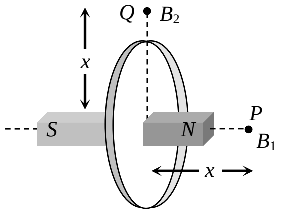
SAFE HANDS & IIT-ian's PACE

BPT # 09 (NEET) SOLUTIONS

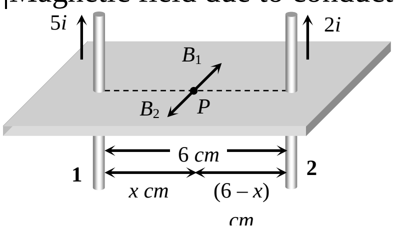
1. (c)
Sol. By using right hand thumb rule or any other rule which helps to determine the direction of magnetic field.

2. (a)
Sol. Current carrying coil behaves as a bar magnet as shown in figure.
We also knows for a bar magnet, if axial and equatorial distance are same then $B_a = 2B_e$



Hence, in this equation $\frac{B_1}{B_2} = \frac{2}{1}$

3. (c)
Sol. Suppose P is the point between the conductors where net magnetic field is zero.
So at P |Magnetic field due to conductor 1| = |Magnetic field due to conductor 2|



i.e. $\frac{\mu_0}{4\pi}.\frac{2(5i)}{i} = \frac{\mu_0}{4\pi}.\frac{2(2i)}{(6-x)} \Rightarrow \frac{5}{x} = \frac{9}{6-x}$

$\Rightarrow x = \frac{30}{7} cm$

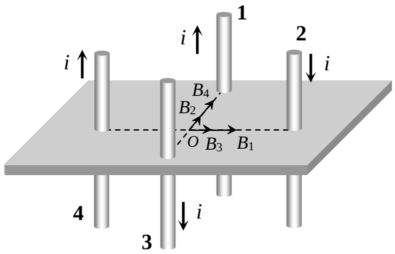
Hence position from B $= 6 - \frac{30}{7} = \frac{12}{7} cm$

4. (c)
Sol. Direction of magnetic field (B_1, B_2, B_3 and B_4) at origin due to wires 1, 2, 3 and 4 are shown in the following figure.

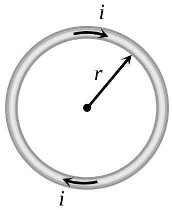
$B_1 = B_2 = B_3 = B_4 = \frac{\mu_0}{4\pi}.\frac{2i}{x} = B$. So net magnetic field at

origin O $B_{net} = \sqrt{(B_1 + B_2)^2 + (B_2 + B_4)^2}$

$= \sqrt{(2B)^2 + (2B)^2} = 2\sqrt{2}B$



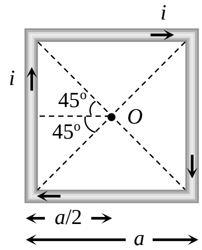
5. (b)
Sol. Circular coil Square coil



Length L = 2π r Length L = 4a

Magnetic field $B = \frac{\mu_0}{4\pi}.\frac{2\pi i}{r} = \frac{\mu_0}{4\pi}.\frac{4\pi^2 i}{r}$

$B = \frac{\mu_0}{4\pi}.\frac{2\sqrt{2}\,i}{a}$ $B = \frac{\mu_0}{4\pi}.\frac{8\sqrt{2}\,i}{a}$



Hence $\frac{B_{circular}}{B_{square}} = \frac{\pi^2}{8\sqrt{2}}$

6. (b)
Sol. By using $r = \frac{\sqrt{2mk}}{qB}$; For both particles $q \rightarrow$ same,
$B \rightarrow$ same, $k \rightarrow$ same

Hence $r \propto \sqrt{m} \Rightarrow \frac{r_e}{r_p} = \sqrt{\frac{m_e}{m_p}}$

$\because m_p > m_e$ so $r_p > r_e$

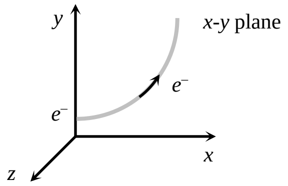
Since radius of the path of proton is more, hence it's trajectory is less curved.

7. (b)
Sol. By using $r = \frac{mv}{qB}$; $v \rightarrow$ same, $B \rightarrow$ same

$\Rightarrow r \propto \frac{m}{2} \Rightarrow \frac{r_p}{r_\alpha} = \frac{m_p}{m_\alpha} \times \frac{q_\alpha}{q_p} = \frac{m_p}{4m_p} \times \frac{2q_p}{q_p} = \frac{1}{2}$

8. (a)
Sol. The given situation can be drawn as follows

According to figure, for deflecting electron in x-y plane, force must be acting an it towards y-axis.



Hence according to Flemings left hand rule, magnetic field directed along positive $y-$axis.

9. (a)

Sol.

$r = \frac{\sqrt{2mK}}{qB}$ and $A = Aq^2 \Rightarrow A = \frac{\pi(2mK)}{q^2b^2} \Rightarrow A \propto K.$

10. (a)

Sol. Sensitivity (S_i) = $\frac{NBA}{C} \Rightarrow S_i \propto N$.

11. (d)

Sol. Velocity magnitude will not change as magnetic field does not work on charge.

12. (b)

Sol. $r = \frac{mv}{qB} = \frac{p}{qB}$ $\frac{r_p}{r_\alpha} = \frac{2e}{e} = \frac{2}{1}$

13. (c)

Sol. When charge moves on circular path in effect of normal magnetic field then KE = constant.

14. (a)

Sol. F_{BA} (Leftward)

F_{BC} (Rightward) but $F_{BA} < F_{BC}$

$\Rightarrow (F_B)_{net}$ Rightward

15. (c)

Sol. Cyclotron frequency = $\frac{qB}{2\pi m}$

$\because m_\alpha = 4m_p$, $q_\alpha = 2e$ $m_d = 2m_p$, $q_d = e$

$\therefore$ (frequency)$_\alpha$ = (frequency)$_d$

16. (d)

Sol. $\tau = NIAB\sin\theta = (1)(I)(\pi r^2)B\sin 90^0 = \pi r^2 IB$

17. (c)

Sol. $\vec{F} = q(\vec{v}\times\vec{B})$

18. (a)

Sol. $B = \frac{\mu_0 NI}{2r}$

19. (d)

Sol. $\vec{F} = \vec{F}_E + \vec{F}_B = q\,[\vec{E} + (\vec{v}\times\vec{B})]$

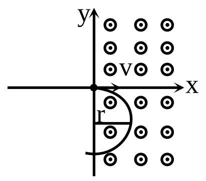
20. (b)

Sol. $B = \frac{\mu_0 Ni}{2r}$, $\ell = 2\pi r.N = \frac{\mu_0 Ni}{2\left(\frac{\ell}{2\pi N}\right)}$

$\therefore B \propto N^2$

21. (c)

Sol.



$B = \frac{\mu_0 nI}{2}$

22. (b)

Sol. Particle penetrate in magnetic field = radius

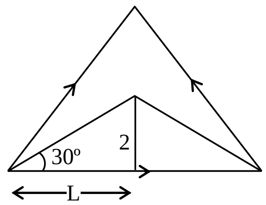
$= \frac{mv}{qB}$

23. (a)

Sol. $\frac{B_{axis}}{B_{centre}} = \left(\frac{R^2 + x^2}{R^2}\right)^{3/2}$

24. (a)

Sol. $\frac{2}{L} = \tan 30^0$



$r = \frac{L}{\sqrt{3}}$ $B = 3\left[\frac{\mu_0 i}{4\pi r}(\sin 60^o + \sin 60^o)\right]$

$= \frac{3\mu_0 i}{4\pi\frac{L}{\sqrt{3}}}[\sqrt{3}] = \frac{9}{4}\ \frac{\mu_0 i}{\pi L}$

25. (c)

Sol. By using $F = Bil\sin\theta \Rightarrow F = (500 \times 10^{-4}) \times 0.4 \times \sin 30^o$

$\Rightarrow 3 \times 10^{-2}$ N.

26. (c)

Sol. $L = 2\pi r$ and $r = \frac{L}{2\pi}$ $M = IA = I(\pi r^2) = I\pi$

$\left(\frac{L}{2\pi}\right)^2 = \frac{IL^2}{4\pi}$

27. (b)

Sol. As $qvB = \frac{mv^2}{r}$

$\therefore r = \dfrac{mv}{qB} \Rightarrow r \propto v$ or $\dfrac{r_A}{r_B} = \dfrac{V_A}{V_B} = \dfrac{3}{2}$

28. (c)

Sol. $E \neq 0, B = 0$

29. Sol. In a cyclotron the centripetal force is balanced by magnetic force then

$qvB = \dfrac{mv^2}{r} \Rightarrow \dfrac{qBr}{m} = v$

Where $v = 2\pi r\upsilon_c$

$\dfrac{qBr}{m} = 2\pi r\upsilon_c \quad \therefore \upsilon_c = \dfrac{qB}{2\pi m}$

30. (c)

Sol. Given $I_1 = 2A, I_2 = 5A, r = 2m$

$\therefore f = \dfrac{\mu_0}{4\pi}\dfrac{2I_1I_2}{r} = 10^{-7} \times \dfrac{2\times2\times5}{2} = 1\times10^{-6}\,Nm^{-1}$

31. (a)

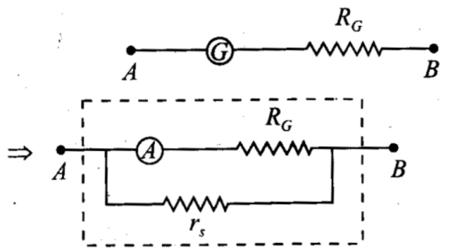
Sol. As $B = \dfrac{\mu_0 NI}{2R}, Here\ N = 100,\ I = 3.2A,$

$R = 10cm = 10\times10^{-2}m$

$\therefore B = \dfrac{4\pi\times10^{-7}\times100\times3.2}{2\times0.1} = 2.01\times10^{-3}T$

32. (b)

Sol. To utilize a galvanometer (G) as ammeter, there is the difficulty in measurement of current due to the sensitivity of galvanometer and also connection of that may change the value of current in the circuit to overcome these difficulties one attaches a small resistance r_s called shunt resistance in parallel with the galvanometer coil as shown in the figure.



33. (c)

Sol. Current sensitivity of galvanometer is deflection per unit current i.e.

$\dfrac{\phi}{I} = \dfrac{NAB}{k}$ …… (i)

Similarly voltage sensitivity is deflection per unit voltage i.e.

$\dfrac{\phi}{V} = \left(\dfrac{NAB}{k}\right)\dfrac{1}{V} = \left(\dfrac{NAB}{k}\right)\dfrac{1}{R}$ …… (ii)

From (i) and (ii)

Voltage sensitivity = current sensitivity × $\dfrac{1}{\text{resistance}}$

Now if current sensitivity is double, then the resistance in the circuit will also be double since it is proportional to the length of the wire, then voltage sensitivity

= (2× current sensitivity × $\dfrac{1}{(2\times\text{resistance})}$

(current sensitivity)× $\dfrac{1}{\text{resistance}}$

Hence voltage sensitivity will remain unchanged.

34. (a)

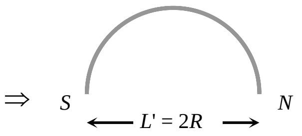
Sol. $\tau = MB\sin\theta$ and $W = MB(1-\cos\theta) \Rightarrow$

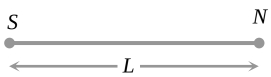
$W = MB(1-\cos 60^o) = \dfrac{MB}{2}$. Hence τ =

$MB\sin 60^o = \dfrac{\sqrt{3}MB}{2} = \sqrt{3}W$

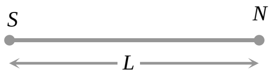
35. (b)

Sol. On bending a rod it's pole strength remains unchanged where as it's magnetic moment changes



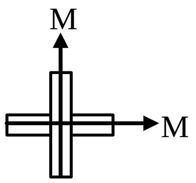


New magnetic moment $M' = m(2R) = m\left(\dfrac{2L}{\pi}\right) = \dfrac{2M}{\pi}$



36. (b)

Sol.



$M_{eq} = \sqrt{2}\ M$

37. (b)

Sol. $\mu = 8 \times 10^{-3}$, H = 160, B = μH = 1.28 wb/m^2

38. (b)

Sol. $\chi_m \propto \frac{1}{T} \Rightarrow \frac{\chi_1}{\chi_2} = \frac{T_2}{T_1} = \frac{100}{200} = \frac{1}{2}$, $\chi_2 = 2\chi_1$

39. (c)

Sol. In C.G.S. $B_{axial} = 9 = \frac{2M}{x^3}$ .....(i)

$B_{equaterial} = \frac{M}{\left(\frac{x}{2}\right)^3} = \frac{8M}{x^3}$ .....(ii)

From equation (i) and (ii) $B_{equaterial} = 36$ Gauss.

40. (b)

Sol. Work done, $W = -MB(\cos\theta_2 - \cos\theta_1)$

$= -MB(\cos 180^o - \cos 0^o) = -MB(-1-1) = 2MB$

$= 2 \times 2.5 \times 0.2 = 1J$

41. (b)

Sol.

$T = 2\pi\sqrt{\frac{I}{MB_H}} \Rightarrow T \propto \frac{1}{\sqrt{M}} \Rightarrow \frac{T_1}{T_2} = \sqrt{\frac{M_2}{M_1}}$ If

$M_1 = 100$ then $M_2 = (100 - 19) = 81$. So,

$\frac{T_1}{T_2} = \sqrt{\frac{81}{100}} = \frac{9}{10} \Rightarrow T_2 = \frac{10}{9}T_1 = 11\%T_1$

42. (d)

Sol. Torque, $\vec{\tau} = \vec{m} \times \vec{B} = mB\sin\theta$

and magnetic potential energy

$U_m = \vec{m}.\vec{B} = mB\cos\theta$

at $\theta = 0^o$ the dipole will be in most stable position $\tau = m\sin\theta = mB\sin 0 = 0$

and, $U_m = -mB\cos\theta = -mB\cos 0 = -mB$

43. (d)

Sol. The magnetic field lines due to a bar magnet are closed continuous curves directed from N to S outside the magnet and directed from S to N inside the magnet. Hence option (d) is correct.

44. (c)

Sol. As, $B_V = \sqrt{3}\ B_H$

Also, $\tan\delta = \frac{B_V}{B_H} = \frac{\sqrt{3}B_H}{B_H} = \sqrt{3}$

Or , $\delta = \tan^{-1}(\sqrt{3}) = 60^o$

$\therefore$ Angle of dip, $\delta = 60^o$

45. (d)

Sol. Relative magnetic permeability

$$\mu_r = \frac{\text{magnetic permeability of material }(\mu)}{\text{permeability of free space}(\mu_0)}$$

It is a dimensionless pure ratio and for paramagnetic materials $\mu_r > 1$.

46. (a)

Sol. $\underset{\text{Acetaldehyde}}{CH_3-\overset{\overset{O}{\|}}{C}-H}+\underset{\text{Hydrogen Cyanide}}{HCN}\longrightarrow \underset{\text{Acetaldehyde Cynohydrin}}{CH_3-\overset{\overset{OH}{|}}{\underset{\underset{CN}{|}}{C}}-H}$

(optically active)

47. (b)

Sol. $\underset{sp^2\ \text{hybridised}}{>C=O}$

48. (b)

Sol. CHOCHO

49. (b)

Sol. $\begin{matrix}R^{\sigma}\\R^{\sigma}\end{matrix}\!\!>C\overset{\pi}{\underset{\sigma}{=}}O$

50. (d)

Sol. $\underset{2,2,2,\text{trichloroethanal}}{Cl-\overset{\overset{Cl}{|}}{\underset{\underset{Cl}{|}}{C}}-\overset{\overset{O}{\|}}{C}-H}$

51. (c)

Sol. Among Carbonyl Compounds, reactivity decrease with increase in alkyl groups as alkyl groups (+I effect) decrease positive character on C-atom. Thus, the correct order of reactivity is

$HCHO > CH_3CHO > C_6H_5CHO$

52. (c)

Sol. $HC\equiv CH\xrightarrow[20\%\ H_2SO_4]{1\%\ HgSO_4}\underset{(A)}{CH_3CHO}\xrightarrow[H_2O]{CH_3MgX}$

$\underset{(B)}{CH_3CHOHCH_3}\xrightarrow{[O]}\underset{\text{Acetone}}{CH_3COCH_3}$

53. (b)

Sol. $(CH_3)_2C=C(CH_3)_2\xrightarrow{O_3}2CH_3-CO-CH_3$

54. (c)

Sol. Ketonic hydrolysis

$CH_3-CO-CH_2COOC_2H_5$

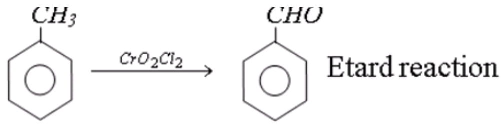
$\xrightarrow[H_2O]{NaOH}CH_3COCH_3+C_2H_5OH+CO_2$

55. (c)

Sol. $CH_3COCl\xrightarrow[Pd/BaSO_4]{2H}CH_3CHO+HCl$

56. (c)

Sol.



57. (c)

Sol. $\underset{Acetone}{CH_3COCH_3}\xrightarrow{CH_3MgI}\underset{tert\text{–Butylalcohol}}{(CH_3)_3COH}$

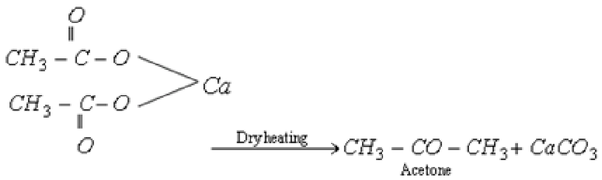
58. (a)

Sol. It is hydration of alkynes.

$CH_3-CH_2-C\equiv CH\xrightarrow[H_2O]{Hg^{++}}\underset{\text{Butanone}}{CH_3-CH_2-\overset{\overset{O}{\|}}{C}-CH_3}$

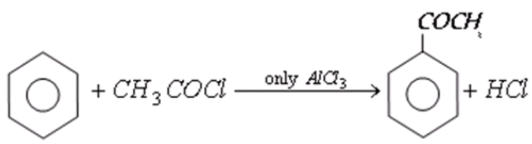
59. (a)

Sol.



60. (c)

Sol.



61. (c)

Sol.

$$CH_3-C\equiv N+\overset{-}{C}H_3Mg^{+}Br\rightarrow CH_3-\underset{\substack{|\\CH_3}}{C}=N-MgBr$$

$$\xrightarrow{\text{Hydrolysis}} CH_3-CO-CH_3+NH_3+Mg\begin{matrix}Br\\OH\end{matrix}$$

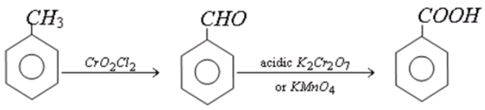
62. (c)

Sol.

$$\underset{\text{2-Butanol}}{CH_3-\underset{\substack{|\\OH}}{CH}-CH_2-CH_3}\xrightarrow[\text{Oxidation}]{KMnO_4}\underset{\text{ethyl methyl ketone}}{CH_3-\overset{\substack{O\\\|}}{C}-CH_2CH_3}$$

63. (c)

Sol.



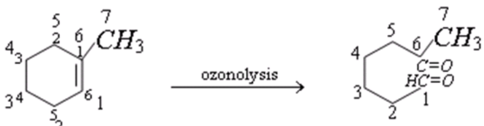
This is Etard's reaction

64. (b)

Sol. $HC\equiv CH+H_2O\xrightarrow{HgSO_4/H_2SO_4}CH_3CHO$

65. (a)

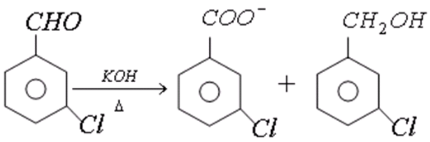
Sol.



6-oxoheptanal

66. (c)

Sol. It is cannizzaro reaction –2



67. (a)

Sol. $R-CO-R'\xrightarrow{HCN}\underset{(A)}{R-\underset{\substack{|\\CN}}{\overset{\substack{OH\\|}}{C}}-R'}\xrightarrow{LiAlH_4}$

$$R-\underset{\substack{|\\R'}}{\overset{\substack{OH\\|}}{C}}-CH_2NH_2$$

68. (c)

Sol. Reduction of $>C=O$ to CH_2 can be carried out with Wolf Kischner reduction.

69. (d)

Sol. Ethanal among the given compounds gives positive iodoform test.

70. (c)

Sol. $2CH_3CHO\xrightarrow[NaOH]{\text{dil.}}CH_3-\overset{\substack{OH\\|}}{C}H-CH_2CHO$

71. (c)

Sol.

$$C_2H_5CHO+2Cu^{+2}+5OH^-\rightarrow\underset{\text{Red }ppt}{Cu_2O}+3H_2O$$

$$+C_2H_5COO^-$$

$$CH_3COCH_3+2Cu^{+2}+5OH^-\rightarrow\text{No reaction}$$

72. (d)

Sol. $CH_3-CH_2-\overset{\substack{O\\\|}}{C}-CH_2-CH_3$ do not have $CH_3-\overset{\substack{O\\\|}}{C}-$ Group

73. (b)

Sol. $CH_3-\overset{\substack{O\\\|}}{C}-CH_3+3Cl_2\rightarrow CH_3-\overset{\substack{O\\\|}}{C}-CCl_3+3HCl$

$$CH_3-\overset{\substack{O\\\|}}{C}-CCl_3+NaOH\rightarrow CHCl_3+CH_3-\overset{\substack{O\\\|}}{C}-ONa$$

74. (b)

Sol. $\underset{\text{dimethyl ketone}}{CH_3-\overset{\substack{O\\\|}}{C}-CH_3}+3I_2+NaOH\rightarrow CHI_3+CH_3-\overset{\substack{O\\\|}}{C}-ONa$

75. (c)

Sol. CHI_3 is yellow compound when iodine reacts with $NaOH$ and ketone.

76. (d)

Sol. The solution represented is fehling's and it has no tendency to oxidise benzaldehyde.

77. (d)

Sol. Amide group represent by the formula $-CONH_2$

78. (a)

Sol. $R-\overset{O}{\overset{\|}{C}}\leftarrow OH \leftrightarrow R-\overset{O^-}{\overset{|}{C}}-O\cdots\cdots H$

It represent the acidic nature.

79. (c)

Sol. Wax are long chain ester.

80. (d)

Sol. Glycine do not have the chiral carbon so it is not optically active acid.

$$H_2N-\underset{H}{\overset{H}{C}}-COOH$$
(Glycine)

81. (d)

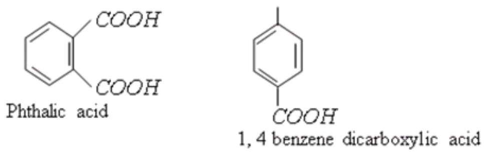
Sol. Except phenyl acetic acid all rest acid are fatty acid.

82. (c)

Sol. Vinegar contain 8-10% acetic acid.

83. (c)

Sol. Phthalic acid is the isomer of 1, 4 benzene dicarboxylic acid because both have the same molecular formula but differ in their structure.



84. (a)

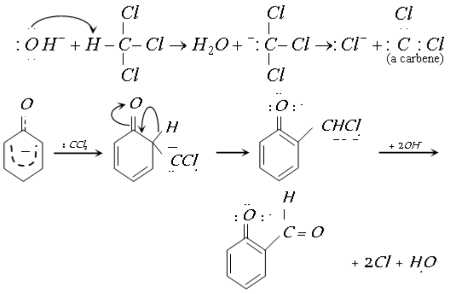
Sol. $\underset{\text{Formic acid}}{HCOOH}+PCl_5\rightarrow\underset{\text{Formyl chloride}}{HCOCl}+POCl_3+HCl$

85. (a)

Sol. $CO+NaOH\xrightarrow{\Delta}HCOONa$

86. (b)

Sol. Reimer-Tiemann reaction involves a carbene intermediate.



87. (d)

Sol. $CH_3Cl\xrightarrow[-KCl]{KCN}CH_3CN\xrightarrow{H_2O}CH_3COOH$

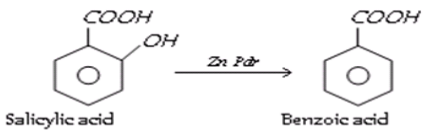
$\xrightarrow{NH_3}CH_3COONH_4\xrightarrow{\Delta}CH_3CONH_2$

88. (c)

Sol. $BrCH_2CH_2COOH$ is least acidic or has less K_a i.e., dissociation constant. It is (a) due to lesser –I effect of Br than F and (b) Br atom further away form $-COOH$ group.

89. (d)

Sol.



90. (d)

Sol. Presence of –I effect chlorine atom increases the acidic nature by withdrawing electrons

$$\underset{\text{Trichloroacetic acid (Mostacidic)}}{Cl_3CCOOH}>\underset{\text{Dichloroacetic acid}}{Cl_2CHCOOH}>\underset{\text{Monochloroacetic acid}}{Cl-CH_2-COOH}>\underset{\text{Acetic acid (Least acidic)}}{CH_3COOH}$$

BIOLOGY ANSWER KEY:

Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.
91	D	109	D	127	B	145	A	163	C
92	B	110	D	128	D	146	C	164	A
93	A	111	A	129	C	147	C	165	C
94	A	112	A	130	A	148	C	166	C
95	A	113	D	131	A	149	C	167	B
96	B	114	A	132	B	150	B	168	D
97	C	115	B	133	D	151	B	169	C
98	B	116	C	134	C	152	B	170	B
99	A	117	A	135	C	153	D	171	A
100	B	118	B	136	C	154	C	172	B
101	C	119	B	137	B	155	C	173	B
102	C	120	B	138	B	156	A	174	A
103	D	121	D	139	C	157	A	175	C
104	A	122	B	140	D	158	A	176	D
105	B	123	C	141	C	159	A	177	D
106	B	124	D	142	A	160	D	178	B
107	B	125	B	143	B	161	A	179	C
108	C	126	D	144	D	162	A	180	B