(For Class – X)
SCHOLASTIC APTITUDE TEST

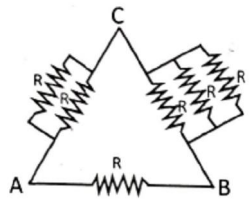
QUESTION PAPER

PHYSICS

101. The sound of same pitch and loudness are "distinguished from one another by their
(1) Wavelengths (2) Velocity
(3) Quality (4) Tones

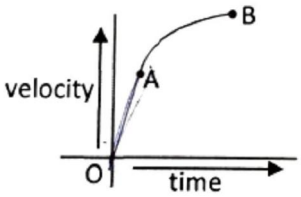
102. A water pumps lifts water from a level 10 m below the ground. The water is pumped at the rate of 30 kg/min with negligible velocity. Calculate the minimum power the pump should have to do this work.
(1) 49 J/s (2) 490 J/s
(3) 500 J/s (4) 48 J/s

103. Six identical resistors connected between points A, B and C as shown in diagram. The equivalent resistance would be maximum between.
(1) A and B
(2) B and C
(3) A and C
(4) Option (1), (2) & (3) are correct.



104. A particle of mass 0.3 kg is subjected to a force F = Kx with K = 15 N/m, what will be its acceleration if it is released from a point x = 20 cm.
(1) 1 m/s^2 (2) 10 m/s^2
(3) 100 m/s^2 (4) 0.1 m/s^2

105. An object is moving in a straight line. The velocity time graph is as shown below. Then
(1) In part OA acceleration is increasing.
(2) In part AB acceleration is increasing.
(3) In part OA acceleration is decreasing.
(4) In part AB acceleration is decreasing.



106. A force of 100 N acts on a body so that the body acquire a velocity of 10 m/s after some time. Now the force of 100 N is replaced by another force F which decelerates the body and body come to the rest then.
(1) F > 100 N (2) F < 100 N
(3) F = 100 N (4) All options are possible

107. 2 points A and B are at electric potentials 10 V and 100 V respectively. A charge q is taken from A to B and 18 Joule of work is done. The value of q is
(1) 2 Coulomb (2) 0.2 Coulomb
(3) 20 Coulomb (4) 0.02 Coulomb

108. Which of the following is NOT correct for magnetic filed lines?
(1) The direction of magnetic field lines outside the magnet is from north pole to south pole.
(2) The direction of magnetic field lines inside the magnet is from south pole to north pole.
(3) The degree of closeness of magnetic field lines tells the relatives strength of magnetic field.
(4) Magnetic field lines never form closed loop.

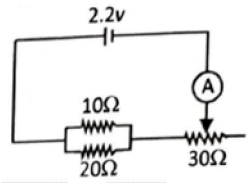
109. A car moving along straight line covers $1/5^{th}$ of total distance with speed v_1 and remaining part of distance with speed v_2. The average speed of car over entire distance is

(1) $\frac{5v_1v_2}{v_2+4v_1}$ (2) $\frac{4v_1v_2}{5v_1+v_2}$ (3) $\frac{5v_1v_2}{4v_2+v_1}$ (4) $\frac{4v_1v_2}{4v_1+v_2}$

110. Light travels through a glass slab of thickness t and having refractive index n. If c is the velocity of light in vaccum then the time taken by light to travel this thickness of glass is

(1) $\frac{t}{nc}$ (2) $\frac{nt}{c}$ (3) $\frac{n^2t}{c}$ (4) $\frac{t}{n^2c}$

111. The resistance of rheostat shown in the figure is 0 – 30 Ω, Neglecting the resistance of ammeter and connecting wire the minimum and maximum currents through the ammeter will be



(1) (0.08 A, 0.33 A)
(2) (0.06A, 0.08A)
(3) (0.06 A, 0.33 A)
(4) (0.33 A, 0.09 A)

112. Three particles A, B and C are thrown from top of a building with same speed. A is thrown upwards, B is thrown downwards and C is thrown horizontally, they hit the ground with speed V_A, V_B and V_C respectively then

(1) $V_A = V_B = V_C$ (2) $V_B > V_C > V_A$
(3) $V_A = V_B > V_C$ (4) $V_A > V_B = V_C$

113. An object of height 2.0 cm is placed on the principal axis of a concave mirror at a distance of 12 cm from the pole. If the image is inverted, real and 5 cm in height then location of the image and focal length of the mirror respectively are

(1) (–30 cm, +8.6 cm) (2) (–30 cm, –8.6 cm)
(3) (+30 cm, +8.6 cm) (4) (+30 cm, –8.6 cm)

CHEMISTRY

114. When lead nitrate is heated a brown gas is evolved, the evolved gas is _____.

(1) Dioxygen (2) Nitrogen dioxide
(3) Nitrous oxide (4) Dinitrogen

115. When a solution of lead(II) nitrate and potassium iodide are mixed, the yellow ppt is formed, the ppt is of_____

(1) KNO_3 (2) KCl
(3) PbI_2 (4) PbI_4

116. Baking powder is a mixture of _____

(1) Sodium hydrogen carbonate and oxalic acid
(2) Sodium carbonate and tartaric acid
(3) Sodium hydrogen carbonate and tartaric acid
(4) Sodium carbonate and oxalic acid.

117. Aqua regia is a mixture of Conc. Hydrochloric acid & Conc. Nitric acid.

(1) 3 : 1 (2) 2 : 1
(3) 1 : 5 (4) 2 : 3

118. $CH_3CH_2OH \xrightarrow[443K]{Conc.H_2SO_4} Products$

The products formed in the above reaction is/are

(1) Ethene and H_2O (2) Ethyne and H_2O

(3) Ethane and H_2O (4) Methane and H_2O

119. Denatured alcohol is a mixture of

(1) CH_3OH and HCHO (2) CH_3OH and CH_3COOH

(3) C_2H_5OH and CH_3OH (4) C_2H_5OH and CH_3COOH

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

(1) Benzene (2) Butane

(3) Methane (4) Ethyne

121. The following metals are arranged in the increasing order of their metallic character. Choose the correct option.

(1) Be < Si < K < Al (2) Si < Be < Al < K

(3) K < Al < Si < Be (4) Be < Si < Al < K

122. Which one of the following oxide is insoluble in water?

(1) Na_2O (2) CuO

(3) K_2O (4) CaO

123. Which of the following oxide turns red litmus into blue?

(1) SO_2 (2) CO_2

(3) NO_2 (4) KO_2

124. Which one of the following is not a green house gas?

(1) CH_4 (2) O_3

(3) CO_2 (4) SO_2

125. Which of the following element does not show allotropy?

(1) Phosphorus (2) Sulphur

(3) Oxygen (4) Aluminium

126. Which one of the following will have the largest number of atoms?

(1) 100 g of He (2) 100 g of Na

(3) 100 g of li (4) 100 g of Al

BIOLOGY

127. Rearrange the following sentences and choose the correct option.

a. Breakdown of H_2O into Hydrogen and Oxygen and Conversion of light energy into chemical energy

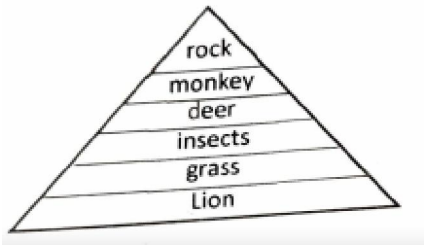
b. Reduction of carbon dioxide to carbohydrates.

c. Absorption of light energy by chlorophyll.

(1) a $\rightarrow$ b $\rightarrow$ c (2) c $\rightarrow$ b $\rightarrow$ a

(3) c $\rightarrow$ a $\rightarrow$ b (4) a $\rightarrow$ c $\rightarrow$ b

128. Deepak is trying to study flow of energy in an area and he made the following diagram for the same. How will you interpret his observations?



(1) His observations and number of trophic levels are wrong.
(2) His observations are correct but the number of trophic levels can be more.
(3) His observations are wrong but number of trophic levels are correct.
(4) His observations as well as number of trophic levels are correct.

129. UV rays cause cancer but in stratosphere the same UV rays are helping us, how?
(1) They divert harmful UV rays back to sun
(2) They convert oxygen in stratosphere into ozone.
(3) UV rays are not present in stratosphere.
(4) UV rays reach the earth surface then bounce back carrying ozone to stratosphere.

130. Match the following.

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

(1) i $\rightarrow$ a; ii $\rightarrow$ e; iii $\rightarrow$ d; iv $\rightarrow$ b v $\rightarrow$ c
(2) i $\rightarrow$ b; ii $\rightarrow$ d; iii $\rightarrow$ a; iv $\rightarrow$ c v $\rightarrow$ e
(3) i $\rightarrow$ b; ii $\rightarrow$ a; iii $\rightarrow$ d; iv $\rightarrow$ c v $\rightarrow$ e
(4) i $\rightarrow$ d; ii $\rightarrow$ e; iii $\rightarrow$ a; iv $\rightarrow$ c v $\rightarrow$ b

131. The opening and closing of the stomata depends upon:-
(1) Oxygen (2) Temperature
(3) Carbon dioxide (4) Water in guard cells

132. Sonu performed an experiment to study dihybrid cross for round/wrinkled and yellow/green coloured seeds. He obtained 2432 seeds in total. What will be the number of seeds which are round and yellow?
(1) 1367 (2) 1356
(3) 1368 (4) 1438

133. The stakeholders of various forest products are:
(i) People living near forests (ii) Government only
(iii) Nature lovers (iv) Wild life

(1) All options are correct (2) Only (i), (ii) and (iii) is correct
(3) Only (ii) is incorrect (4) None of the option is correct.

134. Choose the correct sequence:
(1) Pulmonary vein → Pulmonary artery → Left auricle → Right ventricle
(2) Pulmonary artery → Right auricle → Left ventricle → Pulmonary vein
(3) Right auricle → Pulmonary artery → Pulmonary vein → Left ventricle
(4) Left ventricle → Pulmonary vein → Pulmonary artery → Right auricle

135. **Assertion (A):** No carbon dioxide is released during the day in plants.
Reason (R): Only photosynthesis occurs during the day.

(1) 'A' is true and 'R' is false
(2) 'A' is false and 'R' is true
(3) Both 'A' and 'R' are false
(4) Both 'A' and 'R' are true but 'R' does not explain 'A'

136. Choose the non-biodegradable substance from the following:
i. Carrot ii. Glass bottle
iii. Perfume spray bottle iv. Rice bran v. Papaya vi. Thermocol
vii. Wooden stick viii. Ball pen refill

(1) (ii), (iii), (vii), (viii) (2) (ii), (iii), (vi), (viii)
(3) (iii), (i), (v), (vii) (4) (viii), (v), (i), (iii)

137. Match the column I and column II and select correct option.

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

(1) A → 1; B → 2; C → 4; D → 2
(2) A → 3; B → 1; C → 4; D → 2
(3) A → 4; B → 3; C → 2; D → 1
(4) A → 2; B → 1; C → 3; D → 4

138. Which of the following is a barrier method of contraception?
(1) Diaphragm (2) Contraceptive pills
(3) Tubectomy (4) All of the above

139. Sperms are produced in the:-
(1) Seminiferous tubules (2) Interstitial cell
(3) Vas deferens (4) Prostate gland

140. Blood pressure is measured by an instrument called:-
(1) Barometer (2) Sphygmomanometer
(3) Photometer (4) Manometer

MATHEMATICS

141. If ΔABC is an equilateral triangle such that A(2, 2) and centroid of the triangle is (–2, 2) then find the length of its side.
(1) 4 units (2) 6 units
(3) $4\sqrt{3}$ units (4) 9 units

142. The sum of the n consecutive odd natural numbers starting from 5 is 60. Find the value of $(n^2 - n)$.
(1) 20 (2) 30
(3) 42 (4) 56

143. The sum of the first 'p' odd natural numbers is 100 & the sum of the first 'q' even natural numbers is 90. Find the value of (p + q).
(1) 18 (2) 19
(3) 20 (4) 21

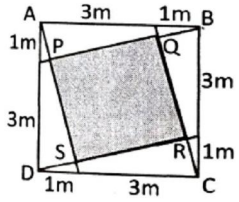
144. If $x + \frac{1}{y} = 1$ and $y + \frac{1}{z} = 1$, then what is the value of $\left(z + \frac{1}{x} + 1\right)$.
(1) 0 (2) 1
(3) 2 (4) 3

145. If $\sqrt[3]{p} + \sqrt[3]{q} + \sqrt[3]{r} = 0$ then the value of $(p + q + r)^3$ is
(1) 3pqr (2) 9pqr
(3) 27pqr (4) 0

146. If $a_1, a_2, a_3, \ldots a_n$ and $b_1, b_2, b_3, \ldots b_n$ are two A.P.'s such that $a_1b_1 = 120$, $a_2b_2 = 143$, $a_3b_3 = 154$ then $a_8b_8 =$
(1) 209 (2) 89
(3) 195 (4) 29

147. In a ΔABC, AX bisects BC and AX is also the angle bisector of angle A. If AB = 12 cm, BX = 3 cm, then what is the area of ΔABC.
(1) 9 cm^2 (2) $\sqrt{2}$ cm^2
(3) $9\sqrt{5}$ cm^2 (4) $9\sqrt{15}$ cm^2

148. If ABCD and PQRS are two squares, such that area of square PQRS is 'A' m^2, then find the value of $\sqrt{17A}$.



(1) 12 (2) 144
(3) 16 (4) 9

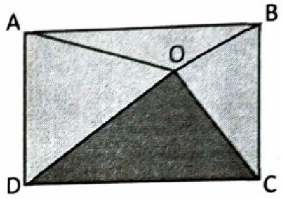
149. If $\cos^2\theta + 2\sin^2\theta + 3\cos^2\theta + 4\sin^2\theta + \ldots + 200\sin^2\theta = 10050$, where θ is an acute angle, find the value of $(\sin\theta + 3\cos\theta)^2$
(1) 8 (2) 4
(3) 2 (4) 1

150. A 'p' m long wire is cut into two pieces one of which is bent into a circle and the other into a square enclosing the circle. What is the radius (in meter) of the circle?

(1) $\frac{p}{\pi+4}$ (2) $\frac{2p}{\pi+4}$

(3) $\frac{p}{2\pi+8}$ (4) $\frac{2p\pi}{\pi+4}$

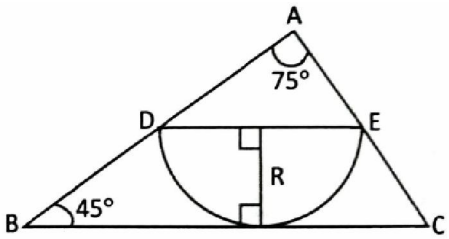
151. In the figure, ABCD is a rectangle such that Area of ΔAOB = a m^2, Area of ΔAOD = b m^2, Area of ΔCOD = c m^2. Then the area of ΔBOC (in m^2) =



(1) a + b + c (2) a + b – c

(3) b + c – a (4) a + c – b

152. In ΔABC, A semi-circle with DE as diameter is drawn such that BC = 26 m. the radius R (in meter) =



(1) $3+\sqrt{3}$ (2) $9-\sqrt{3}$

(3) $9+\sqrt{3}$ (4) $3-\sqrt{3}$

153. If the values of x in the roots of the equation $p(\sin^2 x) + q(\sin x) + r = 0$ are complementary, then

(1) $p^2 = q(q + 2r)$ (2) $q^2 = p(p + 2r)$

(3) $r^2 = q(q + 2p)$ (4) $r^2 = p(q + 2p)$

154. The average age of all the 100 employees in an office is 29 years, where $\frac{2}{5}$ employees are ladies. The ratio of average age of men to women is 5 : 7. The average age of female employees is:

(1) 18 years (2) 35 years

(3) 25 years (4) None of these

155. If, $\frac{1}{a},\frac{1}{b},\frac{1}{c}$ are in A.P., then $\frac{b+a}{b-a}+\frac{b+c}{b-c}$ equals

(1) 1 (2) 2

(3) $\frac{b-c}{a-b}$ (4) $\frac{ab}{c}$

156. If (x + k) is a common factor of $(x^2 + px + q)$ and $(x^2 + lx + m)$, then the value of k is:

(1) l + p (2) m – q

(3) $\frac{l-p}{m-q}$ (4) $\frac{m-q}{l-p}$

157. As a result of 40% hike in the price of rice per kg., a person is able to purchase 10 kg less rice for Rs.1400. What was the original price of rice per kg?
(1) Rs.50 (2) Rs.60
(3) Rs.40 (4) Rs.30

158. A man takes half time in rowing a certain distance downstream than upstream. What is the ratio of the speed of boat in still water to the speed of current?
(1) 1 : 2 (2) 2 : 1
(3) 1 : 3 (4) 3 : 1

159. The mean of a group of 20 consecutive natural numbers is M. What will be the percentage change in the mean when last six consecutive natural numbers are left from the group?
(1) $\frac{3M}{100}\%$ (2) $\frac{3}{M}\%$
(3) $\frac{300}{M}\%$ (4) $\frac{30}{M}\%$

160. One box contains four cards numbered 1, 3, 5 and 7 and another box contains four cards numbered as 2, 4, 6 and 8. One card is drawn from each box at random. The probability that the product of the numbers so drawn is more than 14 is:
(1) $\frac{1}{2}$ (2) $\frac{7}{10}$
(3) $\frac{3}{8}$ (4) $\frac{5}{8}$

SOCIAL SCIENCE

161. "God save our Noble King" was the National Anthem of
(1) Britain (2) Italy
(3) Germany (4) France

162. Who was the ruler of France during the French revolution?
(1) Louis XV (2) Louis XIV
(3) Louis XX (4) Louis XVI

163. Hitler was born in
(1) France (2) Austria
(3) Germany (4) Poland

164. Who published 'The folklores of southern India'?
(1) Rabindra Nath Tagore (2) Natesa Sastri
(3) Mahatma Gandhi (4) Pattabhi Srimalu

165. A tax levied by the church, comprising one tenth of the agricultural produce was
(1) Livre (2) Taille
(3) Tithe (4) None of these

166. What was not the aim of Swaraj Party?
(1) To participate in Provincial council election.
(2) To oppose British policies within the councils.
(3) To demonstrate that councils were not democratic
(4) To make the Act of 1919 successful.

167. Who formed the secret society "young Italy"?
(1) Otto Van Bismarck (2) General Wan Run
(3) Giuseppe Mazzini (4) King Victor Emmanual II

168. The meaning of symbol “Crown of Oak Leaves” was
(1) Readiness to fight (2) Heroism
(3) Being freed (4) Willingness to make peace

169. Which was achieved by the “Enabling Act of 3 March, 1933 in Germany?
(1) Established dictatorship (2) Hitler was appointed chancellor
(3) Establishment of German workers Party (4) Establishment of Weimar Republic

170. Which of the following was not related to Gandhi Irwin Pact 1931?
(1) Government agreed to release the Political prisoners.
(2) Gandhi Ji consented to participate in second Round Table Conference.
(3) Formation of Simon Commission.
(4) Gandhi Ji called off Civil Disobedience Movement.

171. In Swaraj Flag (1921), Self Help was represented by
(1) Flower (2) Crescent Moon
(3) Two Ox (4) Spinning wheel

172. Coffee cultivation was first introduced in
(1) Himalayas (2) Aravali Hills
(3) Garo Hills (4) Baba Budan Hills

173. Which one of the following groups of state have largest number of cotton textile centres?
(1) Gujarat and Maharashtra (2) Karnatak and Tamil Nadu
(3) Maharashtra and Madhya Pradesh (4) Uttar Pradesh and Gujarat

174. Which one of the following describes a system of agriculture where a single crop is grown on a large area?
(1) Shifting Agriculture (2) Plantation Agriculture
(3) Horticulture 4) Intensive Agriculture

175. Neyveli lignite mines are located in the state of
(1) Kerala (2) Tamil Nadu
(3) Karnataka (4) Andhra Pradesh

176. Which of the following regions is suitable for constructing railway lines?
(1) Himalaya Mountains Range (2) Garo, Khasi and Jaintia Hills
(3) The northern Plains (4) Rajasthan desert

177. Hirakund Dam is constructed on the river –
(1) Ganga (2) Manjira
(3) Manas (4) Mahanadi

178. When and where first cement plant was set up?
(1) Chennai, 1905 (2) Chennai, 1904
(3) Kolkata, 1905 (4) Kolkata, 1904

179. Who wrote the book “Small is Beautiful”?
(1) Gandhi Ji (2) Brundtland
(3) Schumacher (4) Annie Besant

180. In which city of Haryana is the automobile industry situated?
(1) Faridabad (2) Gurgaon
(3) Panipat (4) Sonipat

181. According to the main role industry can be divided into
(1) Agro-based and mineral based (2) Key and consumer industries
(3) Public, private, and Joint sector (4) Heavy and light industries

182. Which of the following is not a property of Mica?
(1) Conducting properties (2) Excellent di-electric strength
(3) Less power loss factor (4) Resistance to high voltage

183. Who was the chairman of the drafting committee of Indian Constituent Assembly?
(1) Dr. Rajendra Prasad (2) Dr. B.R. Verma
(3) Dr. B.R. Menon (4) Dr. B.R. Ambedkar

184. Amnesty International is an international organisation which works for
(1) World Peace (2) Human Rights
(3) World Justice (4) Restoration of Democracy

185. The movement that seeks equality in the personal and family life of women is known as –
(1) Narivadi Andolan (2) Nari Sashaktikaran Andolan
(3) Mahila Shakti Andolan (4) Mahila Adhikar Andolan

186. A person who is not a member of Parliament is appointed on minister, he/she has to get elected to one of the houses of Parliament within:
(1) A month (2) Three months
(3) Six months (4) Selected time is fixed by the President

187. Who becomes the members of Gram Sabha?
(1) Only elderly people (2) Only elected members of Gram Panchayat
(3) All the voters of village (4) Only the youth of village

188. President declares emergency when:-
(1) Prime minister advises him to do.
(2) Parliament advises him to declare.
(3) The council of minister, in writing advises him to declare.
(4) Home minister asks him to declare.

189. In case of conflict between the Centre Government and the State Government over subject in the Concurrent list:
(1) Supreme Court decides which of the two should be considered.
(2) The state government should be obeyed.
(3) The central government should be obeyed.
(4) Both governments should be obeyed.

190. What is Mid-Term Election?
(1) Election for the seat to be vocated due to some reason.
(2) Election in the event of death of one member.
(3) Election to be held in whole country or state before the scheduled time.
(4) Completion of 5 years election.

191. In India, seats are reserved for women in which of the following bodies:-
(1) In Lok Sabha (2) In State Legislatures
(3) In Rajya Sabha (4) In Panchayati Raj

192. Which famous Revolution took place in the world history in 1789 –
(1) Russian Revolution (2) American Revolution
(3) German Revolution (4) French Revolution

193. Main Recommendation of Mandal Commission was:
(1) Reservation for Socially and Educationally Backward Classes.
(2) Reservation for schedule caste.
(3) Reservation for schedule Tribes.
(4) Reservation for Minorities.

194. Capital requirement of "NABARD" (National Bank of Agriculture and Rural Development) are met by which of the following institution –
(1) Reserve Bank of India
(2) International Development Association (IDA)
(3) World Bank
(4) All of above

195. Golden Revolution in India is related
(1) Jwellery Export
(2) Gold mines
(3) Honey and Horticulture
(4) Electronic Goods

196. Which of the following is not a renewable resource?
(1) Forest
(2) Animals
(3) Water
(4) Petroleum

197. Which of the following is not related to agriculture marketing?
(1) Storage
(2) Use of chemical fertilizers
(3) Processing
(4) Preservation

198. When an able person is willingly unemployed while here is opportunity to work is known as
(1) Disguised unemployment
(2) Voluntary unemployment
(3) Seasonal unemployment
(4) Educated unemployment

199. The production unit producing shoe comes under
(1) Primary sector
(2) Secondary sector
(3) Tertiary sector
(4) None of the above

200. Which of the following prepares Human Development Report?
(1) Planning Commission of India
(2) International Monetary Fund
(3) World Health Organisation
(4) United Nation Development Programme

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	33.	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

(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/s^2

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

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

108. 4
108. Magnetic filed lines are closed curve because magnetic monopoles do not exist.

109. 1
109. Average speed = $\frac{S}{\frac{S}{5V_1} + \frac{4S}{5V_2}}$

$\Rightarrow \quad \frac{5V_1V_2}{V_2 + 4V_1}$

110. 2

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

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

Distance = speed × time

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

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

111. 3

111. $R_{eq} = \frac{20}{3}\Omega \quad ; \quad I_{max} = \frac{2.2}{\left(\frac{20}{3}\right)} \quad \Rightarrow \quad 0.33\ A$

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

$I_{min} = \frac{2.2}{\left(\frac{110}{3}\right)}$; $I_{min} = 0.06\ A$

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

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

$\Rightarrow \quad \sqrt{u^2 + 2gh}$

$V_A = V_B = V_C$

113. 2

113. u = –12

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

$\Rightarrow \quad \frac{-V}{-12} = \frac{-5}{2}$

V = –30 cm

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

$\Rightarrow$ f = –8.6 cm

CHEMISTRY

114. 2

114. $2Pb(NO_3)_2 \xrightarrow{\Delta} 2PbO + 4NO_2(\uparrow) + O_2(\uparrow)$

115. 3

115. $Pb(NO_3)_2 + 2KI \longrightarrow \underset{\text{Yellow ppt.}}{PbI_2(\downarrow)} + 2KNO_3$

116. 3

116. $NaHCO_3$ + Tartaric acid

117. 1

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

118. 1

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

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 N_A

(3) 100 g of Li = 14.28 N_A

(4) 100 g of Al = 3.70 N_A

BIOLOGY

127. 3

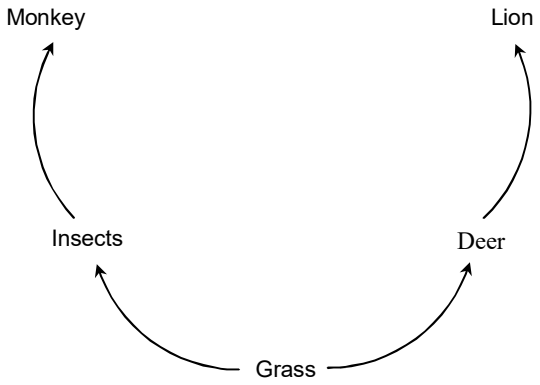
127. $\rightarrow$ Absorption of light energy by chlorophyll.

$\rightarrow$ Breakdown of H_2O into Hydrogen and Oxygen and Conversion of light energy into chemical energy

$\rightarrow$ 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 O_2.

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

$152 \times 9 = 1368$

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 $\rightarrow$ Pulmonary artery $\rightarrow$ Pulmonary vein $\rightarrow$ 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

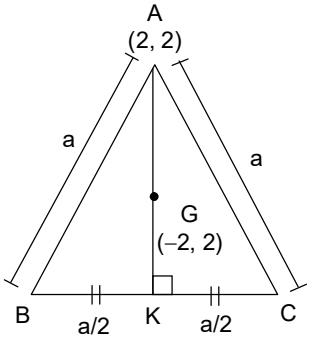
138. 1
138. **Diaphragm** is a barrier method of contraception.

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

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

MATHEMATICS

141. 3
141.



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

$\because AG = \frac{2}{3} \times AK$

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

$\Rightarrow AK = 6$

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

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

$\Rightarrow \frac{12}{\sqrt{3}} = a \Rightarrow \frac{12 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}} \Rightarrow a = 4\sqrt{3}$

142. 2

142. 5 + 7 + 9 + ….. + upto n terms = 60

$\because$ sum of n terms of AP

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

ATQ,

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

$\Rightarrow n\left[5 + n - 1\right] = 60$

$\Rightarrow n(4 + n) = 60$

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

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

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

$\Rightarrow n = 6$

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

$= 6 \times 5 = 30$

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

$\Rightarrow 2 + 4 + 6 +$ ….. upto ‘q’ terms

$= 2\ (1 + 2 + 3 +$ ….. upto q term)

$= 2 \times \frac{q \times (q+1)}{2} = 90$

$q^2 + q - 90 = 0$

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

$\Rightarrow q = 9$

$p + q = 10 + 9 = 19$

144. 3

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

$\Rightarrow xy + 1 = y$

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

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

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

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

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

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

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

$\therefore \frac{1}{x} + z + 1 = 1 + 1 = 2$

145. 3

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

If $a + b + c = 0$ then

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

$\therefore$ by equation (i)

$\left(p^{1/3}\right)^3 + \left(q^{1/3}\right)^3 + \left(r^{1/3}\right)^3 = 3 \times p^{1/3} \times q^{1/3} \times r^{1/3}$

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

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

146. 4

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

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

$a_1b_1 = 120$, $a_2b_2 = 143$, $a_3b_3 = 154$ 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, $a_8\ b_8 = (a + 6d)(B + 6D)$

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

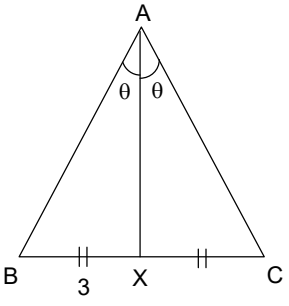
$= 143 + 6(17) + 36\ (-6)$

$= 143 + 102 - 216$

$= 29$

147. 4

147.



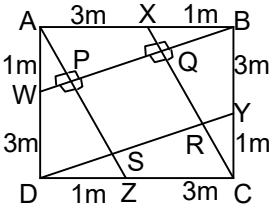
AB = 12
BX = 3 cm
$\because$ $\angle$BAX = $\angle$ CAX
and
AX bisects BC.
$\therefore$ ΔABC is isosceles
$\therefore$ AX $\perp$ BC
$\therefore$ AB = AC = 12

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

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

148. 1

148.



$CX = \sqrt{4^2 + 1^2} = 17$ m

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

$\Rightarrow XQ = WP = ZS = YR = \frac{1}{\sqrt{17}}$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. $(\cos^2\theta + 3\cos^2\theta + 5\cos^2\theta + ... + 199\cos^2\theta) + (2\sin^2\theta + 4\sin^2\theta + ... + 200\sin^2\theta = 10050$

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

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

$\Rightarrow 10^4 \cos^2\theta + 10100 \sin^2\theta = 10050$

$\Rightarrow 10000 \cos^2\theta + 10000 \sin^2\theta + 100 \sin^2\theta = 10050$

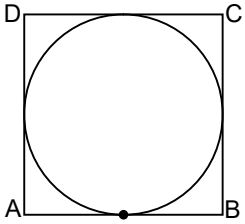
$\Rightarrow 10000 (\cos^2\theta + \sin^2\theta) + 100 \sin^2\theta = 10050$

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

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

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

150. 3

150. 

p = x + y

Where x = $2\pi R$

y = 4a

Now 2r = side of square

$\Rightarrow$ 2r = a

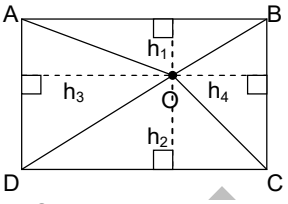
$\Rightarrow$ p = $2\pi r + 4a$

= $2\pi r + 8r$

p = $r(2\pi + 8)$

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

151. 4

151. 

[AOB] = a

[COD] = c

[AOD] = b

[AOB] + [COD] = $\frac{1}{2} \times AB \times h_1 + \frac{1}{2} \times DC \times h_2$

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

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

Similarly,

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

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

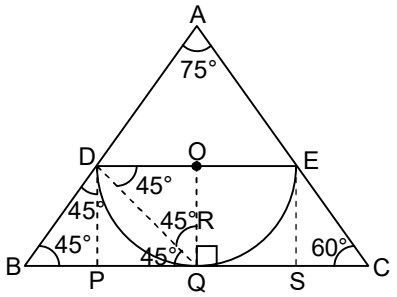
by (i) and (ii)

$\Rightarrow a + c = b + [BOC]$

$\Rightarrow [BOC] = a + c - b$

152. 2

152.



Draw DP $\perp$ BC, ES $\perp$ BC

Hence

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

$\therefore$ PQ = R

Δ BPD $\rightarrow$ BP = R unit ($\because \angle DBP = \angle BDP = 45°$)

Similarly, QS = R units

$\Delta ESC \rightarrow$

$$\tan 60° = \frac{R}{SC} \Rightarrow \sqrt{3} = R/SC$$

$$SC = R/\sqrt{3}$$

$\therefore$ BC = BP + PQ + QS + SC

$$26 = R + R + R + R/\sqrt{3}$$

$$\Rightarrow 26 = 3R + R/\sqrt{3}$$

$$\Rightarrow 26 = \frac{3\sqrt{3}R + R}{\sqrt{3}} \Rightarrow \frac{26\sqrt{3}}{3\sqrt{3}+1} = R$$

$$R = \frac{26\sqrt{3}}{\left(3\sqrt{3}+1\right)} \times \frac{\left(3\sqrt{3}-1\right)}{\left(3\sqrt{3}-1\right)}$$

$$R = \frac{26\sqrt{3}\left(3\sqrt{3}-1\right)}{27-1}$$

$$= \sqrt{3}\left(3\sqrt{3}-1\right)$$

$$R = 9 - \sqrt{3}$$

153. 2

153. $p\left(\sin^2 x\right) + q\left(\sin x\right) + r = 0$

A/c to q

roots are $\sin\theta$ and $\sin(90 - \theta)$

$\therefore$ sum of roots

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

$$\Rightarrow \sin\theta + \cos\theta = -\frac{q}{p} \qquad \ldots(i)$$

$$\text{Product of roots} = \sin\theta \cdot \cos\theta = \frac{r}{p} \qquad \ldots(ii)$$

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

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

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

154. 2

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

$\therefore$ Male employee = 60

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

$\therefore$ 2900 = x + y …(i)

where x = total weight of boys

y = total weight of girls

$\Rightarrow \text{ATQ},\frac{x/60}{y/40}=\frac{5}{7}$

$\Rightarrow 14x = 15y$ …(ii)

by (i) & (ii)

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

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

155. 2

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

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

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

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

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

156. 4

156. $x^2 + px + q = 0$ …(i)

$x^2 + lx + m = 0$ …(ii)

$\because$ (x + k) is common factor of both

$\therefore$ x = –k will satisfy both

$\Rightarrow k^2 – pk + q = 0$ …(iii)

$k^2 – lK + m = 0$ …(iv)

(iii) – (iv)

(–p + l)k = m – q

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

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,

$$\frac{1400}{x}-\frac{1400}{1.4x}=10$$
$$\Rightarrow \frac{1400}{x}\left[1-\frac{10}{14}\right]=10$$
$$\Rightarrow \frac{1400}{x}\times\frac{4}{14}=10 \Rightarrow x=40$$

158. 4

158. Let's say
Speed of boat = x km / hr
Speed of current = y km / hr
$\therefore$ downstream speed = x + y
Upstream speed = x – y
According to question
Time taken in downstream = $\frac{1}{2}$ of time taken in upstream
$$\Rightarrow \frac{d}{x+y}=\frac{1}{2}\times\frac{d}{x-y}$$
$\Rightarrow 2(x – y) = x + y$
$2x – 2y = x + y$
$x = 3y$
$$\Rightarrow \frac{x}{y}=\frac{3}{1}$$

159. 3

159. According to question $M=\frac{n+(n+1)+(n+2)+.....(n+19)}{20}$
$$M=\frac{20n+(1+2+3+.....19)}{20}$$
$$M=\frac{20n+\frac{19\times 20}{2}}{20}$$
$$M=\frac{20n+190}{20}=n+\frac{19}{2}$$
Now, last six consecutive natural numbers are removed.
$\therefore$ New mean, $\Rightarrow \frac{n+(n+1)+.....(n+13)}{14}$
$$N=\frac{14n+(1+2+.....13)}{14}$$
$$=14n+\frac{13\times 14}{2}=\frac{14n+91}{14}$$
$$N=n+\frac{13}{2}$$
% 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 $= \frac{\text{Favorable}}{\text{total}} = \frac{8}{16} = \frac{1}{2}$