



# SCIENCE OLYMPIAD CONTEST 2016

## Tier - I Test

### Model Questions

Time: 90 Minutes

Total Mark: 150

S. No.: 1002

Registration Number: .....

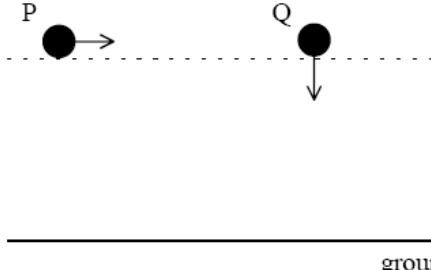
### READ THESE INSTRUCTIONS FIRST

1. Questions are arranged in **two** sections. You should attempt **all** questions of **Section A** (40 Physics, 38 Chemistry & 37 Mathematics). In **Section B**, you will attempt 35 questions of **either** Biology Science **or** Physical Science.
2. You need to attempt all together **150** questions. Each question is provided with **4** answer **options**. A blank sheet is also provided for scratch work & a separate OMR for your answers.
2. Don't forget to write your correct registration number on this set as well as on **OMR**.
3. Select the correct answer for each question and make a complete shade ● in only one appropriate circle of corresponding number in your OMR sheet. Do not use any other shading like ⊙, ⊖, ⊕, ⊗, ⊛, ⊜ or any other.
4. Submit **both** this question set as well as your OMR at the end of the test.
5. Each correct answer is scored **one** point.
6. **0.25** point is deducted for every incorrect answer.
7. Marking in more than one options of a question is regarded as **incorrect** answer.
8. Bringing of mobile, calculator and log tables in the exam hall is strictly prohibited.

## Section A

(Attempt **all** the questions in this section)

### Physics

- A person walks first 10 km north and 20 km east, then the resultant vector is  
(a) 22.36 km      (b) 22.46 km      (c) 25.23 km      (d) 20.36 km
  - Which of the following pair does not have similar dimensions?  
(a) Stress and pressure      (b) Angle and strain  
(c) Tension and surface tension      (d) Planck's constant and angular momentum
  - A car covers the first half of the distance between two places at  $40 \text{ km hr}^{-1}$  and the other half at  $60 \text{ km hr}^{-1}$  the average speed of car is  
(a)  $48 \text{ km hr}^{-1}$       (b)  $50 \text{ km hr}^{-1}$       (c)  $52 \text{ km hr}^{-1}$       (d)  $55 \text{ km hr}^{-1}$
  - The diagram shows two balls P and Q at the same height above the ground. Ball P is projected horizontally and at the same instant ball Q is allowed to fall vertically.  
Which one of the following statements is true?  
(a) Both balls hit the ground with the same velocity  
(b) Both balls take the same time to reach the ground.  
(c) Both balls hit the ground with the same speed  
(d) The balls have different accelerations whilst falling.
- 
- The diagram shows two balls, P and Q, at the same height above the ground. Ball P is projected horizontally to the right, and ball Q is falling vertically downwards. A dashed horizontal line represents the initial height, and a solid horizontal line below it represents the ground.

9. A satellite moving round the Earth in a circular orbit of radius R has a period T. What would the period be if the orbit were of radius R/4?  
 (a) 0.125 T                      (b) 0.25 T                      (c) 0.5 T                      (d) 4 T

### Chemistry

41. The valency of N in  $\text{NH}_3$  &  $\text{NH}_4^+$  is .....respectively.  
 (a) 3 & 2                      (b) 3 & 3                      (c) 3 & 4                      d) all of the above
42. Glucose is a .....  
 (a) aldehyde                      (b) monosoccharides                      (c) carbohydrates                      (d) all of the above
43. Oxo is the another name of.....functional group.  
 (a) aldehyde                      (b) keto                      (c) carboxylic                      (d) hydroxyl
44. Xenon gas is .....gas.  
 (a) monoatomic                      b) diatomic                      c) triatomic                      d) semiatomic
45. Hydrogen & oxygen gas reacts each other in presence of ..  
 (a) sunlight                      (b) sound                      (c) electric spark                      (d) heat & pressure
46. Metallurgy of Sodium is ..  
 (a) Hydrometallurgy                      (b) Electrometallurgy  
 (c) Thermalmetallurgy                      (d) Pyrometallurgy
48. Which one is the heaviest?  
 (a) 1 Gram atom of hydrogen                      (b) 5.6 liter of He gas  
 (c) 11.2 liter of  $\text{O}_2$                       (d) 1000 atoms of Uranium
49. Cobalt ion is present in ...  
 (a) chlorophyll                      (b) hemoglobin                      (c) vitamin B12                      (d) none of above
50. Mole concept was developed by ..  
 (a) Wholer                      (b) Avogadro                      (c) Newton                      (d) Max Plank

### Mathematics

79. The value of  $\sin 15^\circ$  is ...  
 (a)  $\frac{\sqrt{3}+1}{2\sqrt{2}}$                       (b)  $\frac{\sqrt{3}-1}{2\sqrt{2}}$                       (c)  $2 - \sqrt{3}$                       (d)  $2 + \sqrt{3}$
80. If  $\tan A + \tan B = \tan A \tan B - 1$ , then the sum of A and B is ...  
 (a)  $45^\circ$                       (b)  $60^\circ$                       (c)  $135^\circ$                       (d)  $150^\circ$
81. The value of  $\sin (A+B) \cdot \sin (A-B)$  is ..  
 (a)  $\sin^2 A - \sin^2 B$                       (b)  $\cos^2 A - \cos^2 B$                       (c)  $\cos^2 A - \sin^2 B$                       (d)  $\sin^2 B - \sin^2 A$

82. The average of ten numbers is 5. If each number is multiplied by 3, the average of the new set of numbers will be ...  
 (a) 34 (b) 30 (c) 28 (d) 15
83. If  $x:y = 2$ , then  $(x - y):x = ?$   
 (a) -1 (b)  $-\frac{1}{2}$  (c)  $\frac{1}{2}$  (d) 1
84. The value of  $[3.9] - [3.2]$  is equal to ..  
 (a) 0.7 (b) 1 (c) 0 (d) -0.7
85. If  $x = -3.9 - [-3.9]$ , then the value of x is equal to ...  
 (a) 0 (b) 0.5 (c) 0.1 (d) None of above
86. If  $a - b = -2$ ,  $b - c = -1$  and  $c - a = 3$ , then the value of  $a^2 + b^2 + c^2 - ab - bc - ca = ?$   
 (a) 15 (b) 18 (c) 7 (d) 10
87. Find the remainder when  $(17)^{35} \cdot (13)^7$  is divided by 5  
 (a) 1 (b) 2 (c) 3 (d) 4

### Section B

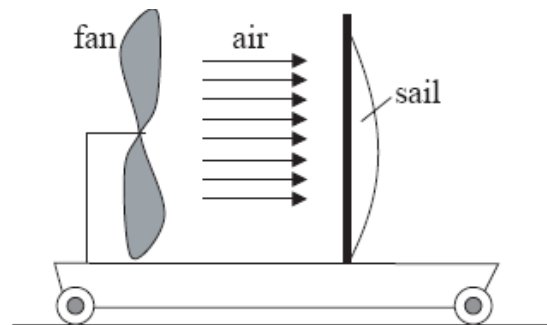
(Attempt **either** Biological Science part **or** Physical Science part)

#### Biological Sciences

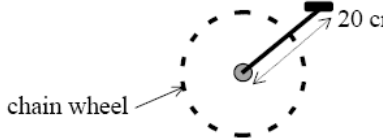
116. Which one of the following has an ink gland?  
 (a) Oyster (b) Hydra (c) Snail (d) Cuttle fish
117. Kalazar is caused by ..  
 (a) *Trypanosome* (b) *Leishmania* (c) *Plasmodium* (d) *Trichomonas*
118. Polymorphism is common in  
 (a) Porifera (b) Aschelminthes (c) Platyhelminthes (d) Coelenterata
119. The earliest fossil of human is ..  
 (a) Cro-magnon man (b) *Australopithecus* (c) Neanderthal man (d) *Ramapithecus*
120. Which of the following is the true fish?  
 (a) Jelly fish (b) Shark (c) Cray fish (d) Cuttle fish
121. The organism having plant and animal character ..  
 (a) Bacteria (b) *Euglena* (c) *Paramecium* (d) Virus
122. The plant which is commonly termed as amphibian plant ...  
 (a) Algae (b) Fungi (c) Bryophytes (d) Pteridophytes
123. Seeds are found in ...  
 (a) Bryophytes (b) Pteridophytes (c) Gymnosperms (d) Spermatophytes
124. Study of algae is called ....  
 (a) Phycology (b) Mycology (c) Mycetology (d) Polynology

## Physical Sciences

151. Find the scalar product of two unit vectors BA and AC if the  $\angle BAC = 120^\circ$   
 (a)  $1/2$  (b)  $-1/2$  (c)  $1$  (d)  $-1$
152.  $Px=Py \Rightarrow x=y$  is true for  
 (a)  $P=0$  (b)  $P=1$  (c)  $P=-1$  (d)  $P=0$  or  $\pm 1$
153. The result  $x^{1/m}y^{1/m}=(xy)^{1/m}$ ,  $x,y \in \mathbb{R}$ , is not true for  
 (a)  $m=2$  (b)  $m=1/3$  (c)  $m=1$  (d)  $m=1/2$
154. If a polynomial  $f(x)$  is divided by  $k(x-a)$  then the remainder is  
 (a)  $F(a)$  (b)  $F(ka)$  (c)  $F(a/k)$  (d)  $F(-ak)$
155. The number  $\sqrt{5+\sqrt{7}}$  is a  
 (a) Pure surd (b) Mixed surd (c) Simple surd (d) Not a surd
156. The rationalized product of  $\sqrt{3}-3\sqrt{5}$  is  
 (a)  $3$  (b)  $2$  (c)  $5$  (d) An irrational number
157. The value sine function of the angle in the standard position such that whose terminal arm passes through  $(3, -4)$  is.....  
 (a)  $-4/5$  (b)  $-5/4$  (c)  $3/4$  (d)  $-4/3$
158. The value of  $\cos 720^\circ$  is  
 (a)  $-1$  (b)  $1/2$  (c)  $1/\sqrt{2}$  (d)  $1$
159. If  $\operatorname{cosec}\theta = -2$  ( $\theta$  lies in third quadrant) find the value of tangent of the single  
 (a)  $1/\sqrt{3}$  (b)  $-1/2$  (c)  $\sqrt{3}$  (d)  $-\sqrt{3}$
160. If  $\sin\theta = -1/2$  and  $\tan\theta = 1/\sqrt{3}$ , ( $\pi \leq \theta \leq 3\pi$ ) then the value of angle  $\theta$  is .....radian.  
 (a)  $7\pi/6$  (b)  $11\pi/6$  (c)  $5\pi/6$  (d)  $5\pi/4$
161. The value of  $\theta$  in the equation  $\sin\theta = \sqrt{2}$  is  
 (a)  $0$  (b)  $45^\circ$  (c)  $60^\circ$  (d) Not defined
162. If the three angles of the triangle are in the ratio  $1:2:3$  then the ratio of the sides are  
 (a)  $1:\sqrt{3}:2$  (b)  $1:2:3$  (c)  $2:1:3$  (d)  $1:3:4$
163. A fan and a sail are mounted vertically on a cart that is initially at rest on a horizontal table as shown in the diagram below. When the fan is turned on an air stream is blown towards the right and is incident on the sail. The cart is free to move with negligible resistance forces. After the fan has been turned on the cart will



- (a) move to the left and then to the right.  
 (b) remain at rest.  
 (c) move towards the right.  
 (d) move towards the left.

164. The heart of a man pumps 4 litre of blood per minute at a pressure of 130 mm of mercury. If the density of blood is 13.6 gm/cc, the power of the heart is  
 (a) 1.55 watt      (b) 1.555 watt.      (c) 1.155 watt      (d) 1.255 watt
165. A stone tied to string is made to whirl in circular motion. Which one of the following statement about the circular motion is true?  
 (a) The tension in the string provides necessary centripetal force on the stone.  
 (b) The tension in the string provides necessary centrifugal force on the stone.  
 (c) The circular motion of stone generates the necessary centripetal force.  
 (d) The circular motion of stone generates the centripetal force to balance centrifugal force.
166. If the radius of earth is contracted by 2 % and its mass remains the same, then weight of the body the earth's surface will  
 (a) decrease      (b) increase      (c) remain the same      (d) none of above
167. A 60 kg person riding a bicycle puts all of her weight on each pedal in turn when climbing a hill. The pedals rotate in a circle of radius 20 cm. Estimate the maximum torque that is exerted by the person.
- 
- (a) 12 Nm      (b) 120 Nm.      (c) 1200 Nm.      (d) 12 000 Nm
168. For a hollow cylinder and a solid cylinder of the same mass and radius, rolling without slipping on an inclined plane, which of these reaches the ground earlier?  
 (a) Hollow cylinder, (b) solid cylinder (c) both simultaneously (d) can't say anything.
169. A liquid of density  $\rho$  is mixed with equal volume of another liquid of density  $2\rho$ . Then the density of mixture is  
 (a)  $2\rho$       (b)  $1.33\rho$       (c)  $1.5\rho$ .      (d)  $0.75\rho$
170. Two simple pendulums of time period 2.0s and 2.1s are made to oscillate simultaneously, they are in phase initially. After how many vibrations they are in same phase?  
 (a) 21      (b) 25      (c) 30      (d) 35
171. A trough full of water is placed on a spring balance. If we put our hand in water touching the trough how will the reading of balance change?  
 (a) It will remain unchanged      (b) it will decrease  
 (c) it will rise      (d) difficult to predict.
172. Suppose  $W$  is the work done when a bubble of volume  $V$  is formed from a soap solution. How much work is required to be done to form a bubble of volume  $2V$ ?  
 (a)  $W$       (b)  $4^{1/3} W$       (c)  $2W$       (d)  $2^{1/3} W$
173. Eight rain drops each of radius 1 mm are falling through air at a terminal velocity of  $5 \text{ cm s}^{-1}$ . If they coalesce to form a bigger drop, the terminal velocity of bigger drop is  
 (a)  $10 \text{ cm s}^{-1}$       (b)  $5 \text{ cm s}^{-1}$       (c)  $15 \text{ cm s}^{-1}$       (d)  $20 \text{ cm s}^{-1}$

174. One can't see own image on the book it is because  
(a) Light rays are not reflected 100% from the surface of book.  
(b) Light rays are refracted through the book.  
(c) Light rays are not monochromatic.  
(d) The surface of book is not regular and smooth.
175. Two mirrors are kept at  $60^\circ$  to each other and a body is placed at middle. The total number of images formed is  
(a) Six                      (b) five                      (c) four                      (d) three.
176. A microscope is focused on a mark. Then a glass slab of refractive index 1.5 and thickness 6 cm is placed on the mark. By what distance would the microscope have to be moved to focus on the mark again?  
(a) 2 cm upward      (b) 2 cm downward      (c) 4 cm upward      (d) 4 cm downward.
177. What is the critical angle for a glass prism of refractive index  $\sqrt{2}$ ?  
(a)  $40.5^\circ$                       (b)  $55^\circ$                       (c)  $45.5^\circ$                       (d)  $50.5^\circ$
178. Two thin lenses of focal length 20 cm and 25 cm are placed in contact. The power of the combination is  
(a) 0.5 D                      (b) 5.0 D                      (c) 7.0 D                      (d) 9.0 D
179. A converging lens is used to form the image of an object on a screen. When the upper half of the lens is covered by an opaque screen  
(a) Half the image will disappear.  
(b) Complete image will be formed with unchanged intensity.  
(c) Complete image will be formed with increased intensity.  
(d) Complete image will be formed of decreased intensity.
180. The people suffering from hyper- metropia can read a book by looking through a small ( 3 – 4 mm diameter) hole in a sheet of paper. It is possible because  
(a) In doing so the focal length of eye lens is effectively reduced.  
(b) In doing so the focal length of eye lens is effectively increased.  
(c) In doing so the distance of object is decreased.  
(d) The fine hole produces an image of the letters at a longer distance.



# Science Olympiad Contest 2016

Answer Sheet (OMR)

Tier - I Test

Registration No.:

Name:

Center:

(a) (b) (c) (d)		(a) (b) (c) (d)		(a) (b) (c) (d)		(a) (b) (c) (d)		(a) (b) (c) (d)											
← Section A →										← Section B →									
<b>Physics</b>				40. ○ ○ ○ ○				<b>Bio. Sciences</b>		<b>Phy. Sciences</b>									
1.	○	○	○	○	<b>Chemistry</b>		116.	○	○	○	○								
2.	○	○	○	○	41.	○	○	○	○	151.	○	○	○	○					
3.	○	○	○	○	42.	○	○	○	○	<b>Mathematics</b>		152.	○	○	○	○			
4.	○	○	○	○	43.	○	○	○	○	79.	○	○	○	○	153.	○	○	○	○
5.	○	○	○	○	44.	○	○	○	○	80.	○	○	○	○	154.	○	○	○	○
6.	○	○	○	○	45.	○	○	○	○	81.	○	○	○	○	155.	○	○	○	○
7.	○	○	○	○	46.	○	○	○	○	82.	○	○	○	○	156.	○	○	○	○
8.	○	○	○	○	47.	○	○	○	○	83.	○	○	○	○	157.	○	○	○	○
9.	○	○	○	○	48.	○	○	○	○	84.	○	○	○	○	158.	○	○	○	○
10.	○	○	○	○	49.	○	○	○	○	85.	○	○	○	○	159.	○	○	○	○
11.	○	○	○	○	50.	○	○	○	○	86.	○	○	○	○	160.	○	○	○	○
12.	○	○	○	○	51.	○	○	○	○	87.	○	○	○	○	161.	○	○	○	○
13.	○	○	○	○	52.	○	○	○	○	88.	○	○	○	○	162.	○	○	○	○
14.	○	○	○	○	53.	○	○	○	○	89.	○	○	○	○	163.	○	○	○	○
15.	○	○	○	○	54.	○	○	○	○	90.	○	○	○	○	164.	○	○	○	○
16.	○	○	○	○	55.	○	○	○	○	91.	○	○	○	○	165.	○	○	○	○
17.	○	○	○	○	56.	○	○	○	○	92.	○	○	○	○	166.	○	○	○	○
18.	○	○	○	○	57.	○	○	○	○	93.	○	○	○	○	167.	○	○	○	○
19.	○	○	○	○	58.	○	○	○	○	94.	○	○	○	○	168.	○	○	○	○
20.	○	○	○	○	59.	○	○	○	○	95.	○	○	○	○	169.	○	○	○	○
21.	○	○	○	○	60.	○	○	○	○	96.	○	○	○	○	170.	○	○	○	○
22.	○	○	○	○	61.	○	○	○	○	97.	○	○	○	○	171.	○	○	○	○
23.	○	○	○	○	62.	○	○	○	○	98.	○	○	○	○	172.	○	○	○	○
24.	○	○	○	○	63.	○	○	○	○	99.	○	○	○	○	173.	○	○	○	○
25.	○	○	○	○	64.	○	○	○	○	100.	○	○	○	○	174.	○	○	○	○
26.	○	○	○	○	65.	○	○	○	○	101.	○	○	○	○	175.	○	○	○	○
27.	○	○	○	○	66.	○	○	○	○	102.	○	○	○	○	176.	○	○	○	○
28.	○	○	○	○	67.	○	○	○	○	103.	○	○	○	○	177.	○	○	○	○
29.	○	○	○	○	68.	○	○	○	○	104.	○	○	○	○	178.	○	○	○	○
30.	○	○	○	○	69.	○	○	○	○	105.	○	○	○	○	179.	○	○	○	○
31.	○	○	○	○	70.	○	○	○	○	106.	○	○	○	○	180.	○	○	○	○
32.	○	○	○	○	71.	○	○	○	○	107.	○	○	○	○	181.	○	○	○	○
33.	○	○	○	○	72.	○	○	○	○	108.	○	○	○	○	182.	○	○	○	○
34.	○	○	○	○	73.	○	○	○	○	109.	○	○	○	○	183.	○	○	○	○
35.	○	○	○	○	74.	○	○	○	○	110.	○	○	○	○	184.	○	○	○	○
36.	○	○	○	○	75.	○	○	○	○	111.	○	○	○	○	185.	○	○	○	○
37.	○	○	○	○	76.	○	○	○	○	112.	○	○	○	○					
38.	○	○	○	○	77.	○	○	○	○	113.	○	○	○	○					
39.	○	○	○	○	78.	○	○	○	○	114.	○	○	○	○					
										115.	○	○	○	○					

**Note:** Select the correct answer for each question and make a complete shade ● in only one appropriate circle of corresponding question in this sheet. Do not use any other shading like ⊙, ⊗, ⊕, ⊖, ⊗, ⊕, ⊖ or any other. Use HB pencil for shading.