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

Explanation

01. (4)1 astronomical unit $=1.496\times10^{11}$ m
All the other unit conversion are correct

02. (2) The speed in general is greater than the magnitude of the velocity
All the other statements are correct.

03. (4)

05. (4) Among the given quantities electric potenital is a scalar quantityt whereas all others are vector quanties

06. (3) Motion with constant momentum along a staright line implies $\vec{p}=$ cosntant
So, according to Newton's 2nd law

$$\vec{F}=\frac{d\vec{p}}{dt}=\frac{d}{dt}\text{ constant }=0$$

07. (1) Newtons laws of motion hold good for inertial frame. All the other statements are correct.

08. The kinetic energy (K) and momentum)p) of a body are related as

$$K=\frac{P^2}{2m} \text{ or } p=\sqrt{2mK}$$

where m is the mass of the body

$$\therefore \frac{p_1}{p_2}=\frac{\sqrt{2m_1K_1}}{\sqrt{2m_2K_2}}=\sqrt{\frac{m_1K_1}{m_2K_2}}$$

But $K_1=K_2$ (given)

$$\therefore \frac{p_1}{p_2}=\sqrt{\frac{m_1}{m_2}}$$

09. If two bodies of masses m_1 and m_2 moving with the same velocities are stopped by the same force, then the ratio of their stopping distances is

$$\frac{d_{s_1}}{d_{s_2}}=\frac{m_1}{m_2}$$

Here, $m_1=1\text{kg}$ and $m_2=2\text{kg}$

$\therefore \frac{d_{s_1}}{d_{s_2}} = \frac{1kg}{2kg} = \frac{1}{2}$

10. (4) Let m be the mass of each disc.
The moment of inertia of disc A is

$I_A = \frac{1}{2}mr^2$

and that of disc B is

$I_B = \frac{1}{2}m(2r)^2 = 4\left(\frac{1}{4}mr^2\right) = 4I_A$ (using (i))

or $I_A = \frac{1}{4}I_B$

11. (3) Radius of gyration is a scalar quantity.
12. (2) Orbital velocity of earth satellite is

$v_0 = \sqrt{\frac{GM}{R+h}} = \sqrt{\frac{gR^2}{R+h}}$ $\left(\because g = \frac{GM}{R^2}\right)$

Thus it is independent of the mass of the satellite (m) but depends on the mass of the earth (M), radius of the earth (R), acceleration due to gravity (g) and height (h) of the satellite from the surface of earth.

13. (4) Gravitational potential energy of a body of mass m at a height (h) of the satellite from the surface of earth is

$U = -\frac{GMm}{(R+h)}$

14. (4) When the stones are unloaded into water, the water level falls becasue the volume of the water displaced by stones in water will be less than the volume of water displaced when stones in hte boat
15. (4) According to definition of Young's modulus

$Y = \frac{F/A}{\Delta L/L} = \frac{F/\pi r^2}{\Delta L/L}$

$\therefore$ Elongation produced in a wire is

$\Delta L = \frac{FL}{\pi r^2 Y}$

Where L is the length of the wire, r is its radius and F is the stretching force.
As both wires are of same length (L) and same mateiral i.e., Y is same and produce equal elogations

$\therefore \Delta L_1 = \Delta L_2$

$\frac{FL}{\pi r^2 Y} = \frac{fL}{\pi (2r)^2 Y}$

$\frac{F}{r^2} = \frac{f}{(2r)^2}$

$\frac{F}{f} = \frac{r^2}{(2r)^2} = \frac{r^2}{4r^2} = \frac{1}{4}$

16. (1) The terminal velocity of a rain is

$v_t = \frac{2r^2(\rho - \sigma)g}{5\eta}$

Thus $v_t \propto r^2$

(2) water proof agents increase the angle of contact between the water and fibres
(3) Detergents decrease the surface tension of water
(4) Hydraulic machine work one the Pascal's law.

17. (3) According to first law of thermodynamics

$\Delta Q = \Delta U + W$

In an adiabatic process, $\Delta Q = 0$

$\therefore 0 = \Delta U + W$

or $\Delta U = -W$

18. (4) If Q_1 is the energy input and Q_2 is the energy rejected to the sink, then work done

$W = Q_1 - Q_2$

Dividing by Q_1 on both sides, we get

$\frac{W}{Q_1} = 1 - \frac{Q_2}{Q_1}$ or $\frac{Q_2}{Q_1} = 1 - \frac{W}{Q_1}$

As $Q_1 = 3W$ (given)

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

Thus the fraction of energy rejected to the sink is $\frac{2}{3}$.

19. (3) Since temperature is not specifed, $v_{rms} \propto \sqrt{P}$

So, $\frac{v_{rms(P)}}{v_{rms(2P)}} = \sqrt{\frac{P}{2P}} = \frac{1}{\sqrt{2}}$]

Note : If temperature remains constant, ther rms speed of an ideal gas is independent of the pressure of the gas. So $v_{rms(P)} : v_{rms(2)} = 1:1$

20. Let L be length of the pendulum
$\therefore$ Its time period on earth is

$T_e = 2\pi\sqrt{\frac{L}{g_e}}$ -----(i) and that on the planet is

$$T_p = 2\pi\sqrt{\frac{L}{g_p}} \quad \text{----(ii)}$$

$$\frac{T_p}{T_e} = \sqrt{\frac{g_e}{g_p}}$$

21. (4) The frequency remains constant in simple harmonic motion
22. (1) Sound waves can't be polarized
(2) they can exhibit diffraction.
(3) They are longitudinal in nature
(4) They travel faster in liquids than in air
23. (2) Let L_C and L_0 be the lengths of the closed and then open organ pipes respectively.
The frequency of third harmonic of the clsoed organ pipe is

$$\upsilon_{3c} = \frac{3v}{4L_C}$$

and that of the open organ pipe is

$$\upsilon_{3c} = \frac{3v}{2L_c}$$

where v is the speed of the sound

As $\upsilon_{3c} = \upsilon_{30}$ (given)

$$\therefore \frac{3v}{4L_c} = \frac{3v}{2L_0} \text{ or } \frac{L_c}{L_0} = \frac{1}{2}$$

24. (2) Here,
Mass of the particle, $m = 1.96 \times 10^{-15}$ kg
Distance between the plates, $d = 0.02$m
Potenital difference between the plates, $d = 0.02$m
The electric field between the plates is

$$E = \frac{V}{d} = \frac{400V}{0.02m} = 2 \times 10^4 Vm^{-1}$$

25. Let the point P be at the distance x from the centre of A where the electric field intensity is zero.

$\therefore$ At point P, $E_A = E_B$

$$\frac{1}{4\pi\varepsilon_0}\frac{9C}{x^2} = \frac{1}{4\pi\varepsilon_0}\frac{4C}{(10m - x)^2}$$

$$\frac{9}{x^2} = \frac{4}{(10m - x)^2}$$

$$3x = \frac{2}{10m - x} \text{ or } 30\,m - 3x = 2x$$

$$5x = 30m \text{ or } x = \frac{30m}{5} = 6m$$

26. (1) Charge is a scalar quantity.
All the other statements are correct.
27. (3) When the rate of flow charge through a metallic conductor of non uniform cross section is uniform, then current remains constant along the conductor while current density, electric field, electrical potential and drift velocity are not constans and all vary inversely with area of cross section.
29. (3) According to Ohm's law,

$$\frac{\text{Potential difference (V)}}{\text{Current (I)}} = \text{Resistance(R)}$$

$\therefore$ The slope of the given graph is

$$= \frac{I}{V} = \frac{1}{R} = \text{reciprocal of resistance}$$

31. (4) the magnetization of a diamaganetic material is independent of the temperature.
32. (3) Let r be the radius of the coil.

$$\therefore B = \frac{\mu_0 I}{2r}$$

When the coil is bent into small circular coil of n turns of radius r', then

$$n2\pi r' = 5\pi r \text{ or } r' = \frac{r}{n} \quad \text{----(i)}$$

$$\therefore B' = \frac{\mu_0 nI}{2r'} = \frac{\mu_0 nI}{2(r/n)} = \frac{n^2\mu_0 I}{2r} \quad \text{(using iii))}$$

Dividing eqn. (ii) by eqn. (i) we get

$$\frac{B'}{B} = \frac{n^2}{1}$$

33. (1) According to Faraday's law of induction, the magnitude of the magnitude of the induced emf in the circuit is

$$|\varepsilon| = \frac{\Delta\phi}{\Delta t}$$

As R is the resistance of the circuit, so induced current is

$$I = \frac{|\varepsilon|}{R} = \frac{\Delta\phi}{R\Delta t}$$

$$\therefore Q = I\Delta t = \left(\frac{\Delta\phi}{R\Delta t}\right)\Delta t = \frac{\Delta\phi}{R}$$

34. The resonant frequency of an LCR series circuit is

$$\upsilon_r = \frac{1}{2\pi\sqrt{LC}}$$

When the capacitance is changed to $C'(=4C)$ and inductance changed to L' the new resonant frequency becomes

$$\upsilon_r' = \frac{1}{2\pi\sqrt{L'C'}}]$$

But $\upsilon_1' = \upsilon_r$ (given)

$$\therefore m \frac{1}{2\pi\sqrt{L'C'}} = \frac{1}{2\pi\sqrt{LC}}$$

Squaring both sides, we get

$$\frac{1}{L'C'} = \frac{1}{LC} \qquad \therefore L' = \frac{LC}{C'} = \frac{LC}{4C} = \frac{L}{4}$$

35. (1) Changing magnetic fields can set up current loops in nearby metal (any conductor) bodies. The dissipate electrical energy as heat. Such currents are called eddy currents.

37. (4) When final image is formed at the near

$$m = \frac{D}{f}$$

where D is the length distance of sistinct vision and f is the focal ength of the convex lens

Here, D = 25 cm, f = 10cm

$$\therefore m = 1 + \frac{25cm}{10cm} = 1 + 2.5 = 3.5$$

38. Ultravsound are mechanical waves and they require a medium to travel whereas infrared radiation, ultraviolet radiation, visible and X-rays are all electromagnetic waves and they do not require a medium to travel.

40. (3) de Broglie wavelength associated with an electron (mass m, charge e) accelerated from rest with a voltage V volt is

$$\lambda = \frac{h}{\sqrt{meV}} \qquad \text{or } \lambda \propto \frac{1}{\sqrt{V}}$$

$$\therefore \lambda_1 : \lambda_2 : \lambda_3 = \frac{1}{\sqrt{V_1}} : \frac{1}{\sqrt{V_2}} : \frac{1}{\sqrt{V_3}}$$

$$= \frac{1}{\sqrt{100V}} : \frac{1}{\sqrt{200V}} : \frac{1}{\sqrt{300V}}$$

$$= 1 : \frac{1}{\sqrt{2}} : \frac{1}{\sqrt{3}}$$

41. (1) Since hte half-life is 2 hours, the intensity of the radiation falls by a factor of 2 every 2 hours. In 12 hours, it will fall a factor of $(2)^6 = 64$. Thus, in 12 hours, the intensity attains the safe level.

42. (4) Atom bomb is based on nuclear fission whereas all other are based on nuclear fusion.

43. (4) The nuclear mass density is indpendent of mass number (A). Thus the approximate ratio of nuclear mass densities of $^{197}_{79}Au$ and $^{107}_{47}Ag$ nuclei is 1:1.

44. (1)

The outpute is high only when both input A and B are high. So the logic gate is AND.

45. (4) Acceptor level in p-type semiconductor lies nearer to the valence band.

46. (1) $$\frac{\lambda_\alpha}{\lambda_\beta} = \frac{R_H\left(\frac{1}{4}-\frac{1}{9}\right)}{R_H\left(\frac{1}{4}-\frac{1}{16}\right)}$$

$$\frac{X}{\lambda_\beta} = \frac{5}{36} \times \frac{16}{3} = \frac{80}{108}$$

$$\lambda_\beta = \frac{108X}{80}$$

47. (3)

48. (2) $NH_4NO_3 \xrightarrow{\Delta} N_2O + 2H_2O$

49. (3)

50. (2) NCERT

51. (4) MgF_2 cannot used

52. (3) $S > Cl > P > Si$

$3p^3 3p^4 3p^2 3p^1$

53. (3) $$M = \frac{W \times 1000 \times d}{M \times W} = \frac{120 \times 1000 \times 1.15}{60 \times 1120}$$

54. (4)

55. (2) $$\log_{10} K_C = \frac{nE^0}{0.0591} = \frac{1 \times 0.591}{0.0591} = 10$$

$$K_C = 10^{10}$$

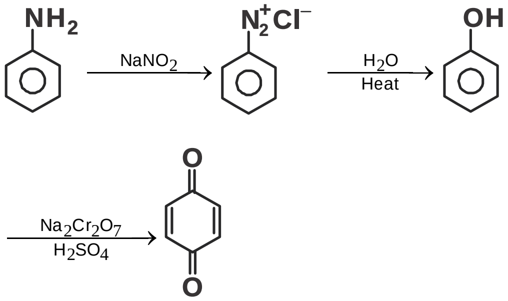
56. (1) Stability of IIA gp carbonate increase down the gp and solubility of sulphate decrease in group.

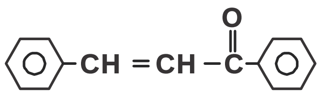
57. (2) $n = 2$

$$mvr = \frac{nh}{2\pi} = \frac{2h}{2\pi} = \frac{h}{\pi}$$

58. (4) Molecular weight is same functional gp is different

59. (3) 0.05 mole $= 0.25$ gm eq.
So to reduce 0.25 F required.

60. (3)


61. (1)


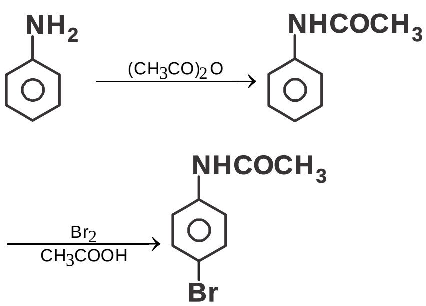
62. (3)

63. (4) Vanillin has six line pair.

64. (2) Aspirin possesses anti inflammatory, Antipyretic properties

65. (1) $C_2H_2 \xrightarrow[HgSO_4]{H_2SO_4} CH_3CHO \xrightarrow{O} CH_3COOH$

$\xrightarrow{NaOH} CH_3COONa \xrightarrow{NaOH/CaO} CH_4 + Na_2CO_3$

66. (3)


67. (4) $CH_3OH + \frac{3}{2}O_2 \rightarrow CO_2 + 2H_2O$

$\Delta G = (-237.2 \times 2) + (-394.4) - (-166.2)$

$= -868.8 + 166.2 = -702.6\ kJ$

$\eta = \frac{\Delta G}{\Delta H} = \frac{-702.6}{726} \times 100 = 96.7\%$

68. (3) $\log_{10}\frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{T_2 - T_1}{T_1T_2}\right]$

$\log_{10}\frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{300-280}{300 \times 280}\right]$

$\log\frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{20}{84000}\right]$

$\log\frac{k_2}{k_1} = \frac{E_a 10^{-4}}{R}$

$\log\frac{k_2}{k_1} = \frac{E_a}{R \times 10^4}$ Antilog

$\frac{k_2}{k_1} = \frac{1}{4}$

69. (2) $E_{cell} = E^0_{cell} - \frac{0.0591}{n}\log\frac{Zn^{+2}}{Cu^{+2}}$

$E_1 > E_2$

70. (2) $P_T = P_A^0 X_A + P_B^0 X_B$

$P_T = 44.5\left(\frac{60/46}{\frac{60}{46} + \frac{40}{32}}\right) + 88.7\left(\frac{40/32}{\frac{60}{46} + \frac{40}{32}}\right)$

$P_T = 66.11\,mm\,Hg$

A/c to dalton low

$P_A X_A = Y_A P_T$

$y_A = \frac{P_A X_A}{P_T}$

71. (1) $pH = Pk_a + \log_{10}\left(\frac{salt}{acid}\right)$

$5 = 6 + \log_{10}\left(\frac{S}{A}\right)$

$-1 = \log_{10}\left(\frac{S}{A}\right)$

$10^{-1} = \left(\frac{S}{A}\right)$

$\left(\frac{A}{S}\right) = 10$

72. (1) $(NH_4)_2SO_4.Fe_2(SO_4)_3.24H_2O$ is a double salt and give all the ions NH_4^+, Fe^{3+} and SO_4^{2-} in their aqueous solution, then test of iron can be done.

73. (4) $\frac{\Delta T_{f_2}}{\Delta T_{f_1}} = \frac{WB_1}{WB_2} = \frac{0.25}{0.2}$

$WB_2 = \frac{100 \times 0.2}{0.25} = 80g$

Separated ice $= 100 - 80 = 20g$

74. (3) $E = \frac{Mw}{V.F} = \frac{M}{6}$

75. (4) Wt of $N = \frac{1}{5} \times \frac{40}{1000} \times 14 = 0.112g$

% of $N = \frac{0.112}{1} \times 100 = 11.2\%$

76. (3) $A = O.V = BC + EC$

$B = FCC + FC + corner$

on remaining atom from 1 body diagonal remaining atom in unit cell are

$A = O + 12 \times \frac{1}{4} = 3$

$B = 6 \times \frac{1}{2} + 6 \times \frac{1}{8} = \frac{15}{4}$

$A_3B_{\frac{15}{14}} = A_4B_5$

77. (1) $H_2 + S + 2O_2 \rightarrow H_2SO_4$

$\Delta H_f = -298.2 - 98.7 - 130.2 - 287.3$

$= -814.4 \text{ kJ mole}^{-1}$

78. (2) For NaCl $a = 2r_{Na^+} + 2r_{Cl^-}$

$= 2 \times 101 + 2 \times 181$

$= 564 \text{ Pm}$

79. (4) $2A_2B \rightleftharpoons 2A(g) + B_2(g)$

4   —   —

4–x   x   x/2

$$k_p = \frac{x^2 . \frac{x}{2}}{(4-x)^2} \times \frac{P}{\left(4 + \frac{x}{2}\right)}$$

$$P = \frac{x^3 P}{2(4-x)^2 (4 + x/2)}$$

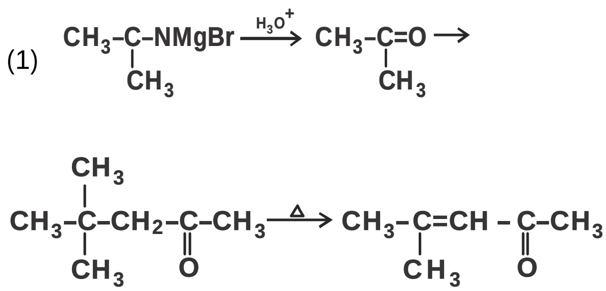
on solving $x = \frac{8}{3}$

80. (3) HF > HI > HBr > HCl

Boiling point

81. (2)

82. (1)



83. (2)

84. (4)

85. (2) $\lambda_{(BaSO_4)} = \frac{k \times 1000}{N}$

Normality $= \frac{1000 \times 8 \times 10^{-5}}{400}$

Molarity $= \frac{\text{Normality}}{2} = 10^{-4}$

$k_{sp} = s^2 = 10^{-8} m^2$

86. (1)

87. (1)

88. (4)

89. (2) 1 mole of AgCl

$[Co(NH_3)_4Cl_2]Cl + \underset{Ag}{AgNO_3} \rightarrow \underset{\text{white ppt}}{AgCl}$

90. (2)