NATIONAL TALENT SEARCH EXAMINATION (STAGE - I) – 2019-2020(UP)
SOLUTIONS
(SAT)
PHYSICS

101. (3)
Sol. $p = mv$
$\therefore$ units are kg ms^{-1}.

102. (4)
Sol. Total mechanical energy is conserved.

103. (3)
Sol. $\sin C = \frac{n_w}{n_g} = \frac{\frac{4}{3}}{\frac{3}{2}} = \frac{8}{9}$

104. (2)
Sol. $g = \frac{GM}{R^2}$
At poles 'R' is less than that at equator.

105. (3)
Sol. Gobar gas is derived from bio mass.

106. (4)
Sol. D is the angle of deviation between incident ray and emergent ray.

107. (2)
Sol. $P = \frac{1}{\text{focal length (in 'm')}}$
$\therefore 1D = 1m^{-1}$

108. (1)
Sol. When the object is at 2F, image formed is real, inverted and of same size.

109. (1)
Sol. Focal length of plane mirror is ∞ and $P = \frac{1}{f}$

110. (2)

Sol. $R_1 = \frac{\rho l_1}{A_1}$ and $R_2 = \frac{\rho l_2}{A_2}$; $l_2 = 2l_1$ and $A_2 = \frac{A_1}{2}$

$\Rightarrow R_2 = 4R_1 = 16\Omega$

111. (4)
Sol. AC supply in India is at 220 V and 50 Hz.

112. (2)
Sol. 1 unit = 1 kW $\times$ 1 hour
here power = 100 W = 0.1 kW
$E = P \times t \Rightarrow 1 = 0.1 \times t \Rightarrow t = 10\,hr$

113. (4)
Sol. Solar energy is not a conventional source of energy.

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CHEMISTRY

114. (4)
Sol. As we move down the group electronegativity decreases thus electropositivity increases.
F < Cl < Br < I
↓
Most electronegative Electropositive

115. (4)
Sol. Na is an alkali metal and is highly reactive thus it decomposes water in cold.

116. (2)
Sol. Sublimation is the change of a substance from solid to directly in gaseous state without undergoing the liquid state.

117. (3)

Sol. $CH_2 = CH_2 + S_2Cl_2 \rightarrow \left(\begin{array}{l} Cl \\ | \\ CH_2 - CH_2 \end{array} \right)_2 S + S$

Mustard gas

$C_4H_8Cl_2S \rightarrow$ Mustard gas

118. (1)
Sol. pH = –log(H^+)
pH = –log(2×10^{-8})
= 8 – log 2
= 8 – 0.5010
pH = 7.699

119. (3)
Sol. Transition elements exhibit variable valency.

120. (3)
Sol. Addition reactions are those in which the reactants combine to form a single product. Thus, $2H_2 + O_2 \rightarrow 2H_2O$ an addition reaction.

121. (4)
Sol. SO_2 has both covalent as well as co-ordinate bonds.

122. (4)
Sol. Tetra amine copper (II) sulphate is a complex salt.
$\left[Cu\left(NH_3\right)_4\right]SO_4$

123. (3)
Sol. Calamine is Zinc carbonate $ZnCO_3$ thus an one of zinc.

124. (2)
Sol. Acid used in lead batteries is H_2SO_4 sulphuric acid.

125. (2)
Sol. Sulphide ores are concentrated by forth floatation process. This is used because pine oil selectively wets the sulphide ore and hence brings it to the froth.

126. (3)
Sol. Al_2O_3 is an amphoteric oxide.

BIOLOGY

127. (2)
Sol. Hypothalamus (It is also called thermostat of the body)

128. (4)
Sol. CO_2 (Any one of the gases that cause the greenhouse effect, especially CO_2)

129. (2)
Sol. Iodine (Iodine is required for synthesis of throxine)

130. (1)
Sol. Species (Species is the smallest and basic unit of classification)

131. (4)
Sol. Vas deferens (Vas deferens is a part of the male reproductive system in human beings)

132. (4)
Sol. Lysosome (Lysosmes are membrane – bound vesicles that contain digestive enzymes)

133. (3)
Sol. Protozoan (Kala azar is caused by the protozoan Leishmania parasites which are transmitted by the bite of infected female sandflies.

134. (4)
Sol. Watermelon (Flowers having either male or female reproductive organ. e.g. Watermelon, papaya etc.)

135. (4)
Sol. All of the above (Biotic components, can be described as any living component that affects another organism of the ecosystem)

136. (1)
Sol. Protein (Amino acids are the monomers that make up proteins).

137. (2)

Sol. Fungi (Penicillin is a group of antibiotics, derived originally from common moulds.

138. (1)
Sol. Leydig cell (Leydig cells produce testosterone in the presence of Luteinizing hormone).

139. (4)
Sol. Humans have a pair of sex chromosomes which are referred to as X and Y.

140. (4)
Sol. Lysosomes are also known as suicidal bags of the cell.

SOCIAL STUDIES

141. (2)

Sol. 1921

142. (1)

Sol. Rigveda

143. (3)

Sol. Chandragupta Maurya

144. (1)

Sol. Nand

145. (2)

Sol. Farid

146. (3)

Sol. Mohammad Tughalaq

147. (1)

Sol. Babar

148. (4)

Sol. Nadir Shah

149. (2)

Sol. Lord Wellesley

150. (3)

Sol. Das Capital

151. (1)

Sol. Lala Hardayal

152. (1)

Sol. Bal Gangadhar Tilak

153. (2)

Sol. Folding Mountain

154. (3)

Sol. Sundar Ban

155. (2)

Sol. 75

156. (2)
Sol. Africa
157. (2)
Sol. Fish Production
158. (1)
Sol. 1956
159. (2)
Sol. Pampas
160. (3)
Sol. India
161. (3)
Sol. Himachal Pradesh
162. (4)
Sol. 27 September
163. (2)
Sol. 19.98 crores
164. (1)
Sol. Bretton Woods Committee.
165. (2)
Sol. 1966
166. (1)
Sol. Sikkim
167. (3)'
Sol. Washington
168. (1)
Sol. Recardo
169. (1)
Sol. Panama Canal
170. (4)
Sol. Deforestation
171. (3)
Sol. The Governor of the State
172. (3)
Sol. 2005
173. (2)
Sol. Socialist
174. (3)
Sol. Jammu and Kashmir

175. (1)

Sol. Sachchidanand Sinha

176. (1)

Sol. President

177. (1)

Sol. Speaker of Lok Sabha

178. (4)

Sol. Meira Kumar

179. (3)

Sol. Rajasthan

180. (2)

Sol. Dr. Zakir Hussain

MATHEMATICS

181. (3)

Sol. $\left(\frac{1}{2}\right)^{\frac{1}{2}} > \left(\frac{1}{3}\right)^{\frac{1}{3}}$

$\left(\frac{1}{2}\right)^{\frac{3}{6}}$ and $\left(\frac{1}{3}\right)^{\frac{2}{6}}$

$\left(\frac{1}{8}\right)^{\frac{1}{6}} > \left(\frac{1}{9}\right)^{\frac{1}{6}}$

182. (4)

Sol. Given $\frac{x_1 + ... + x_8}{8} = 48$, $\frac{x_8 + ... + x_{15}}{8} = 53$, $\frac{x_1 - x_{15}}{15} = 50$

$\frac{x_1 + ...x_{15} + x_8}{8} = 101$

$\frac{x_1 + ...x_{15}}{8} + \frac{x_8}{8} = 101$

$\frac{50 \times 15}{8} + \frac{x_8}{8} = 101$

$x_8 = 808 - 750$

$= 58$

183. (2)

Sol. $P(0, a)$

$PA = PB$

$\Rightarrow PA^2 = PB^2$

$(0-6)^2 + (a-5)^2 = (0+4)^2 + (a-3)^2$

$36 + a^2 + 25 - 10a = 16 + a^2 + 9 - 6a$

$36 = 4a$

$a = 9$

Point $P(0,9)$

184. (4)

Sol. $\sec^- - \tan^- = k$

$$\frac{\sec^- - \tan^-}{\sec^- + \tan^-} \times (\sec^- + \tan^-) =$$

$$\Rightarrow \frac{\sec^{2-} - \tan^{2-}}{\sec^- + \tan^-} = k$$

$$\frac{1}{\sec^- + \tan^-} = k$$

$$\Rightarrow \frac{1}{k} = \sec^- + \tan^-$$

185. (Bonus)

Sol. $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$\frac{1}{3} = \frac{2}{k} \neq \frac{5}{15}$

$k = 6,\ k \neq 6$

186. (1)

Sol. $a + a + 3 = 0$

$2a = -3$

$a = \frac{-3}{2}$

$1 + 1 + b = 0$

$b = -2$

$ab = -\frac{3}{2} \times -2 = 3$

187. (1)

Sol. $\Delta = 0$

$a(b-1) + 0(1-0) + 1(0-b) = 0$

$ab - a + 0 - b = 0$

$ab = a + b$

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

188. (4)

Sol. $\frac{a+b+c}{3} = 0$

$\Rightarrow a + b + c = 0$

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

$\Rightarrow a^3 + b^3 + c^3 = 3abc$

189. (2)

Sol. $A(\cos^{-},\sin^{-}),\ B(\sin^{-},-\cos^{-})$

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

$$=\sqrt{\sin^{2-}+\cos^{2-}-2\sin^{-}\cos^{-}+\cos^{2-}+\sin^{2-}+2\sin^{-}\cos^{-}}$$

$$=\sqrt{1+1}=\sqrt{2}$$

190. (2)

Sol. 35% of A = 25% of B

$$\frac{A}{B}=\frac{5}{7}$$

191. (3)

Sol. $$\frac{v_1}{v_2}=\frac{6a_1^3}{6a_2^3}=\frac{27}{64}$$

$$\frac{a_1}{a_2}=\frac{3}{4}$$

$$\frac{s_1}{s_2}=\frac{6a_1^2}{6a_2^2}=\frac{a_1^2}{a_2^2}=\left(\frac{a_1}{a_2}\right)^2=\frac{9}{16}$$

192. (4)

Sol. $$\Delta_0=\frac{1}{2}\times b\times h$$

$$\Delta_N=\frac{1}{2}\times\left(b-\frac{30b}{100}\right)\times\left(h+\frac{25}{100}h\right)$$

$$=\frac{1}{2}\times\frac{70b}{100}\times\frac{125h}{100}$$

$$=\frac{1}{2}bh\times\frac{70\times125}{100\times100}$$

$$\Delta_N=\frac{7}{8}\Delta_0$$

% change = $\dfrac{\Delta_N-\Delta_0}{\Delta_0}\times100$

$$=\frac{\frac{7}{8}\Delta_0-\Delta_0}{\Delta_0}\times100$$

$$=-\frac{1}{8}\times100=-12.5\%$$

$\therefore$ 12.5% decrease

(-ve sign represents decrease)

193. (3)

Sol. Let ht of eq. Δ be AD

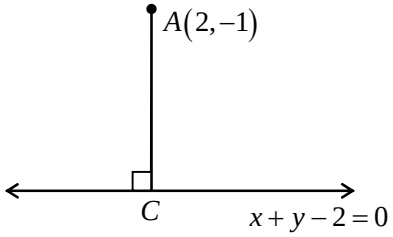
$\therefore$ distance AD

$$=\left|\frac{2-1-2}{\sqrt{1^2+1^2}}\right|=\frac{1}{\sqrt{2}}$$

ht of eq. $\Delta=\frac{\sqrt{3}}{2}a=\frac{1}{\sqrt{2}}$

$\therefore\ a=\frac{\sqrt{2}}{\sqrt{3}}$

Area of eq. $\Delta=\frac{\sqrt{3}}{4}a^2=\frac{1}{2\sqrt{3}}$



194. (4)

Sol. $\because \angle BAC=90°$

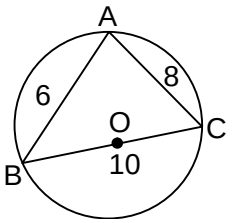
$\Rightarrow$ BC is diameter.

According to Pythagoras theorem in ΔABC

$AC^2+AB^2=BC^2$

$\Rightarrow BC=10$

$\Rightarrow BO=OC=5=$ radius



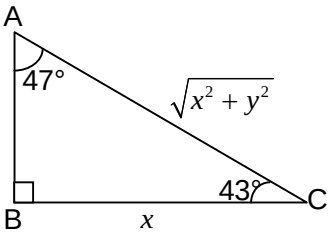
195. (3)

Sol. $AB^2=AC^2-BC^2$

$=x^2+y^2-x^2=y^2$

$\therefore\ AB=y$

$\tan 47°=\frac{BC}{AB}=\frac{x}{y}$



196. (3)

Sol. $2x^2+4x+(a+5)=0$

For equal roots

$D=0$

$16-4\cdot 2(a+5)=0$

$a=-3$

For distinct real roots

$D>0$

$(a+4)x^2+ax-3b=0$

$a^2-4(a+4)(-3b)>0$

$a^2+12b(a+4)>0$

$9+12b(-3+4)>0$

$9+12b>0$

$12b>-9$

$b > -\frac{3}{4}$

197. (2)

Sol. $\tan 1^\circ \tan 2^\circ \tan 3^\circ ..... \tan 89^\circ$

$\tan 1^\circ \cot 1^\circ \tan 2^\circ \cot 2^\circ ..... \tan 44^\circ \cot 44^\circ \tan 45^\circ$

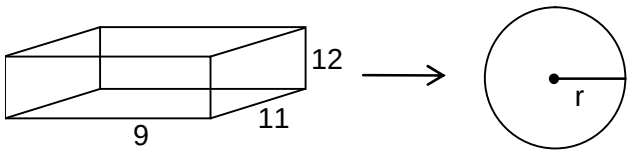
= 1

198. (1)

Sol. $(3157)^{2020} \equiv (7)^{2020} \equiv 7^{4n} \equiv 1$

199. (1)

Sol. Vol. of cuboid = $n\times$ vol. of sphere balls



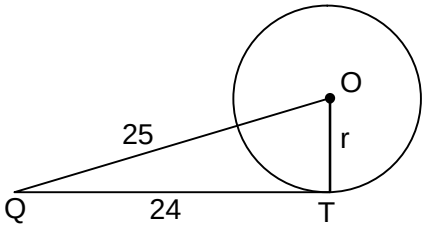
$9 \times 11 \times 12 = n \times \frac{4}{3}® \times \left(\frac{0.3}{2}\right)^3$

$n = \frac{9 \times 11 \times 12 \times 3 \times 8 \times 7 \times 1000}{4 \times 22 \times 27}$

$= 84000$

200 (1)

Sol. $\because$ ΔOQT is right angled Δ at T.



$OQ^2 = OT^2 + QT^2$

$25^2 = 24^2 + r^2$

$r^2 = 25^2 - 24^2$

$= (25-24)(25+24)$

$r^2 = 49$

$\therefore r = 7$