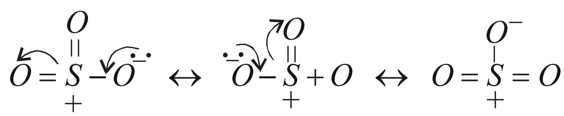
Hints & solutions of NEET (UG) 2018 Mock Test - V

1. (2) $HC\equiv C^-$
i.e. -ve charge on $HC\equiv C^-$ is most stable due to greaterelectronegativity of sp-hybridised carbon. The stability of other carbanions decreases as the +2-effect of the alkyl groups increases

2. (3) SO_3
i.e. SO_3 can be written as a resonance hybrid of the following



Due to the presence of +ve charge on sulpher it is electrophilic in nature

3. (4) the ion formed initially may react with Br^- or CH_3OH
i.e Bromination of ethene is slow reaction
i.e $CH_2 = CH_2 + Br_2 \xrightarrow{slow} \overset{+}{C}H_2CH_2Br$
$\overset{+}{C}H_2CH_2Br \xrightarrow[Fast]{Br^-} BrCH_2CH_2Br$
$\overset{+}{C}H_2CH_2Br \xrightarrow[-H^+]{CH_3OH} CH_3OCH_2CH_2Br$

4. (3) $\Delta H_1 < \Delta H_2$
i.e. when $H_2O(g)$ condenses to form $H_2O(l)$, heat is evolved and hence $\Delta H_2 > \Delta H$.

5. (4) -103 KJ
i.e. ΔH^0 = (B.E. of H_2 + B.E. of Br_2) - (2B.E. of HBr)

6. (4) CrO_4^{2-}
i.e. In basic medium, chromium salts form chromate ions

7. (2) Malachite

8. (4) Sulphapyridine

9. (2) Styrene and butadiene

10. (4) 6 : 3 : 2

i.e.	$Ag^+ + e^- \rightarrow Ag$	1 mol $\rightarrow$ 1
		3 mol $\rightarrow$ 3
	$Cu^{2+} + 2e^- \rightarrow Cu$	2 mol $\rightarrow$ 1
		1 mol $\rightarrow \frac{1}{2}$
		3 mol $\rightarrow$ 3/2
	$Au^{3+} + 3e^- \rightarrow Au$	3 mol $\rightarrow$ 1
	$\therefore$ molar ratio =	3 : 3/2 : 1 i.e 6 : 3 : 2

11. (2) Y > Z > X
i.e. Greater the reduction potential, less is the reducing power

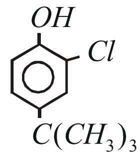
12. (4) $[Cu(NH_3)_4]^{2+}$
$[Cu(NH_3)_4]^{2+}$ is square planar but others are tetrahedral in shape due to extra stability of completely filled d-orbitals.

13. (3) sp^3d^2

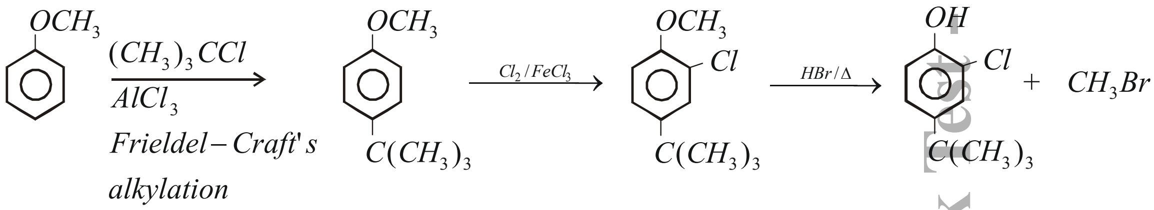
14. (2) $ZnCl_2$

15. (4) Mn^{2+}

16. (3) $(CH_3)_2C=CHCH_3$
i.e. Due to more stable according to Saytzeff's rule

17. (4) 

i.e.



Unsymmetrical ether containing no 3^0 alkyl group reacts with HX, alxyl group containingless no. of carbon will combine with halogen

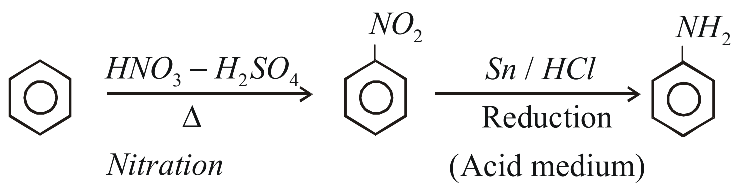
18. (2) 2-chloropropane-1, 3-diol
i.e. Anti mark. addition due to the presence of an e^- withdrawing group

19. (4) Acetophenone
i.e. Carbonyl compounds containing atleast 2 α - Hydrogen can undergo Aldol condensation

20. (3) 3-pentanone
i.e negative Tollen's test means ketone containing 3 α - H will not give +ve iodoform test

21. (3) CH_3CBr_2-COOH
i.e. Hell - Vohlard Zellinsky reaction

22. (2) Aniline

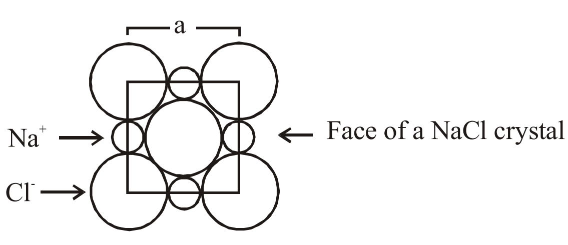
i.e 

23. (2) $LiAlH_4$
i.e simple reduction with LAH

24. (1) II < III < IV < I < V
I. sp^2 II. sp^3d^2 III. sp^3d IV. sp^3 V. sp (50% s & 50%p character)

25. (2) Hybridization state and Basicity
All are sp^3 hybridised & Monobasic acids

26. (1) $\frac{1}{2}a\sqrt{2}$



Face diagonal $\Rightarrow$ 2d = $\sqrt{2}a$, so d = $\frac{\sqrt{2}}{2}a$

27. (1) $\alpha - D - (+) -$ Glucopyranose
OH group on C_1 carbon is down so $\propto$

28. (2) mutual coagulation, $Al^{3+} > Ba^{2+} > Na^+$
Hardy Schultz rule says more +ve charge, more power to coagulate a -ve sol.

29. (2) $\frac{dc}{dt} = k[A]$

Keeping [A] constt and [B] is changed, rate do not change, so it is zero order w.r.t. B. But when [A] is doubled, rate is also doubled, so it is first order w.r.t. A

30. (4) A > B > D > C

Para form have highest B.P. due to more extend of intermolecular hydrogen bonding.

31. (3) $\frac{27}{5}$

$$E_n = -\frac{13.6}{n^2} ev$$

$$E_2 - E_1 = -3.4 - (-13.6) = 10.2 ev$$

$$E_3 - E_2 = -1.51 - (-3.4) = 1.89 ev$$

so. $\frac{E_2 - E_1}{E_3 - E_2} = \frac{10.2}{1.89} = 5.4 = \frac{27}{5}$

32. (2) 6.023×10^{24}

18 ml of water = 1 mole = 6.023×10^{23} molecules and each molecules contains 10 electrons.

so. no. of e^- = $10 \times 6.023 \times 10^{23}$

33. (1) $\left(1 - \frac{a}{RTV}\right)$

At low pressure, b term is negligible. so

$$\left(P + \frac{a}{v^2}\right)V = RT$$

PV + $\frac{a}{v} = RT$

Dividing by RT

$$\frac{PV}{RT} + \frac{a}{RTV} = 1$$

$\because$ Z = $\frac{PV}{RT}$

so Z = 1 - $\frac{a}{RTV}$

34. (3) $X_2 = Cl_2$

Order of oxidising power is $F_2 > Cl_2 > Br_2 > I_2$ and so Br_2 can not oxidise Cl^-

35. (1) $\frac{Kp}{Kc} < 1$

For the reaction, $n_p = 1$, $n_r = 2$, $\Delta n = -1$

$\because K_P = K_C(RT)^{\Delta n}$

$K_p = K_C.(RT)^{-1}$

$\frac{K_P}{K_C} = \frac{1}{RT}$ Which is less than 1 $\because$ RT > 1

36. (4) 40 mL

On the reaction

2 volume CO is obtained from 1 volume of CO_2

so, 20 ml will give 40 ml of CO

37. (3) $\frac{2}{3}$ atm

$$n_{CH_4} = \frac{4}{6} = 0.25$$

$$n_{He} = \frac{2}{4} = 0.5$$

$$x_{He} = \frac{0.5}{0.75}$$

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

According to dalton law, $P_{He} = P_T\, x_{He}$

38. (1) +6, +6
Caro's acid = H_2SO_5
Marshal's acid = $H_2S_2O_8$ and both contains on peroxide bond with O.S of oxygen -1 each.

39. (3) $CHCl_3$ & CH_2Cl_2
$CHCl_3$ and CH_2Cl_2 are both polar molecules

40. (2) Gelatin

41. (1) II, IV, V
NO_3^- and CO_3^{2-} are trigonal planar while others are non-planar

42. (4) Solvated electron

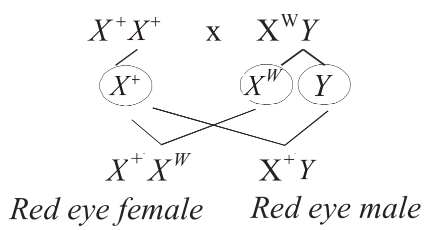
43. (2) Reducing power of $FeSO_4$ to convert NO_3^- to NO

44. (2) A – B interaction is weaker than A – A and B – B interaction

45. (2) $2HI + H_2SO_4 \rightarrow I_2 + SO_2 + 2H_2O$
S is reduced from +6 to +4 O.S in second reaction .

46 (4) NCERT-XII Pg. No. 242
47 (1) NCERT-XII Pg. No. 243
48 (1)
49 (4)
50 (2) NCERT-XI Pg. No. 270/271
51 (3) NCERT-XII Pg. No. 187
52 (1)
53 (4)
54 (2)
55 (3)
56 (1) NCERT-XII Pg. No. 244
57 (3) NCERT-XII Pg. No. 251
58 (4) NCERT-XI Pg. No. 334
59 (3) NCERT-XI Pg. No. 336
60 (2) NCERT-XI Pg. No. 324 / 325
61 (3)
62 (4)
63 (4)
64 (3) NCERT-XI Pg. No. 275
65 (1)
66 (1)
67 (1)
68 (4) NCERT-XI Pg. No. 4
69 (3)
70 (1)
71 (2) NCERT-XI Pg. No. 308

72 (1)
73 (2)
74 (2)
75 (1) NCERT-XI Pg. No. 19
76 (3)
77 (3)
78 (3) NCERT-XI Pg. No. 323
79 (4)
80 (2) NCERT-XII Pg. No. 168
81 (2)
82 (2) NCERT-XI Pg. No.338
83 (2)
84 (1)
85 (2)
86 (3)
87 (2) NCERT-XI Pg. No.20/21
88 (2) NCERT-XI Pg. No.302
89 (1) NCERT-XI Pg. No. 101/102
90 (3) NCERT-XI Pg. No. 311
91 (3) Peroxisomes and Glyoxysomes are microbodies
92 (4) NCERT-XII Pg. No. 81, 82
93 (2) NCERT-XI Pg. No.132
94 (1) NCERT-XI Pg. No. 130
95 (1) NCERT-XI Pg. No. 130
96 (1) NCERT-XI Pg. No. 147
97 (3) Feedback allosteric inhibition
98 (3) G_1 - Maximum duration
M - Minimum duration
99 (4)
100 (3)
101 (4) T ψC loop binds with Ribosome
102 (4)



X^+X^W X^+Y

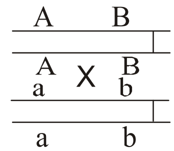
	X^+	Y
X^+	X^+X^Y	X^+Y
X^W	X^+X^W	X^WY

103 (2) NCERT-XII Pg. No. 115
104 (2) NCERT-XI Pg. No. 194
105 (3) NCERT-XII Pg. No. 201
106 (3) NCERT-XII Pg. No. 202, 203
107 (2) NCERT-XII Pg. No. 197
108 (4) $A_aB_bC_cD_d$ X $A_aB_bC_cD_d$

↓

aabbccdd

$\frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} = \frac{1}{256}$

109 (2) 

110 (2) $Y_y R_r$ X yyrr

111 (1)

112 (3) NCERT-XI Pg. No. 93

113 (2) NCERT-XI Pg. No.93

114 (2) NCERT-XI Pg. No. 97

115 (4) NCERT-XI Pg. No.86, 89

116 (1) Most advanced group - Chlorophyta
Most primitive group - Rhodophyta

117 (4) *Chondrus* is a red alga

118 (4) NCERT-XI Pg. No.29

119 (2) Endosperm is pre fertilization tissue
NCERT-XI Pg. No.39

120 (4)

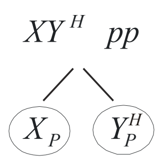
121 (3)

122 (1) NCERT-XI Pg. No.76

123 (2) NCERT-XII Pg. No. 28

124 (1) NCERT-XII Pg. No. 36

125 (2) NCERT-XII Pg. No. 25

126 (4) 

127 (2) NCERT-XI Pg. No.232

128 (1) NCERT-XII Pg. No. 252

129 (4) NCERT-XII Pg. No. 202

130 (3) NCERT-XI Pg. No. 38

131 (1) NCERT-XI Pg. No. 138

132 (4) NCERT-XII Pg. No. 198

133 (3) NCERT-XI Pg. No. 80

134 (1) NCERT-XI Pg. No. 79

135 (1) NCERT-XI Pg. No.90, 91

136 (4) -(1/2) mv^2 Total energy = - KE = $\frac{PE}{2}$

K.E = $\frac{1}{2}mv^2$

137 (3) E is always negative

In a circular or elliptical orbital motion, torque is always acting parallel to displacement or velocity. So, angular momentum is conserved. In attractive field, potential energy is negative. Kinetic energy changes as velocity increase when distance is less. So, option (3) is correct

138 (3) Using $\frac{F-32}{180}=\frac{C}{100}$

$\Rightarrow$ C = 60

Temperature of boiling water = 100^{0}C

We get, fall in temperature = 100 - 60 = 40^{0}C

139 (1) ΔU = -ΔW, in an adiabatic process

By first law of thermodynamics, $\Delta Q=\Delta U+\Delta W$

In adiabatic process, $\Delta Q=0$

$\therefore\ \Delta U=-\Delta W$

In isothermal process, $\Delta U=0$

$\therefore \Delta Q=\Delta W$

140 (1) 600 K

Efficiency of carnot engine (η_1) = 40% = 0.4; Initial intake temperature (T_1) = 500K and new efficiency (η_2) = 50% = 0.5.

Efficiency $(\eta)=1-\frac{T_2}{T_1}$ or $\frac{T_2}{T_1}=1-\eta$.

Therefore in first case, $\frac{T_2}{500}=1-0.4=0.6$.

$\Rightarrow T_2=0.6\times500=300\text{K}$

And in second case, $\frac{300}{T_1}=1-0.5=0.5$

$\Rightarrow T_1=\frac{300}{0.5}=600\,K$

141 (4) 7/5

$C_P=\frac{7}{2}R;\ C_V=C_P-R=\frac{7}{2}R-R=\frac{5}{2}R$

$\frac{C_P}{C_V}=\frac{7/2\,R}{5/2\,R}=\frac{7}{5}$

142 (3) $\frac{nkT}{2}$

According to law of equipartition of energy, the energy per degree of freedom is $\frac{1}{2}$kT. For a polyatomic gas with n degrees of freedom , the mean energy per molecule = $\frac{1}{2}$nkT

143 (3) K_0 and K_0

We have, $U+K=E$

where, U = potential energy, K = Kinetic energy, E = Total energy.

Also, we know that, in S.H.M., when potential energy is maximum, K.E. is zero and vice-versa.

$\therefore U_{max}+0=E \Rightarrow U_{max}=E$

Further,

$$K.E.=\frac{1}{2}m\omega^2a^2\cos^2\omega t$$

But by question, $K.E.=K_0\cos^2\omega t$

$$\therefore K_0=\frac{1}{2}m\omega^2a^2$$

Hence, total energy, $E=\frac{1}{2}m\omega^2a^2=K_0$

$\therefore U_{max}=K_0$ & $E=K_0$.

144 (4) $\sqrt{(g^2+a^2)}$

The effective value of acceleration due to gravity is $\sqrt{(a^2+g^2)}$

145 (1) $y=0.2\sin\left[2\pi\left(6t-\frac{x}{60}\right)\right]$

$v=n\lambda$

$$\Rightarrow n=\frac{v}{\lambda}=\frac{360}{60}=6$$

$a=0.2$

For a wave travelling along positive x-axis

$y=a\sin(\omega t-kx)$

$$=a\sin\left(2\pi nt-\frac{2\pi x}{\lambda}\right)$$

$$=a\sin 2\pi\left(nt-\frac{x}{\lambda}\right)=0.2\sin 2\pi\left(6t-\frac{x}{60}\right)$$

146 (1) 20 m/s

Here, $\nu'=\frac{9}{8}\nu$

Source and observer are moving in opposite direction, therefore, apparent frequency

$$\nu'=\nu\times\frac{(v+u)}{(v-u)}$$

$$\frac{9}{8}\nu=\nu\times\frac{340+u}{340-u}$$

$$\Rightarrow 9\times340-9u=8\times340+8u$$

$$\Rightarrow 17u=340\times1\Rightarrow u=\frac{340}{17}=20\text{ m/sec.}$$

147. (3) pE

When electric dipole is aligned parallel $\theta = 0°$ and the dipole is rotated by $90°$ i.e., $\theta = 90°$.
Energy required to rotate the dipole
$W = U_f - U_i = (-pE\cos 90°) - (-pE\cos 0°)$
$= pE.$

148. (4) 20 N/C

Charge (q) = 0.2 C; Distance (d) = 2m; Angle $\theta = 60°$ and work done (W) = 4J.
Work done in moving the charge (W)
$= F.d\cos\theta = qEd\cos\theta$

$$\text{or, } E = \frac{W}{qd\cos\theta} = \frac{4}{0.2\times 2\times\cos 60°} = \frac{4}{0.4\times 0.5}$$
$= 20$ N/C.

149. (3) 20μF

$C = 10\,\mu$F $\quad d = 8$ cm
$C' = ?$ $\quad d' = 4$ cm

$$C = \frac{A\epsilon_0}{d} \Rightarrow C \propto \frac{1}{d}$$
If d is halved then C will be doubled.
Hence, $C' = 2C = 2\times 10\,\mu F = 20\,\mu F$

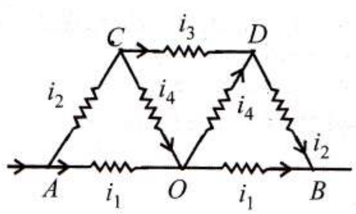
150. (4) $\frac{8}{7}\Omega$

At A current is distributed and at B currents are collected. Between A and B, the distribution is symmetrical. It has been shown in the figure. It appears that current in AO and OB remains same. At O, current i_4 returns back without any change. If we detach O from AB there will not be any change in distribution.
Now, CO & OD will be in series hence its total resistance $= 2\Omega$
It is in parallel with CD, so, equivalent resistance

$$= \frac{2\times 1}{2+1} = \frac{2}{3}\Omega$$

This equivalent resistance is in series with AC & DB, so, total resistance

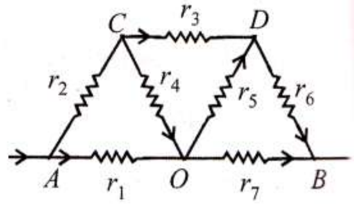
$$= \frac{2}{3} + 1 + 1 = \frac{8}{3}\Omega$$



Now $\frac{8}{3}\Omega$ is parallel to AB, that is, 2Ω, so total resistance

$$= \frac{8/3 \times 2}{8/3 + 2} = \frac{16/3}{14/3} = \frac{16}{14} = \frac{8}{7}\Omega$$

[Alt :



Between C & D, the equivalent resistance is given by

$$1/r = \frac{1}{r_3} + \frac{1}{(r_4 + r_5)} = 1 + \frac{1}{2} = \frac{3}{2}$$

Equivalent resistance along

$$ACDB = 1 + \frac{2}{3} + 1 = \frac{8}{3}$$

$\therefore$ Effective resistance between A and B is

$$\frac{1}{R} = \frac{3}{8} + \frac{1}{2} = \frac{7}{8} \text{ or } R = \frac{8}{7}\Omega]$$

151. (3) 8

To carry a current of 4 ampere, we need four paths, each carrying a current of one ampere. Let r be the resistance of each path. These are connected in parallel. Hence, their equivalent resistance will be r/4. According to the given problem $\frac{r}{4} = 5$ or $r = 20\Omega$.

For this propose two resistances should be connected. There are four such combinations. Hence, the total number of resistance $= 4 \times 2 = 8$.

152. (2) move in a circular orbit with its speed unchanged

In a perpendicular magnetic field, the path of a charged particle is a circle, and the magnetic field does not cause any change in energy

153. (2) $-\vec{F}$

Here, $\vec{F}_{AB} + \vec{F}_{BCDA} = \vec{0}$

$\Rightarrow \vec{F}_{BCDA} = -\vec{F}_{AB} = -\vec{F}$

$\left(\because F_{AB} = \vec{F}\right)$

154. (1) 2450Ω in series

$R_g = 50\Omega, I_g = 25 \times 4 \times 10^{-A}\Omega = 10^{-2}$ A

Range of $V = 25$ volts

$V = I_g(R_e + R_g)$

$$\therefore R_e = \frac{V}{I_g} - R_g = 2450\Omega$$

155. (3) $\vec{M} \times \vec{B}$

We know that when a bar magnet is placed in the magnetic field at an angle θ, then torque acting on the bar magnet (τ)

$= MB\sin\theta = \vec{M} \times \vec{B}$.

Note : This torque τ has a tendency to make the axis of the magnet parallel to the direction of the magnetic field.

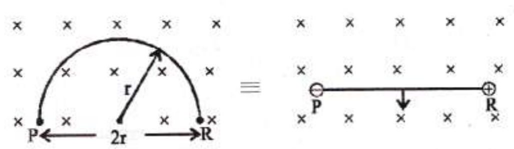
156 (4) 2rBv and R is at higher potential

Rate of decreasing of area of semicircular

ring $= \frac{dA}{dt} = (2r)V$

From Faraday's law of electromagnetic induction

$$e = -\frac{d\phi}{dt} = -B\frac{dA}{dt} = -B(2rV)$$



As induced current in ring produces magnetic field in upward direction hence R is at higher potential.

157 (3) 0.5 A

$$i = \frac{e}{R} = \frac{\frac{nAdB}{dt}}{R}$$

$$= \frac{20 \times (25 \times 10^{-4}) \times 1000}{100} = 0.5\text{A}$$

158 (3) 2 s

$L = 2\text{mH}, i = t^2 e^{-t}$

$$E = -L\frac{di}{dt} = -L[-t^2e^{-t} + 2te^{-t}]$$

when $E = 0$,

$-e^{-t}t^2 + 2te^{-t} = 0$

or, $2t\,e^{-t} = e^{-t}t^2$

$\Rightarrow t = 2$ sec.

159 (4) Zero and therefore no current
A transformer is essentially an AC device. DC source so no mutual induction between coils $\Rightarrow E_2 = 0$ and $I_2 = 0$

160 (2) $\lambda_m > \lambda_v > \lambda_x$

We know $E = \frac{hc}{\lambda} \Rightarrow E \propto \frac{1}{\lambda}$

$\Rightarrow E_m < E_v < E_x$

$\therefore \lambda_m > \lambda_v > \lambda_x$

161 (2) only $\frac{d}{2}$

Using the lens formula $\frac{1}{f}=\frac{1}{v}-\frac{1}{u}$

Given $v=d$, for equal size image $|v|=|u|=d$

By sign convention $u=-d$

$\therefore \quad \frac{1}{f}=\frac{1}{d}+\frac{1}{d} \quad$ or $f=\frac{d}{2}$

162 (1) 10 cm

The silvered plano convex lens behaves as a concave mirro; whose focal length is given by

$\frac{1}{F}=\frac{2}{f_1}+\frac{1}{f_m}$

If plane surface is silvered

$f_m=\frac{R_2}{2}=\frac{\infty}{2}=\infty$

$\therefore \frac{1}{f_1}=(\mu-1)\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$

$=(\mu-1)\left(\frac{1}{R}-\frac{1}{\infty}\right)=\frac{\mu-1}{R}$

$\therefore \frac{1}{F}=\frac{2(\mu-1)}{R}+\frac{1}{\infty}=\frac{2(\mu-1)}{R}$

$F=\frac{R}{2(\mu-1)}$

Here, $R=10$ cm, $\mu=1.5$

$\therefore F=\frac{10}{2(1.5-1)}=10\text{cm}$

163 (1) 0.30 mm

$$\beta'=\frac{\beta}{\mu}=\frac{0.4}{\frac{4}{3}}=0.3 \text{ mm}$$

164 (3) V_0

Since, stopping potential is independent of distance hence new stopping potential will remain unchanged i.e., new stopping potential = V_0

165 (4) 180^0

Impact parameter for Rutherford scattering experiment,

$$b=\frac{Ze^2\cot\left(\frac{\theta}{2}\right)}{4\pi\epsilon_0 k_i}=0 \Rightarrow \cot\left(\frac{\theta}{2}\right)=0$$

$$\Rightarrow \frac{\theta}{2}=90° \text{ or } \theta=180°$$

166 (3) $1/2\lambda$

$\lambda_A = 5\lambda$ and $\lambda_B = \lambda$

At $t = 0$, $(N_0)_A = (N_0)_B$

Given, $\frac{N_A}{N_B} = \left(\frac{1}{e}\right)^2$

According to radioactive decay,

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

$$\therefore \frac{N_A}{(N_0)_A} = e^{-\lambda_A t} \quad .....(1)$$

$$\frac{N_B}{(N_0)_B} = e^{-\lambda_B t} \quad .....(2)$$

From (1) and (2),

$$\frac{N_A}{N_B} = e^{-(5\lambda-\lambda)t}$$

$$\Rightarrow e^{-2} = e^{-(5\lambda-\lambda)t}$$

$$\Rightarrow 2 = 4\lambda t \Rightarrow t = \frac{1}{2\lambda}$$

167. (3) the emitter injects holes into the base of the p-n-p and electrons into the base region of n-p-n
In p-n-p transistor holes are injected into the base while electrons are injected into the base of n-p-n transistor. Emitter-base junction is forward biased.

168 (1) Moment of inertia and moment of a force
[Moment of inertia] = $[ML^2T^0]$
[Moment of force] = Force x distance
= $[ML^2T^{-2}]$

169 (1) 37.5 km/hr

$$v_{av} = \frac{2v_1v_2}{v_1+v_2}$$

$$= \frac{2 \times 30 \times 50}{30 + 50} = 37.5 km/h$$

170 (4) the acceleration is independent of the velocity

171 (1) $7\sqrt{2}$ units

$$\vec{v} = \vec{u} + \vec{a}t$$

$$= (3\hat{i} + 4\hat{j}) + 10(0.4\hat{i} + 0.3\hat{j})$$

$$= 7\hat{i} + 7\hat{j}$$

$$Speed = |\vec{v}| = \sqrt{7^2 + 7^2} = 7\sqrt{2}\ units$$

172 (3) 30^0
Given : $(\text{Range})^2 = 48\ (\text{Max. Height})^2$

$$\left(\frac{u^2 \sin 2\theta}{g}\right) = 48\left(\frac{u^2 \sin^2 \theta}{2g}\right)^2$$

$$u^2 \frac{\sin 2\theta}{g} = 4\sqrt{3}\,\frac{u^2 \sin^2 \theta}{2g}$$

$$2 \sin \theta \cos \theta = 2\sqrt{3} \sin^2 \theta$$

$$\tan \theta = \frac{1}{\sqrt{3}}$$

$$\theta = 30^0$$

173. (3) 0.06

Here u = 6 ms^{-1}, v = 0, t = 10 s

$$\therefore \quad a = \frac{v-u}{t}$$

$$= \frac{0-6}{10} = -0.6 ms^{-2}$$

$$\mu = \frac{f}{R} = \frac{ma}{mg} = \frac{a}{g}$$

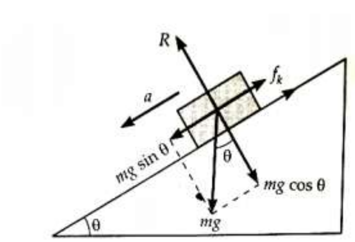
$$= \frac{0.6}{10} = 0.06$$

174 (1) zero

According to Newton's second law,

ma = f_k - mg sinθ = μ_kR - mg sinθ

= μ_k . mg cos θ - mg sin θ



$$\therefore \quad a = g(\mu_k \cos\theta - \sin\theta)$$

$$= g\left(\frac{1}{\sqrt{3}} \cos 30° - \sin 30°\right)$$

$$= g\left(\frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{2} - \frac{1}{2}\right) = \mathbf{0}.$$

175 (1) 475 J

$$K_i = \frac{1}{2}mv_i^2 = \frac{1}{2}\times 10\times (10)^2 = 500 \text{ J}$$

$$W = \int F\,dx = -0.1\int_{20}^{30} x\,dx$$

$$= -0.1\left[\frac{x^2}{2}\right]_{20}^{30} = -\frac{0.1}{2}[30^2 - 20^2] = -25 \text{ J}$$

By work-energy theorem,

$$K_f - K_i = W$$

$$K_f = W + K_i = -25 + 500 = \mathbf{475\ J}$$

176. (1) 2.5 m/sec

By conservation of momentum,

$$5\times 10 + 20\times 0 = 5\times 0 + 20\times v$$

$$\therefore \quad v = \frac{50}{20} = \mathbf{2.5\ ms^{-1}}.$$

177 (2) +7

$$W = \vec{F}\cdot\vec{r} = (5\hat{i} + 3\hat{j} + 2\hat{k})\cdot(2\hat{i} - \hat{j})$$

$$= 5\times 2 + 3(-1) + 2\times 0 = +\mathbf{7\ J}.$$

178 (2) when no external torque acts upon the system

Angular momentum of a system is conserved only when no external torque acts on it.

179 (2) 10.04 kg m^2

$$I = \left[\frac{2}{5}\times 1\times (0.1)^2 + 1\times 1^2\right] + \left[\frac{2}{5}\times 2\times (0.1)^2 + 2\times 1^2\right] + \left[\frac{2}{5}\times 3\times (0.1)^2 + 3\times 1^2\right] + \left[\frac{2}{5}\times 4\times (0.1)^2 + 4\times 1^2\right]$$

$$= 1.004 + 2.008 + 3.012 + 4.016 = \mathbf{10.04\ kg\ m^2}.$$

180 (1) $\frac{7}{10}mv^2$

$$E_{tot} = E_{tran} + E_{rot} = \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$$

$$= \frac{1}{2}mv^2 + \frac{1}{2}\times\frac{2}{5}mr^2.\frac{v^2}{r^2}$$

$$= \frac{1}{2}mv^2 + \frac{2}{10}mv^2 = \frac{7}{10}mv^2$$