

# SOLUTIONS

## NTSE TEST

STAGE-I

**PART TEST-3**

**Test Date: 15-09-17**



**Corporate Office :** Paruslok, Boring Road Crossing, Patna-01  
**Kankarbagh Office :** A-10, 1st Floor, Patrakar Nagar, Patna-20  
**Bazar Samiti Office :** Rainbow Tower, Sai Complex,  
Rampur Rd., Bazar Samiti Patna-06  
**Call :** 0612-3223681/2 | 7544015993/6/7 | 7070999604/5

## MENTAL ABILITY

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

## ENGLISH

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

## SCHOLASTIC APTITUDE TEST

101. (B)

$$\frac{P_1}{P_2} = \frac{20}{15} = \frac{4}{3}$$

102. (B)

Work done by gravitational field is path independent

103. (D)

$$T - mg = ma$$

$$T = m(g+a)$$

$$s = \frac{1}{2}at^2 \quad W = T.S = \frac{m}{2} \cdot (g+a)at^2$$

104. (D)

By energy conservation

$$m \times g \times 5 + \frac{1}{2}m \times 16 = m \times g \times 1.6 + \frac{1}{2}mv^2$$

$$v^2 = 2(5g - 16)$$

$$v = \sqrt{84} \approx 9 \text{ m/s}$$

105. (B)

$$W = -9.8 \times 1 = -9.8 \text{ J}$$

106. (B)

$$\delta = 360^\circ - 2\theta$$

$\theta$  : angle between two mirrors.

$\delta$  : total angle of deviation after two reflections.

$$240^\circ = 360^\circ - 2\theta \Rightarrow \theta = 60^\circ$$

$$x = \frac{360^\circ}{\theta} = \frac{360^\circ}{60} = 6 \text{ (even)}$$

$$\text{Number of images, } n = x - 1 = 6 - 1 = 5$$

107. (C)

Since image is real and inverted.

$$m = -n$$

$$\text{Let } u = -x$$

$$m = -\frac{v}{u} \Rightarrow n = -\frac{v}{-x}$$

$$v = -nx$$

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{-nx} + \frac{1}{-x} = \frac{1}{-f} \Rightarrow \frac{1+n}{nx} = \frac{1}{f}$$

$$x = \left( \frac{n+1}{n} \right) f$$

108. (A)

The complete image is formed but intensity of image will decrease.

Intensity  $\propto$  (area of mirror reflecting the light)

109. (B)

$$u = -(f+x), \quad v = -(f+y) \quad f = -f$$

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f} \Rightarrow \frac{1}{-(f+y)} + \frac{1}{-(f+x)} = \frac{1}{-f}$$

$$\frac{2f+x+y}{(f+y)(f+x)} = \frac{1}{f} \quad 2f^2 + f(x+y) = f^2 + f(x+y) + xy$$

$$f^2 = xy \quad f = \sqrt{xy}$$

110. (A)

Conceptual.

111. (C)

Conceptual.

112. (C)

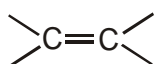
$$v \propto \frac{1}{\mu}$$

$$\frac{v_g}{v_\omega} = \frac{a\mu_\omega}{a\mu_g} = \frac{4/3}{3/2} = \frac{8}{9}$$

113. (B)

$$\text{Apparent height} = \mu h = \frac{4}{3} \times 24 = 32 \text{ cm}$$

114. (D)



It involves sharing of two pairs of electrons.

115. (B)

$$\text{Na} = 1s^2 2s^2 2p^6 3s^1$$

$$\text{For, } n = 3, l = 0, 1, 2$$

$$\text{when, } \left. \begin{array}{l} n = 3 \\ l = 0 \end{array} \right\} \rightarrow 3s$$

$$m = 2l + 1$$

$$= 2 \times 0 + 1$$

$$m = 1, 3s^1$$

$$s = +\frac{1}{2}$$

116. (D)

Graphite is used as a lubricant because it is soft and slippery in nature and it has free electrons.

117. (D)

SnO<sub>2</sub> is an example of amphoteric oxide

118. (D)

All species have same number of electrons in all the 4 options.

(1) Each have 10 electron

(2) Each have 32 electrons

(3) Each have 18 electrons

(4) Each have 10 electrons.

So, all options are the example of isoelectronic series.

119. (A)

In  $X^{-2}$ ,

number of protons = 16

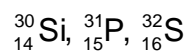
So, number of electrons =  $16 + 2 = 18$

So, In  $X^{+2}$ ,

number of electrons =  $16 - 2 = 14$

120. (B)

In option (B)



Each species have same number of neutrons i.e. 16

${}_{14}^{30}\text{Si}$  have, number of neutrons =  $30 - 14 = 16$

${}_{15}^{31}\text{P}$  have, number of neutrons =  $31 - 15 = 16$

${}_{16}^{32}\text{S}$  have, number of neutrons =  $32 - 16 = 16$

121. (B)

122. (D)

Except smelting all are the method of concentration of metal ores.

123. (C)

${}_{89}\text{Y}^{231}$  species have,

number of proton = 89

number of electrons = 89

number of neutrons =  $231 - 89 = 142$

124. (C)

(1)  ${}_{32}\text{Ge}^{76}$  has

neutrons =  $76 - 32 = 44$

(2)  ${}_{33}\text{As}^{77}$  has

neutrons =  $77 - 33 = 44$

(3)  ${}_{34}\text{Se}^{78}$  has

neutrons =  $78 - 34 = 44$

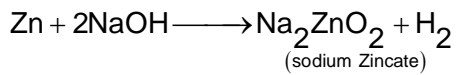
All have same number of neutrons, so, they are the example of Isotones

So, option (C) is correct.

125. (B)

Smelting is a process of reduction by carbon.

126. (B)



127. (A)

128. (D)

All the methods are example of asexual reproduction.

129. (D)

To maintain the continuity of species reproduction is done.

130. (B)

131. (C)

Multiple new organisms are formed in multiple fission.

132. (B)

133. (D)

134. (C)

135. (A)

136. (D)

137. (B)

138. (B)

139. (A)

Oogenesis is the process of formation of ovum in ovaries.

140. (B)

141. (B)

$$\begin{aligned} & 3[\cos^4 \alpha + \sin^4 \alpha] - 2[\cos^6 \alpha + \sin^6 \alpha] \\ \Rightarrow & 3[(\cos^2 \alpha)^2 + (\sin^2 \alpha)^2] - 2[(\cos^2 \alpha)^3 + (\sin^2 \alpha)^3] \\ \Rightarrow & 3[(\cos^2 \alpha + \sin^2 \alpha)^2 - 2\cos^2 \alpha \sin^2 \alpha] - 2[(\cos^2 \alpha + \sin^2 \alpha)(\cos^4 \alpha - \cos^2 \alpha \sin^2 \alpha + \sin^4 \alpha)] \\ \Rightarrow & 3[1 - 2\cos^2 \alpha \sin^2 \alpha] - 2[\cos^4 \alpha + \sin^4 \alpha - \cos^2 \alpha \sin^2 \alpha] \\ \Rightarrow & 3[1 - 2\cos^2 \alpha \sin^2 \alpha] - 2[1 - 2\sin^2 \alpha \cos^2 \alpha - \cos^2 \alpha \sin^2 \alpha] \\ \Rightarrow & 3 - 6\cos^2 \alpha \sin^2 \alpha - 2 + 6\cos^2 \alpha \sin^2 \alpha = 1 \end{aligned}$$

142. (B)

$$a_1 + a_{2n} = a_2 + a_{2n-1} = \dots = a_n + a_{n+1} = k$$

$$\begin{aligned} \text{Expression} &= k \left\{ \frac{\sqrt{a_1} - \sqrt{a_2}}{a_1 - a_2} + \dots + \frac{\sqrt{a_n} - \sqrt{a_{n+1}}}{a_n - a_{n+1}} \right\} \\ &= \frac{-k}{d} (\sqrt{a_1} - \sqrt{a_{n+1}}) = \frac{-k}{d} \frac{a_1 - a_{n+1}}{\sqrt{a_1} + \sqrt{a_{n+1}}} = (a_1 + a_{2n}) \frac{-nd}{-d(\sqrt{a_1} + \sqrt{a_{n+1}})} \\ &= \frac{n(a_1 + a_{2n})}{\sqrt{a_1} + \sqrt{a_{n+1}}} \end{aligned}$$

143. (D)

144. (B)

$$t_p = a + (P - 1)d$$

$$Q = a + (P - 1)d \quad (I)$$

$$Q = a + Pd - d$$

$$t_{(P+Q)} = a + (P + Q - 1)d$$

$$0 = a + Pd + Qd - d \quad (II)$$

$$(II) - (I)$$

$$0 = a + Pd + Qd - d$$

$$\underline{-Q = a + Pd - d}$$

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$$-Q = Qd$$

$$\boxed{d = -1}$$

Now put the value of Q in (I)

$$Q = a - P + 1$$

$$\boxed{Q + P - 1 = a}$$

$$t_Q = a + (Q - 1)d$$

$$= Q + P - 1 + (Q - 1)(-1) = P + Q - 1 - Q + 1$$

$$\boxed{t_Q = P}$$

145. (B)

$$\text{Let } |x| = y$$

$$y^2 + y - 6 = 0$$

$$y^2 + 3y - 2y - 6 = 0$$

$$y(y + 3) - 2(y + 3) = 0$$

$$y = 2, y = -3$$

$$x^2 - x - 6 = 0$$

$$x^2 - 3x + 2x - 6 = 0$$

$$x(x-3) + 2(x-3) = 0$$

$$x = -2, y = 3$$

∴ Sum of roots = 0

146. (A)

$$\sqrt{x+1} - \sqrt{x-1} = \sqrt{4x-1}$$

$$\Rightarrow (x+1) + (x-1) - 2\sqrt{(x+1)\sqrt{x-1}} = (4x-1)$$

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

$$\Rightarrow -2x + 1 = 2\sqrt{x^2 - 1}$$

$$\Rightarrow (-2x + 1)^2 = 2(x^2 - 1)$$

$$\Rightarrow 4x^2 + 1 - 4x = 2x^2 - 2$$

$$\Rightarrow 2x^2 - 4x + 3 = 0$$

$$\Rightarrow D = 16 - 4 \cdot 3 \cdot 2 = 16 - 24 = -8$$

$$D < 0$$

∴ no solution

147. (B)

Let one root is  $\alpha$ , other is  $\frac{1}{\alpha}$

Product of roots

$$\alpha \cdot \frac{1}{\alpha} = \frac{4k}{k^2 + 1}$$

$$\Rightarrow k^2 - 4k + 1 = 0$$

$$\Rightarrow D = 16 - 4 = 12$$

$$\alpha = \frac{4 + \sqrt{12}}{2} = \frac{4 + 2\sqrt{3}}{2} = 2 + \sqrt{3}$$

$$\beta = \frac{4 - \sqrt{12}}{2} = 2 - \sqrt{3}$$

148. (B)

$$\alpha + \beta = P$$

$$\alpha\beta = Q$$

$$(\alpha - \beta)^2 = (\alpha + \beta)^2 - 4\alpha\beta$$

$$(\alpha^2 - \beta^2)(\alpha^3 + \beta^3)$$

$$\Rightarrow (\alpha + \beta)(\alpha - \beta)(\alpha - \beta)(\alpha^2 + \alpha\beta + \beta^2)$$

$$\Rightarrow (\alpha + \beta)\{(\alpha + \beta)^2 - 4\alpha\beta\}\{(\alpha + \beta)^2 - \alpha\beta\}$$



$$\Rightarrow P\{P^2 - 4Q\}\{P^2 - Q\}$$

$$\Rightarrow P(P^2 - 4Q)(P^2 - Q)$$

$$\Rightarrow P(P^2 - Q)(P^2 - 4Q)$$

149. (B)

Clearly  $\alpha, \beta$  are the roots of the equation  $x^2 - 5x + 3 = 0$  use  $\alpha + \beta = 5$

$$\alpha\beta = 3$$

$$x^2 - \left(\frac{\alpha^2 + \beta^2}{\alpha\beta}\right)x + 1 = 0$$

$$x^2 - \left(\frac{25 - 6}{3}\right)x + 1 = 0$$

$$\Rightarrow 3x^2 - 19x + 3 = 0$$

150. (C)

$$2x^2 - 7x + 1 = 0$$

$$ax^2 + bx + 2 = 0$$

have common root

$$\frac{2}{a} = \frac{-7}{b} = \frac{1}{2}$$

$$a = 4, b = -14$$

151. (D)

$$\tan \theta = a - \frac{1}{4a} = \frac{4a^2 - 1}{4a} = \frac{p}{b}$$

$$h = \sqrt{(4a^2 - 1)^2 + (4a)^2}$$

$$= \sqrt{16a^4 - 8a^2 + 1 + 16a^2} = \sqrt{(4a^2)^2 + 2 \cdot 4a^2 \cdot 1 + 1}$$

$$h = \pm(4a^2 + 1)$$

$$\sec \theta = \frac{4a^2 + 1}{4a} = a + \frac{1}{4a}$$

$$\tan \theta = a - \frac{1}{4a}$$

$$\sec \theta - \tan \theta = \cancel{a} + \frac{1}{4a} - \cancel{a} + \frac{1}{4a} = \frac{1}{2a}$$

and  $-2a$

152. (B)

$$\sqrt{3} \operatorname{cosec} 20 - \sec 20$$

$$\Rightarrow \sqrt{3} \frac{1}{\sin 20} - \frac{1}{\cos 20}$$

$$\Rightarrow \frac{\sqrt{3} \cos 20 - \sin 20}{\sin 20 \cdot \cos 20} = \frac{\frac{\sqrt{3}}{2} \cdot \cos 20 - \frac{1}{2} \sin 20}{\frac{\sin 20 \cdot \cos 20}{2}}$$

$$\Rightarrow \frac{4(\sin 60 \cdot \cos 20 - \cos 60 \cdot \sin 20)}{\sin 40}$$

$$\Rightarrow 4 \frac{\sin 40}{\sin 40} = 4$$

153. (A)

$$e^{\sin x} - \frac{1}{e^{\sin x}} - 4 = 0$$

Let  $e^{\sin x} = y$

$$y - \frac{1}{y} - 4 = 0$$

$$y^2 - 4y - 1 = 0$$

$$D = 16 + 4 = 20$$

$$\alpha = \frac{4 + \sqrt{20}}{2}$$

$$\beta = \frac{4 - \sqrt{20}}{2}$$

Which is absurd because  $0 < e^{\sin x} \leq e = 2.72$  (nearly)

154. (B)

$$x^2 - Px + Q = 0$$

$$\sec \alpha + \operatorname{cosec} \alpha = P \Rightarrow \sin \alpha + \cos \alpha = P \sin \alpha \cdot \cos \alpha$$

$$\sec \alpha \cdot \operatorname{cosec} \alpha = Q \text{ and } \sin \alpha \cdot \cos \alpha = \frac{1}{Q}$$

$$\boxed{\sin \alpha + \cos \alpha = \frac{P}{Q}}$$

$$\therefore \frac{P^2}{Q^2} = 1 + 2 \sin \alpha \cdot \cos \alpha$$

$$\Rightarrow \frac{P^2}{Q^2} = 1 + \frac{2}{Q}$$

$$\Rightarrow \frac{P^2}{Q^2} = \frac{Q+2}{Q}$$

$$\Rightarrow P^2 = Q^2 + 2Q = Q(Q+2)$$

$$\Rightarrow P^2 = Q(Q+2)$$

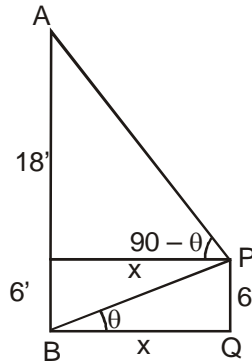
155. (C)

$$a = d \cos \alpha + c \sin \alpha$$

$$b = c \cos \alpha - d \sin \alpha$$

$$\boxed{a^2 + b^2 = c^2 + d^2}$$

156. (C)



$$\tan \theta = \frac{6}{x} \quad (I)$$

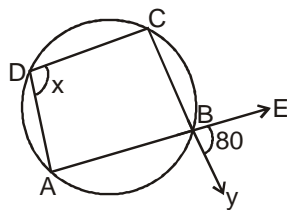
$$\tan(90 - \theta) = \frac{18}{x} \quad (II)$$

(I) × (II)

$$\frac{6}{x} \cdot \frac{18}{x} = 1$$

$$x = 6\sqrt{3}$$

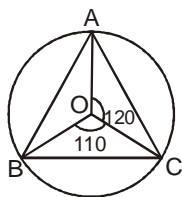
157. (C)



$\angle CBE = 100$  (Linear pair)

$\angle x = 100^\circ$  [By, In circle exterior angle is equal to opposite internal angle]

158. (A)



Sum of angles at the point is  $360^\circ$

$$\angle AOB + \angle BOC + \angle COA = 360^\circ$$

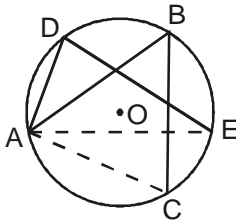
$$\angle AOB = 360 - (\angle BOC + \angle COA) = 130^\circ$$

$$\angle C = \frac{1}{2} \angle AOB = \frac{130}{2} = 65$$

$$\angle A = \frac{1}{2} \angle BOC = \frac{1}{2} \times 110 = 55$$

$$\angle B = \frac{1}{2} \angle AOC = \frac{1}{2} \times 120 = 60^\circ$$

159. (C)



AE > AC

$$\angle ADE > \angle ABC$$

$$\angle ADE - \angle ABC = 15^\circ$$

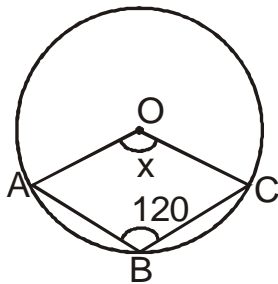
$$\therefore \frac{\angle AOE}{2} - \frac{\angle AOC}{2} = 15$$

$$\angle AOE - \angle AOC = 30$$

$$\angle COE = 30^\circ$$

$$\therefore \angle CAE = \frac{1}{2} \angle COE = 15^\circ$$

160. (A)



$$\text{Reflex } \angle AOC = 2\angle ABC = 240^\circ$$

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

## NTSE PART TEST-3 [STAGE-1] \_15-09-2017-2018

## ANSWER KEY

MENTAL ABILITY

- |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|
| 1. (B)  | 2. (B)  | 3. (C)  | 4. (A)  | 5. (B)  | 6. (D)  | 7. (B)  |
| 8. (B)  | 9. (C)  | 10. (B) | 11. (D) | 12. (C) | 13. (D) | 14. (C) |
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| 29. (A) | 30. (A) | 31. (D) | 32. (C) | 33. (C) | 34. (D) | 35. (D) |
| 36. (B) | 37. (C) | 38. (A) | 39. (A) | 40. (B) | 41. (A) | 42. (B) |
| 43. (C) | 44. (B) | 45. (C) | 46. (D) | 47. (B) | 48. (B) | 49. (A) |
| 50. (A) |         |         |         |         |         |         |

ENGLISH

- |          |         |         |         |         |         |         |
|----------|---------|---------|---------|---------|---------|---------|
| 51. (C)  | 52. (B) | 53. (A) | 54. (C) | 55. (B) | 56. (B) | 57. (A) |
| 58. (A)  | 59. (D) | 60. (C) | 61. (D) | 62. (C) | 63. (D) | 64. (B) |
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| 86. (A)  | 87. (D) | 88. (C) | 89. (C) | 90. (D) | 91. (B) | 92. (D) |
| 93. (D)  | 94. (B) | 95. (A) | 96. (C) | 97. (D) | 98. (D) | 99. (A) |
| 100. (A) |         |         |         |         |         |         |

SCHOLASTIC APTITUDE TEST

- |          |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|----------|
| 101. (B) | 102. (B) | 103. (D) | 104. (D) | 105. (B) | 106. (B) | 107. (C) |
| 108. (A) | 109. (B) | 110. (A) | 111. (C) | 112. (C) | 113. (B) | 114. (D) |
| 115. (B) | 116. (D) | 117. (D) | 118. (D) | 119. (A) | 120. (B) | 121. (B) |
| 122. (D) | 123. (C) | 124. (C) | 125. (B) | 126. (B) | 127. (A) | 128. (D) |
| 129. (D) | 130. (B) | 131. (C) | 132. (B) | 133. (D) | 134. (C) | 135. (A) |
| 136. (D) | 137. (B) | 138. (B) | 139. (A) | 140. (B) | 141. (B) | 142. (B) |
| 143. (D) | 144. (B) | 145. (B) | 146. (A) | 147. (B) | 148. (B) | 149. (B) |
| 150. (C) | 151. (D) | 152. (B) | 153. (A) | 154. (B) | 155. (C) | 156. (C) |
| 157. (C) | 158. (A) | 159. (C) | 160. (A) | 161. (C) | 162. (D) | 163. (D) |
| 164. (D) | 165. (C) | 166. (B) | 167. (A) | 168. (C) | 169. (D) | 170. (D) |
| 171. (D) | 172. (B) | 173. (D) | 174. (C) | 175. (C) | 176. (D) | 177. (C) |
| 178. (A) | 179. (A) | 180. (B) | 181. (B) | 182. (C) | 183. (B) | 184. (C) |
| 185. (C) | 186. (C) | 187. (B) | 188. (C) | 189. (C) | 190. (C) | 191. (D) |
| 192. (C) | 193. (C) | 194. (B) | 195. (A) | 196. (D) | 197. (A) | 198. (C) |
| 199. (B) | 200. (C) |          |          |          |          |          |