ANSWER KEYS

PHYSICS

Q.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A.	2	3	3	2	3	3	4	4	2	1	3	2	1	2	2	1	3	2	1	1
Q.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
A.	4	2	2	3	2	2	1	3	2	4	3	1	3	2	4	2	2	4	1	1
Q.	41	42	43	44	45															
A.	2	1	2	3	1															

CHEMISTRY

Q.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
A.	4	3	4	3	3	4	3	1	3	3	2	3	3	4	4	3	4	4	2	2
Q.	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
A.	3	2	1	3	1	4	3	3	2	1	4	3	3	3	2	2	2	2	3	1
Q.	86	87	88	89	90															
A.	4	2	2	3	2															

BIOLOGY

Q.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110
A.	3	2	3	3	3	2	3	3	2	3	3	3	1	3	3	4	2	4	2	1
Q.	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
A.	1	1	2	2	4	2	4	3	2	1	4	2	3	3	3	4	1	4	1	3
Q.	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
A.	1	2	2	3	3	3	2	2	3	3	3	4	3	3	4	2	2	3	4	3
Q.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170
A.	3	2	4	2	1	2	3	4	2	1	1	1	3	1	3	2	2	4	1	2
Q.	171	172	173	174	175	176	177	178	179	180										
A.	2	3	3	1	1	2	1	2	1	1										

SOLUTIONS

PHYSICS

1) $W = (Q_f - Q_i)V = \left(CV - \frac{CV}{2}\right)V = \frac{CV^2}{2}$

2) n plates connected alternately gives rise to (n – 1) capacitors connected in parallel.
 Resultant capacitance = (n – 1) C

3) $W = C_{eq.}V^2 = 2\mu(10)^2 = 200\mu J$

4) $C = 4\pi\varepsilon_0 R = 4\pi\varepsilon_0 n^{\frac{1}{3}} r = n^{\frac{1}{3}} C$

5) $V = \frac{C_1V_1 + C_2V_2}{C_1 + C_2} = \frac{12(50)}{12+4} = 37.5V$

6)

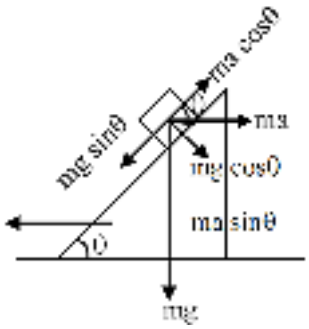
By nodal method, $(V_A - 5) \times 3 + (V_A - 10) \times 2 = 0$
$\Rightarrow V_A = 7$ V

7) $q_i = C_{eq}.\ V = (1)\ 10 = 10\ \mu C$
$q_f = \frac{4}{3}(10) = \frac{40}{3}$
% change $= \frac{\left(\frac{40}{3} - 10\right)}{10} \times 100 = \frac{100}{3}\%$

8) $q = q_{max}\left(1 - e^{-\frac{t}{RC}}\right)$
$\frac{q_{max}}{2} = q_{max}\left(1 - e^{-\frac{t}{RC}}\right) \Rightarrow t = RC \ln 2$

9) Statement (1) is correct and (2) is incorrect.

10) By F. B.D



as we know

$a = g \tan \theta$

$\tan \theta = \frac{5}{10} = \frac{1}{2}$

Now

$N = mg \cos\theta + ma \sin\theta$

$= 1 \times 10 \times \frac{2}{\sqrt{5}} + 1 \times 5 \times \frac{1}{\sqrt{5}} \Rightarrow \frac{25}{\sqrt{5}}$

$= 5\sqrt{5}N$

11) Since

$\mu mg\cos\theta > mg\sin\theta$

Hence body will decelerate and come to rest.

12) Normal Reaction= 15 N weight = 10N

$f_{max} = \mu N = 9$ N

since, weight > f_{max}

block will move downwards.

13) From F.B.D of man

$T + N = 50\ g$ ...(1)

From F.B.D of frame $T = 30\ g + N$

$T - N = 30\ g$ ....(2)

From (1) & (2)

$2T = 80\ g$

$\boxed{T = 40g}$

Here external force of rope by man is equal to tension.

$F = 40\ g$

14) at t = 2 s

$\Delta P = m (v - u)$

$= 0.1 (0 - 2)$

$= - 0.2$ kg m/sec.

15)

Pseudo force from ground = Zero (inertial frame)

Pseudo force from platform = $-m_{body} . a_{Frame}$

$= -50(-5\hat{i}) = 250\hat{i}$

Pseudo force from trolley $= -m_{body}\, a_{frame}$

$= 250\ \hat{i}$

16) $F = \frac{V.dm}{dt}$

$= 20.\left(\frac{50}{60}\right)$

$= \frac{1000}{60} = 16.66N$

17) $\frac{V.dm}{dt} - mg = ma$

upthrust = mg + ma

$= 7.0 \times 10^5$ N

18) $a = \frac{60-30}{3+6} = \frac{10}{3}$ m/s^2

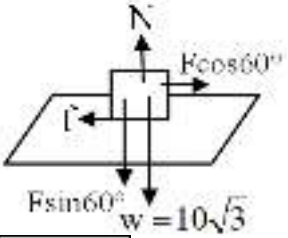
T – 30 = $3 \times \frac{10}{3}$

T = 40 N

Reading = 2T = 80 N = 8 kgf

19) f = μN

Fcos60 = μ (w + Fsin 60°)



$\boxed{F = 20N}$

20) I case : $\boxed{mg - F = ma}$ ....(1)

II case : $f - m'g = m'a$ ..... (2)

From (1) & (2)

$m' = \frac{m(g-a)}{(g+a)}$

Removed mass = m – m'

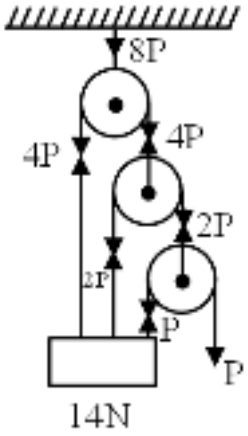
or $\frac{2ma}{g+a}$

21) $a = \frac{F_{net}}{m+M} = \frac{10}{10} = 1m/s^2$

Let F_0 is the reading of dynamometer

$F - F_0 = M\,(a)$
$20 - F_0 = (6)\,(1)$
$\boxed{F_0 = 14N}$

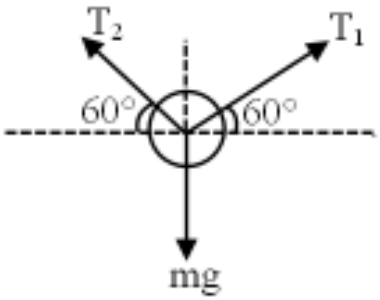
22) From constrained motion
$7P = 14$ N
$P = 2$N
Tension in upper cable
$\Rightarrow 8P$ or 16 N



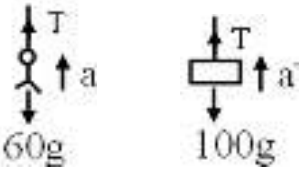
23) $T_1 \cos 60 - T_2 \cos 60 = ma$ ... (1)
$T_1 \sin 60 + T_2 \sin 60 = mg$ ... (2)
$T_1 = 2T_2$ .... (3)
On solving equation

$$T_1 = \frac{4mg}{3\sqrt{3}} \qquad T_2 = \frac{2mg}{3\sqrt{3}}$$

$$a = \frac{g}{3\sqrt{3}}$$



24) $F = K_1x_1 = K_2x_2$
force on wall
$F = K_1x_1(\hat{i})$

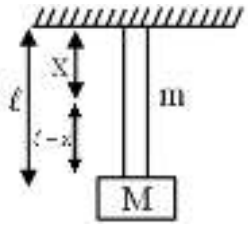


25)
$T - 60g = 60a$ ... (1) $T - 100g = 100a'$ ...(2)
and $a + a' = \frac{5}{4}g$ ... (3) By solving (1), (2) & (3)

$$T = \frac{19500}{16} = 1218\ N$$

26) In equilibrium

$$T = Mg + \frac{m}{\ell}(\ell - x)\,g$$



For ℓ length mass – m

For (ℓ – x) length mass

$$= \frac{m}{\ell}(\ell - x)$$

27) From t = 0 to some time friction increases as applied force increase, then friction becomes constant after a particular time.

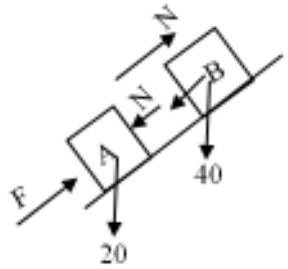
28) Action - Reaction should be on different bodies of same magnitude, same nature and in opposite direction.

29) From F. B. D of A

F – N – 10 = 2a

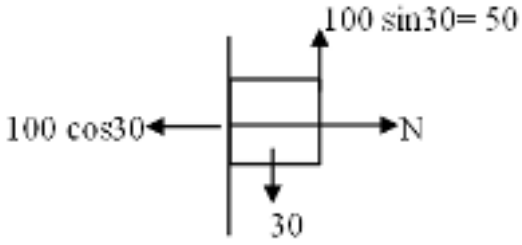
From F. B. D of B

N – 20 = 4a



Check by putting F

If F = 15 N , N = 10 N



30)

$f_{max} = \mu N$

$$= \frac{1}{4} \times 100 \times \frac{\sqrt{3}}{2}$$

$$= 21.25$$

$$50 = 30 + f$$

$$f = 20\ N < f_{max}$$

Hence $\boxed{f = 20N}$

31) Value of N is decreasing when block A moves from P to Q. At Q point N becomes zero. Hence it will leave the contact.

32) F - f = ma μmg = 10

30 – 10 = m (10) $\mu = \frac{1}{2}$ or 0.5

m = 2 Kg f_{max} = 10 N (block start at force = 10 N)

33)

We know Q = CV

Hence $(Q_1)_{max}$ = 6 mC while $(Q_2)_{max}$ = 12mC

However in series charge is same so maximum charge on C_2 will also be 6mC (and not 12mC)

and hence potential difference across C_2 will be $V_2 = \frac{6mC}{3\mu F} = 2kV$ and as in series

$V = V_1 + V_2$

So V_{max} = 6kV + 2kV = 8kV

34) Energy density = $\frac{\text{Energy}}{\text{Volume}}$

Energy = Energy density × volume

$= \frac{1}{2}\varepsilon^0 E^2 \times a^3$

Put $E = \frac{\sigma}{\varepsilon_0}$

35) After closing the switch, inner sphere is grounded.

Hence V_{inner} = 0

Let after closing the switch, charge on inner sphere be q then

$V_{inner} = \frac{Kq}{R} + \frac{KQ}{3R} = 0$

$q = \frac{-Q}{3}$

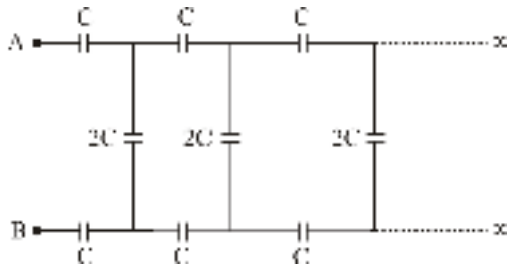
36) $T_{1/2}$ = 0.7 RC

$R = \frac{T_{1/2}}{0.7C} = \frac{70 \times 10^{-3}}{0.7 \times 2 \times 10^{-6}}$

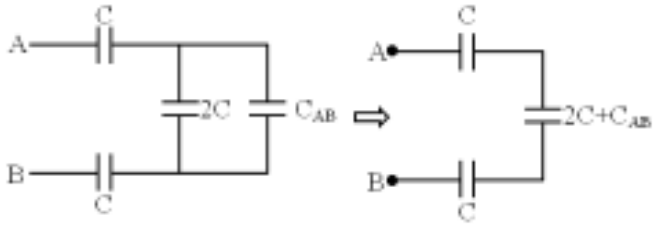
$= \frac{10^5}{2} = 5 \times 10^4$

$R = 50 \times 10^3\ \Omega = 50\ k\Omega$

37)



We have find C_{AB}, then circuit can be redrawn like this .....



OR $\frac{1}{C_{AB}} = \frac{1}{C} + \frac{1}{2C + C_{AB}} + \frac{1}{C}$

$\frac{1}{C_{AB}} = \frac{2}{C} + \frac{1}{2C + C_{AB}} = \frac{(4C + 2C_{AB}) + C}{C(2C + C_{AB})}$

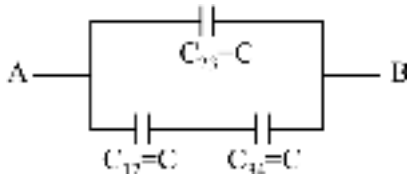
OR $C(2C + C_{AB}) = C_{AB}(5C + 2C_{AB})$

OR $C_{AB}^2 + 2C\,C_{AB} - C^2 = 0$

OR $C_{AB} = \frac{-2C \pm \sqrt{(2C)^2 - 4\left(-C^2\right)}}{2}$

OR $C_{AB} = \left(\sqrt{2} - 1\right) C$

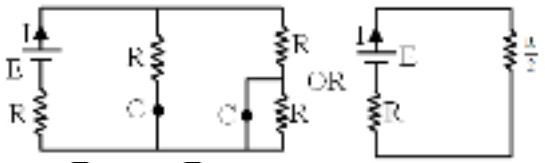
38)



$C_{eq} = \frac{3}{2}C = \frac{3}{2}\frac{\varepsilon_0 A}{d}$

39)

At t = 0 capacitor behave like short circuit
so



$I = \frac{E}{R + \frac{R}{2}} = \frac{2E}{3R}$

40)

When dielectric is placed

$-\frac{dv}{dx} = E = \frac{\sigma}{K\varepsilon_0} = \frac{E_0}{K}$

And $K_1 > K_2 > 1$ So

Slop of V and d curve $\left(\frac{dv}{dx} \propto -\frac{1}{K}\right)$ is more for K_2 than K, But slope for both K_1 and K_2 is lesser than for air or vacuum.

41) $V_{com} = \frac{3 \times 300 - 2 \times 200}{3+2} = 100\,V$

$q_1 = 3 \times 300 = 900\ \mu C$

$q'_1 = 3 \times 100 = 300\ \mu C$

$\Delta q = 900 - 300$

$= 600\ \mu C$

42) In case 2F force is used to lift 2m mass whereas in all other cases lesser force is used to lift 2m mass.

43)

For 2Kg limiting friction is $f_e = 0.6 \times 2 \times 10 = 12N$

Its maximum possible acceleration = $\frac{12}{2} = 6m/s^2$

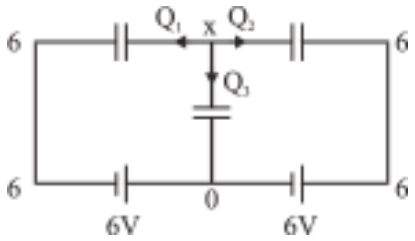
But applied force is 20 N it gives acceleration = $\frac{20}{2+3} = 4m/s^2$

So both block will more together and acceleration = $4m/s^2$

44) $\frac{\varepsilon_0 A}{d} = 9\ PF$

$$C' = \frac{\frac{\varepsilon_0 \times 3A}{d/3} \times \frac{\varepsilon_0 \times 6A}{2d/3}}{\frac{\varepsilon_0 \times 3A}{d/3} + \frac{\varepsilon_0 \times 6A}{2d/3}} = \frac{\frac{9\varepsilon_0 A}{d} \times \frac{9\varepsilon_0 A}{2d}}{\frac{18\varepsilon_0 A}{2d}} = \frac{9}{2}\frac{\varepsilon_0 A}{d}$$

$C' = \left(\frac{9}{2} \times 9\right) pF = 40.5pF$



45)

By KCL

$Q_1 + Q_2 + Q_3 = 0$

$2(x - 6) + 2(x - 6) + 4(x - 0) = 0$

$\boxed{x = 3}$

$Q = CV$

$= 2 \times 3 = 6\ \mu C$

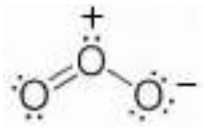
CHEMISTRY

46)

Concept - Square pyramidal geometry, as seen in BrF_5 and $XeOF_4$, requires six electron domains. This corresponds to sp^3d^2 hybridization, which provides the necessary six hybrid

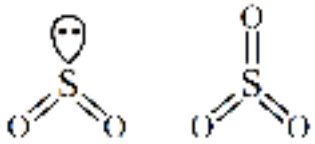
orbitals for the observed shape.

47) XeF_3^+ hybridisation is sp^3d (3 bp, 2 □p) T-shape.

48) 

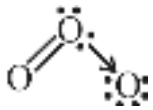
49)

(1) Bond order of SO_4^{-2} is 1.5 and O_2^- is also 1.5.

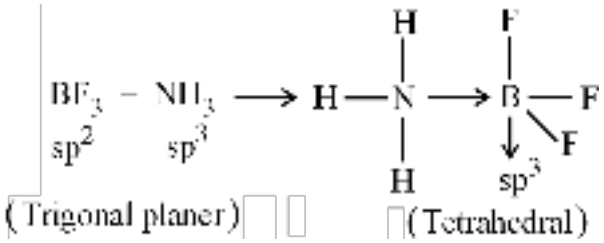
(2) 

1 pπ – pπ 1 pπ – pπ
1 pπ – dπ 2 pπ – dπ

(3) s and p block elements are main group elements.
(4) sp hybridisation is called diagonal hybridisation.

50) H–O–O–H O = O 
B.O. = 1 B.O. = 2 B.O. = 1.5

51) Intermolecular H-bond ∝ Boiling point
∝ Viscosity
$$\propto \frac{1}{\text{Volatile nature}}$$

52) 

53) $CH_3Cl > CH_3F > CH_3Br > CH_3I$ is order of dipole moment based upon q × d values of all bonds and vector sum of all bond moments.

54)

Vapour pressure ∝ $\frac{1}{\text{Boiling point}}$
order of boiling point is

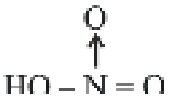
$PH_3 < AsH_3 < NH_3 < SbH_3$
So, minimum vapour pressure of SbH_3.

55) (P) Along the I.N.A. ⇒ σ
(Q) p + d ⇒ π bonding
(R) Opposite phase → π antibonding
(S) Opposite phase → σ bond (s–s)

56) XeF_2, I_3^- → Linear (planar)
BCl_3 → Plane triangle (planar)
XeF_4 → Square planar (planar)
$[XeF_5]^-$ → Pentagonal planar (planar)
ClF_3 → Bent 'T' - shape (planar)
H_2O → 'V' - shape (planar)

57) NaCl Ionic

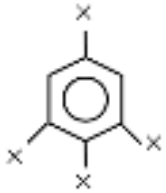
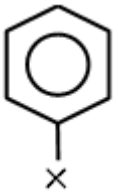
58) HNO_3



Maximum covalency of Nitrogen = 4

59) L.E. $\propto \frac{\text{Charge}}{\text{size}}$

60) Due to large size of I^-.

61) 
The three bond moments, which are 120° apart and equal in magnitude, have resultant zero.
It's net dipole moment equals to the  .

62)

b.p ∝ molar mass or surface area
$CH_4 < SiH_4 < GeH_4 < SnH_4$

63)

Ortho nitrophenol, salicylaldehyde ⇒
Intra H–bonding
Para nitrophenol ⇒ inter –H bonding.

64)

Hybridisation same, □p at central atom same
⇒ EN of central atom ∝ bond angle

65) As the electronegativity of central atom increases the bond angle increases due to repulsion between bond pair and bond pair as bond pairs are more close to the central atom.

66)

Due to intramolecular H-bonding in o-hydroxy benzoic acid

67) sp^3 – tetrahedral, dsp^2 - square planar
sp^3d – trigonal bipyramidal, d^2sp^3-octahedral

68) Bond order $= \frac{1}{2}[N_b - N_a]$

69) In vapour phase of sulphur S_2 molecule has 2 unpaired es^-

70) NCERT Pg.#131

$$C_2 \Rightarrow \underbrace{1s^2(\sigma)1s^2(\sigma*)2s^2(\sigma*)}_{\text{Non bonding}}$$

$$\pi 2p_x^2\,\pi 2p_y^2 \Rightarrow \text{B.O.} = \frac{4-0}{2} = 2$$

(Only π orbitals are used so 2π bonds present only)

71) B.E. = $Cl_2 > Br_2 > F_2 > I_2$
EN = F > Cl > Br > I

72)

I.E. → B > T□ > Ga > A□ > In
due to Lanthanoid contraction & Transition contraction

73)

EN has no direct correlation with EA.

74)

Acidic character $H_2O < H_2S < H_2Se < H_2Te$
Top to bottom size increases
so, bond length increases, so bond strength decreases.

75) Both has same no of valence electron.

76)

(A) 3rd Alkali metal : Li Na K Rb Cs ⇒ $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$
(B) 2nd Transition element : $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^2$
(C) 2nd Noble gas : $1s^2\ 2s^2\ 2p^6$
(D) 2nd Halogen : $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$

77)

NCERT-XI (Part-1) Pg. # 91

78)

Boron exhibits a diagonal relationship with Silicon.

79) **Concept :** Element 115 is called Ununpentium (Uup)

80)

$1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^6$, $3d^{10}$, $4s^2$, $4p^6$, $4d^{10}$, $5s^2$, $5p^5$
belong's to p-block
for p-block = 12 + no of pe^-
= 12 + 5
group no. = 17

81) • Natural transuranic elements (A) like Neptunium (Np) and Plutonium (Pu) match with (S).
• d-block elements (B) such as lron (Fe) and Cobalt (Co) correspond to (R).
• Diagonally related elements (C) like Beryllium (Be) and Aluminium (Al) match with (Q).
• Typical elements (D) such as sodium (Na) and Magnesium (Mg) correspond to (P).

82) $A\ell \simeq Ga$ Transitional contraction.

83) **Solution/Explanation :**
F > O > N > C
(4) (3.5) (3) (2.5)

Final Answer - F > N < O > C

84) **Concept :** +ve charge $\propto \frac{1}{\text{Size}}$
In case of ion's of same atom +ve charge has less size & –ve charge has more size.
$\therefore I^- > I > I^+$

85) Fe ≈ Co ≈ Ni Atomic radii order

86) I.E ⇒ $Be^{+2} > Li^+ > He > He^-$

87) $\mathbf{Ca_{(g)} \rightarrow Ca^+_{(g)} + e^-}$ **:** This represents the first ionization energy of Ca.

88)

IE ⇒ B < C < O < N

89) NCERT, Pg # 88, Fig.-3.5
Li Na K
Na is placed between Li & K in same group. So property will be intermediate.

90) Sudden jump in between 2nd IP & 3rd IP decide 2 electron in outermost shell.

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92) NCERT Pg. # 72

93) NCERT Pg # 74

94)

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95) NCERT Pg # 72

96)

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97) NCERT (XI) Pg. # 72

98) NCERT (XI) Pg. # 73

99)

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100) NCERT Pg. # 73

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126) NCERT_Pg. No. # 63

127) NCERT_Pg. No. # 65

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130) NCERT_Pg. No. # 60

131)

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132) NCERT_Pg. No. # 64

133) Old NCERT_Pg. No. # 79

134) NCERT Pg. No. # 60

135) NCERT_Pg. No. # 61

136) NCERT_Pg. No. # 80

137) NCERT-Pg. No. 80

138) NCERT_Pg. No. # 80

139) NCERT_Pg. No. 81

140) NCERT_Pg. No. 82

141) Only statement-II is correct.
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142) NCERT_Pg. No. # 83

143) NCERT_Pg. No. # 83, 84

144) NCERT old Pg. No. # 101

145)

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146) NCERT_Pg. No. 103

147) NCERT_Pg. No. # 103

148) NCERT_Pg. No. 104

149) NCERT Pg. No. # 112

150) NCERT Pg. No. # 112

151) NCERT Pg. No. # 112

152) NCERT_Pg. No. # 113

153) NCERT_Pg. No. 113

154) NCERT_Pg. No. # 113

155) Both **(A)** and (**R)** are true and (**R)** is the correct explanation of (**A)**.
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157)

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158) NCERT_Pg. No. 114, 115

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