



**SOF NATIONAL CYBER OLYMPIAD**

**SYLLABUS**

**Section – 1 :** Verbal and Non-Verbal Reasoning.

**Section – 2 :** Programming in C++, Database Concepts, SQL, Boolean Algebra, MS-Word, MS-Excel, HTML, Networking & Topologies, Network Security Concepts, Cyber ethics, Viruses and Antiviruses, Open Source Terminologies.

**Section – 3 :** Higher Order Thinking Questions - Syllabus as per Section – 2.

**Questions are based on Windows 7 and MS-Office 2010.**

Total Questions : 50

Time : 1 hr.

PATTERN & MARKING SCHEME			
Section	(1) Logical Reasoning	(2) Computers & IT	(3) Achievers Section
No. of Questions	10	35	5
Marks per Ques.	1	1	3



**SOF NATIONAL SCIENCE OLYMPIAD**

**SYLLABUS**

**Section – 1 : Physics :** Electricity and Magnetism, Electromagnetic Induction, AC, Electromagnetic waves, Optics, Modern Physics, Semiconductor Electronics, Communication Systems.

**Chemistry :** Solid State, Solutions, Electrochemistry, Chemical Kinetics, Surface Chemistry, General Principles and Processes of Isolation of Elements, p-Block Elements (Group 15 to 18), d- & f-Block Elements, Coordination Compounds, Haloalkanes and Haloarenes, Alcohols, Phenols and Ethers, Aldehydes, Ketones and Carboxylic Acids, Amines, Biomolecules, Polymers, Chemistry in Everyday Life.

**Section – 2 :** Higher Order Thinking Questions - Syllabus as per Section – 1.

**Section – 3 :** Relations and Functions, Inverse Trigonometric Functions, Matrices and Determinants, Continuity and Differentiability, Application of Derivatives, Integrals, Application of Integrals, Differential Equations, Vector Algebra, Three Dimensional Geometry, Probability, Linear Programming.

**OR**

**Section – 3 :** Reproduction, Genetics and Evolution, Biology in Human Welfare, Biotechnology, Ecology.

Total Questions : 50

Time : 1 hr.

PATTERN & MARKING SCHEME			
Section	(1) Physics & Chemistry	(2) Achievers Section	(3) Mathematics or Biology
No. of Questions	25	5	20
Marks per Ques.	1	3	1



**SOF INTERNATIONAL MATHEMATICS OLYMPIAD**

**SYLLABUS**

**Section – 1 :** Verbal and Non-Verbal Reasoning.

**Section – 2 :** Relations and Functions, Inverse Trigonometric Functions, Matrices and Determinants, Continuity and Differentiability, Application of Derivatives, Integrals, Application of Integrals, Differential Equations, Vector Algebra, Three Dimensional Geometry, Probability, Linear Programming.

**Section – 3 :** The Syllabus of this section will be based on the Syllabus of Mathematical Reasoning and Quantitative Aptitude.

**Section – 4 :** Higher Order Thinking Questions - Syllabus as per Section – 2.


Total Questions : 50

Time : 1 hr.

PATTERN & MARKING SCHEME				
Section	(1) Logical Reasoning	(2) Mathematical Reasoning	(3) Everyday Mathematics	(4) Achievers Section
No. of Questions	15	20	10	5
Marks per Ques.	1	1	1	3



**SOF INTERNATIONAL ENGLISH OLYMPIAD**

In association with  **BRITISH COUNCIL**

Total Questions : 50

Time : 1 hr.

PATTERN & MARKING SCHEME				
Section	(1) Word and Structure Knowledge	(2) Reading	(3) Spoken and Written Expression	(4) Achievers Section
No. of Questions	45			5
Marks per Ques.	1	1	1	3

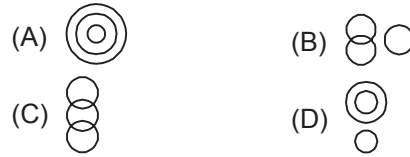
**SYLLABUS :** As Per Your Prescribed Syllabus.



# National Cyber Olympiad

## LOGICAL REASONING

1. If  $\times$  stands for 'addition';  $<$  stands for 'subtraction';  $>$  stands for 'multiplication';  $+$  stands for 'division';  $-$  stands for 'equal to';  $\div$  stands for 'greater than';  $=$  stands for 'less than'; then which one of the given alternatives is correct ?  
(A)  $8 < 4 \times 3 - 3 \times 2 \times 1$   
(B)  $8 > 4 < 3 - 3 > 2 < 1$   
(C)  $8 \times 4 < 3 \div 3 < 2 < 1$   
(D)  $8 + 4 \times 3 \div 3 > 2 \times 1$
2. Which one of the following Venn diagrams represents the relationship amongst "Musicians, Instrumentalists and Violinists"?



3. In a certain code language, 'nee muk pic' means 'grave and concern', 'ill dic so' means 'every body else' and 'tur muk so' means 'body and soul'. Which of the following would mean 'every concern' ?  
(A) dic pic  
(B) pic nee  
(C) ill nee  
(D) Cannot be determined

## COMPUTERS AND INFORMATION TECHNOLOGY

4. Which of the following benefits are offered by Homegroup Networking feature in Windows 7?  
(A) Easy sharing of libraries and other files throughout the homegroup in Windows Explorer.  
(B) Easy access to shared media libraries in Windows Media Player and Windows Media Center.  
(C) Ability to stream media to devices (other computers, media extenders and players, digital picture frames, and so on) using Play To.  
(D) All of these
5. \_\_\_\_\_ is a device that will only send a message to the device that needs or requests it rather than broadcasting it to all devices.  
(A) Router  
(B) Hub  
(C) Switch  
(D) Bridge

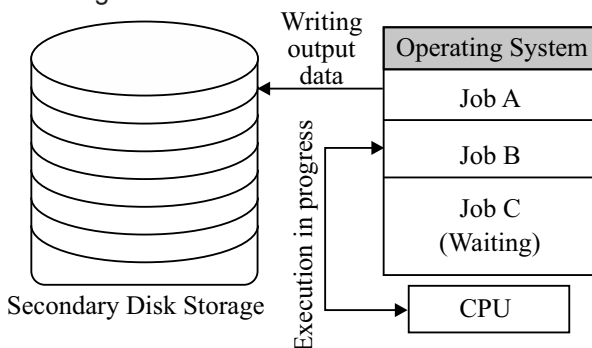
6. In OSI layer, end-to-end connectivity is provided from host-to-host in \_\_\_\_\_.  
(A) Data link layer  
(B) Session layer  
(C) Network layer  
(D) Transport layer
7. \_\_\_\_\_ is a method of encryption that provides two different keys, a secret key and a public key.  
(A) Symmetric encryption  
(B) Asymmetric encryption  
(C) Authentication  
(D) Detection
8. Aero shake feature of Windows 7 requires \_\_\_\_\_ shakes only in order to perform the task.  
(A) 3  
(B) 2  
(C) 10  
(D) 7

## ACHIEVERS SECTION

9. Which of the following is/are advantage(s) of Cyber Laws under IT Act of India 2000?  
1. Digital signatures have been given legal validity and sanction in the Act.  
2. It now allows Government to issue notification on the web thus heralding e-governance.  
3. It also addresses the important issues of security, which are so critical to the success of electronic transactions.

4. It shall now be possible for corporates to have a statutory remedy in case if anyone breaks into their computer systems or network and causes damages or copies data. The remedy provided by the Act is in the form of monetary damages, not exceeding ₹ 1 crore.  
(A) Only 1 and 2  
(B) Only 2 and 4  
(C) 1, 2, 3 and 4  
(D) 1, 3 and 4.

10. Identify the type of system with the help of given diagram.



- (A) Multiprogramming system  
 (B) Multiprocessing system  
 (C) Batch-processing system  
 (D) Uniprogramming system



# National Science Olympiad

## PHYSICS AND CHEMISTRY

- A ray of light passes from vacuum into a medium of refractive index  $\mu$ , the angle of incidence is found to be twice the angle of refraction. Then the angle of incidence is

(A)  $\cos^{-1}(\mu/2)$       (B)  $2\cos^{-1}(\mu/2)$   
 (C)  $2\sin^{-1}\mu$       (D)  $2\sin^{-1}(\mu/2)$
- A capacitor of capacitance  $C_0$  is charged to a potential  $V_0$  and isolated. A small capacitor of capacitance  $C$  is then charged from  $C_0$ , discharged and charged again, the process being repeated  $n$  times. Due to this, potential of the larger capacitor is decreased to  $V$ .

The value of  $C$  is

(A)  $C_0 \left[ \frac{V_0}{V} \right]^{1/n}$       (B)  $C_0 \left[ \left( \frac{V_0}{V} \right)^{1/n} - 1 \right]$   
 (C)  $C_0 \left[ \left( \frac{V_0}{V} \right) - 1 \right]^n$       (D)  $C_0 \left[ \left( \frac{V_0}{V} \right)^n - 1 \right]$
- A ray of light in a liquid of refractive index 1.4, approaches the boundary surface between the liquid and air at an angle of incidence whose sine is 0.8. Which of the following statements is correct about the behavior of the light ?

(A) It is impossible to predict the behavior of the light ray on the basis of the information supplied.

(B) The sine of the angle of refraction of the emergent ray will be less than 0.8.  
 (C) The ray will be internally reflected.  
 (D) The sine of the angle of refraction of the emergent ray will be greater than 0.8.
- A metal X is prepared by the electrolysis of fused chlorides. It reacts with hydrogen to form a colourless solid from which hydrogen is released on treatment with water. The metal is

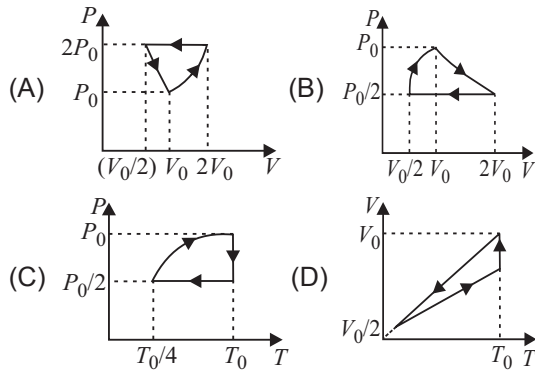
(A) Al      (B) Ca  
 (C) Cu      (D) Zn
- A 0.008 M solution of  $M_2SO_4$  is isotonic with a 0.02 M solution of glucose at the same temperature. The apparent degree of dissociation is

(A) 0.5      (B) 0.75  
 (C) 1      (D) 0.25
- A compound 'X' when reacted with  $PCl_5$  and then with  $NH_3$  gives 'Y'. When 'Y' is treated with  $Br_2$  and  $KOH$ , it produced 'Z'. 'Z' on treatment with  $NaNO_2$  and  $HCl$  at  $0^\circ C$  and then warmed with water produced *ortho*-cresol. Compound 'X' is

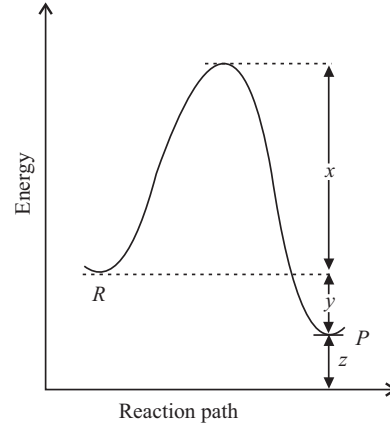
(A) *o*-toluic acid      (B) *o*-chlorotoluene  
 (C) *o*-bromotoluene      (D) *m*-toluic acid

## ACHIEVERS SECTION

7. One mole of an ideal gas at pressure  $P_0$ , temperature  $T_0$  and volume  $V_0$  is expanded isothermally to twice its volume and then compressed at constant pressure to  $(V_0/2)$  and the gas is brought to original state by a process in which pressure is directly proportional to volume. The correct representation of process is



8. Observe the given graph carefully.



The activation energy of the backward reaction, heat of reaction and threshold energy of the reaction respectively are

- (A)  $x - y$ ;  $y$  and  $x + y - z$   
 (B)  $x + y + z$ ;  $y + z$  and  $z$   
 (C)  $x + y$ ;  $y$  and  $x + y + z$   
 (D)  $x + y$ ;  $y$  and  $x - y - z$ .

## MATHEMATICS

9. If  $\sqrt{1-x^6} + \sqrt{1-y^6} = a(x^3 - y^3)$  and  $\frac{dy}{dx} = f(x, y) \sqrt{\frac{1-y^6}{1-x^6}}$ , then
- (A)  $f(x, y) = \frac{y}{x}$       (B)  $f(x, y) = \frac{y^2}{x^2}$   
 (C)  $f(x, y) = \frac{2y^2}{x^2}$       (D)  $f(x, y) = \frac{x^2}{y^2}$

10. For non-zero vectors  $\vec{a}, \vec{b}, \vec{c}$   $(\vec{a} \times \vec{b}) \cdot \vec{c} = |\vec{a}| |\vec{b}| |\vec{c}|$  holds iff
- (A)  $\vec{a} \cdot \vec{b} = 0, \vec{b} \cdot \vec{c} = 0$   
 (B)  $\vec{b} \cdot \vec{c} = 0, \vec{c} \cdot \vec{a} = 0$   
 (C)  $\vec{c} \cdot \vec{a} = 0, \vec{a} \cdot \vec{b} = 0$   
 (D)  $\vec{a} \cdot \vec{b} = \vec{b} \cdot \vec{c} = \vec{c} \cdot \vec{a} = 0$

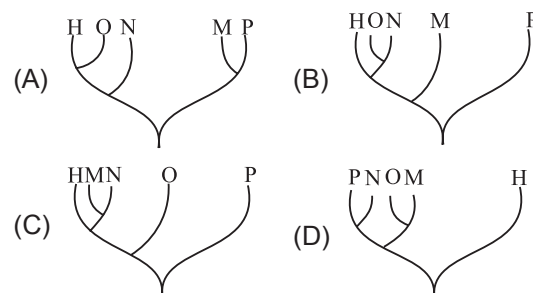
## BIOLOGY

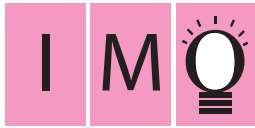
9. The allele for pea comb (P) in chickens is completely dominant to the allele for single comb (p). The alleles for black feather colour (B), and white feather colour (B') show codominance, so that BB' individuals possess blue feathers. If chickens heterozygous for both pairs of genes are mated, what proportion of offspring are expected to be pea combed and white feathered?
- (A) 9/16      (B) 3/16  
 (C) 1/16      (D) 2/16
10. Human blood, when mixed with antibodies to human blood, will give maximum precipitation. If another animal's blood is mixed with antibodies

to human blood, the percentage of precipitation indicates evolutionary relationship with that animal. The following experimental results were obtained :

Species: Human (H) - 100%; M - 37%; N - 75%; O - 79%; P - 17%

Which phylogenetic tree would best represent these results?





# International Mathematics Olympiad

## LOGICAL REASONING

1. In the given letter series, some of the letters are missing which are given in that order as one of the options below it. Choose the correct option.

a\_cb\_a\_aba\_abc\_

- (A) cccbc (B) cbbac  
(C) bccba (D) abbba

2. There is a group of letters followed by four combinations of digits/symbols. You have to find out which of the combinations correctly represents the group of letters based on the following coding system and the conditions.

**Letter:** R D A E J M K T B U I P W H F

**Digit/** 4 8 5 \$ \* 1 2 6 % © 7 @ 3 9 #

**Symbol:**

**Conditions:**

- (i) If the first letter is a consonant and the last letter is a vowel, both are to be coded as d.  
(ii) If both the first and the last letters are consonants, both are to be coded as the

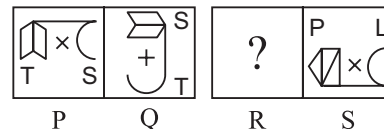
code for the last letter.

- (iii) If the first letter is a vowel and the last letter is a consonant, their codes are to be interchanged.

METUFB

- (A) %\$6©#1 (B) 1\$6©#1  
(C) %\$6©#% (D) 1\$6©#%

3. There is a definite relationship between figures P and Q. Establish a similar relationship between figures R and S by selecting a figure from the options that would replace (?) in figure R.



- (A) (B) (C) (D)

## MATHEMATICAL REASONING

4.  $\int \frac{dx}{[(x-1)^3(x+2)^5]^{1/4}} =$

- (A)  $\frac{4}{3} \left( \frac{x-1}{x+2} \right)^{1/4} + C$  (B)  $\frac{4}{3} \left( \frac{x+2}{x-1} \right)^{1/4} + C$   
(C)  $\frac{1}{3} \left( \frac{x-1}{x+2} \right)^{1/4} + C$  (D)  $\frac{1}{3} \left( \frac{x+2}{x-1} \right)^{1/4} + C$

5. Degree of the differential equation

$$\left[ 1 + 2 \left( \frac{dy}{dx} \right)^2 \right]^{3/2} = 5 \frac{d^2y}{dx^2} \text{ is}$$

- (A) 1 (B) 2  
(C) 3 (D) 4

6. The value of x for which the matrix product

$$\begin{bmatrix} 2 & 0 & 7 \\ 0 & 1 & 0 \\ 1 & -2 & 1 \end{bmatrix} \begin{bmatrix} -x & 14x & 7x \\ 0 & 1 & 0 \\ x & -4x & -2x \end{bmatrix}$$

equals an identity matrix is

- (A)  $\frac{1}{2}$  (B)  $\frac{1}{3}$   
(C)  $\frac{1}{4}$  (D)  $\frac{1}{5}$

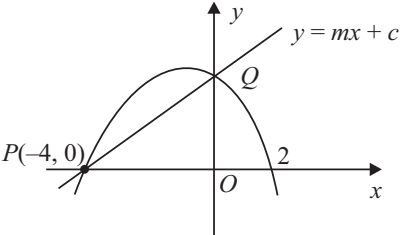
## EVERYDAY MATHEMATICS

7. A can lay railway track between two given stations in 16 days and B can do the same job in 12 days. With the help of C, they did the job in 4 days only. Then C alone can do the job in

- (A)  $9\frac{1}{5}$  days (B)  $9\frac{2}{5}$  days  
(C)  $9\frac{3}{5}$  days (D) 10 days

8. In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there?
- (A) 159  
(B) 194  
(C) 205  
(D) 209

### ACHIEVERS SECTION

9. Consider the following statements.  
**Statement 1** : A tangent parallel to  $x$ -axis can be drawn for  $f(x) = (x - 1)(x - 2)(x - 3)$  in the interval  $[1, 3]$ .  
**Statement 2** : A horizontal tangent can be drawn in Rolle's theorem.  
 Which of the following option hold?
- (A) Both statement 1 and statement 2 are true.  
 (B) Both statement 1 and statement 2 are false.  
 (C) Statement 1 is true, Statement 2 is false.  
 (D) Statement 1 is false, Statement 2 is true.
10. The diagram shows a quadratic curve and a straight line  $y = mx + c$ . They meet at the points  $P$  and  $Q$  on the  $x$ -axis and  $y$ -axis respectively.
- 
- (a) Find the equation of the quadratic curve.  
 (b) Find the values of  $m$  and  $c$  respectively.
- (a) (b)  
 (A)  $-x^2 - 2x + 8$  2, 8  
 (B)  $x^2 + 2x + 8$  6, 4  
 (C)  $x^2 - 2x - 8$  4, 6  
 (D)  $-x^2 - 2x + 8$  8, 2



# International English Olympiad

### WORD AND STRUCTURE KNOWLEDGE

**Direction :** Choose the best option.

1. Nobody in this team will never allow us to get too \_\_\_\_\_.  
 (A) Big for your boots  
 (B) Big for your pants  
 (C) Big for your size  
 (D) Big for your boot

**Direction :** Identify the incorrect part of the sentence.

2. (A) We recommend that you  
 (B) follow the formatted shown here  
 (C) when preparing notices  
 (D) to be displayed on the bulletin board formatted.

### READING

**Direction (Q. No. 3 to 6) :** Complete the gaps in this paragraph with the right option.

When her friends arrived, Suman \_\_\_\_\_3\_\_\_\_\_ chips and other snacks and her sister \_\_\_\_\_4\_\_\_\_\_ drinks. She went round the room \_\_\_\_\_5\_\_\_\_\_

glasses whenever she noticed that anyone needed a \_\_\_\_\_6\_\_\_\_\_.

- (A) Top-up (B) Handed round  
 (C) Poured out (D) Topping up

### SPOKEN AND WRITTEN EXPRESSION

**Direction (Q. No. 7 and 8) :** Choose the phrase that best completes the sentences.

7. If you are \_\_\_\_\_, you have extreme or very strong views.

8. If you are \_\_\_\_\_, you are in favour of new ideas.

- (A) Progressive (B) Innovative  
 (C) Diplomatic (D) Radical

## ACHIEVERS SECTION

**Direction : Choose the option which is closet in meaning to the underlined word.**

9. Dappled light filtered through the trees on to the ground.
- (A) Patches of                      (B) Rays  
(C) Stirring                        (D) Slanting

**Direction : Choose the best option.**

10. The RBI Governor said in a press conference that the nation's economy is \_\_\_\_\_ yet.
- (A) Out of the forests  
(B) Not out of the trees  
(C) Out of the trees  
(D) Not out of the woods

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SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK

ANSWERS

National Cyber Olympiad	National Science Olympiad	International Mathematics Olympiad	International English Olympiad
	<b>PHYSICS AND CHEMISTRY</b>		
1. (C) 2. (A) 3. (D)	1. (B) 2. (B) 3. (C)	1. (C) 2. (C) 3. (D)	1. (A) 2. (B) 3. (B)
4. (D) 5. (C) 6. (D)	4. (B) 5. (B) 6. (A)	4. (A) 5. (B) 6. (D)	4. (C) 5. (D) 6. (A)
7. (B) 8. (A) 9. (C)	7. (C) 8. (C)	7. (C) 8. (D) 9. (A)	7. (D) 8. (A) 9. (A)
10. (A)	<b>MATHEMATICS</b>	10. (A)	10. (D)
	9. (D) 10. (D)		
	<b>BIOLOGY</b>		
	9. (B) 10. (A)		