PACE-IIT & MEDICAL

ANSWER KEY FOR MAJOR TEST- 02 (FOR 2024 ASPIRANTS) 08th Jan 2023

1. (2)	2. (3)	3. (1)	4. (1)	5. (2)
6. (2)	7. (4)	8. (1)	9. (4)	10. (3)
11. (1)	12. (2)	13. (4)	14. (3)	15. (1)
16. (2)	17. (1)	18. (1)	19. (2)	20. (1)
21. (4)	22. (2)	23. (1)	24. (2)	25. (3)
26. (1)	27. (4)	28. (2)	29. (1)	30. (4)
31. (1)	32. (2)	33. (3)	34. (3)	35. (4)
36. (3)	37. (3)	38. (1)	39. (3)	40. (2)
41. (4)	42. (2)	43. (1)	44. (3)	45. (2)
46. (1)	47. (1)	48. (3)	49. (3)	50. (3)
51. (3)	52. (1)	53. (4)	54. (1)	55. (1)
56. (3)	57. (3)	58. (3)	59. (4)	60. (2)
61. (3)	62. (1)	63. (3)	64. (3)	65. (3)
66. (4)	67. (2)	68. (2)	69. (3)	70. (4)
71. (2)	72. (4)	73. (3)	74. (4)	75. (1)
76. (3)	77. (1)	78. (2)	79. (3)	80. (1)
81. (4)	82. (2)	83. (4)	84. (4)	85. (2)
86. (3)	87. (3)	88. (4)	89. (3)	90. (3)
91. (4)	92. (2)	93. (4)	94. (2)	95. (4)
96. (4)	97. (4)	98. (1)	99. (4)	100. (1)
101. (1)	102. (4)	103. (2)	104. (Bonus)	105. (4)
106. (1)	107. (2)	108. (2)	109. (4)	110. (3)
111. (3)	112. (Bonus)	113. (3)	114. (2)	115. (1)
116. (4)	117. (2)	118. (1)	119. (3)	120. (3)
121. (4)	122. (3)	123. (4)	124. (Bonus)	125. (4)
126. (1)	127. (4)	128. (4)	129. (2)	130. (2)
131. (1)	132. (4)	133. (3)	134. (2)	135. (1)
136. (2)	137. (4)	138. (2)	139. (4)	140. (1)
141. (3)	142. (3)	143. (3)	144. (2)	145. (2)
146. (Bonus)	147. (2)	148. (3)	149. (Bonus)	150. (3)
151. (3)	152. (1)	153. (3)	154. (1)	155. (2)
156. (4)	157. (4)	158. (2)	159. (3)	160. (1)
161. (1)	162. (3)	163. (3)	164. (3)	165. (4)
166. (4)	167. (2)	168. (1)	169. (4)	170. (3)
171. (4)	172. (2)	173. (2)	174. (3)	175. (4)
176. (2)	177. (3)	178. (2)	179. (2)	180. (2)
181. (1)	182. (4)	183. (2)	184. (4)	185. (3)
186. (3)	187. (1)	188. (2)	189. (3)	190. (2)
191. (1)	192. (4)	193. (3)	194. (3)	195. (2)
196. (3)	197. (2)	198. (1)	199. (2)	200. (4)

Solutions

1. (2)

2. (3)

$$(M-m)gh = \frac{1}{2}(M+m)v^2$$

$$\therefore \quad v = \sqrt{\frac{2gh(M-m)}{M+m}}$$

3. (1)

4. (1)

Centre of mass of square plate is at O. Centre of mass of two masses of 5 kg each is at H. Hence, centre of mass of the whole system is at mid-point of OH.

5. (2)

Net external force is zero. Hence velocity of CM of the box and ball system will remain constant.

6. (2)

Centre of mass of whole system was at point O. Hence, x_2 (area of remaining portion) = c (area of removed disc)

$$\therefore \quad x_2\left(\pi a^2 - \pi b^2\right) = c\left(\pi b^2\right)$$

$$\therefore \quad x_2 = \frac{cb^2}{a^2 - b^2}$$

7. (4)

N = applied force = 12 N

$$\therefore \quad f_{max} = \mu N = 7.2N$$

Since weight $w < f_{max}$

Force of friction f = 5N

$$\therefore \text{Net contact force} = \sqrt{N^2 + f^2}$$

$$= \sqrt{(12)^2 + (5)^2} = 13N$$

8. (1)

$$f_{max} = \mu mg = 0.8 \times 4 \times 10 = 32N$$

$$\text{At } t = 2s, F = kt^2(2)(2)^2 = 8N$$

Since applied force $f < f_{max}$. force of friction will be 8 N

9. (4)

10. (3)

Apply polygon law.

11. (1)
$v^2 = 25x$. Comparing with $v^2 = 2as$, we have, $a = 12.5\ m/s^2$

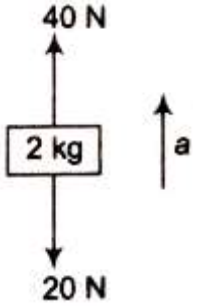
12. (2)
$$v^2 = u^2 + 2as, \text{slope} = 2a = -\frac{16}{2} = -8m/s^2$$
or $$a = -4m/s^2$$

13. (4)
$$R = \frac{u^2 \sin 2\theta}{g} = \frac{2u_x u_y}{g}$$
$\therefore$ range $\propto$ horizontal initial velocity component (u_x)
In path 4 range is maximum of football has maximum horizontal velocity component in this path.

14. (3)
$$R = 2H \text{ or } \frac{2u_x u_y}{g} = \frac{2u_y^2}{2g} \text{ or } 2u_x = y \text{ or } 2a = b$$

15. (1)

16. (2)
Upward force on 2 kg block in upward direction will be 40 N (=2F) in the form of tension.



$\therefore$ $$a = \frac{40-20}{2} = 10m/s^2$$

17. (1)
In free fall, T = 0

18. (1)

19. (2)
Net pulling force on the system $F = 10g \sin 37^o - 4g = 20N$
Maximum force of friction
$$f_{max} = \mu mg\cos 37°$$
$$= 0.7 \times 10 \times 10 \times \frac{4}{5} = 56N$$
Since $F < f_{max}$, system will not move. Equilibrium of 4 kg gives T = 40 N.

20. (1)

21. (4)

22. (2)

$T_B = 3T \text{ and } T_A = 2A$

$\therefore \quad v_A = \frac{T_B}{T_A}.v_B = \frac{3}{2}v_0 (\text{towards right})$

$\therefore \quad v_{AB} = \frac{3v_0}{2} - v_0 = \frac{v_0}{2}, \text{towards right.}$

In such cases velocity and acceleration are in increase ratio of tensions.

23. (1)

Change in kinetic energy = work done

= Area under *F–x* graph

$\therefore \frac{1}{2} \times 5 \times v^2 = 10 \times 25 + \frac{1}{2} \times 25 \times 10$

$= 375$

$\therefore \quad v = 12.2 m/s$

24. (2)

25. (3)

Two balls will meet if,

$(50 \cos 37^o) tA = 120 \text{ or } t_A = 3s$

Vertical component of A is also 50 sin 37^o or 30 m/s, so they will meet if thrown simultaneously.

$h_A = h_B$

$= 30 \times 3 - \frac{1}{2} \times 10 \times (3)^2$

$= 45m$

26. (1)

$v = at_1$

$\therefore \quad a = \frac{v}{t_1}$

$W = \frac{1}{2}mv^2 = \frac{1}{2}m(at)^2$

$= \frac{1}{2}m\left(\frac{v}{t_1} \times t\right)^2$

$= \frac{1}{2}m\frac{v^2t^2}{t_1^2}$

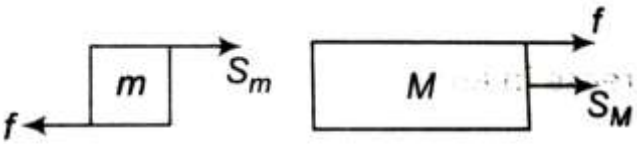
27. (4)

Decrease in gravitational potential energy = increase in elastic potential energy

$\therefore \quad mg(h + x) = \frac{1}{2}Kx^2$

Solving we get $x = 0.1m$

28. (4)



$S_m \neq S_M$

29. (1)

Block A moves due to friction. Maximum acceleration of A can be $\frac{f_{max}}{m}$ or $\frac{\mu mg}{m}$ or $\mu g = 0.2 \times 10 = 2 m/s^2$. If both the blocks move together, then combined acceleration of A and B can be $\frac{10}{3}$ of 3.33 m/s^2. Since this is more than the maximum acceleration of A. Slipping between them will take place and force of friction will be maximum or $\mu m_A g = 2N$.

30. (4)

$$W = \int_0^5 F dx = \int_0^5 \left(7 - 2x + 3x^2\right) dx$$

$$= \left[7x - x^2 + x^3\right]_0^5$$

$$= 135 \text{units}$$

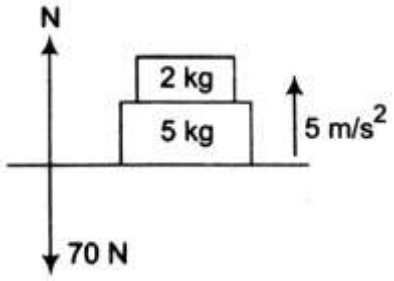
31. (1)

$$\text{Acceration} = \omega^2 r = \frac{v^2}{r} = \omega v = \frac{2\pi}{T} v$$

32. (2)

33. (3)

34. (3)



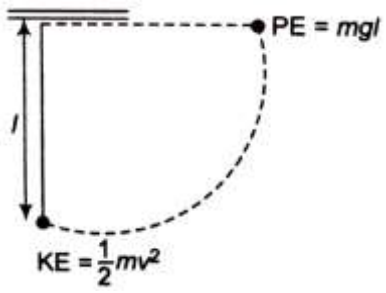
$$N - 70 = 7 \times 5$$

$\therefore$ $N = 105 \text{newton}$ ...(i)

$F = 300N$

35. (4)

Kinetic energy given to a sphere at lowest point = potential energy at the height of suspension



$\Rightarrow \qquad \frac{1}{2}mv^2 = mgl$

$\therefore \qquad v = \sqrt{2gl}$

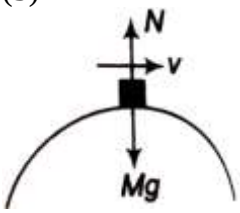
36. (3)

$P = F.v = \left(10\hat{i} + 10\hat{j} + 20\hat{k}\right).\left(5\hat{i} - 3\hat{j} + 6\hat{k}\right)$

$= 50 - 30 + 120$

$140 J/s$

37. (3)



$Mg - N = \frac{Mv^2}{r}$

or $\qquad N = Mg - \frac{Mv^2}{r}$

38. (1)

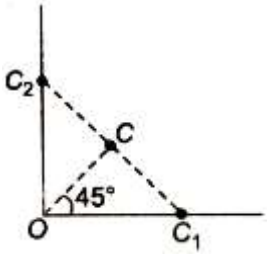
39. (3)

40. (2)

Area of circle, $\frac{\pi}{4}a^2 = A_1$, area of square = $a^2 = A_2$. Since, $A_2 > A_1$ centre of mass will lie inside the square plate.

41. (4)

$OC_1 = \frac{1}{4}m$



$\therefore \qquad OC = OC_1 \cos 45°$

$= \frac{1}{4\sqrt{2}}m$

42. (2)

$$a_{CM} = \frac{(m)(0)+(m)(a)}{m+m} = \frac{1}{2}a$$

43. (1)

Minimum velocity at topmost point is $\sqrt{Rg}$

44. (3)

Centre of mass does not change its path during explosion Therefore it will keep on falling vertically.

45. (2)

$P \times Q$ is perpendicular to the plane formed by P and Q.

P + Q lies in this plane. Hence P + Q is perpendicular to $P \times Q$.

46. (1)

47. (1)

$$N = \frac{mv^2}{R}, mg = \mu_s N = \frac{\mu_s mv^2}{R}$$

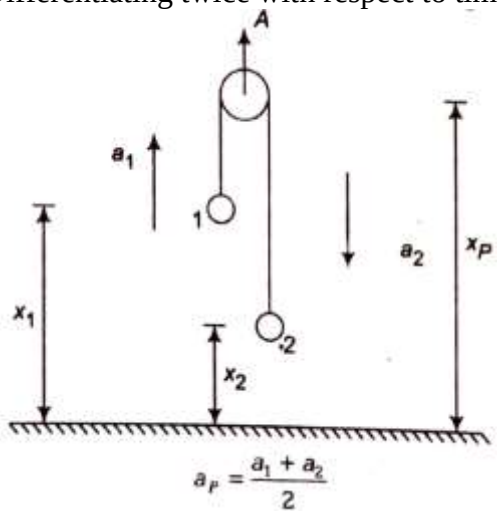
$$\therefore \qquad v = \sqrt{\frac{Rg}{\mu_s}}$$

48. (3)

49. (3)

$x_P - x_1 + x_P - x_2 =$ length of string = constant

Differentiating twice with respect to time, we get



Here $a_P = A$, a_1 is positive and a_2 is negative. Hence

$$A = \frac{a_1 - a_2}{2}$$

50. (3)

51. (3)

Electronic configuration of species after the removal of one electron i.e.,

$${}_6C^{+1} = 1s^2 2s^2 2p^1$$

$_7N^{1+} = 1s^2 2s^2 2p^2$

$8O^{1+} = 1s^2 2s^2 2p^3$ (most stable configuration due to half filled subshell)

$9F^{1+} = 1s^2 2s^2 2p^4$

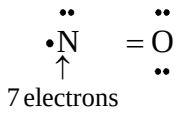
Thus O > F > N > C

Ionisation energy increases from left to right in a period.

52. (1)

53. (4)

In NO, nitrogen has incomplete octet



54. (1)

Group-1 and group -2 elements has lesser ionization energy than d-block elements

55. (1)

For N_2 and its ions, the increasing order of energy is as follows:

$(\sigma_{1s})(\sigma^*_{1s})(\sigma_2 s)(\sigma^*_{2s})(\pi_{2px}) = (\pi_{2py})(\sigma_{2px})\pi^*_{2py} = \pi^*_{2pz}$

$N_2(14e's)$ B.O. $= \frac{1}{2}[10-4] = 3$

$N_2^+(13e's)$ B.O $= \frac{1}{2}[9-4] = 2.5$

$N_2^-(15es)$ B.O. $= \frac{1}{2}[10-5] = 2.5$

$N_2^{2-}(16s)$ B.O. $= \frac{1}{2}[10-6] = 2$

Stability $\propto$ bond order

If bond order is same than

$$\text{Stability} \propto \frac{1}{\text{number of antibonding electrons}}$$

56. (3)

NO of VE = 7

bp = 3

Therefore lp = $\frac{7-3}{2} = 2$

Thus central atom has 5 ep's out of which three are bp's and two are lone pairs. Thus geometry is T-shaped

57 (3)

58. (3)

Higher the electronegativity of central atom higher bp/bp repulsion, higher the bond angle

$$\xrightarrow[\text{electronegativity decreasing order}]{\text{O} \quad \text{S} \quad \text{Se} \quad \text{Te}}$$

59. (4)

(a) 0.1×12 (b) 0.1×17

(c) $\frac{6.02\times10^{22}}{6.02\times10^{23}}\times2$ (d) $\frac{1120}{22400}\times44$

60. (2)

$$C_nH_{2n+2}+\left(\frac{3n+1}{2}\right)O_2\rightarrow nCO_2+(n+1)H_2O$$

$$\frac{\frac{3n+1}{2}}{n}=\frac{7}{4}$$

$\Rightarrow n=2$

61. (3)

PM =dRT

$$\Rightarrow\frac{P_1M_1}{d_1}=\frac{P_2M_2}{d_2}$$

$$\therefore\frac{P_1}{P_2}=\left[\frac{d_1}{d_2}\right]\times\left[\frac{M_2}{M_1}\right]=\frac{4}{1}$$

62. (1)

$$r_{SO_2}:r_{O_2}:r_{CH_4}::\frac{1}{\sqrt{64}}:\frac{1}{\sqrt{32}}:\frac{1}{\sqrt{16}}$$

$$=\frac{1}{2}:\frac{1}{\sqrt{2}}:1=1:\sqrt{2}:2$$

63. (3)

For H_2 and He, Z> 1 (except for very low T)

64. (3)

65. (3)

66. (4)

$$\left[\frac{40\times0.8}{1.6\times10^{-19}}\right]\times20=N\times\frac{1240}{620}\Rightarrow N=2\times10^{21}$$

67. (2)

$$R=a_0\times\frac{1^2}{1};r=a_0\times\frac{3^2}{3}=3R$$

68. (2)
No. of waves = orbit no.

69. (3)
$\lambda = \frac{\lambda}{mv}$

70. (4)
$L = \sqrt{l(l+1)}.\frac{h}{2\pi}$
For 3s put $l = 0 \Rightarrow L = 0$
And 3p put $l = 1 \Rightarrow L = \frac{h}{2\pi}$

71. (2)
No. of angular nodes = *l*

72. (4)
$\Delta T = 0 \Rightarrow \Delta H = 0$

73. (3)
$q_v = x = 5 \times C_v \times 5;$
$q_p = \frac{2x}{5} + 2R \times 5 = \frac{2x}{5} + 2 \times 5 \times \frac{2x}{75} = \frac{10x}{15} = \frac{2x}{3} J$

74. (4)

75. (1)

76. (3)

77. (1)

78. (2)

79. (3)

80. (1)

81. (4)

82. (2)

83. (4)

84. (4)

85. (2)

86. (3)
Oxides of halogens are highly acidic. More is electronegativity, more is acidity of oxide of that element.

87. (3)
Solubility $\propto$ charge on cation or on anion anion is same in all the three cases therefore Solubility $\propto$ Charge on cation.

88. (4)

Polarisation of anion $\propto \frac{1}{\text{Size of cation}}$

89 (3)
XeF_5

VE = 8

$ep = GA + \frac{1}{2}[VE - V - C]$

$= 5 + \frac{1}{2}[8 - 5]$

$= 5 + \frac{3}{2}$

= 5 + 1.5 = 6.5

Ep is always whole number.

90. (3)
Wt. of 1 gm atom of nitrogen = 14 gm

Wt. of 11.2 L N_2 at 1 atm and 273 $= 28 \times \frac{1}{2}$

$\Rightarrow 14\text{gm}$

91. (4)

$\frac{30 \times 6.023 \times 10^{23} \times 2}{18.069 \times 10^{23}} = 20\text{g}$

92. (2)

$\frac{2.8}{56} \times 10$

93. (4)
P_{gas} = 76+19= 95 cm

$M = \frac{W \times R \times T}{P \times V} = \frac{100 \times 0.0821 \times 300}{\frac{95}{76} \times 16} = 123\text{g/mol}$

$\Rightarrow x \times 24 = 123$

$\Rightarrow x \simeq 5$

94. (2)

$\frac{T}{40} = \frac{800}{32} \Rightarrow T = 1000K \text{ or } 727^0C$

95. (4)

n = 10to n = 1

Total lines = $\frac{10 \times 9}{2} = 45$: No. of Brackett lines

$\Rightarrow$ Also $4 \to 3$, $4 \to 2$, $4 \to 1$ should not be consider

$10 \to 4$, $9 \to 4$, $8 \to 4$, $7 \to 4$, $6 \to 4$, $5 \to 4$ } 6

96. (4)

Total No. of nodes = n – 1

97. (4)

98. (1)

99. (4)

100. (1)

101. Page no. 19,21,23 and 24

102. Page no. 139

103. Page no. 41

104. Page no. 167 and 170

105. Page no. 9 and 10

106. Page no. 72,74,75,79 and 80

107. Page no. 131

108. Page no. 26

109. Page no. 71,72,74,75 and 76

110. Page no. 7,8,10,11 and 12

111. Page no. 169

112. Page no. 42

113. Page no. 77

114. Page no. 22

115. Page no. 75 and 76

116. Page no. 133 and 136

117. Page 17 and 18

118. Page no. 165 and 166

119. Page no. 35 and 36

120.

121. Page no. 67 and 68

122. Page no. 133 and 134

123. Page no. 19

124. Page no. 70,78,80 and 81

125. Page no. 129,132,133,134 and 135

126. Page no. 68

127. Page no. 19

128. Page no. 166

129. Page no. 137

130. Page no. 36,37 and 38

131. Page no. 168

132. Page no. 21 and 22

133. Page no. 127

134. Page no. 30,31,32 and 33

135. Page no. 9

136. Pg no. 2, 64, 124, 256

137. Page no. 19

138.

139. Pg no. 27

140. NCERT Pg. 10 and 11

141. Page no. 20

142. Page no. 19

143.

144. Page no. 18

145. Page no. 163

146. Page no. 68,78,79 and 81

147. Page no. 168

148.

149. Page no. 79

150. Page no. 18

151. XI NCERT pg 159

152. NCERT Pg. 270, 17.2 Paragraph.

153. XI NCERT pg 149

154. NCERT Pg. 268, (17.1) paragraph, 5^{th} line. As blood in insects lack respiratory pigment, hence blood plays no role in transport or exchange of gases.

155. Cartilage, Bone, Blood etc are the various types of specialized connective tissue .

156. Secretion of bile juice from gall bladder is stimulated by cholecystokinin (CCK) whereas secretion of pancreatic enzyme is also stimulated by cholecystokinin.

157. NCERT Pg 262, 2nd paragraph – (cyanocobalamin is also called vit B_{12})

158. XI NCERT pg 54. Echinoderms have an endoskeleton of hard calcareous plates .They are exclusively marine.

159. Competitive inhibition is seen when an inhibitor competes with substrate to bind with enzyme. Allosteric inhibitors bind to the enzyme irreversibly or reversibly. As Non-competitive inhibition are mostly irreversible, it cannot be overcome by adding large amount of substrate.

160. XI NCERT pg 150

161. NCERT Pg 263.Pepsin – acits in stomach, Trypsin- acts on proteins in duodenum, Peptidase- acts on small peptides in small intestine.

162. NCERT 266; 1st paragraph

163. NCERT Pg. 259, Fig 16.3

164. NCERT Pg. 273, 4th line.

165. Gap junction – For rapid transfer of ions, small / big molecules

166. NCERT Pg. 261, Fig 16.6

167. Proteins are only hetero polymers of amino acids.

168. NCERT Pg 273, last paragraph.

169. NCERT Pg. 260, 261. Hepatopancreatic duct opens into the duodenum. Pancreas consists of two parts, i.e. endocrine and exocrine ,which secrete insulin and glucagon hormone and pancreatic juices containing enzymes, respectively.

170. XI NCERT pg 154. Proteins play diverse roles. Almost all enzymes are proteins except ribozyme.

171. NCERT Pg. 262, 1st paragraph.
NCERT Pg. 264, last paragraph.
NCERT Pg. 265, 2nd paragraph.

172. NCERT Pg. 270, table 17.1

173. The cyton of neurons has Nissl granules and hence cytoplasm is not clear.

174. XI NCERT pg 151. The above figure is of B-DNA.

175. XI NCERT pg 52. Echinoderms- radial symmetry, Platyhelminths- acoelomate, Aschelminthes- pseudocoelomate.

176. XI NCERT pg 156

177. XI NCERT pg 57

178. The inner of trachea is made up of ciliated epithelium to trap dust particles.

179. NCERT Pg. 275, last paragraph.

180. NCERT Pg. 271, 272

181. XI NCERT pg 149

182. NCERT Pg. 262, 3rd paragraph .Rennin is secreted only in infants. Pepsin digests proteins to form proteodse and peptones and never amino acids. Nuclease digests nucleic acids to form nucleotides.

183. The chemosensitive area is independent to the change in pO_2 in blood.

184. Amino acids and glucose are primary metabolites.

185. NCERT Pg. 272, (17.3 paragraph)

186.

187. NCERT Pg. 262, 1st para, 2nd para, last para. I-Saliva,pH 6.8, II gastric juics, pH -1.8, III Intestinal juice pH 7.8

188. In teenager the 3rd molar/wisdom teeth is absent. Wisdom teeth erupts after 17 years of age.

189. Cnidarians show tissue level of organization

190. NCERT Pg. 264

191. NCERT Pg. 275, 1st paragraph, last line (Every oxygenated blood supply 25% O_2 to tissue)

192. NCERT Pg. 271, 1st paragraph.

193. At resting condition, body temperature is remains the same as BMR is not increased. pCO_2 in oxygenated blood is 40 mmHg . pO_2 in deoxygenated blood is 40 mmHg

194. Feedback inhibition of enzymes is due to increased end products.

195. Figure 2 has Ribose sugar and hence cannot be a part of DNA.

196. Rennin & pepsin is present in gastric juice.

197. XI NCERT pg 57

198. (XI-NCERT) (Pg. 115-Fig. 7.18(a)

199. All muscles have contractile proteins like actin and myosin. Only cardiac muscle has intercalated disc and striations are absent in smooth muscles. And only skeletal muscle is voluntary.

200. dsDNA as per Chargarff rule, A pairs with T and G pairs with C.As A is 120, so T shall be 120, also C is 120 and hence G shall be 120, making the total 480.