PRACTICE PAPER – XI

ANSWERS KEY

Mathematics

1. C
2. C
3. C
4. A
5. B
6. A
7. C
8. A
9. A
10. C
11. C
12. A
13. B
14. B
15. A
16. C
17. A
18. D
19. B
20. A
21. B
22. B
23. B
24. A
25. B
26. D
27. D
28. A
29. A
30. B
31. B
32. B
33. D
34. C
35. C
36. C
37. B
38. B

39. A
40. A
41. C
42. D
43. C
44. D
45. C

PHYSICS

46. B
47. D
48. D
49. A
50. C
51. C
52. C
53. C
54. B
55. C
56. B
57. D
58. D
59. B
60. D
61. B
62. A
63. C
64. B
65. A
66. A
67. A
68. C
69. A
70. C
71. D
72. C
73. A
74. C
75. C
76. B
77. D
78. B
79. B
80. A

81. D
82. A
83. B
84. A
85. D

CHEMISTRY

86. A
87. A
88. B
89. D
90. B
91. C
92. D
93. B
94. A
95. D
96. B
97. D
98. B
99. B
100. B
101. B
102. B
103. A
104. B
105. B
106. D
107. D
108. C
109. B
110. C
111. B
112. A
113. B
114. A
115. A
116. C
117. D
118. C
119. C
120. A
121. B
122. A

123. C
124. B
125. A

INTELLIGENCE, LOGIC & REASONING

126. D
127. C
128. C
129. A
130. D
131. D
132. D
133. C
134. D
135. D

ENGLISH LANGUAGE & LITERATURE

136. D
137. C
138. D
139. B
140. B
141. A
142. A
143. C
144. C
145. D
146. C
147. A
148. B
149. C
150. C

PRACTICE PAPER – XI Solutions

EXPLANATIONS

Sol 1.

Cosec A (sin B cos C + cos B sin C)

$= \frac{1}{\sin A} \sin (B + C)$

$= \frac{\sin (180^\circ \pm A)}{\sin A} = 1.$

Sol 2.

Since, $y = \frac{1}{x \pm 2} \neq 0$, therefore, $y^2 = -2y^3$.

$\Rightarrow \quad 1 = - 2y$

$\Rightarrow \quad 1 = - \frac{2}{x-2}$

$\Rightarrow \quad x - 2 = - 2$

Sol 3.

$\text{Sin}^{-1}\left(\sin \frac{2\pi}{3}\right) = \sin^{-1}\left(\sin \left(\pi - \frac{2\pi}{3}\right)\right)$

$= \sin^{-1}\left(\sin \frac{\pi}{3}\right) = \frac{\pi}{3}$

$(\because \sin^{-1} x \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right], |x| \leq 1)$

Sol 4.

Angles of the triangle are 30˚, 60˚, 90˚ and hence sides are in the raito,

Sin 30˚ : sin 60˚ : sin 90˚

Sol 5.

Since $\sqrt{2^2 + 1^2} = \sqrt{5} < 3$, hence the equation has no solution.

Sol 6.

$F(x) = \frac{3x+2}{5x-3} = y$ (say)

$\Rightarrow \quad 3x + 2 = 5xy - 3y$

$\Rightarrow \quad 2 + 3y = x (5y - 3)$

$\Rightarrow \quad x = \frac{2 + 3y}{5y-3}, y \neq \frac{5}{3}$

$\Rightarrow \quad f^{-1}(y) = \frac{2 + 3y}{5y-3}$

$\Rightarrow \quad f^{-1}(x) = \frac{2 + 3x}{5x-3} = f(x)$

Sol 7.

$F(x) = x^3$

$\Rightarrow \quad f'(x) = 3x^2 \geq 0 \ \forall \ x \in R,$

Hence, f is increasing in R.

Sol 8.

$(\sin x - \cos x)^2 = \sin^2 x + \cos^2 x - 2\sin \cos x$

$= - \{ (\sin x + \cos x)^2 \}$

$(\sin^2 x + \cos^2 x)\}$

$= - (a^2 - 1) = 2 - a^2$

Sol 9.

$f'(x) = \frac{\sin x - x \cos x}{\sin^2 x}$

$= \frac{\cos x}{\sin^2 x} (\tan x - x) > 0.$

Sol 10.

$F'(x) = 3x^2 + 3x + 3$

$= 3 (x^2 + x + 1)$

$= 3 \left\{ \left(x + \frac{1}{2} \right)^2 + \frac{3}{4} \right\} \geq \frac{9}{4}.$

Sol 11.

$\text{Sin } \theta = \frac{1}{\text{cosec } \theta}$

$= \frac{1}{\sqrt{1 + \cot^2 \theta}}$

$= \frac{1}{\sqrt{1 + \left(\frac{n}{m} \right)^2}}$

$= \frac{|m|}{\sqrt{m^2 + n^2}} \quad (\because \sin \theta < 0)$

Sol 12.

$\cos 52^\circ + \cos 68^\circ + \cos 172^\circ$

$= 2 \cos 60^\circ \cos 8^\circ + \cos (180^\circ - 8^\circ)$

$= 0$

Sol 13.

Y_1 = a cos mx . m + b (-sin mx) m

$\Rightarrow$ y_2 = ma (2 sin mx) m – mb cos mx. M

$\therefore$ $\frac{d^2y}{dx^2} = -\ m^2y.$

Sol 14.

F ‘(0) = e˚g’ (0) +e˚g (0)

= 1 + 2 = 3($\because$ f ‘(x) = exg’(x) + g(x)ex).

Sol 15.

I = $\int_1^3 \frac{cos\ (log\ x)}{x}$ dx, Put log x = t,

$\Rightarrow$ $\frac{1}{x}$ dx = dt

$\therefore$ $I = \int_{log\ 1}^{log\ 3} cos\ t\ dt = [\sin t]_0^{log\ 3}$

$= \sin (\log 3).$

Sol 16.

$\int \sqrt{x^2 + a^2}dx = \frac{x}{2}\sqrt{x^2\ + a^2} + \frac{a^2}{2} \log (x + \sqrt{x^2 +\ a^2}$

Sol 17.

Let y = f (g(x)) and z = g(x)

Then,

$\frac{dy}{dz} = \frac{(dy/dx)}{(dz/dx)} = \frac{f'(g(x))g\prime(x)}{g\prime(x)}$ = f ‘(g(x)

Sol 18.

$\underset{x \to o}{Lt} \boldsymbol{\phi}\left(\frac{x}{a}\right) = \underset{at \to 0}{Lt} \boldsymbol{\phi}\left(\frac{at}{a}\right) = \underset{t \to 0}{Lt} \boldsymbol{\phi}\ (t) = \underset{x \to 0}{Lt} \boldsymbol{\phi}\ (x) = a^3.$

Sol 19.

In the given differential equation , highest order derivative is $\frac{d^2y}{dx^2}$ and its highest power is $\left(\frac{d^2y}{dx^2}\right)^2$. Hence the degree of the given differential equation is 2.

Sol 20.

$\frac{(\hat{\imath} + 2\hat{\jmath} + 3\hat{k}) \times (-3\hat{\imath} - 2\hat{\jmath} + \hat{k})}{l\,(\hat{\imath} + 2\hat{\jmath} + 3\hat{k}) \times (-3\hat{\imath} - 2\hat{\jmath} + \hat{k})\,l}$

Sol 21.

$\overline{AB} + \overline{OB} + \overline{OC}$

$= (\overline{OG} + \overline{GA}) + (\overline{OG} + \overline{GA}) + (\overline{OG} + \overline{GC})$

$= 3\overline{OG} + (\overline{GA} + \overline{GB} + \overline{GC})$

$= 3\,\overline{OG}$ ($\because \overline{GA} + \overline{GB} + \overline{GC} = \overline{0}$

Sol 22.

The given differential equation is of order 4 and degree 1.

Sol 23.

$\int_0^{\pi} l \cos x \, l \, dx = \int_0^{\pi/2} l \cos x \, l \, dx + \int_{\pi/2}^{\pi} l \cos x \, l \, dx$

$= \int_0^{\pi/2} l \cos x \, l \, dx + \int_{\pi/2}^{\pi} -\cos dx.$

Sol 24.

Required length = $\left|\frac{(3\hat{\imath} - \hat{\jmath} - 2\hat{k}).(\hat{\imath} - 2\hat{\jmath} - 3\hat{k})}{\sqrt{1^2 + 2^2 + (-3)^2}}\right|$

$= \frac{7}{\sqrt{14}}$

Sol 25.

Divide numerator and denominator by $\cos^2\boldsymbol{\theta}$ and put $\tan \boldsymbol{\theta} = t$.

Sol 26.

Eliminating t, we get the equation of the curve as $y^2 = 4ax$.

For t = 1, x = a and for t = 3, x = 9a.

$\therefore$ Required aera = $\int_a^{9a} l \, y \, l \, dx = \int_a^{9a} 2\sqrt{a}\sqrt{x} \, dx.$

Sol 27.

Required vector projection

$= (\vec{a} \,.\, \hat{b})\, \hat{b} = \left(\vec{a} \,.\, \frac{\vec{b}}{|\vec{b}|}\right) \hat{b} = \frac{(\vec{a} \,.\vec{b})}{|\vec{b}|} \hat{b}$.

Sol 28.

$(\vec{a} \times \vec{b})^2 + (\vec{a} \,.\, \vec{b})^2 = l\, \vec{a} \times \vec{b}\, l^2 + (\vec{a} \,.\, \vec{b})^2 = (ab \sin\boldsymbol{\theta})^2 + (ab \cos\boldsymbol{\theta})^2.$

Where $\boldsymbol{\theta}$ is the angle between $\vec{a}\ and\ \vec{b} = a^2\, b^2 = |\vec{a}|^2\, |\vec{b}|^2$.

Sol 29.

Both the given curves vae the same tangent at (0, 0) namely y-axis i.e. x = 0

Moreover, (0, 0) is the only point which lie on both the curves.

Sol 30.

Since, two parabolas meet in the points (0, 0) and (1, 1), hence,

Length of the common chord = $\sqrt{(1-0)^2+(1-0)^2}$,

= $\sqrt{2}$.

Sol 31.

If the points are A (0, 2, 0), B $(\sqrt{3}, 1, 0)$ and

C $\left(\frac{1}{\sqrt{3}}, 1, \frac{2\sqrt{2}}{3}\right)$, then

|AB| = |BC|= |CA|= 2

So that the triangle ABC is equilateral.

Sol 32.

Locus of a first degree equation in x, y, z is a plane.

Sol 33.

Out of given points only (-1, -1) lies on the given line.

Sol 34.

A, B, C are collinear if area ΔABC = 0.

Sol 36.

Let the four points be A, O, C and D respectively, then these are coplanar if $\overrightarrow{AB}, \overrightarrow{AC}, \overrightarrow{AD}$ are coplanar.

i.e., if $[\overrightarrow{AB}\overrightarrow{AC}\overrightarrow{AD}] = 0$

$$\begin{vmatrix} -1 & 5 & -3 \\ -4 & 3 & 3 \\ 1 & 7 & \gamma+1 \end{vmatrix} = 0$$

Sol 37.

Let P (x, y) be any point on the locus, then the equation of the locus is, x = y.

Sol 38.

Given equation is,

$|\vec{r}|^2 - \vec{r}\,(2\hat{\imath} + 4\hat{\jmath} - 2\hat{k})$- 10 = 0

$\Rightarrow \quad x^2 + y^2 + z^2 - 2x + 4y + 2z - 10 = 0$

Which the equation of a sphere, whose centre of (1, 2, -1) and

Radius $= \sqrt{1^2 + 2^2 + 1^2 + 10} = 4$

Sol 40

Out of the given options only $\left(\frac{7}{2}, \frac{13}{2}\right)$ lies on the line $y = x + 3$.

Sol 41.

Required length $= \sqrt{12^2 + 4^2 + 3^2}$.

Sol 42.

Any point on the given lines is (6 – t, -1, -3 + 4 t). This point lies, in the given plane

If $6 - t + (-1) - (-3 + 4t) = 3$

If $-5t = -4$

i.e., if $t = 1$

Sol 43.

cov (x, y) = 0

⇒ byx = bxy = 0

So, the two line of regression are $y - \overline{y} = 0$

And $x - \overline{x} = 0$, which are at right angles.

Sol 44

Two lines of regression are at right angles

Only when byx = $\left(\frac{1}{b_{xy}}\right)$ = -1

⇒ byx = - bxy

But, both byx and bxy are of the same sign,
Therefore, we must have
Byx = byx = 0
⇒ p(x, y) =0
(∵ {p $(x, y)^2$ = bxy byx = 0)

Sol 45.

Given, maximum height of projectile H = R

Where, R = horizontal range

Maximum height attained by a projectile,

H = $\frac{u^2 sin^2\theta}{2g}$

And horizontal range of the projectile,

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

Thus $\frac{u^2 sin^2\theta}{2g} = \frac{u^2 sin^2 2\theta}{g}$

Or $\frac{sin^2\theta}{2}$ = 2 sin θ cos θ

Or $\frac{sin\theta}{cos\theta}$ = 4

∴ tan θ = 4.

Therefore θ = $\tan^{-1}$ (d) = 76˚.

Sol 47.

According to the Newton's first law of motion, no forxe is required to keep a body in motion with uniform velocity.

Sol 48.

Given, horizontal velocity = 720 km/h

= 200 m/s;

Vertical height of plane = 396.9 m

And g = 9.8 m/sec^2.

∴ vertical height, h = ut + $\frac{1}{2}gt^2$

Or 396.9 = 0 + $\frac{1}{2}$× 9.8 × t^2 = 4.9 t^2

Or $t^2 = \frac{396.9}{4.9}$ = 81

Or t = 9 sec.

∴ Horizontal range = Horizontal velocity

Time = 200 × 9 = 1800 m.

Sol 49.

Given, radius of first circular path = r_1 and radius of second circular path =r_2.

Centripetal force, F = $\frac{mv^2}{r} = \frac{mr^2w^2}{r}$ = mrw2 ∝ r.

∴ $\frac{F_1}{F_2} = \frac{r_1}{r_2}$

Sol 50.

As the particle has returned to its initial position, therefore its displacement of the particle is 30 m' is a false statement.

Sol 51.

Given, mass of each ball, m = 60 g;

Initial speed of each ball, u = 4 m/s
And final speed of each ball, v = -4 m/s.
Initial momentum of each ball before collision = mu
= 0.06 × 4 = 0.24 kg – m/s
And final momentum of each ball after collision = mv
= 0.06 × (-4) = - 0.24 kg-m/s.
(-4) = - 0.24 kg-m/s.
∴ Change in the momentum = Initial momentum – Final momentum
= 0.24 = (- 0.24) = 0.48 kg-m/s.

Sol 52.

Given; speed of cyclist, v =4.9 m/s and radius of circular path, r = 4 m.

Centrifugal force acting on the cyclist = $\frac{mv^3}{r}$
And friction force = μmg.
Equating these two forces, we get
$\mu mg = \frac{Mv^2}{r}$
or Coefficient of friction, $\mu = \frac{v^2}{rg} = \frac{(4.9)^2}{4\times9.8} = 0.61$

Sol 53.

Translational kinetic energy of a sphere,

$K_1 = \frac{1}{2}\ mv^2$ and rotational kinetic energy of sphere,

$K_2 = \frac{1}{2}l\omega^2 = \frac{1}{2}\times\left(\frac{5}{2}mr^2\right)\omega^2$

$= \frac{5}{4}\ m(r^2\omega^2) = \frac{5}{4}mv^2$ (∵ v = ωr). ∴ $\frac{K_1}{K_2} = \frac{(1/2)mv^2}{(5/4)mv^2} = \frac{2}{5}$

Sol 54.

Given, radius of the earth R = 6400 km.

Distance of a geostationary satellite from the centre of earth = 42,000 km

$\therefore$ 42,000 = 6.56 R $\approx$ 7 R

Sol 55.

According to bernoulli's principle, total energy (pressure energy, potential energy and kinetic energy) of an incompressible, non viscous fluid in a steady flow remains constant throughout the flow.

Mathematically, for unit mass of fluid,

$\frac{P}{\rho} + gh + \frac{1}{2}v^2 =$ Constant.

Sol 56.

Weight of a body = mg

Where, g = acceleration due to gravity Since the value of g is maximum at the poles of the earth, therefore weight of a body is maximum at poles of the earth.

Sol 57.

Hygrometer is an instrument for measuring the percentage of moisture in air o in other gases. Thus

hygrometer is not used to measuring specific gravity.

Sol 58.

A drop of liquid tends to acquire minimum surface area due to surface tension. Since the surface area for a given volume is minimum for a spherical shape,. Therefore a drop of liquid under no external force always assumes spherical shape.

Sol 59.

From the Pascal's principle that if pressure is applied to an incompressible fluid, it is transmitted equally throughout the entire fluid. The pressure is transmitted uniformly throughout the liquid. Thererfore the given statement is based on Pascal's principle.

Sol 60.

At least two variables among pressure, volume and temperature are required to represent the state of a thermodynamic system. Therefore any one of them can not determine the state of a thermodynamic system.

Sol 61.

Given, temperature in Fahrenheit, F = 140.

Relation between Fahrenhit temperature(F)

And centigrade temperature,

$\frac{C}{5} = \frac{F-32}{9}$

Or C = $\frac{F-32}{9} \times 5 = \frac{(140-32)}{9} \times 5$

= $12 \times 5 = 60$.

∴ Fall in temperature in centigrade

= 100° – 60° = 40°

….(Temperature of boiling wate = 100°C)

Sol 62.

Given : Amplitude, a = 0.01 m and

Frequency,

N = 60 hz.

Maximum acceleration of the particle

= $\boldsymbol{\omega}^2 a = (2\boldsymbol{\pi} n)2 .a$

= $(2\boldsymbol{\pi} \times 60)^2 \times 0.01$

= $144\ \boldsymbol{\pi}^2$ m/s^2.

Sol 63.

Length of pipe closed at one end for first

Overtone, p1 = $\frac{3\lambda}{4}$.

And, length of pipe at both ends for

Third overtone, p2 = $\frac{4\lambda}{2} = 2\boldsymbol{\lambda}$.

∴ Ratio of lengths, $\frac{p_1}{p_2} = \frac{3\lambda/4}{2\lambda} = \frac{3}{8}$

Or $p_1 : p_2 = 3 : 8$

Sol 64.

Given, length of closed organ pipe $= 1$ m,

And velocity of sound, v $= 330$ m/s.

The frequencies of a closed organ pipe are

$$\frac{v}{4I}, \frac{3v}{4I}, \frac{5v}{4I}$$

Therefore frequency for the second note = $\frac{3v}{4I}$

= $\frac{3\times330}{4\times1} = 3 \times \frac{330}{4}$ Hz.

Sol 65.

Given, initial time perios of the simple

Pendulum, $T_1 = T$

Initial length of the pendulum, $I_1 = 100$ I

And final length of the pendulum, $I_2 = 121$ I.

Time period of Simple pendulum,

$T = 2\pi\sqrt{\frac{I}{g}} \propto \sqrt{i}$

$\therefore \quad \frac{T_1}{T_2} = \sqrt{\frac{I_1}{I_2}} = \sqrt{\frac{121I}{100I}} = 1.1$

Or $\quad T_2 = 1.1\ T_1$

herefore increase in time period $= 1.1$

$T_1' - T_1 = 0.1$

$T_1 = 10\%$

Sol 66.

Given, frequency of damped oscillator $= \boldsymbol{\omega}$;

Frequency of harmonic driving force $=$ n

And $\quad n < \boldsymbol{\omega}$.

We know that if $n < \boldsymbol{\omega}$, then vibrations are nearly in phase with the impressed force. Therefore response of the oscillator is controlled by the spring constant.

Sol 67.

We know that sound is a form of energy produced by vibrating bodies and transmitted in the form of longitudinal waves or in the form of compressions and rarefactions through a material medium.

Sol 68.

Given: radius of first sphere = R' Radius of

Second sphere = r

And both spheres have similar charges

(Q and q) and surface density of each

Sphere = $\boldsymbol{\sigma}$.

We know, electric potential.

$U = \frac{1Q}{4\pi\varepsilon_{\circ}R} + \frac{1q}{4\pi\varepsilon_{\circ}r}$

$= \frac{1}{\varepsilon_{\circ}}\left[\frac{Q\times R}{4\pi R^2} \times \frac{q\times r}{4\pi r^2}\right]$

Since $\frac{Q}{4\pi R^2} = \frac{q}{4\pi r^2} = \boldsymbol{\sigma}$ (density)

Therefore, $U = \frac{\sigma}{\varepsilon_{\circ}}(R + r)$.

Sol 69.

Given, wire's length, a = 4 m; Resistance

R = 10, and e.m.f., E = 2V.

Current in the wire, $I = \frac{E}{R} = \frac{2}{10} = 0.2$ A.

∴ Potential difference per unit length of the

Wire $= \frac{I.R}{I} = \frac{0.2\times10}{4} = 0.5$ V/m.

Sol 70.

A diode valve is a non-ohmic resistor. Because the relationship between potential and resulting current is not linear. Once the saturation current is reached. There is no increase in plate current, irrespective of the voltage applied. Even before saturation region, the relationship between plate potential and plate current is not linear.

Sol 71.

Since the resistances 40 Ω and 60 Ω are connected in parallel combination, hence

Their equivalent resistancr, $R = \frac{60\times40}{60+40} = 24\ \Omega$

∴ Current in the circuit,

$I = \frac{E}{R+r} = \frac{6}{24+0} = \frac{6}{24}$

…(where r = Internal resistance of the voltmeter equal to zero)

Thus, potential difference across voltmeter

$= I \times R = \frac{6}{24} \times 24 = 6.0\ V$

Sol 72.

Given, mass of water drop = m.

Weight of water drop (mg) = Electrostatic

Force applied by the field = qE = eE

Hence, electric field required to keep the

Water drop to remain suspended $E = \frac{mg}{e}$

Sol 73.

Given: electric field, E = 500 V/m and

Potential difference, V = 3000 V.

Electric field, $E = 500 = \frac{V}{d}$

We know that, $d = \frac{v}{500} = \frac{3000}{500} = 6\ m$

Sol 74.

Since in series combination, bulb of maximum power has the minimum resistance, therefore 100 W bulbs has minimum resistance and will give maximum light.

Sol 75.

We now that to allow a charged particle passing with a constant velocity, both magnetic and electric fields are to be applied (i.e., $E \neq 0$ and $B \neq 0$).

Sol 76.

Given, velocity of radio waves $= 3 \times 10^5$ km/s

$= 3 \times 10^8$ m/s

And wavelength, $\boldsymbol{\lambda} = 300$ m.

Frequency $= \frac{Velocity\ of\ radiowaves}{Wavelength}$

$= \frac{3\times10^8}{300} = 10^8$ Hz

Or $\quad n = 1$ MHz.

Sol 77.

Given reaction will be complete if

$_{92}X^{235} \rightarrow {}_{82}Y^{207} + {}_{72}He^4 + 4{}_{-1}e^0$.

Therefore in this reaction. Seven **α**-particles

And four **β**-particles are emitted.

Sol 78.

Wavelength of infra-red radiation extends from

8000×10^{-10} m to $4{,}00{,}000 \times 10^{-10}$ m.

These radiations have longer-wavelength and these can penetrate deeply into materials, causing heating effect.

Sol 79.

We know that light, after passing through a tourmaline crystal, acquires certain one sided property called polarization. Only transverse waves in which particles of medium vibrate perpendicular to the mean position can exhibit the property of polarization.

Sol 80.

Given, refractive angle of first prism, (**μ**1) =100 and refractive angle to second prism, (**μ**2) = 200. Since colors deviation power depends upon the material of the prism (refractive index) and not the angles of prism, therefore ratio of deviation power will be 1 : 1.

Sol 81.

Betatron is an accelerator, used to impart high velocity to electrons or acceleratine the electrons.

Sol 82.

Black and white colors are not physical colors. Since the res colors has larger wavelength than violet, therefore the speed of red colors is maximum in glass.

Sol 83.

The positive α-particles can be deflected through large angles only, if whole of the positive charge is concentrated in a small space. The fact that only a very small number of particles retrace their path, suggest that the positive charge is concentrated in a small space. A heavy particle such as the α-particle can imdergo large deflectiononly if the entire mass of the atom is concentrated in a small portion of the atom. It led Rutherford. To conclude that both the mass and the positive charge in an atom are concentrated in a small space, whose size is $\frac{1}{10,000}$ th of the size of atom. It is called nucleus.

Sol 84.

Given, energy of the ground electronic state of hydrogen atom, E = - 13.6 eV.

Energy of the first excited state for second orbit (where n = 2)

En = $-\frac{13.6}{n^2} = -\frac{13.6}{(2)^2}$ = -3.4 eV.

Sol 85.

Moderator used in nuclear reactor is a heavy water. When fast moving neutrons collide with moderator's atoms, they lose their energy and get slow down.

Sol 86.

Inert gas has the highest first ionization energy. Because of its stable configuration. Therefore it is very difficult to remove electron from atoms of an inert gas.

Sol 87.

Isotopes are those substances which have same atomic number but different atomic weights. Also atomic number is equal to the, number of protons. Therefore isotopes have same number of protons.

Sol 88.

From the Rutherford's model, also when an α-particle is bombarded on the gold foil, some α-particle is pass in a straight path, some are reflected but some rays are deflected. This Phenomenon shows the presence of nucleus.

Sol 89.

Trisilylamine is sp^2 hybridised. Therefore pπ – dπ bonding is possible due to the availability of vacant α-orbitals with silicon.

Sol 90.

Heavy water (D_2 O) is used as a moderator in nuclear reaction, to slow down the speed of fast moving neutrons. A molecule of heavy water contains two heavy hydrogen atoms and one oxygen atom.

Sol 91.

Given, concentration of $[H_3O^+] = 1 \times 10^6$.

$[H_3O^+] = [OH^{-1}] = 1 \times 10^{-6}$ mole/litre.

$\therefore$ Concentration of water (K) = $[H_3O^+][OH^-]$

$= [1 \times 10^{-6}] \times [1 \times 10^{-6}]$

$= 1 \times 10^{-12}$.

Sol 92.

Given, weight of sulphur burnt = 0.5 g:

Heat liberated = 4.6 kJ:

Molecular weight of sulphur = 32

And molecular weight of oxygen = 16.

When 0.5 g of sulphur is burnt. 4.6 kJ heat is liberated.

Therefore when 32 g of sulphur is burnt then

Heat liberated = $\frac{4.6}{0.5} \times 32$ = -294.4 kJ.

(Minus sign due to liberation of heat).

Also the enthalpy of formation of sulphur dioxide is same as the enthalpy of combustion of sulphur i.e., -294 kJ.

Sol 93.

total number of all the possible kinds of energy of a system is called its internal energy. This energy depends upon the pressure, volume and temperature of the system. Therefore internal energy increases with an increase in temperature.

Sol 94.

Given, number of product, np = 3 mol;

Number of reactant (nr) = 2 moles;

Equilibrium constant in term of partial pressure

(K_ρ) = 1.80×10^{-3}; K**ρ** = 14

And R = 8.314 JK^{-1} mol^{-1}.

We know, number of moles, Δn = np – n

= 3 – 2 = 1.

Therefore equilibrium constant $K_c = \frac{K_p}{(RT)^{\Delta n}}$

$= \frac{1.80 \times 10^{-3}}{(8.314 \times 700)^1} = 3.09 \times 10^{-7}$ mol-litre.

Sol 95.

When NH_4OH is ionized in a soulution, it forms OH^- ion. OH^- ion combines with H^+ ion and turn to unionisedH_2O molecule. H^+ ion concentration decreases in the solution. Therefore H_2S is more ionized and S^{--}concentration increases.

Sol 96.

Given, pH value of solution = 6.

PH of neutral solution is 7. If the pH is less than 7, the solution is acidic. Therefore pH of this solution is acidic because its value is 6.

Sol 97.

Let x is the oxidation number of nitrogen in

HNO3.

Therefore $1 + x + 3 \times (-2) = 0$

Or x = + 5.

Sol 98.

Given, electrode potentials of Zn = + 0.76 V and electrode potential of Cu = - 0.34 V.

E.m.f. of a galvanic cell (E^0_{cell}) = Electrode Potential of Zn – Electrode potential of Cu

= 0.76 – (-0.34) = + 1.1 V.

Sol 99.

Arrhenius suggested a simple relationship between the rate constant (K) for a reaction and the temperature of the system, K = Ae-Ea/RT.

This is called Arrhenius equation in which A is an experimentally determined quantity , Ea is the activation energy, R is the gas constant and T is the temperature in kelvin.

Sol 100.

In the preparation of sulphuric acid, vanadium pentoxide (V_2O_5) is used in the reaction

$2SO_2 + O_2 \xrightarrow{V_2O_5} 2SO_3$ as cataclyst, because V_2O_5 is much cheaper as compared to other catalysts. It is also not easily poisoned.

Sol 101.

Baking soda is sodium bicarbonate ($NaHCO_3$). It is used in food industry and in making medicines for acidity.

Sol 102.

Nesseler's reagent is an alkaline solution of

K_2HgI_4 ($HgCl_2$ solution + excess of KI). It is used in the detection of ammonium radical which gives a brown colors or brown precipitate with the reagent.

Sol 103.

In Castner's process; fused sodium hydroxide is eletrolysed for the extraction of sodium. In this process, sodium is liberated at the cathode while oxygen, is evolved at the anode.

Sol 104.

When isomers have same structural formula but differ in relative arrangement of thei.r atoms or group, they are called stereoisoemers because of space within the molecules.

105. $C_6H_5CH_3 + CrO_2Cl_2 \rightarrow C_6H_5CHO$.

Thus in this reaction, benzaldehyde (C_6H_5CHO) is formed when Toluene ($C_6H_5CH_3$) reacts with chromyl chloride (CrO_2Cl_2).

Sol 106.

Propane is obtained from propene by the catalytic hydrogenation of propene in the presence of nickel catalyst.

Sol 107.

Kjeldahl's method depends upon the fact that most of the organic compounds containing nitrogen are quantitatively decompose to give ammonium sulphate when heated strongly with concentrated sulphuric acid. In this method, copper sulphate ($CuSO_4$) acts as a catalytic agent.

Sol 108.

Given, mass of organic compound = 0.2595

G and mass of $BaSO_4$ = .35 g.

$= \frac{32}{233} \times \frac{Mass\ of\ BaSO_4}{Mass\ of\ substance}$

$= \frac{32}{233} \times \frac{0.35}{0.2595}$ = 0.01852 = 18.52%.

Sol 109.

Given, second orde Bragg diffraction n = 2;

Wavelength, $\boldsymbol{\lambda}$ = 1Å and e = 60°.

From the Bragg equation, $n\boldsymbol{\lambda} = 2\ d \sin \boldsymbol{\theta}$

Or $2 \times 1 = 2\ d \sin 60° = 2d \frac{\sqrt{3}}{2}$

Or $d = \frac{2}{\sqrt{3}} = 1.15$ Å.

Sol 110.

solutions having same osmotic concentration are called isotonic. It means when two solutions having the same osmotic pressure cannot be separated with one another through a semipermeable membrane because there will be no flow of solvent from one solution to another. Isotonic solutions have same molar concentration.

Sol 111.

Given,weight of the solute = 5.85 g; Mol. Wt.

Of NaCl = 58.5

And volume of solution = 0.5 litre.

Molarity = $\frac{Weight\ of\ solute}{Molecular\ weigth \times Dissolved\ in\ water\ solution}$

$= \frac{5.85}{58.5 \times 0.5}$ = 0.2.108.

Sol 112.

In a three dimensional lattice, each point at a corner belongs to eight unit cells. Similarly a point-on each edge belongs to four, a point on face belongs to two and point within the unit cell belongs solely to the single unit cell. Thus the contribution to unit cell, in a face centered cubic cell, at the face is $\frac{1}{2}$.

Sol 113.

Given: current, c = 0.5 amp; Time t = 10

Minutes = 10 × 60 = 600 sec

And equivalent weight of silver nitrate,

E = 108.

∴ W = $\frac{Ect}{96500} = \frac{108\times0.5\times600}{96500}$ = 0.336g.

Sol 114.

Given: electrolyzed time, t = 150 min = 9000sec;

Current, I = 0.15 A

And weight of metal deposited, W = 0.783 gm.

Charge, Q = I × t = 0.15 × 9000 = 1350.

Since 1350 coulombs of electricity will deposit

= 0.783 gm of metal, 96500 coulombs of

Electricity will deposit = $\frac{0.783\times96500}{1350}$

Sol 115.

Given, increase in concentration of B = 5×10^{-3}

Mol^{-1} and time taken = 10 sec.

Rate of appearance of B

= $\frac{Increase\ in\ concentration\ of\ B}{time\ taken}$

= $\frac{5\times10^{-3}(mol\ L^{-1})}{10\ sec}$ = 5×10^{-4} mol L^{-1} sec^{-1}.

Sol 116.

Ethanol is used as a beverage. It is known in commerce as spirit of wine or grain alcohol.

Sol 117.

Molecules of alcohol are bonded together by a hydrogen bond while that of ether are Donded by covalent bond. We also know that hydrogen bond needs more heat to break. Therefore boiling point of alcohol is higher than that of ether.

Sol 118.

The compound is diethyl ether (CH3CH2)2O which resists nucleophilic attack by hydroxyl ion due to the presence of two lone pairs of electrons on the oxygen atom on it.

Sol 119.

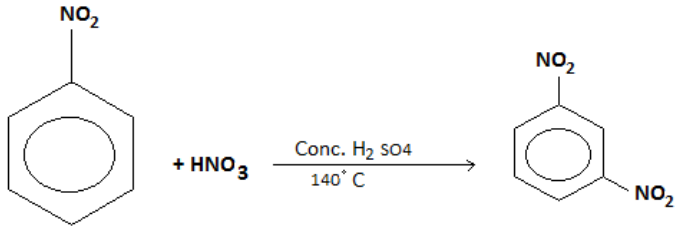
An aldehyde which contains at least one **α**-hydrogen atom when treated with dilute base (like NaOH, $Ba(OH)_2$ K_2CO_3) undergo condensation to form aldol.

Sol 120.

$$C6H5OH + NH3 \xrightarrow[300°C]{ZnCI_2} C6H5NH2 + H2O.$$

Thus in this reaction, aniline (C6H5NH2) which is aromatic primary amine is formed when phenol (C6H5OH) reacts with ammonia (NH).

Sol 121



Thus in this reaction m-dinitrobenzene is produced.

Sol 122.

the reaction of lower halongenated ethers with Grinard reagents is used in the preparation of higher homologous of ethers. It is a common practice for the preparation of ether.

Sol 123.

$SnCI_2 + C_4H_9Li \rightarrow (C_4H_9)\ Sn + 4\ LiCI.$

Thus in this reaction, tetra butyl tin $[(C_4H_9)]_4$ Sn] is formed.

Sol 124.

$Fe3+ + [Fe(CN)6]3- \rightarrow Fe[Fe(CN)6]$

Brown

Thus when potassium hexcyanoferrate react with ferric salt, a brown coloration is produced due to the formation of a undissociated complex, iron hexacynoferrate.

Sol 125.

Given, atomic weight of Th and Bi are 228 and 212 and nuclear charge of Th and Bi are 90 and 83 respectively. When one **α**-particle is emitted, then atomic weight of the resulting nuclei is decreased by 4 units and the nuclear charge by 2 units. Also, when one **β**-particle is emitted nuclear charge increases by one unit but atomic weight is not affected.

Therefore, decrease in atomic weight

$= 228 - 212 = 16 = \frac{16}{4} = 4$

And decrease in nuclear charge

$= 90 - 4 \times 2 = 82.$

Thus, 4**α** particles and 1**β** particles is emitted because nunlear charge on Bi $= 82 + 1 = 83$.

Sol 126.

Time is measured by a clock as pressure is measured by barometer. Barometer is used in the measurement of atmospheric pressure and depth from the surface of the earth of sea level. Voltmeter, hydrometer and Ammeter are used to the measurement of potential difference, relative gravity and current respectively.

Sol 127.

Eroding means destroy gradually,.. Therefore the colors of the paint is eroding from the walls.

Sol 128.

The code is obtained by interchanging the first two letters, next two letters and so on, Similary TEACHER will be Coded as ETCAEHR.

Sol 129.

Hoof is the lower portion ofleg of horse, while foot is the lower portion of leg a man.

Sol 130.

The code is obtained by first the last digit, then first digit, then second last digit , the second digit and so on. Therefore 24321 may be coded as 12243.

Sol 131.

Given, the series 2, 5, 11, 23,_

2nd term × 2 + 1 = 2 × 2 + 1 = 5;

3rd term - = 2nd tern × 2 + = 5 × 2 + 1 = 11

And

4th term = 3rd term × 2 + 1 = 11 × 2 + 1 = 23.

∴ 4th term = 3rd term × 2 + 1 = 23 × 2 + 1 =47.

Sol 132.

Given, the series 3, 14, 47, ___ 443, 1334,

2nd term = 1st term × 3 + 5 = 3 × 3 + 5 = 14;

3rd term = 2nd term × 3 + 5 = 14 × 3 + 5 =47.

∴ 4th term = 3rd term × 3 + 5 = 47 × 3 + 5 + 146.

Sol 133.

Given, the series 26, 23, 20, 17, 14, 11, _,

Differences between the consecutive term of the series is 3 as

26 – 23 = 3,

23 – 20 = 3, 20 – 17 = 3, 17 – 14 = 3, 14 – 11 = 3.

∴ last term = 7^{th} term = 6^{th} term – 3 = 11 – 3 = 8.

Sol 134.

Given, (a + b + c) = 0

Or (a + b) = - c

Cubing both sides, we get

$(a + b)^3 = - c^3$

Or $a3 + b3 + 3ab (a + b) = -c^3$

Or $a3 + b3 + c^3 + 3ab (a + b) = 0$

Or $a3 + b3 + c^3 + 3ab(-c) = 0$ as a + b = - c,

∴ $a3 + b3 + c^3 = 3abc$.

Sol 135.

Given, the number = 182, the factors of 182 are 2, 7 and 13 2, 7 and 13 are prime numbers. Therefore all the three factors of 182 are prime numbers.

Sol 136.

The correct sequence 'is 'if Socrates was innocent at the age of seventy, it may be imagined now innocent St. John was at the age of seventeen'. Therefore correct combination is (d).

Sol 137.

The correct sequence is 'it was all very wonderful and glamorous here in the old places that seemed so ordinary'. Therefore correct combination is (c).

Sol 138.

The correct sequence is if you feed a dog or tame a bear by hand, they get their teeth into the meet and tear and pull at it until they bite a piece of or until they succeed in getting it all out of our hand'. Therefore correct combination is (d).

Sol 139.

To express general truths we use simple present tense, therefore, (b) is the correct choice.

Sol 140.

The simple past is used to indicate an antion completed in the past. Therefore option (b) is correct.

Sol 141.

Simple present tense is also used, instead to the simple future tense, therefore option (a) is correct.

Sol 142.

'amenties' means 'pleasing acts' and 'courtesies' means 'polite behaviour'. Therefore correct synonym is (d).

Sol 143.

'deflect' means 'turn aside' and 'pervert' means 'twist'. Therefore correct synonym is ©.

Sol 144.

'exorbitant' means 'beyond the limit' and 'excessive' means 'extreme'. Therefore correct synonym is (c).

Sol 145.

'at' is used for things at rest.

Sol 146.

'towards' is used to show the sense of direction.

Sol 147.

'at' is used for things at rest.

Sol 148.

According to the passage, our world has a heritage of culture means, we have an inherited cultural tradition. Therefore option (b) is correct.

Sol 149.

According to the passage common people may be described as the less active and important people. Therefore option (c) is close to correct answer.

Sol 150.

According to the passage the persons who are not aware of history are the men ignorant of the past. Therefore option (c) is correct.