NTSE PHYSICS SOLUTIONS

1. (4)

$P = F\ V_{rel}$

$V_{rel} = V_{BA} = t\ 2.5$ m/s

$P = +100\ (2.5)$

$P = 250$ w

2. (1)

$$\frac{d}{V_m + V_R} = 3.....(1)$$

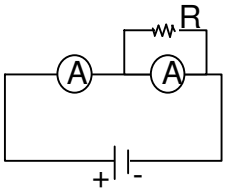
$$\frac{d}{V_m - V_R} = 6.....(2)$$

Solving (1) and (2)

$V_R = d/12$

T = 12 hours

3. (1)



As total potential difference is constant across the circuit, current will across A and this decreases the potential difference across v will decrease and across A increases

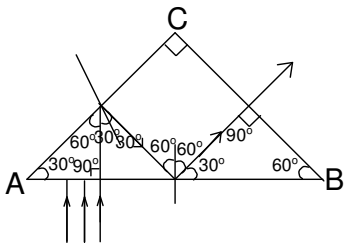
4. (4)

$\delta = (\mu - 1)A$ for $A = 2^o, \delta = 1^o.$

As $\delta = 1^o, \mu \approx \frac{3f}{2}, v = 3f$

5. (1)

As $\mu = 2.1, \sin^{-1}\left(\frac{10}{21}\right) = 28^{o}.26'$ Critical Angle.



The ray will come out of CB

6. (2)

$$mg_B(T-0) = m_e L$$

$$ms_B T = \frac{V}{2} PL$$

$$ms_B T = \frac{m}{d2} L \times P_{\ell}$$

By Solving T = 39.82°C.

7. (3)

P.D. across $500\,\Omega$ = P.D across

$\Rightarrow (R_1+R_2+R_3) = 125$ ……. (1)

P.D. across $(500+R_1)$ = P.D across (R_2+R_3)

$\Rightarrow (500+R_1) = 49\,(R_2+R_3)$ ……. (2)

P.D. across $(500+R_1+R_2)$ = P.D across R_3

$\Rightarrow (500+R_1+R_2) = 499\,R_3$ …….. (3)

From (1) and (3)

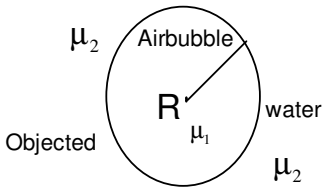
We get $R_3 = 1.25\,\Omega$

8. (2)

For refraction at spherical surfaces

Form denser to rarer medium

$$\frac{\mu_1}{v}-\frac{\mu_2}{v}=\frac{(\mu_1-\mu_2)}{R}.....(1)$$



Form rarer to denser

$$\frac{\mu_2}{v}-\frac{\mu_1}{v}=\frac{(\mu_2-\mu_1)}{R}.....(2)$$

Substituting value in equation (1) and (2) the final image is formed at $\frac{2R}{3}$ and it is virtual image

9. (2)

$$g_h=g(1-\frac{2h}{R}).....(1)$$

$$g_h=0.99g.....(2)$$

Solving equation (1) and (2)

$$h=\frac{R}{200}=\frac{6400}{200}=32km$$

10. (2)

$$v\alpha\frac{1}{x},v=\frac{R}{x}$$

When x = 1 m, v= 0.02 m/s

So, R = 0.02

$$\frac{dx}{dt}=\frac{R}{x}$$

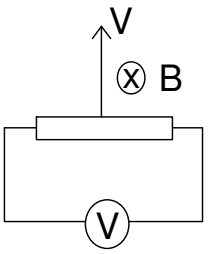
$$\int_1^2 x\,dx=\int_0^T R\,dt$$

$$\frac{x^2}{2}\Big]_1^2=\frac{2}{100}T$$

T = 758

11. (3)

$$E = \frac{-d}{dt}$$



So, $E = \frac{d}{dt}(BA)$

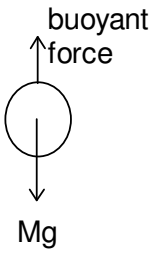
$$E = \frac{BdA}{dt} = B\ell v$$

$E = B\ell v$ only if the rod moves in any direction

12. (3)

$B = V\delta g$

$= \frac{3}{d}\delta g$



$= \frac{3}{2}m\delta g$

As $\delta = 1 gm/m^3$

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

Resultant force = B – Mg = Mg/2 (upward)

a = -g/2

$\mu = \sqrt{2gh}$

$v^2 - u^2 = 2as$

V = 0, S = 20m

13. (1)

As tension in thread A becomes zero all the masses fall under gravity so $a_1 \neq 0, a_2 \neq 0, a_3 \neq 0, a_4 \neq 0.$

NTSE CHEMISTRY SOLUTIONS

114. i) B, C are more active than Hydrogen
ii) B is more reactive than A, C, D
iii) Due to oxidizing nature of HNO_3
$\therefore$ B < C < A < D $\Rightarrow$ Ans. : 1

115. $Zn + 2AgNO_3 \longrightarrow Zn(NO_3)_2 + 2Ag$ (Displacement, Redox reaction)
$Ca(OH)_2 \xrightarrow{\Delta} CaO + H_2O$ (Decompistion)
$Cu(NO_3)_2 + Na_2S \longrightarrow \underset{(Black\ ppt)}{CuS_{(2)}} \downarrow 2NaNO_3$ (Precipitation reaction)
$H_2SO_3 + 2KOH \longrightarrow K_2SO_3 + 2H_2O$ (Neutralization reaction)
Ans. : 3

116. i) Ba & F (metal, non-metal); K & O (metal, non-metal) form ionic bond
ii) $C-F$ bond is more polar $(E.N\ of\ C = 2.5\ \&\ F = 4)$
iii) $I-H$ bond is more covalent $(E.N\ of\ I = 2.5,\ H = 2.1)$
iv) $N-F$ bond is covalent (E.N of N = 3.0, F = 4) so less polar
Ans. : 1

117. If p^H down to zero. That means the solution is more acidic
$\therefore$ The quote is wrong
Ans. : 2

118. $C_2H_4 - alkene$
$C_7H_{12} - alkyne$
$C_{13}H_{28} - alkane$
$C_5H_{10} - cyclo\ alkane$
Ans. : 2

119. aldehyde $\left(-\overset{O}{\overset{\|}{C}}-H\right)$; Ether $(-O-)$; Carboxylic acids $\left(-\overset{O}{\overset{\|}{C}}-O-H\right)$; Ester $\left(-\overset{O}{\overset{\|}{C}}-O-R\right)$
Ans. : 2

120. $NaN^-3 \Rightarrow N_3^-$ (azide ion) contains 3 atoms & 22 electrons.
$CO_2 \Rightarrow$ contains 3 atoms & 22 electrons
Ans. : 3

121. Blood is a colloidal solution
Ans. : 1

122. Na^+ is smallest in size
Ans. : 4

123. Presense of hydrophilic & hydrophobic groups only
Ans. : 4

124. Softness is due to weak vanderwaal forces between any two layers
Ans. : 4

125. $C_2H_2 + \frac{5}{2}O_2 \rightarrow 2CO_2 + H_2O$
Ans. : 2

126. Compounds A, C and D are wrong
Because in A; X is in +3 state (wrong)
in C; ClO_4^- is in $^-5$ state (wrong)
D; NO_3^- is in -3 state (wrong)

NTSE MATHS SOLUTIONS

141. $x + 3y - z = 4$ ….. (1)

$3x + 3y + z = 12$ ….. (2)

$(x + 3y)^2 - z^2 = 36$ ….. (3)

$(x + 3y + z)(x + 3y - z) = 36$

$(x + 3y + z)(4) = 36$

$x + 3y + z = 9$ …... (4)

$(2) - (4) \Rightarrow 2x = 3$

$x = 3/2$

142. $x^2 + px + q = 0$

$\alpha = \tan 30^o, \beta = \tan 15^o$

$\alpha + \beta = \tan 30^o + \tan 15^o = -p$

$\alpha\beta = \tan 30^o \tan 15^o = q$

$$\frac{\alpha + \beta}{1 - \alpha b} = \frac{-p}{1 - q}$$

$$\frac{\tan 30^o + \tan 15^o}{1 - \tan 30^o \tan 15^o} = \frac{-p}{1 - q}$$

$$\tan 45^o = \frac{-p}{1 - q}$$

$1 - q = - p$

$Q - p = 1$

$2 + q - p = 2 + 1 = 3$

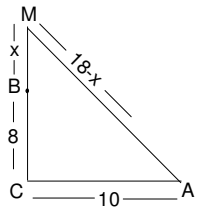
143. 30, 72 and x

LCM – 30, 72 = 360

HCF – 30, 72 = 6

The third number = LCM/HCF = 360/6 = 60

$x = 60$

144. 

$(18-x)^2 = (x+8)^2+(10)^2$

$x = 40/13$

145. $a - 7b + 8c = 4$

$8a + 4b - c = 7$

Consider $c = k$

$a - 7b = 4 - 8k$

$$a = \frac{5k-13}{12}, b = \frac{5-13k}{12}$$

$$a^2 - b^2 + c^2 = \left(\frac{5k-13}{12}\right)^2 - \left(\frac{5-13k}{12}\right)^2 + k^2 = 1$$

146. $x^3 + 3x^2 + 4x - 11 = 0$

$a + b + c = -3\, ab + bc + ca = 4, abc = 11$

$t = -(a+b)(b+c)(c+a)$

$-[2abc + a^2b + b^2c + c^2a + ab^2 + bc^2 + ca^2]$

$(a+b+c)(ab+bc+ca) = (-3)(4)$

$3abc + a^2b + b^2c + c^2a + ab^2 + bc^2 + ca^2 = -12$

$2abc + a^2b + b^2c + c^2a + ab^2 + bc^2 + ca^2 = -23$

- [-23] = 23

147. $a < b < c < d < e$

$a = x - 2, b = x - 1, c = x, d = x + 1, e = x+2$

b + c + d = perfect square

3x = perfect square

a + b + c + d + e = perfect cube

5x = perfect cube

$x = 675 = 5 \times 5 \times 3 \times 3 \times 3$

$3x$ = perfect square

$5x$ = perfect cube

148. $x^4 - 11x^3 + kx^2 + 269x - 2001$

a, b, c, d, are roots

$a + b + c + d = 11 \Rightarrow x + y = 11$

$ab + bc + cd + da + ac + bd = k$

$abc + bcd + cda + abd = -269$

$abcd = -2001$

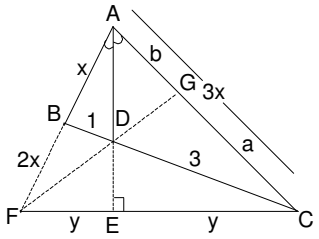
$cd = -69 \Rightarrow ab = 29$

$29(c) + b(-69) + a(-69) + d(29) = -269$

$a + b = 6 \qquad c + d = 5$

$k = ab+bc+cd+da+ac+bd = 29-69+(a+b)(c+d) = 29-69+30 = -10$

149.



In ΔAFC

$$\frac{AB}{BF} \times \frac{FE}{EC} \times \frac{CG}{GA} = 1$$

$$\frac{x}{2x} \times \frac{y}{y} \times \frac{a}{b} = 1$$

$$\frac{a}{b} = \frac{2}{1}$$

$$\frac{(\Delta FGC) - \Delta DGC}{\Delta FGA - \Delta DGA} = \frac{2}{1}$$

$$\frac{ar(\Delta DFC)}{ar(\Delta ADF)} = \frac{2}{1}$$

$$\frac{2y}{zx}=\frac{2}{1} \quad , \quad \frac{x}{y}=\frac{1}{3}$$

$$\frac{ar(\Delta ABD)}{ar(\Delta CDE)}=\frac{1}{3}$$

150. x-1, x, x+1 are sides

$$\underline{|C}=\underline{|2A}$$

Sin C = Sin 2A

Sin C = 2 Sin A Cos A

$$\frac{C}{2R}=\frac{2a}{2R}.\cos A$$

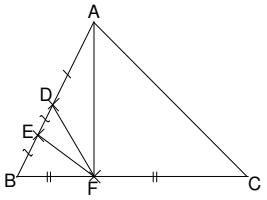
$$\cos A=\frac{C}{2a}$$

$$\frac{b^2+c^2-a^2}{2bc}=\frac{c}{2a}$$

$\Rightarrow$ x = 5

$\Rightarrow$ sides are 4, 5, 6 perimeter is 15

151.



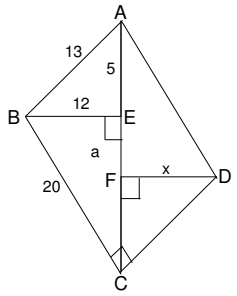
ar (ΔABC) = 96

ar (ΔABF) = 48

ar (ΔADF) = 24, ar (ΔBDF) = 24, ar (ΔEDF) = 12,

ar (ΔAEF) = ar (ΔADF) + ar (ΔEDF) = 24 + 12 = 36

152.

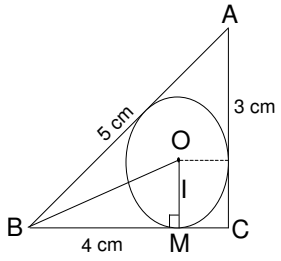


EF = a, FC = 16-a

$\Delta AEB \sim \Delta DFA$	$\Delta BEC \sim \Delta DFC$
$\frac{AE}{DF} = \frac{EB}{FA}$	$\frac{BE}{DF} = \frac{EC}{FC}$
$\frac{5}{x} = \frac{12}{a+5}$	$\frac{12}{x} = \frac{16}{16-a}$
$5a + 25 = 12x$	$232 - 12a = 16x$

$\Rightarrow x = \frac{20}{3} = 6\frac{2}{3}$

153.



$\Delta = 6$, S = 4+3+5/2 = 6

r = Δ/5 = 1

$OC^2 = OM^2 + CM^2 = 1^2 + 3^2$

OC = $\sqrt{10}$

154. $p(x) = x^4 + ax^3 + bx^2 + cx + d$

P(1) = p(2) = p(3) = 0

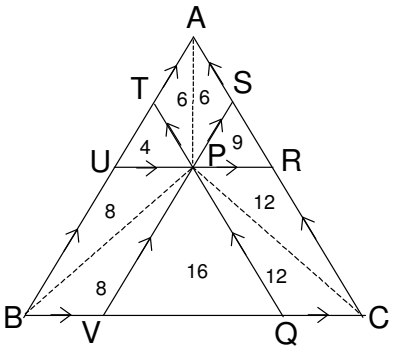
P(x) = (x-1)(x-2)(x-3)(x-a)

P(4)+p(0) = (4-1)(4-2)(4-3)(4-4)+(-1)(-2)(-3)(-a)

= 6(4-a)+6a

= 24-6a+6a

= 24



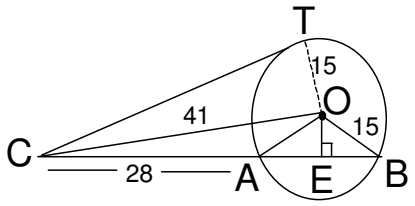
155.

$\Delta TUP \sim \Delta PVQ$ $\qquad$ $\Delta SPR \sim \Delta PVQ$

$\frac{UP}{VQ} = \frac{2}{4} = \frac{1}{2}$ $\qquad$ $\frac{PR}{VQ} = \frac{3}{4}$

$\frac{BV}{VQ} = \frac{1}{2}$ $\qquad$ $\frac{QC}{VQ} = \frac{3}{4}$

Similarly $\frac{AT}{TU} = \frac{3}{2}$



156.

$CT^2 = C.A.C.B$

$CO^2 - OT^2 = 28(28+AB)$

$41^2 - 15^2 = 28(28+AB)$

$AB = 24$

$AE = 12$

157. $\sin\alpha + \cos\alpha = \frac{-b}{a}$

$\sin\alpha.\cos\alpha = \frac{c}{a}$

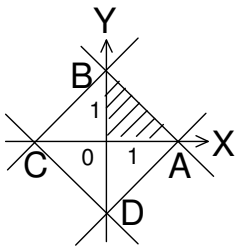
$-(\sin\alpha + \cos\alpha) = \left(-\frac{b}{a}\right)^2$

$\sin^2\alpha + \cos^2\alpha + 2\sin\alpha\cos\alpha = \frac{b^2}{a^2}$

$1 + \frac{2c}{a} = \frac{b^2}{a^2} \Rightarrow a^2 + 2ac = b^2$

158. $|x|+|y| = 1$

We get st. lines



$x + y = 1$

$x - y = 1$

$- x + y = 1$

$- x - y = 1$

Ar (ABCD) = ½ + ½ + ½ + ½ = 2

159. $3^9 + 3^{12} + 3^{15} + 3^n$

$= 3(1 + 3^3 + 3^6 + 3^{n-9})$

$= 3^9$ is a perfect cube

$= 3^9 (757 + 3^{n-9})$

If $n = 14 \Rightarrow 3^{n-9} = 3^{14-9} = 3^5 = 243$

$\Rightarrow 757 + 243 = 1000$ is a perfect cube

$\Rightarrow$ n = 14

160. 7744 is a perfect square

$7744 = (88)^2$