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EXPLANATIONS

1. The line y =1 is parallel to x-axis and the line $y = \sqrt{3}x$ is passing through the origin and is inclined at an angle of 60° with the +ve x–axis. These two lines along with the y–axis enclose a right angled triangled.

2. Given curve is, $x^2 + y^2 = 169$,

Differential with respect to x, we get

$$2x + 2y\frac{dy}{dx} = 0$$

$$\Rightarrow \quad \frac{dy}{dx} = -\frac{x}{y}$$

$\therefore$ Slope of tangent at (5, 12) $= -\frac{5}{12}$ and slope of tangent at (–5, 12) $= -\frac{(-5)}{-12} = -\frac{5}{12}$.

Hence the tangents at the two points are parallel.

3. We must have, $k^2 + k^2 + k^2 = 1$

$$\Rightarrow \quad 3k^2 = 1$$

4. The d.c of the line are < 2, –1, 2 > and attitude numbers of the planes are <4, –2, 4 > which are proportional.

Hence, the line is at right angles to the plane.

5. Since $(-1)^2 + 2^2 - 2(-1) + 4(2) = 15 > 0$, therefore, the point (–1, 2) lies outside the circle. So, there are two tangents to the circle through the point (–1, 12).

6. A point on the line 5x – 12y + 65 = 0 is (–13, 0)

Distance of this point from the second line

$$= \frac{|5(-13) - 12(0) - 39|}{\sqrt{5^2 + (-12)^2}} = \frac{104}{13} = 8.$$

7. Each of the four points is at a fixed distance = 5 from the origin.

So, radius of the sphere is 5 and centre at (0, 0, 0)

8. Here $D \equiv \left(\frac{a}{2}, 0\right)$ and $E = \left(\frac{a}{2}, \frac{b}{z}\right)$.

So, slope of [AD] $= \frac{0 - B}{\frac{a}{2} - 0} = -\frac{2b}{a}$ and slope of [BE] $= \frac{\frac{b}{2} - 0}{\frac{a}{2} - 0} = \frac{b}{a}$.

Hence, [AD] ⊥ [BE] if $-\frac{2b^2}{a^2} = -1$

i.e., if $a^2 2b^2 a = \pm \sqrt{2}\, b.$

9. Angles between first and second line equals the angle between first and third.

or

The vertices of the triangle are A (1, 1) and B (2, – 2) and C (–2, 2).

We note that |AB|= |AC|

10. If two vartiables x and y are in perfect correlation (direct or indirect), then there is a linear relation between the two variables.

11. Here, we are given that the lower quartitle $Q_1 = 35$ and the upper quartile $Q_3 = 75$.

$\therefore$ Quartile deviation $= \frac{Q_3 - Q_1}{2} = \frac{75 - 35}{2} = 20.$

12. Any parallel to given line x – 2y + γ = 0.

The point (ϕ, ϕ) lies on this line if 2 – 3 + γ = 0

i.e., if γ = 1.

13. Required area $= \frac{1}{2}$ modulus of $\begin{vmatrix} a & b+c & 1 \\ b & c+a & 1 \\ c & a+b & 1 \end{vmatrix}$

$= 0$

(orperate $C_2 \to C_1 + C_1$)

14. If the magnitudes of the two forms are P and Q (P > Q), then

maximum magnitude = P + Q and minimum magnitude = P – Q

i.e., P + Q = 18 and P – Q = 4.

15. Magnitude of the resultant

$$= \sqrt{p^2 + q^2 + 2pq\cos 90°}$$

$$= \sqrt{p^2 + q^2}$$

16. If the acceleration is f, then

$$f = \frac{40 - 0}{10} \text{ m/s}^2$$

$\therefore$ Displacement in 10 seconds

$$= (0 \times 10 + \frac{1}{2} \times 4 \times 10^2) \text{ m}$$

$$= 200 \text{ m}.$$

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17. As the three forces acting at a point are in equilibrium, therefore, magnitude of the resultant of the first two forces is equal to the magnitude of the third force.

$\therefore$ $R = \sqrt{3^2 + 5^2 + 2 \times 3 \times 5\cos\alpha}$, where α is the required angles.

19. We known that if $x_1 = (x_1, y_1)$ and $x_2 = (x_2, y_2)$ are two optimal solutions of a L.P.P., then for all $\lambda \in [0, 1]$. $\lambda x_1 + (1 - \lambda) x_2$ is also an opitmal solution.

20. $(100)_2 = 1 \times 2^2 + 0 \times 2^1 + 0 \times 2^0 = 4$

21. 0.0001 has only one significant digit 1.

22. Since, $x^2 + y^2 = 1$,

Hence, we can take $x = \cos t$, $y = \sin t$ for some real t.

$\therefore (3x - 4x^3)^2 + (3y - 4y^3)^2 = (3\cos t - 4\cos^3 t) + (3\sin t - 4\sin^3 t)^2$

$= (-\cos 3t)^2 + (\sin 3t)^2$

$= 1$

23. $1 + \cos^2 2A = (\cos^2 a + \sin^2 a)^2 + (\cos^2 a - \sin^2 a)$.

24. $[x] - x = [x + 1] - (x + 1)$

$= [x + 2] - (x + 2)$

$= \ldots .$

$(\because [x + i] = [x] + i \ \forall\, i \in I)$

25. The given relation is valid only for $x\,y < 1$.

26. The result hold only

if $\quad -\frac{\pi}{2} \le 3\sin^{-1} x \le \frac{\pi}{2}$

i.e., if $\quad -\frac{\pi}{6} \le \sin^{-1} x \le \frac{\pi}{6}$

i.e., if $\quad -\frac{1}{2} \le x \le \frac{1}{2}$

i.e., if $\quad |x| \le \frac{1}{2}$.

27. $3\sin\theta + 4\cos\theta = 5$,

Squaring both side and solving, we get

$(3\cos\theta - 4\sin\theta)^2 = 0$.

28. $f(g(x)) = g(f(x))$

$\Leftrightarrow \quad a(cx + d) + b = c(ax + b) + d$

$\Leftrightarrow \quad ad + b = bc + d$

$\Leftrightarrow \quad f(d) = g(b)$.

29. $F(2) = 2F(0) - F(1) = 2.2 - 3 = 1$,

$F(3) = 2F(1) - F(2) = 2.3 - 1 = 5$,

$F(4) = 2F(2) - F(2) = 2.1 - 5 = 3$,

and $\quad F(5) = 2F(3) - F(4) = 2.5 - (-3) = 13$.

30. $\text{Inradius} = \frac{\Delta}{s} = \frac{\frac{\sqrt{3}}{4}a^2}{\frac{a+a+a}{2}} = \frac{\sqrt{3}a^2}{6a}$

$= \frac{\sqrt{3}a}{6} = \frac{\sqrt{3}a}{2.3} = \frac{a}{2\sqrt{3}}$.

31. Since, greatest angle is always opposite to the smallest angle.

$\therefore$ Greatest angle + smallest angle = 180°.

So, least angle = 45° whose circular measure is $\frac{\pi}{4}$.

32. For D_f, $\quad \log x \ge 0,\ x > 0$

$\Rightarrow \quad x \ge e^0,\ x > 0$

$\Rightarrow \quad x \ge 1$,

$\therefore \quad D_f = [1, \infty)$.

33. Here, f is not a function from A to B as f (1) is not unique.

34. $\sum_{n=1}^{4} \sin\left(\frac{\pi}{n}\right) = \sin\pi + \sin\frac{\pi}{2} + \sin\frac{\pi}{3} + \sin\frac{\pi}{4}$

$= 0 + 1 + \frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}}$

37. $\frac{d}{dx}\left(\log\left|\tan\frac{x}{2}\right|\right) = \frac{1}{\tan\frac{x}{2}}\sec^2\left(\frac{x}{2}\right)\cdot\frac{1}{2}$

$= \frac{1}{2\sin\frac{x}{2}\cos\frac{x}{2}}$

$= \frac{1}{\sin x} = \text{cosec } x$

(Since, $\frac{d}{dx}(\log|x|) = \frac{1}{x}$, $x \ne 0$)

38. $\int_0^{\pi} \sqrt{(1 - \cos x)}\, dx = \sqrt{2}\int_0^{\pi} \sin\frac{x}{2}\, dx$

$= \sqrt{2}\left[-\frac{\cos\frac{x}{2}}{\frac{1}{2}}\right]_0^{\pi}$

$= -2\sqrt{2}\left[\cos\frac{\pi}{2} - \cos 0\right]$

$= 2\sqrt{2}$.

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39. $\int f(x)\,dx = f(x)$

$\Rightarrow \frac{d}{dx}(f(x)) = f(x)$

$\Rightarrow f'(x) = e^x.$

40. $f(x) = (x-1)^2 + (x-2)^2 + (x-3)^2 + (x-4)^2 + (x-5)^2$

$\Rightarrow f'(x) = 2[(x-1) + (x-2) + (x-3) + (x-5)]$

$= 2[5x - 15].$

For $f'(x) = 0,\ x = 3.$

41. $\frac{dy}{dx} = \frac{1}{5}x^{-4/5} \to \infty$ as $x \to 0.$

So, at (0, 0), the curve $y = x^{1/5}$ has a vertical tangent.

42. $\int e^{-\sin^2 x}\,dx$ cannot be evaluated.

43. Required limit = G′ (4)

$\frac{d}{dx}((25 - x^2)^{-1/2})$ at $x = 4.$

44. Required limit

$\frac{d}{dx}(\cos^2 x) = 2\cos x(-\sin x)$

$= -\sin 2x.$

45. For $x = \cos\theta,$

$\tan^{-1}\sqrt{\frac{1-x}{1+x}} = \tan^{-1}\sqrt{\frac{1-\cos\theta}{1+\cos\theta}}$

$= \tan^{-1}\sqrt{\tan\frac{\theta}{2}} = \frac{\theta}{2}$

46. $E = \frac{hc}{\lambda}$

In tungsten, photoemission take place with a light of wavelength 2300 Å. As emission of electron is inversely proportional to wavelength, all the wavelengths smaller than 2300 Å will cause emission of electrons.

48. $Y = \frac{\text{stress}}{\text{strain}} = \frac{F/A}{\Delta l/l}$

$\because$ Stress $= \frac{F}{A} \propto \frac{\text{length}}{\text{change in length}}$

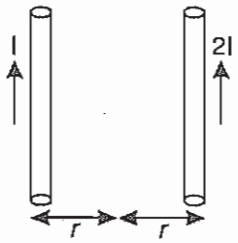
$\therefore \frac{l}{\Delta l} = \frac{l/2}{\Delta l'}$

$\Rightarrow \Delta l' = \frac{\Delta l}{2} = 1$ mm.

50. Light year is the unit of distance. It is the distance travelled by light in vacuum in one year.

1 ly $= 9.46 \times 10^{15}$ m.

51.



When two parallel conductors carrying current 1 and 21 in same direction, then magnetic field at the midpoint,

$B = \frac{\mu_0 2I}{2\pi r} - \frac{\mu_0 I}{2\pi r} = \frac{\mu_0 I}{2\pi r}$

When current 2I is switched off, then magnetic field due to conductor carrying current I,

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

52. Energy stored in strained wire

$= \frac{1}{2} \times$ stress $\times$ strain

53. Volume of sphere $= \frac{4}{3}\pi R^3$

$\therefore \ln V = \ln\frac{4}{3}\pi + 3\ln R$

Differentiating both sides, we get

$\frac{\Delta V}{V} = \frac{3\Delta R}{R}$

$\therefore$ Percentage change in volume = 3 $\times$ percentage change in radius.

55. Time taken by coin to reach the floor is given by, $t_1^2 = \frac{2s}{g}$

If coin is dropped when lift is moving up with constant acceleration a, then time taken by coin is given by,

$t_2^2 = \frac{2s}{g+a}$

$\therefore t_2^2 < t_1^2$

i.e. $t_2 < t_1$ or, $t_1 > t_2$

56. Upward thrust due to Archimede's principle is the weight of water displaced by the body.

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57. $L = \frac{\mu N^2 A}{l}$

where l = length of the coil,
N = total number of turns of solenoid and
A = area of cross-section of the solenoid.

$L \propto N^2$.

58. To reduce hysterisis loss in transformer, perforated or laminated sheets of soft iron are used.

59. A transformer is based on the principle of mutual induction. An e.m.f. is induced in a coil when a changing current flows through the nearby coil.

60. According to Brewester's law, the refractive index of the refractive medium (μ) is numerically equal to tangent of the angle of polarisation.
i.e., $\mu = \tan\theta$.

61. In first 10 sec, from straight line equation,

$$x = 0 + \frac{1}{2}a(10)^2$$

$$\Rightarrow \quad a = \frac{2x}{100}$$

Now, $v = at$

$$= \frac{2x}{100} \times 10 = \frac{2x}{100} \times 100$$

In next 10 sec, the car moves with constant acceleration with initial velocity v.

$$\therefore \quad y = vt + \frac{1}{2}at^2$$

$$= \frac{2x}{100} \times 10 + \frac{1}{2} \times \frac{2x}{100} \times 100$$

$$= 2x + x = 3x$$

62. Maximum height is obtained when $\theta = 45°$.

Horizontal range, $R = \frac{u^2 \sin 2\theta}{g}$

$$\therefore \quad 400 = \frac{u^2 \sin 90°}{g}$$

$$\Rightarrow \quad \frac{u^2}{g} = 400 \text{ m}$$

Maximum height, $H = \frac{u^2 \sin^2 45}{2g}$

$$= \frac{400}{2} \times \frac{1}{2} = 100 \text{ m}.$$

63. The nature of the path is decided by the velocity, acceleration and the direction of acceleration. The trajectory can be a straight line, circle or a parabola depending on these factors.

64. In case of perfectly inelastic collision, the bodies stick together after impact.

65. For seconds pendulum on the earth,

$$T = \frac{1}{2\pi}\sqrt{\frac{l}{g}} \quad (\text{where } l = 1 \text{ m})$$

$$\Rightarrow \quad 2 = \frac{1}{2\pi}\sqrt{\frac{R^2 l}{GM}} \quad \text{...(i)}$$

For seconds pendulum on other planet,

$$2 = \frac{1}{2\pi}\sqrt{\frac{4R^2 l'}{G(2M)}} \quad \text{...(ii)}$$

From equations (i) and (ii), weget

$$\frac{R^2 l}{GM} = \frac{4R^2 l_p}{G(2M)}$$

$$\Rightarrow \quad l_p = 0.5 \text{ m}$$

66. As the two bodies are not in contact with each other in vacuum, hence temperature of the hot body will decrease due to radiation.

67. Frequency of sound depends on the source which produces it. It is independent of medium of propagation.

68. Sound needs a medium for propagation. There is no atmosphere around the moon therefore sound produced by a bomb explosion will never reach the earth.

69. The direction of electric field intensity at a point on the equatorial line of the dipole is opposite to the direction of dipole moment.

70. Potential difference across the parallel plate capacitor = 10 V – (–10V) = 20 V.

$$\therefore \text{ Capacitance} = \frac{Q}{V} = \frac{40}{20} = 2 \text{ F}.$$

71. Maximum current will be drawn from the circuit if resultant resistance of all internal resistances is equal to the value of external resistance if the arrangement is mixed. In series, $R >> nr$ and in parallel, the external resistance is negligible.

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72. As we know, $R \propto l$

Resistance of single cut wire, $R' \propto \frac{l}{4}$

$$R' = \frac{R}{4}$$

Since all four wires are connected in parallel,

hence $$R_{res} = \frac{R'}{4} = \frac{R}{16}$$

73. Fringe width $\propto$ wavelength

and Wavelength of light in liquid $= \frac{\lambda}{\mu}$

$\therefore$ Fringe width $\propto \frac{\lambda}{\mu}$.

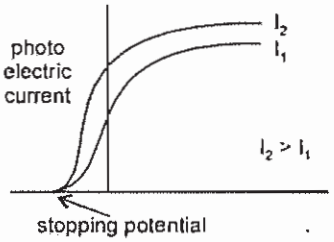
Fringe width will be decreases by $1/\mu$ factor when immersed in the water.

74. In convex mirror, $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

$$\Rightarrow \quad \frac{1}{v} + \frac{1}{f} = \frac{1}{f}$$

75. The ability of eye to alter its focal length and to produce images of objects at different distance is called accommodation.

76.



The value of saturation current depends on intensity. It is independent of stopping potential.

77. Neutron are unstable and have a mean lifetime of 886 seconds, decaying by emitting an electron and antineutrino to become proton.

78. As we know, $\frac{N}{N_0} = \left(\frac{1}{2}\right)^n$

$$\Rightarrow \quad \frac{1}{16} = \left(\frac{1}{2}\right)^n$$

$$\Rightarrow \quad n = 4$$

Also, $$n = \frac{1}{T_{1/2}}$$

$$\therefore \quad T_{1/2} = \frac{2}{4} \times 60 \text{ min} = 30 \text{ min}.$$

79. Heat given by water to cool upto 0°C = 100 × 1 × (50 – 0) = 5000 cal.

Heat taken by ice to melt = 10 × 80 = 800 cal.

Since the hot water can give more heat, therefore temperature of the mixture cannot be zero degree.

If the temperature of mixture is θ, then

$100 \times 1 \times [50 - \theta] = 10 \times 80 + 10 \times 1(\theta - 0)$

$\Rightarrow \quad 500 - 10\theta = 80 + \theta$

$\Rightarrow \quad 11\theta = 420$

$\Rightarrow \quad \theta = 38.2°C.$

81. Pascal. sec = Pressure × time

$$= \frac{MLT^{-2}}{L^2} . T = ML^{-1}T^{-1}$$

$$\Rightarrow \quad [\eta] = ML^{-1}T^{-1}$$

From $F = 6\pi\eta av$, we get

$$[\eta] = \frac{MLT^{-2}}{L \times LT^{-2}} = ML^{-1}T^{-1}$$

82. Since, $P + \frac{1}{2}\rho V^2 + \rho gh = K$

hence K has the same dimensions as each one of the factors on the L.H.S.

i.e., $P, \frac{1}{2}\rho V^2$ and ρgh.

$$\therefore \quad \frac{[K]}{[P]} = 0$$

Since angle has no dimensions, hence

$$\therefore \quad [\theta] = 0.$$

83. $f \propto \sqrt{g}$

In deep mine, $g' = g\left(1 - \frac{d}{R}\right)$ decreases.

Therefore, frequency also decreases as pendulum is moved from surface of the earth to deep mines.

84. Volume of cube = Surface area of cube

i.e., $a^3 = 6a^2$

or, $a = 6$ m

$\therefore$ Volume of cube = $(6)^3 = 216$ m^3.

85. Ice is lighter than water. When ice melts, the volume occupied by water is less than that of ice. Due to which the level of water go down.

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86. $K = C\alpha^2 = 0.1 \times \left(\frac{1.34}{100}\right)^2$

$= 1.79 \times 10^{-5}$.

87. We know $T = t_{v2} \times n$

$\therefore \quad 12 = 3 \times n$

$\Rightarrow \quad n = 4.$

$$N = N_0\left(\frac{1}{2}\right)^n$$

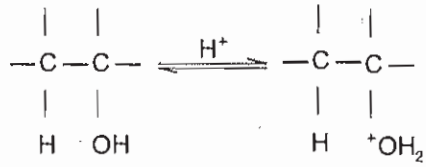
$$\Rightarrow \quad \frac{N}{N_0} = \left(\frac{1}{2}\right)^4 = \frac{1}{16}$$

88. Amount of $AgNO_3$ added in 60 ml of solution $= 60 \times 0.03 = 1.8$ g.

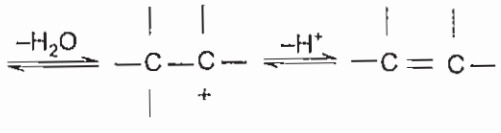
89. Distillation particularly fractional distillation because the boiling point of benzene (80°C) and chloroform (61.5°C) are close.

Fractional distillation involves repeated distillations and condensations, in a fractionating column. As a result of distillation and condensation at each point of the fractionating column, the vapours rising up become richer in more volatile component and the liquid falling back into the flask becomes richer in less volatile component. Thus, the low boiling liquid distils first while the higher boiling liquid distils afterwards.

90.



protonated alcohol



carbonium ion

In all cases intermediate is carbonium ion, and there may be 1,2-hydride or 1,2-methyl shift to form more stable carbonium ion.

91. According to law of mass-action, "at a given temperature, the rate of a reaction at a particular instant is proportional to the product of the active masses of the reactants at that instant raised to powers which are numerically equal to the numbers of their respective molecules in the stoichiometric equation describing the reaction".

Active mass = molar concentration of the substance.

92. Pure alumina is a bad conductor of electricity and the fusion temperature of pure alumina is about 2000°C and at this temperature when the electrolysis is carried of fused mass, the metal formed vapourises as the boiling point of Al is 1800°C.

To overcome this difficulty, Na_3AlF_6 and CaF_2 are mixed with alumina.

93. Sulphuric acid, a strong electrolyte, is fully dissociated in aqueous solution.

$$H_2SO_4 \longrightarrow 2H^+ + SO_4^{2-}$$

Water is a weak electrolyte and is only slightly dissociated.

$$H_2O \longrightarrow H^+ + OH^-$$

During electrolysis, the hydrogen ions, H^+ migrates towards the cathode, and are discharged there (i.e. they gain an electron and are converted to hydrogen gas).

$$2H^+ + 2e^- \longrightarrow H_2\uparrow$$

At the anode the concentration of hydroxyl ions HO^-, is too low to maintain a reaction and the sulphate ions $\left(SO_4^{2-}\right)$ are not oxidised but remain on in solution at the end. Water molecules must be the species reacting at the anode.

$$2H_2O \longrightarrow O_2 + 4H^+ + 4e^-$$

The overall reaction is

Cathode reaction : $2H^+ + 2e^- \longrightarrow H_2$

$4H^+ + 4e^- \longrightarrow 2H_2$

Anode reaction : $2H_2O \longrightarrow O_2 + 4H^+ + 4e^-$

94. Acetic acid is the chief constituent of vinegar and hence its name (Latin : acetum = vinegar).

95. According to quantum theory of radiation, a hot body emits radiant energy not continuously but discontinuously in the form of small packets of energy called quanta or photons.

96. During charging of acid cell the external supplies current due to which its emf increases and also relative density of cell increases.

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97. The cell involves the following reaction.

$$NaCl \rightleftharpoons Na^+ + Cl^-$$

At anode : $2Cl^- \rightarrow 2Cl + 2e \rightleftharpoons Cl_2$

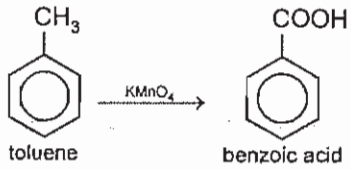
At cathode : $Na^+ + e \rightarrow Na$

$Na + Hg \rightarrow$ amalgam

At anode : Na-amalgam $\rightarrow Na^+ + Hg + e$

At cathode : $2H_2O + 2e \rightarrow H_2 + 2OH^-$

98.



toluene benzoic acid

99. Solder contains Sn 67% and Pb 33%.

100. Phenol was discovered by Runge in the middle oil fraction of coal-tar distillation and named it 'carbolic acid' (carbo-coil, oleum = oil) or phenol containing 5% water in liquid at room temperature and it is termed as carbolic acid.

101. Saturated monohydric alcohols show functional isomerism with ethers. Both have the general formula $C_nH_{2n+2}O$. The alcohols contain a hydroxyl group (—OH) whereas ethers have ethereal oxygen (— O —).

102. Fats are esters of glycerol with long chain monocarboxylic acids.

103. Waxes are esters of long chain fatty acids and monohydric alcohols. General formula of waxes can be given as RCOOR.

104. CH_3F, CH_3Cl, CH_3Br and C_2H_5Cl are gases at room temperature. CH_3I is a liquid at room temperature and solidifies at – 66.5°C.

105. $Al_4C_3 + 12H_2O \longrightarrow 3CH_4 + 4Al(OH)_3$

106.

$$\begin{matrix} CH_2 \\ \| \\ CH_2 \end{matrix} + H_2SO_4 \longrightarrow \begin{matrix} CH_3 \\ | \\ CH_2HSO_4 \end{matrix} \xrightarrow{H_2O} \begin{matrix} CH_3 \\ | \\ CH_2OH \end{matrix} + H_2SO_4$$

Except ethyl alcohol, no other primary alcohol can be prepared by this method as the addition of H_2SO_4 follows Markownikoff's rule. Generally secondary and tertiary alcohols are obtained.

108. $Na_2CO_3.10H_2O \xrightarrow{\Delta} Na_2CO_3.H_2O \xrightarrow{\Delta}$ washing powder

$Na_2CO_3 + H_2O\uparrow$

109. Glass being a mixture of sodium and calcium silicates reacts with hydrofluoric acid forming sodium and calcium fluorosilicates respectively.

$$Na_2SiO_3 + 3H_2F_2 \longrightarrow Na_2SiF_6 + 3H_2O$$

$$CaSiO_3 + 3H_2F_2 \longrightarrow CaSiF_6 + 3H_2O$$

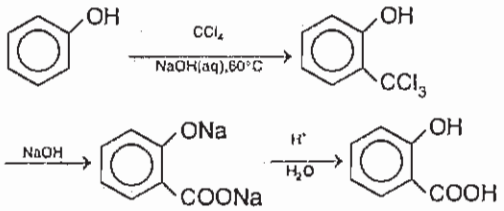
The etching of glass is based on these reactions.

110. $H_2S \longrightarrow$ colourless gas with unpleasant odour of rotten eggs

$SO_2 \longrightarrow$ colourless gas with a pungent suffocating odour

$PH_3 \longrightarrow$ colourless gas with unpleasant garlic like odour or rotten fish odour.

111.



The above given reaction is known as Reimer-Tiemann reaction.

112. Roasting involves heating of the ore either alone or with some other material usually in presence of air below its fusion temperature. In roasting, definite chemical changes like oxidation, chlorination etc. take place.

$$S + O_2 \longrightarrow SO_2$$

114.

$$H_2 + \frac{1}{2}O_2 \longrightarrow H_2O$$

1 mole $\frac{1}{2}$ mole 1 mole

1 volume $\frac{1}{2}$ volume

Since, 1 ml H_2 reacts with $\frac{1}{2}$ ml O_2

$\therefore$ 30 ml of H_2 reacts with $= \frac{1}{2} \times 30 = 15$ ml O_2

Hence (20 – 15) = 5 ml of O_2 will left at the end of the reaction.

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115. $HgCl_2$ has corrosive action. It is highly poisonous and sublimes on heating. Therefore, it is known as corrosive sublimate.

116. Molarity of $H_2SO_4 = 0.5$

Normality of H_2SO_4 $(N_1) = 0.5 \times 2 = 1$

Now $N_1V_1 = N_2V_2$

$\therefore$ $1 \times 1 = N_2 \times 10$

or, $N_2 = \frac{1}{10} = 0.1$ N

117. When treated with concentrated nitric acid, chloroform gives chloropicrin or nitrochloroform (CCl_3NO_2) known as tear gas.

118. In potassium ferricyanide, iron exists in +3 oxidation state.

119. $Na_2S + \underset{\text{sodium nitroprusside}}{Na_2[Fe(NO)(CN)_5]} \longrightarrow$

$\underset{\text{violet coloured complex}}{Na_3[Fe(ONSNa)(CN)_5]}$ or $\underset{\text{purple colour complex}}{Na_4[Fe(CN)_5NOS]}$

120. $C_2H_5Cl + H_2 \xrightarrow{Pd/C} C_2H_6 + HCl$

This reaction is used for the preparation of pure alkanes.

121. Given, $pH = 5$

$\Rightarrow$ $[H^+] = 10^{-5}$ M.

After dilution $[H^+] = 10^{-5}/100 = 10^{-7}$ M

$[H^+]$ from H_2O cannot be neglected.

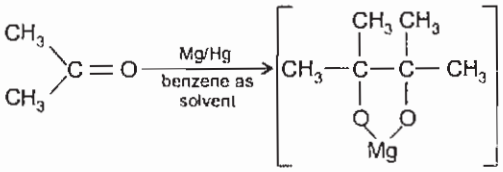
Total $[H^+] = 10^{-7} + 10^{-7} = 2 \times 10^{-7}$

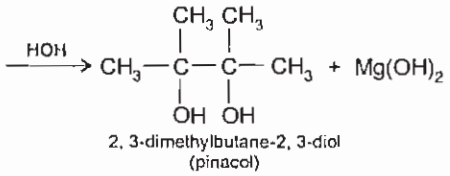
$pH = -\log 2 \times 10^{-7}$

$= 7 - 0.3010$

$= 6.6990 \approx 7$ (neutral).

122. Two molecules of ketones undergo reduction in the presence of Mg/Hg to form pinacol.





2, 3-dimethylbutane-2, 3-diol
(pinacol)

123. $X \xrightarrow{NaOH/CaO} C_2H_6$

$\underset{\text{propionic acid}}{C_2H_5COOH} \xrightarrow{NaOH/CaO} \underset{\text{ethane}}{C_2H_6}$

124. $BaSO_4 + Na_2CO_3 \longrightarrow BaCO_3 + Na_2SO_4$

125. $M_1V_1 = M_2V_2$

i.e. $5 \times 1 = M_2 \times 10$

$\Rightarrow$ $M_2 = 0.5$

$\therefore$ Normality of the solution $= \frac{0.5}{2} = 0.25$.

126. For any two positive number x and y, we get,

$x \times y =$ (LCM of x and y) $\times$ (HCF of x and y)

$\therefore$ $200 \times y = 400 \times 40$

$\Rightarrow$ $y = 80$

127. Since, $\frac{34968725}{12} = 2914060\ \frac{5}{12}$, then

$\Rightarrow$ Remainder $= 5$

128. SI for 4 year on 1000 = 400

$\therefore$ SI for 1 year on 1000 = 100

$\therefore$ R = 10%

At 10%, 1000 becomes 1210 in 2 year at CI.

129. Let the original number be 100.

Thus the student must have obtained first, the number as 80 (decreased 100 by 20%) and then as 96 (increased the decreased number viz. 80 by 20%).

Thus, the difference between the resultant number

$\therefore$ $\frac{4}{20} = \frac{100}{x}$ ....(assumed original number)

$\frac{4}{20} = \frac{100}{x}$ ....(required original number)

$\therefore$ $x = 20 \times 100 \div 4 = 500$

130. Let the shares of A, B and C be ₹ X, ₹ Y and ₹ Z respectively.

Hence, $\frac{X}{2} = \frac{Y}{3}$

$= \frac{Z}{4} = K$

$\Rightarrow$ $X : Y : Z = 2 : 3 : 4$

$\therefore$ $Y = \frac{720}{9} \times 4 =$ ₹ 320

131. Givne. ratio $= 58 \times 8 : 52 \times 22$

$= 29 \times 9 : 26 \times 11$

$= 261 : 286$

132. Let the false weight be of x gms.

Thus, the profit made is through sale of (100 – x) gms.

$$\therefore \quad \frac{1000 - x}{x} \times 100 = 25\% = \frac{1}{4}$$

$$\Rightarrow \qquad x = 800 \text{ gm}$$

133. 16 persons can complete a job in 12 days.

Hence, 32 women can complete the job in 12 days.

Hence, 32 women can complete the job in 12 days or 64 children can complete the job in 12 days.

($\because$ 1 person = 2 women = 4 children)

Thus, 32 women (equivalent to 64 children) and 64 children together would take (12 ÷ 2) = 6 days to complete the job.

134. The representations for cities A and B are as follows

City A

Beginning of year 12.00.000

after 1st year 12,00,000 – 2,40,000 = 9,60,000

after 2nd year 9,60,000 – 1,92,000 = 7,68,000

City B

6,00,000 + 2,40,000 = 8,40,000

8,40,000 + 1,92,000 = 10,32,000

Thus, during 2nd year, the population of both cities would be equal.

135. During the time 7.00 am to 10.00 am.

Rajeev must have travelled 3 × 40 = 120 kms.

Now, Abhishek would be travelling 40 kmph faster than Rajeev.

Hence, to cover the lead of 120 kms taken by Rajeev, he would need 3 hours, from 10.00 am onwards.

Hence they would meet 1.00 am.

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