SOLUTIONS

NTSE TEST

FULL TEST-2

Test Date : 01.11.2017

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MENTAL ABILITY

1. (A)	2. (C)	3. (D)	4. (B)	5. (B)	6. (C)	7. (A)
8. (C)	9. (C)	10. (A)	11. (C)	12. (A)	13. (A)	14. (C)
15. (D)	16. (B)	17. (B)	18. (D)	19. (C)	20. (D)	21. (B)
22. (C)	23. (B)	24. (B)	25. (C)	26. (B)	27. (A)	28. (A)
29. (C)	30. (A)	31. (B)	32. (D)	33. (C)	34. (B)	35. (D)
36. (B)	37. (B)	38. (D)	39. (A)	40. (A)	41. (D)	42. (C)
43. (D)	44. (D)	45. (C)	46. (D)	47. (B)	48. (A)	49. (B)
50. (D)						

ENGLISH

51. (A)	52. (B)	53. (B)	54. (B)	55. (B)	56. (B)	57. (B)
58. (B)	59. (D)	60. (C)	61. (A)	62. (B)	63. (B)	64. (B)
65. (B)	66. (A)	67. (D)	68. (D)	69. (D)	70. (A)	71. (C)
72. (A)	73. (C)	74. (A)	75. (D)	76. (B)	77. (D)	78. (B)
79. (D)	80. (C)	81. (A)	82. (C)	83. (B)	84. (A)	85. (A)
86. (D)	87. (C)	88. (D)	89. (C)	90. (B)	91. (B)	92. (D)
93. (C)	94. (B)	95. (A)	96. (D)	97. (D)	98. (C)	99. (B)
100. (A)						

PHYSICS

101. (C)

$v_e \propto \frac{1}{\sqrt{r}}$ where r is position of body from the surface.

$$\frac{v_1}{v_2} = \sqrt{\frac{r_2}{r_1}} = \sqrt{\frac{7R+R}{R}} = \sqrt{\frac{8R}{R}}$$

$$\therefore \frac{v_e}{v_2} = 2\sqrt{2}$$

on $\boxed{v_2 = \frac{v_e}{2\sqrt{2}}}$

102. (D)

Total distance = 130 + 120 =250 m

Relative velocity = 30 –(–20) = 50 m/s

Hence $t = \frac{\text{Total distance}}{v_{rel}} = \frac{250}{50} = 5\ \text{sec}.$

103. (C)

$E = \frac{1}{2}mv^2$ — (I)

Now $v' = (v+2)$ m/s

Now $E' = 2E = \frac{1}{2}m(v')^2$

$= \frac{1}{2}m(v+2)^2$ —(II)

From (I) & (II)

$2.\frac{1}{2}mv^2 = \frac{1}{2}m(v+2)^2$ or $2v^2 = (v+2)^2$

or $v + 2 = \sqrt{2}\,v$ or $(\sqrt{2}-1)v = 2$

or $v = (2 + 2\sqrt{2})$ m / s

104. (B)

$m = \frac{-v}{u} = -5$

$\therefore$ $v = 5u$

$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$ $\Rightarrow$ $-\frac{1}{v} - \frac{1}{u} = -\frac{1}{10}$

$\Rightarrow$ $-\frac{1}{5u} - \frac{1}{u} = -\frac{1}{10}$ $\Rightarrow$ $\frac{-1-5}{5u} = \frac{-1}{10}$

$\Rightarrow$ $-\frac{6}{5u} = -\frac{1}{10}$ $\therefore$ $u = 12$ cm

105. (B)

$$F = \frac{1}{4\pi\epsilon_0}\frac{q^2}{r^2}$$

$$0.1 = \frac{(9\times10^9)(q^2)}{(0.96)^2} \Rightarrow q = \frac{0.96}{3}\times10^{-5}$$

$= n\ (1.6 \times 10^{-19})$

$n = 2 \times 10^{13}$

106. (A)

Volume is same in both cases

$V = A'L' = AL$

or $\frac{A'}{A} = \frac{L}{L'} = \frac{L}{\frac{L}{2}} = 2$

$\therefore$ $A' = 2A$

$$\therefore \quad \frac{R'}{R} = \frac{\rho\frac{L'}{A'}}{\rho\frac{L}{A}} = \frac{L'}{L}.\frac{A}{A'} = \frac{1}{2}\times\frac{1}{2} = \frac{1}{4}$$

$\therefore \ \% \text{change} = \frac{R - R'}{R} \times 100 = \frac{3}{4} \times 100 = 75\%$

107. (C)

Conceptual.

108. (B)

$qvB = \frac{mv^2}{r}$

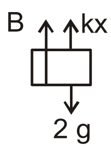
$\therefore \quad r = \frac{mv}{qB}$

or $B = \frac{mv}{qr} = \frac{9.1 \times 10^{-31} \times 10^6}{1.6 \times 10^{-19} \times 0.1} = 5.6 \times 10^{-5}$ T.

109. (C)

$I = \frac{(n - 2m)E}{nr + R} = \frac{(4-2).E}{4 \times \frac{1}{4} + 1} = \frac{2E}{2} A = 1.5A$

110. (C)



kx < 2g

For liquid

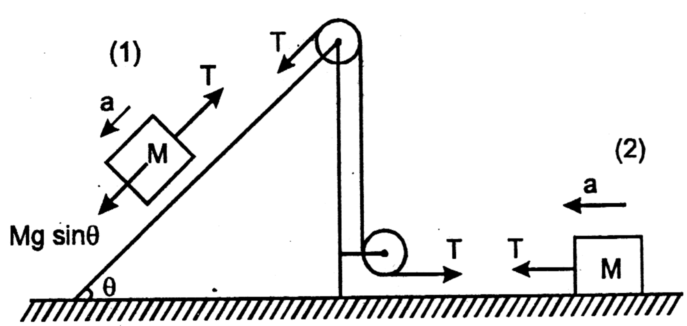
N' >mg

hence (C) is correct

111. (C)

$\sin i_c = \frac{1}{\mu} = \frac{2}{3} = \cos 48° = \sin 42°$

112. (C)



Mg $\sin\theta$ – T = Ma [Newton's II law for block 1]

T = Ma [Newton's II law for block 2]

By subtracting both equations

2 T = Mg $\sin\theta$ $\quad T = \frac{Mg \sin\theta}{2}$

113. (A)

The time taken by the stone to reach the lake

$t_1 = \sqrt{\left(\frac{2h}{g}\right)} = \sqrt{\left(\frac{2 \times 500}{10}\right)}$ = 10 sec (Using $h = ut + \frac{1}{2}gt^2$)

Now time taken by sound from lake to the man

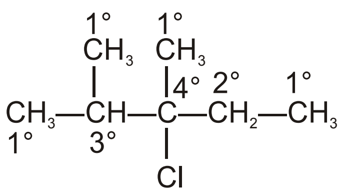
$t_2 = \frac{h}{v} = \frac{500}{340} = 1.5 \text{ sec}$

$\Rightarrow$ Total time = $t_1 + t_2$ = 10 + 1.5 = 11.5 sec.

CHEMISTRY

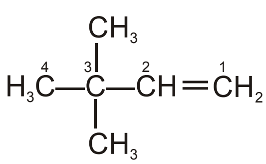
114. (B)

3-chloro-2, 3-dimethyl pentane contains all the four 1°, 2°, 3° and 4° carbon atoms.



3-chloro-2-3-dimethyl pentane

115. (D)



IUPAC name =3, 3-dimethyl-1-butene.

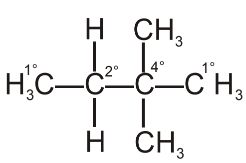
116. (D)

1° carbon is attached to one carbon atom.

2° carbon is attached to two carbon atoms.

3° carbon is attached to three carbon atoms.

The hydrogen attached to 2° carbon atom are 2°.



$\therefore$ It has one 2° carbon atom and two 2° hydrogen atoms.

117. (A)

(i) n = 4, l = 1 $\Rightarrow$ 4 p orbital

(ii) n = 4, l = 0 $\Rightarrow$ 4s orbital

(iii) n = 3, l = 2 $\Rightarrow$ 3d orbital

(iv) n = 3, l = 1 $\Rightarrow$ 3p orbital

According to aufbau principle, energies of above mentioned orbitals are in the order of

118. (A)

Given, Atomic number of Rb, Z = 37

Thus, its electronic configuration is [Kr] $5s^1$. Since the last electron or valence electron enter in 5s subshell.

So, the quantum numbers are n = 5, l = 0, (for s orbital) m = 0

$(\therefore m = +l \text{ to } -l), s = +1/2 \text{ or } -1/2$

119. (D)

The balanced chemical reaction is

$$3BaCl_2 + 2Na_3PO_4 \longrightarrow Ba_3(PO_4)_2 + 6NaCl$$

In this reaction, 3 moles of $BaCl_2$ combines with 2 moles of Na_3pO_4. Hence, 0.5 mole of $BaCl_2$ require

$\frac{2}{3} \times 0.5 = 0.33$ mole of Na_3PO_4.

Since available Na_3PO_4 (0.2 mole) is less than required mole (0.33), it is the limiting reactant and would determine the amount of product $Ba_3(PO_4)_2$.

$\because$ 2 moles of Na_3PO_4 gives 1 mole $Ba_3(PO_4)_2$

$\therefore$ 0.2 mole of Na_3PO_4 would give $\frac{1}{2} \times 0.2$

= 0.1 mole $Ba_3(PO_4)_2$

120. (A)

$$2NaHCO_3 \longrightarrow Na_2CO_3 + H_2O + CO_2(g)$$

2 mole 1 mole 1 mole 1 mole

$\frac{1.806 \times 10}{6.022 \times 10}$

6 mole 3 mole 3 mole 3 mole

6 x 84 3 x 22.4

= 504 gm. = 67.2 L

121. (B)

$Na_2CO_3 + 2HCl \longrightarrow 2NaCl + H_2O + CO_2(g)$

1 mole 2 mole 1 mole

6 4

$\frac{6}{1}$ $\frac{4}{2}$

6 2 mole

↓

Limiting Reagent

$\therefore$ HCl is the limiting Reagent.

So,

From 2 mole of HCl $\longrightarrow$ 1 mole of CO_2 gas produced

$\therefore$ 4 mole " " $\longrightarrow \frac{4}{2} = 2$ mole of CO_2 gas

$\downarrow$

i.e. 2 x 22.4 L

= 44.8 L

122. (A)

Highly reactive elements are obtained by electrolysis.

123. (C)

Roasting removes volatile impurites like water vapours and converts sulphides into oxides.

$2ZnS + O_2 \rightarrow 2ZnO + SO_2$

124. (B)

Removal of impurities from ores is known as enrichment of ore or concentration of ore.

125. (C)

HCOOH is a monobasic acid.

126. (A)

$$\underset{\text{Base}}{CO_3^{-2}} + \underset{\text{Acid}}{H_2O} \longrightarrow \underset{\text{Acid}}{HCO_3^-} + \underset{\text{Base}}{OH^-}$$

BIOLOGY

127. (C)

Cytokinin delays senescense

128. (D)

129. (B)

130. (B)

131. (B)

Fungi are eukaryotic in nature.

132. (A)

Antibiotics are used either to kill or inhibit the growth of bacteria

133. (D)

134. (A)

Glucagon increases the level of blood glucose level.

135. (A)

136. (C)

137. (D)

138. (B)

139. (D)

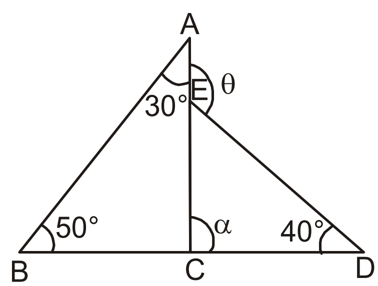
140. (A)

MATHEMATICS

141. (A)

142. (B)

143.

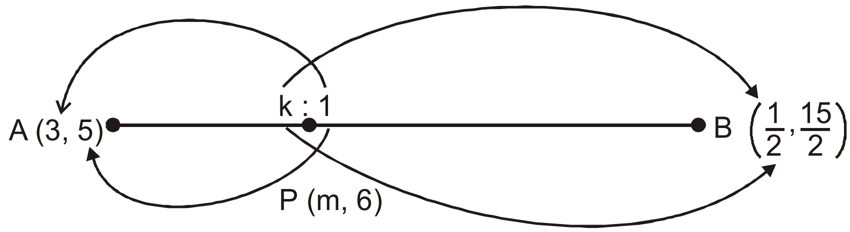


$\alpha = 50° + 30° = 80°$

$\therefore \angle CED = 180 - (40° + 80°) = 60°$

$\therefore \angle AED = 120°$, sin 120 = $\frac{\sqrt{3}}{2}$

144. Let P (m, 6) divides the line segment AB joining A (3,5) B in the ratio k : 1.



Applying section formula, we get the co-ordinates of P :

$$\left(\frac{\frac{1}{2}k+3\times 1}{k+1},\frac{\frac{15}{2}k+5\times 1}{k+1}\right)=\left(\frac{k+6}{2(k+1)},\frac{15k+10}{2(k+1)}\right)$$

But P (m, 6) = P $\left(\frac{k+6}{2(k+1)},\frac{15k+10}{2(k+1)}\right)$ $\Rightarrow$ $m=\frac{k+6}{2(k+1)}$ and also $\frac{15k+10}{2(k+1)}=6$

$\Rightarrow \frac{15k+10}{2(k+1)}=6$ $\Rightarrow 15k+10=12(k+1)$

$\Rightarrow 15k+10=12k+12$ $\Rightarrow 15k-12k=12-10$

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

Putting $k=\frac{2}{3}$ in the equation $m=\frac{k+6}{2(k+1)}$ we get :

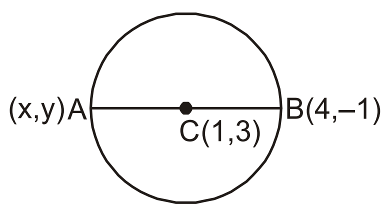
$$m=\frac{\left(\frac{2}{3}+6\right)}{2\left(\frac{2}{3}+1\right)}=\frac{\left(\frac{2+18}{3}\right)}{2\left(\frac{2+3}{3}\right)}=\frac{20}{3}\times\frac{3}{10}=\frac{20}{10}\quad\left(\because k=\frac{2}{3}\right)$$

$$m=\frac{10\times 2}{10}=2$$

Required value of m is 2 $\Rightarrow$ m = 2,

2m + 1 = 5

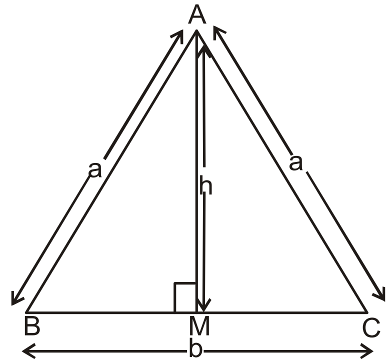
145.



$\frac{x+4}{2}=1\Rightarrow \boxed{x=-2}$

$\frac{y-1}{2}=3\Rightarrow \boxed{y=7}$ $\therefore$ Other end = (–2, 7)

146.



Perimeter = 2a + b

BM = b/2

$$a^2 = (b/2)^2 + h^2 \Rightarrow h = \sqrt{a^2 - \frac{b^2}{4}} = \frac{\sqrt{4a^2 - b^2}}{2}$$

$$\therefore \text{Area}(\Delta ABC) = \frac{1}{2}.b.\frac{\sqrt{4a^2 - b^2}}{2}$$

$$= \frac{1}{4}b.\sqrt{4a^2 - b^2}$$

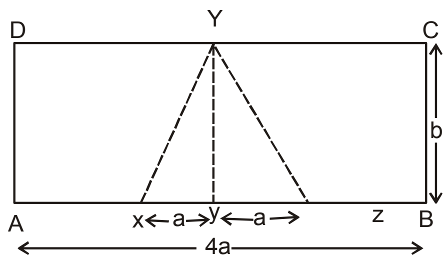
147. x + y = a —(I) , xy = b —(II)

$$\therefore \frac{1}{x^3} + \frac{1}{y^3} = \frac{x^3 + y^3}{(xy)^3} = \frac{(x+y)^3 - 3xy(x+y)}{(xy)^3}$$

$$= \frac{a^3 - 3ab}{b^3}$$

$$\Rightarrow \frac{1}{x^3} + \frac{1}{y^3} = \frac{a^3 - 3ab}{b^3} \text{ Ans.}$$

148.



$$Ar(\Delta xyz) = \frac{1}{2}\,2a.b = ab$$

Ar (rectangle ABCD) = 4ab

$$\therefore \text{Ratio of Area} = \frac{1}{4}$$

149. Given, a+1=b+2=c+3=d+4=a+b+c+d+5

Now, a+1=a+b+c+d+5

b+2=a+b+c+d+5

c+3=a+b+c+d+5

d+4=a+b+c+d+5

Add all the above equations, we get

(a+b+c+d)+(1+2+3+4)=4a+4b+4c+4d+20

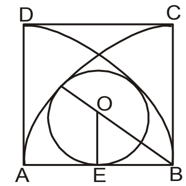
10=3a+3b+3c+3d+20

10–20=3(a+b+c+d)

–10=3(a+b+c+d)

$$-\frac{10}{3} = a+b+c+d$$

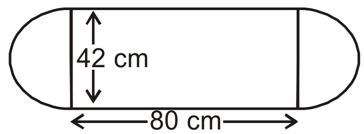
150. Let O be the centre of Γ . By symmetry O is on the perpendicular bisector of AB. Draw $OE \perp AB$. Then BE = AB/2 = 1/2. If r is the radius of Γ . We see that OB = 1– r, and OE = r. Using Pythagoras, theorem.



$$(1-r)^2 = r^2 + \left(\frac{1}{2}\right)^2$$

Simplification gives r = 3/8

151.



$\text{Area} = 80 \times 42 + \pi \times 21^2$ = 3360 + 1386 = 4746 cm^2

152. E = $\{1^2, 2^2, 3^2, ...14^2, 15^2\}$

$\Rightarrow n(E) = 15$

n(S) = 250

$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{15}{250} = \frac{3}{50}$

153. S = ut

$50\text{ m} = u \times \frac{9}{2}$

$h = \frac{100}{9}\text{ m/sec} = \frac{100}{9} \times \frac{18}{5}\text{ km/hr}$

Speed= u = 40 km/hr

154. $\cot^2\theta\left(1 - 3\sec\theta + 2\sec^2\theta\right) = 1$ and $\theta > 90°$,

$1 - 3\sec\theta + 2\sec^2\theta = \tan^2\theta = \sec^2\theta - 1$

$\Rightarrow \sec^2\theta - 3\sec\theta + 2 = 0$

$\Rightarrow \sec\theta = 1, 2$

$\cos\theta = 1, \frac{1}{2}$

$\theta = 2\pi, 0, \frac{\pi}{3}, 2\pi - \frac{\pi}{3}$

$\theta = 360°, 0, 60°, 300°$

155. $T_n = \sin^n\theta + \cos^n\theta$

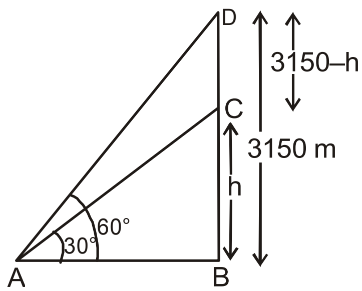
$$\frac{T_3 - T_5}{T_1} = \frac{\sin^3\theta + \cos^3\theta - \sin^5\theta - \cos^5\theta}{\sin\theta + \cos\theta}$$

$$= \frac{\sin^3\theta\cos^2\theta + \cos^3\theta\sin^2\theta}{\sin\theta + \cos\theta} = \frac{\sin^2\theta\cos^2\theta(\sin\theta + \cos\theta)}{\sin\theta + \cos\theta} = \sin^2\theta\cos^2\theta$$

$$\frac{T_5 - T_7}{T_3} = \frac{\sin^5\theta\cos^2\theta - \cos^5\theta\sin^2\theta}{\sin^3\theta + \cos^3\theta} = \sin^2\theta\cos^2\theta$$

$\therefore$ Option (A) is correct

156.



$$\tan 60^\circ = \frac{3150}{AB} = AB = \frac{3150}{\sqrt{3}}$$

$$\tan 30^\circ = \frac{h}{AB}$$

$$h = AB\tan 30^\circ = \frac{3150}{\sqrt{3}} \times \frac{1}{\sqrt{3}} = \frac{3150}{3} = 1050$$

h= 1050

Distance b/w two planes = 3150 – 1050 = 2100 m

157. 1st three digits no's divisible by 13 and having middle no 5 is 156

25.....×

2nd No— 351

3rd No— 455

4th No —553

65.....×

5th No —754

6th No —858

95.....×

Clearly there will be six no's only

158. If x < 0 and $\log_7(x^2 - 5x - 65) = 0$

$\Rightarrow x^2 - 5x - 65 = 1$

$\Rightarrow x^2 - 5x - 66 = 0$

= (x – 11)(x + 6) = 0 $\Rightarrow$ x =11 , –6

only x= –6 acceptable b/c x < 0 (given)

159. Let the polynomial f(x)

It yields a remainder 2 upon divisor by x – 1

i.e. f(1)=2 ....(1)

and also yields a remainder 1 upon divisor by x – 2

i.e. f(2)=1 ....(2)

Now to find the remainder when f(x) is divided by (x–1)(x–2) we can not use remainder theorem

Let us use division algorithm

Dividend = divisor × quotient + remainder

$f(x) = (x-1)(x-2) \times q(x) + ax + b$

Put x=1,

$f(1) = a + b \Rightarrow a + b = 2$.......(3)

put x=2,

$f(2) = 2a + b \Rightarrow 2a + b = 1$.......(4)

by solving (3) and (4), we get

$a=-1$ and $b=3$

$\therefore$ remainder=ax+b =–x+3

160. $S = \frac{2}{15} + \frac{2}{35} + \frac{2}{63} + \frac{2}{99} + \text{..........} + \frac{2}{9999}$

$\Rightarrow S = \frac{2}{3\times5} + \frac{2}{7\times5} + \frac{2}{9\times7} + \frac{2}{11\times9} + \text{..........} + \frac{2}{99\times101}$

$= \left(\frac{1}{3} - \frac{1}{5}\right) + \left(\frac{1}{5} - \frac{1}{7}\right) + \left(\frac{1}{7} - \frac{1}{9}\right) + \left(\frac{1}{9} - \frac{1}{11}\right) + \text{............} + \left(\frac{1}{99} - \frac{1}{101}\right)$

$= \frac{1}{3} - \frac{1}{101} = \frac{101-3}{3\times101} = \frac{98}{303}$

161. (C)	162. (C)	163. (A)	164. (C)	165. (C)	166. (C)	167. (B)
168. (D)	169. (C)	170. (C)	171. (C)	172. (D)	173. (A)	174. (A)
175. (C)	176. (C)	177. (B)	178. (D)	179. (C)	180. (C)	181. (B)
182. (C)	183. (C)	184. (A)	185. (D)	186. (A)	187. (A)	188. (C)
189. (B)	190. (B)	191. (C)	192. (D)	193. (C)	194. (B)	195. (B)
196. (A)	197. (A)	198. (A)	199. (A)	200. (D)		