NTSE STAGE – I (DELHI STATE)
(2020 – 21)
(For Class – X)
SCHOLASTIC APTITUDE TEST
ANSWER KEYS

PHYSICS

101.	3	102.	1	103.	1	104.	2
105.	4	106.	4	107.	2	108.	4
109.	1	110.	2	111.	3	112.	1
113.	2						

CHEMISTRY

114.	2	115.	3	116.	3	117.	1
118.	1	119.	3	120.	4	121.	2
122.	2	123.	4	124.	4	125.	4
126.	1						

BIOLOGY

127.	3	128.	1	129.	2	130.	4
131.	4	132.	3	133.	2	134.	3
135.	3	136.	2	137.	2	138.	1
139.	1	140.	2				

MATHEMATICS

141.	3	142.	2	143.	2	144.	3
145.	3	146.	4	147.	4	148.	1
149.	1	150.	3	151.	4	152.	2
153.	2	154.	2	155.	2	156.	4
157.	3	158.	4	159.	3	160.	1

SOCIAL SCIENCE

161.	1	162.	4	163.	2	164.	2
165.	3	166.	4	167.	3	168.	2
169.	1	170.	3	171.	4	172.	4
173.	1	174.	2	175.	2	176.	3
177.	4	178.	2	179.	3	180.	2
181.	2	182.	1	183.	4	184.	2
185.	1	186.	3	187.	3	188.	3
189.	3	190.	3	191.	4	192.	4
193.	1	194.	1	195.	3	196.	4
197.	2	198.	2	199.	2	200.	4

NTSE STAGE – I (DELHI STATE)
(2020 – 21)
(For Class – X)
SCHOLASTIC APTITUDE TEST
HINTS & SOLUTIONS
PHYSICS

101. 3

101. Quality of sound helps to distinguish between two sounds.

102. 1

102. Power (p) = $\frac{W}{t} = \frac{mgh}{t} = \frac{30 \times 9.8 \times 10}{60} = 49$ J/s

103. 1

103. $R_{AB} = \frac{5R}{11}$

$R_{BC} = \frac{3R}{11}$

$R_{AC} = \frac{4R}{11}$

104. 2

104. F = kx = 15 × 0.2 = 3 N

$a = \frac{F}{m} = \frac{3}{0.3} = 10$ m/s2

105. 4

105. As slope of v–t graph is decreasing between points A and B. So acceleration is decreasing.

106. 4

106. A retarding force of any magnitude can stop the moving body.

107. 2

107. As, W = VQ

$Q = \frac{18}{90} = 0.2$ C

108. 4

108. Magnetic filed lines are closed curve because magnetic monopoles do not exist.

109. 1

109. Average speed = $\frac{S}{\frac{S}{5V1} + \frac{4S}{5V2}}$

$= \frac{5V1V2}{V2 + 4V1}$

110. 2

110. Refractive index = $\frac{C}{V}$

$n = \frac{C}{V}$ $\Rightarrow$ $V = \frac{C}{n}$

Distance = speed × time

$t = \frac{C}{n}$ (time)

Time = $\frac{nt}{C}$

111. 3

111. $R_{eq} = \frac{20}{3}\Omega$; $I_{max} = \frac{2.2}{\frac{20}{3}}$ = 0.33 A

$R_{eq} = \frac{20}{3} + 30 = \frac{110}{3}\Omega$

$I_{min} = \frac{2.2}{\frac{110}{3}}$; I_{min} = 0.06 A

112. 1

112. $V_A = \sqrt{u^2 + 2gh}$

$V_B = \sqrt{u^2 + 2gh}$

For C: Vertical velocity $V_y = \sqrt{2gh}$

Horizontal velocity = u

$V_C = \sqrt{V_x^2 + V_y^2}$

$= \sqrt{u^2 + 2gh}$

VA = VB = VC

113. 2

113. u = –12

$m = \frac{v}{u} = \frac{5}{2}$

$\frac{V}{12} = \frac{5}{2}$

V = –30 cm

$\frac{1}{v} = \frac{1}{u} + \frac{1}{f}$; $\frac{1}{30} = \frac{1}{12} + \frac{1}{f}$

$\Rightarrow$ f = –8.6 cm

CHEMISTRY

114. 2

114. $2Pb(NO_3)_2 \rightarrow 2PbO + 4NO_2 + O_2$

115. 3

115. $Pb(NO_3)_2 + 2KI \rightarrow PbI_2 \downarrow + 2KNO_3$

Yellow ppt.

116. 3

116. $NaHCO_3$ + Tartaric acid

117. 1

117. 3 mole conc. HCl + 1 mole conc. HNO_3

118. 1

118. $CH_3CH_2OH \xrightarrow[443K]{\text{Conc. } H_2SO_4} H_2C = CH_2(\text{Ethene}) + H_2O$

119. 3

119. Denatured alcohol is a mixture of C_2H_5OH and CH_3OH.

120. 4

120. For welding a mixture of oxygen and ethyne is burnt.

121. 2

121. Si < Be < Al < K

122. 2

122. CuO is insoluble in water.

123. 4

123. KO_2 turns red litmus into blue.

124. 4

124. SO_2 is not a green house gas.

125. 4

125. Aluminium does not show allotropy.

126. 1

126. (1) 100 g of He $= \frac{100}{4} = 25N_A$

(2) 100 g of Na = 4.3 NA

(3) 100 g of Li = 14.28 NA

(4) 100 g of Al = 3.70 NA

BIOLOGY

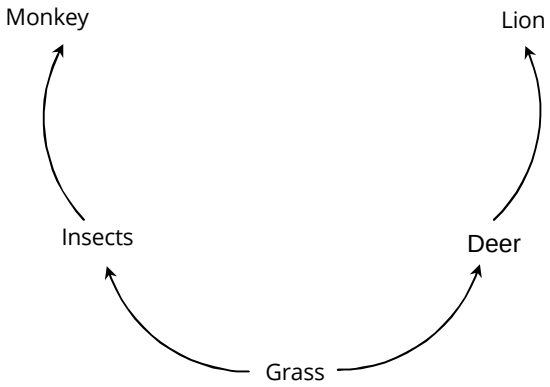
127. 3

127. • Absorption of light energy by chlorophyll.

• Breakdown of H_2O into Hydrogen and Oxygen and Conversion of light energy into chemical energy

• Reduction of carbon dioxide to carbohydrates.

128. 1

128. 

129. 2

129. In stratosphere the ozone is formed naturally through the interaction of solar ultraviolet radiation with molecular O2.

130. 4

130.

Column-I			Column-II
(i)	Regeneration	(d)	Planaria
(ii)	Rhizophus	(e)	Spores
(iii)	Plumule	(a)	Shoot
(iv)	Rose	(c)	Vegetative Propagation
(v)	Stigma	(b)	Pollen grain

131. 4

131. The opening and closing of stomata regulated by water in guard cells.

132. 3

132. Total = 2432 seeds

$\frac{2432}{16} = 152$

Dihybrid cross ratio = 9 : 3 : 3 : 1

152 × 9 = 1368

Yellow round – 9
Yellow wrinkled – 3
Green round – 3
Green wrinkled – 1

133. 2

133. The stakeholders of various forest products are:
- People living near forests
- Government only
- Nature lovers

134. 3
134. Right auricle → Pulmonary artery → Pulmonary vein → Left ventricle

135. 3
135. Both statements A and R are false.

136. 2
136. Glass bottle, Perfume spray bottle, Thermocol, Ball pen refill are non biodegradable substances

137. 2
137.

Column-I			Column-II
(A)	Ribosome	(3)	Protein synthesis
(B)	Mitochondria	(1)	ATP formation
(C)	Centriole	(4)	Cell division
(D)	Chloroplast	(2)	Photosynthesis

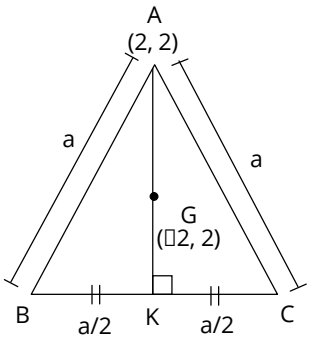
138. 1
138. Diaphragm is a barrier method of contraception.

139. 1
139. Sperms are produced in the seminiferous tubules.

140. 2
140. Blood pressure is measured by Sphygmomanometer.

MATHEMATICS

141. 3
141.



$AG = \sqrt{(-2)^2 + 2^2} = 4$

$\Rightarrow AG = \frac{2}{3} AK$

$4 = \frac{2}{3} AK$

$\Rightarrow AK = 6$

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

$6 = \frac{3}{2}a$

$\therefore \frac{12}{3}a = \frac{12}{3\sqrt{3}}a = 4\sqrt{3}$

142. 2

142. $5 + 7 + 9 + \ldots.. +$ upto n terms $= 60$

$\therefore$ sum of n terms of AP

$\frac{n}{2}[2a + (n-1)d]$

ATQ,

$\text{sum} = \frac{n}{2}[2(5) + (n-1)2] = 60$

$n[5 + n - 1] = 60$

$n[4 + n] = 60$

$\therefore n^2 + 10n - 6n - 60 = 0$

$\therefore n(n + 10) - 6(n + 10) = 0$

$\therefore (n + 10)(n - 6) = 0$

$\therefore n = 6$

$\therefore n^2 - n = n(n - 1)$

$= 6 \times 5 = 30$

143. 2

143. Sum of n odd natural number $= n^2$

$\therefore$ sum of p odd natural number $= p^2 = 100 \Rightarrow p = 10$

sum of first 'q' even natural number

$\therefore 2 + 4 + 6 + \ldots..$ upto 'q' terms

$= 2(1 + 2 + 3 + \ldots..$ upto q term)

$2\left[\frac{q(q+1)}{2}\right] = 90$

$q^2 + q - 90 = 0$

$(q + 10)(q - 9) = 0$

$\therefore q = 9$

$p + q = 10 + 9 = 19$

144. 3

144. $x = \frac{1}{y} - 1$

$xy + 1 = y$

$\therefore xy - y = -1 \Rightarrow y(x - 1) = -1$

$\therefore y = \frac{1}{1 - x}$

$y = \frac{1}{z} - 1 \Rightarrow yz = 1 - z \Rightarrow yz + z = 1$

$\therefore z(y + 1) = 1 - y \Rightarrow z = \frac{1 - y}{1 + y}$

$\therefore z = \frac{1}{1 - x} - 1 = \frac{1}{1 - x} - 1$

$\Rightarrow xz = 1 - x \Rightarrow 1 + xz = x$

$\Rightarrow \frac{1}{x} + z = 1$

$\Rightarrow \frac{1}{x} + z = 1 \; 1 \; 1 \; 2$

145. 3

145. $p^{1/3} + q^{1/3} + r^{1/3} = 0$ ...(i)

If $a + b + c = 0$ then

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

$\Rightarrow$ by equation (i)

$(p^{1/3})^3 + (q^{1/3})^3 + (r^{1/3})^3 = 3 \cdot p^{1/3} \cdot q^{1/3} \cdot r^{1/3}$

$\Rightarrow p + q + r = 3(pqr)^{1/3}$

$\Rightarrow (p + q + r)^3 = 27\, pqr$

146. 4

146. $a_1, a_2, a_3, \ldots\ldots a_n \rightarrow AP_1$

$b_1, b_2, b_3, \ldots\ldots b_n \rightarrow AP_2$

$a_1b_1 = 120$, $a_2b_2 = 143$, $a_3b_3 = 154$ then $a_8b_8 = ?$

Let's say three terms of 1st AP are

$a - d, a, a + d,$

and first three terms of 2nd AP are

$B - D, B, B + D,$

Now, $a_1b_1 = 120$

$\Rightarrow (a - d)(B - D) = 120$

$\Rightarrow aB - aD - Bd + dD = 120$ ...(i)

$a_2 b_2 = 143$

$a \cdot B = 143$ ...(ii)

$a_3b_3 = 154$

$\Rightarrow (a + d)(B + D) = 154$

$aB + aD + Bd + dD = 154$ ...(iii)

by equation (i) and (ii)

$23 = aD + Bd - dD$ ...(iv)

By equation (iii) and (ii)

$11 = aD + Bd + dD$ ...(v)

By equation (iv) and (v)

$12 = -2\, dD \Rightarrow dD = -6$

and $aD + Bd = 17$

Now, $a_8 b_8 = (a + 6d)(B + 6D)$

$= aB + 6aD + 6Bd + 36\, dD$

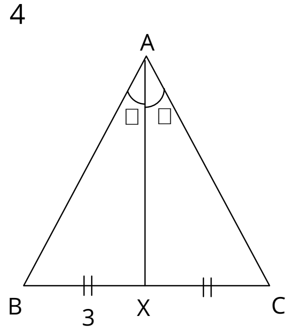
$= 143 + 6(17) + 36(-6)$

$= 143 + 102 - 216$

$= 29$

147. 4

147.



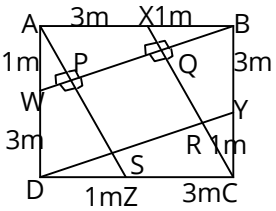
AB = 12
BX = 3 cm
$\Rightarrow \angle BAX = \angle CAX$
and
AX bisects BC.
$\Rightarrow \triangle ABC$ is isosceles
$\Rightarrow AX \perp BC$
$\Rightarrow AB = AC = 12$

$AC = \sqrt{12^2 - 3^2} = \sqrt{135} = 3\sqrt{15}$

$\Rightarrow$ Area of $\triangle ABC = \frac{1}{2} \times 6 \times 3\sqrt{15} = 9\sqrt{15} cm^2$

148. 1

148.



$CX = 4\sqrt{2} - 12 = 17m$

We have, BW = AZ = DY = CX

$ar(BXC) = \frac{1}{2} \times 1 \times 4 = \frac{1}{2} \times BQ \times XC$

$\Rightarrow 4 = BQ \times \sqrt{17}$

$\Rightarrow BQ = \frac{4}{\sqrt{17}} m$

Also, BQ = CR = DS = AP = $\frac{4}{\sqrt{17}}$

By Pythagoras theorem

$XQ = \sqrt{BX^2 - BQ^2} = \sqrt{1 - \frac{16}{17}} = \frac{1}{\sqrt{17}} m$

$XQ = WP = ZS = YR = \frac{1}{\sqrt{17}} m$

Side of square = CX – CR – XQ

$= \sqrt{17} - \frac{4}{\sqrt{17}} - \frac{1}{\sqrt{17}} = \frac{12}{\sqrt{17}} m$

Area of square $= \left(\frac{12}{\sqrt{17}}\right)^2 = \frac{144}{17} m^2$

So, $\sqrt{17A} = \sqrt{17 \times \frac{144}{17}} = 12$

149. 1

149. $(\cos^2\theta + 3\cos^2\theta + 5\cos^2\theta + ... + 199\cos^2\theta) + (2\sin^2\theta + 4\sin^2\theta + ... + 200\sin^2\theta) = 10050$
$\Rightarrow \cos^2\theta (1 + 3 + ... 199) + 2\sin^2\theta (1 + 2 + 3 + ... + 100) = 10050$

$$\frac{100}{2}(2\cos^2\theta) + 2\sin^2\theta \frac{100 \times 101}{2} = 10050$$

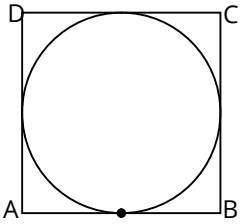
$\Rightarrow 104\cos^2\theta + 10100\sin^2\theta = 10050$
$\Rightarrow 10000\cos^2\theta + 10000\sin^2\theta + 100\sin^2\theta = 10050$
$\Rightarrow 10000(\cos^2\theta + \sin^2\theta) + 100\sin^2\theta = 10050$
$\Rightarrow 100\sin^2\theta = 50$ ($\because \sin^2\theta + \cos^2\theta = 1$)

$\sin 2\theta = \frac{1}{2} \Rightarrow \sin\theta = \frac{1}{\sqrt{2}} \Rightarrow \theta = 45°$

$\sin^2\theta + 3\cos^2\theta = \sin^2 45 + 3\cos^2 45 = \left(\frac{1}{\sqrt{2}}\right)^2 + 3\left(\frac{1}{\sqrt{2}}\right)^2 = \frac{4}{2} = 8$

150. 3

150.



p = x + y

Where x = 2πR

y = 4a

Now 2r = side of square

⇒ 2r = a

⇒ p = 2πr + 4a

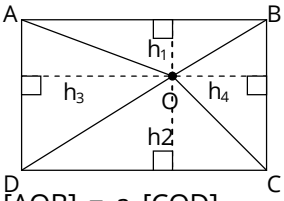
= 2πr + 8r

p = r(2π + 8)

$r = \frac{p}{2\pi + 8}$

151. 4

151.



[AOB] = a [COD]

= c [AOD] = b

[AOB] + [COD] =

$\frac{1}{2} \times AB \times h_1 + \frac{1}{2} \times DC \times h_2$

$= \frac{1}{2} \times AB \times (h_1 + h_2) = AB \times DC$

$a \times c = \frac{1}{2} AB \times AD$ ... (i) $h_1 + h_2 = AD$

Similarly,

[AOD] + [BOC] = $\frac{1}{2} \times AD \times AB$

$b + BOC = \frac{1}{2} \times AB \times AD$ ...(ii)

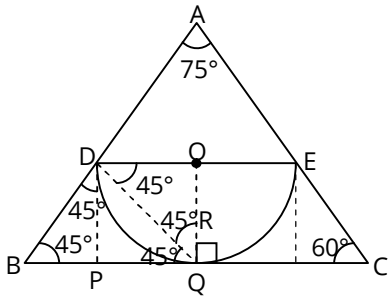
by (i) and (ii)

$a + c = b + BOC$

$BOC = a + c - b$

152. 2

152.



Draw DP ⊥ BC, ES ⊥ BC

Hence

DOQP, ESQO will be a square of side 'R' unit.

∴ PQ = R

∴ BPD ≅ BP = R unit (∵∠DBP = ∠BDP = 45°)

Similarly, QS = R units

∠ESC ≅

tan60° =

$SC = \frac{R}{SC} \Rightarrow \sqrt{3}\,SC = R \Rightarrow SC = \frac{R}{\sqrt{3}}$

∴ BC = BP + PQ + QS + SC

$= R + R + R + \frac{R}{\sqrt{3}}$

$= 2R + \frac{3R}{\sqrt{3}}$

$= 2R + \frac{3\sqrt{3}R}{3} = 2R + \sqrt{3}R = (2+\sqrt{3})R$

$R = \frac{2+\sqrt{3}}{(2+\sqrt{3})} = \frac{(2+\sqrt{3})(3\sqrt{3}-1)}{(3\sqrt{3}+1)(3\sqrt{3}-1)}$

$= \frac{6\sqrt{3}-2+9-\sqrt{3}}{27-1}$

$= \frac{5\sqrt{3}+7}{26}$

$R = 9 - \sqrt{3}$

153. 2

153. $p\sin 2x + q\sin x + r = 0$

A/c to q

roots are sinα and sin(90° − α)

∴ sum of roots

$= \sin\alpha + \sin(90° - \alpha) = -\frac{q}{p}$

$\Rightarrow \sin\alpha + \cos\alpha = -\frac{q}{p}$ ...(i)

Product of roots $= \sin\alpha \cdot \cos\alpha = \frac{r}{p}$ ...(ii)

$\frac{1}{2}(\sin 2\alpha + \cos 2\alpha + 2\sin\alpha\cos\alpha) = \frac{q}{2p}$

$\Rightarrow 1-\frac{2r}{p}+\frac{q^2}{p^2}$

$\Rightarrow \frac{p^2-2r}{p}+\frac{q^2}{p^2} \Rightarrow p(p^2-2r)+q^2$

154. 2

154. Female employee $=\frac{2}{5}$ of $100=40$

$\Rightarrow$ Male employee = 60

$\because$ Avg $=29=\frac{\text{total weight}}{100}$

$\Rightarrow 2900 = x + y$ ...(i)

where x = total weight of boys

y = total weight of girls

x/60

y/40

$\because$ ATQ, $\frac{}{} = \frac{5}{7}$

$\Rightarrow 14x = 15y$ ...(ii)

by (i) & (ii)

$2900=\frac{29y}{14}+y=1400$

$\Rightarrow \frac{y}{40}=\frac{1400}{40}=35$

155. 2

155. $\frac{1}{a},\frac{1}{b},\frac{1}{c}$ are in AP

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

Now, $\frac{b+a}{b-a}=\frac{b+c}{b-c}$

$\Rightarrow \frac{b^2-bc+ab+ac}{b^2-bc-ab+ac}=\frac{b2+bc+ab+ac}{b2-ab-ac}$

$\Rightarrow \frac{2b2+2ac}{b^2-bc-ab-ac}=\frac{2(b^2+ac)}{b2+ac}=2$

156. 4 $x2 + px + q = 0$ $x2 + lx + m = 0$

156. $(x + k)$ is common factor of both ... (i)

$x = -k$ will satisfy both ... (ii)

$k2 - pk + q = 0$ ... (iii)

$k2 - lK + m = 0$ ... (iv)

$(-p + l)k = m - q$

$K=\frac{m-q}{-p}$

157. 3

157. Let's say price of rice per kg = x

After 40% hike, new price = x + 40% of x = 1.4 x

Now, ATQ,

$$\frac{1400}{x} - \frac{1400}{1.4x} = 10$$

$$\frac{1400}{x}\left(1 - \frac{10}{14}\right) = 10$$

$$\frac{1400}{x} \times \frac{4}{14} = 10 \Rightarrow x = 40$$

158. 4

158. Let's say
Speed of boat = x km / hr
Speed of current = y km / hr
∴ downstream speed = x + y
Upstream speed = x – y
According to question
Time taken in downstream = $\frac{1}{2}$ of time taken in upstream

$$\frac{d}{x+y} = \frac{1}{2} \times \frac{d}{x-y}$$

$$\Rightarrow 2(x - y) = x + y$$
$$2x - 2y = x + y$$
$$x = 3y$$

$$\frac{x}{y} = \frac{3}{1}$$

159. 3

159. According to question $M = \frac{n + (n+1) + (n+2) + \ldots + (n+19)}{20}$

$$M = \frac{20n + 1 + 2 + 3 + \ldots + 19}{20}$$

$$M = \frac{20n + \frac{19 \times 20}{2}}{20}$$

$$M = \frac{20n + 190}{20} = n + \frac{19}{2}$$

Now, last six consecutive natural numbers are removed.

∴ New mean, $= \frac{n + (n+1) + \ldots + (n+13)}{14}$

$$N = \frac{14n + 1 + 2 + \ldots + 13}{14}$$

$$\Rightarrow 14n + \frac{13 \times 14}{2} = \frac{14n + 91}{14}$$

$$N = n + \frac{13}{2}$$

% Change $= \frac{M - N}{M} \times 100$

$$= \frac{\left(n + \frac{19}{2}\right) - \left(n + \frac{13}{2}\right)}{\left(n + \frac{19}{2}\right)} \times 100$$

$\frac{3}{M} \times 100$

$\frac{300}{M}\%$

160. 1

160. Fav. cases = {(3 × 6), (3 × 8), (5 × 4), (5 × 6), (5 × 8), (7 × 4), (7 × 6), (7 × 8)} = 8
Total cases = 4 × 4 = 16

$\therefore$ Probability $= \frac{\text{Favorable}}{\text{total}} = \frac{8}{16} = \frac{1}{2}$