SCIENCE OLYMPIAD FOUNDATION

Sample Paper

SYLLABUS 2015-16

CLASS 11

SOF NATIONAL CYBER OLYMPIAD

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**

SYLLABUS

Section – 1 : Verbal and Non-Verbal Reasoning.

Section – 2 : History, Generation and Types of Computers, Working with OS, Input, Output & Memory Devices, Data Representation, Basics of IT, Internet Services and Protocols, HTML, MS-Word, MS-Excel, Networking, Viruses and Antiviruses, Introduction to C++ till Data Structures.

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

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

SOF NATIONAL SCIENCE OLYMPIAD

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**

SYLLABUS

Section – 1 : *Physics* : Units & Measurements, Mechanics, Properties of Matter, Heat & Thermodynamics, Oscillations, Waves.

Chemistry : Some Basic Concepts of Chemistry, Structure of Atom, Classification of Elements and Periodicity in Properties, Chemical Bonding and Molecular Structure, States of Matter, Thermodynamics, Equilibrium, Redox Reactions, Hydrogen, The s-Block Elements, The p-Block Elements (Groups 13 and 14), Organic Chemistry - Some Basic Principles and Techniques, Hydrocarbons, Environmental Chemistry.

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

Section – 3 : Sets, Relations and Functions, Principle of Mathematical Induction, Logarithms, Complex Numbers & Quadratic Equations, Linear Inequations, Sequences and Series, Trigonometry, Straight Lines, Conic Sections, Permutations and Combinations, Binomial Theorem, Statistics, Mathematical Reasoning, Limits and Derivatives, Probability, Introduction to 3-D Geometry. **OR**

Section – 3 : Diversity in the Living World, Structural Organisation in Plants and Animals, Cell : Structure and Functions, Plant Physiology, Human Physiology.

SOF INTERNATIONAL MATHEMATICS OLYMPIAD

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**

SYLLABUS

Section – 1 : Verbal and Non-Verbal Reasoning.

Section – 2 : Sets, Relations and Functions, Principle of Mathematical Induction, Logarithms, Complex Numbers & Quadratic Equations, Linear Inequations, Sequences and Series, Trigonometry, Straight Lines, Circles, Conic Sections, Permutations and Combinations, Binomial Theorem, Statistics, Mathematical Reasoning, Limits and Derivatives, Probability, Introduction to 3-D Geometry.

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.

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. Pointing to a person, Madhu says, "He is the son of my father's brother's only sister-in-law". How is the person related to Madhu?

(A) Son (B) Brother
(C) Nephew (D) Uncle

2. How many such pairs of letters are there in the word 'EXPERIMENT', each of which has as many letters between them in the word as they have in the English alphabet?

(A) None (B) One
(C) Two (D) Three

3. If '+' stands for subtraction; '–' stands for multiplication and '×' stands for division, then which one of the following equations is correct?

(A) 265 + 11 – 2 × 14 = 22
(B) 2 – 14 × 4 + 11 = 16
(C) 46 – 10 + 10 × 5 = 92
(D) 66 × 3 – 11 + 12 = 230

COMPUTERS AND INFORMATION TECHNOLOGY

4. A device that uses laser-beam scanning technology to read a combination of adjacent vertical lines based on their varying width and spaces between them is _____.

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

5. Which of the following is a point-to-point serial storage interface in which controllers are linked directly to drives?

(A) SCSI (B) RARP
(C) IGMP (D) IMAP

6. Which of the following is not correct?

(A) E-commerce includes all business activities involved in the development, facilitation and implementation of business communications and transaction through electronic media
(B) The Intranet is a restricted version of the Internet within a group of users
(C) The Extranet is a closed online network connecting two or more organisations
(D) None of these.

7. $(2AB)_{16}$ = (_____)$_2$.

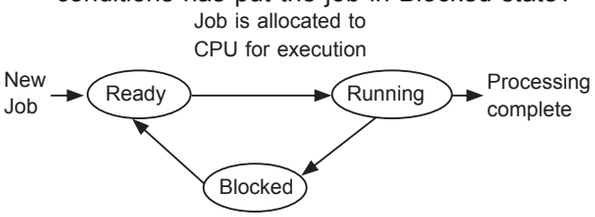
(A) 001010101011 (B) 0010101011
(C) 111000110101 (D) 001010101010

8. In printing process, when the output lines temporarily get stored in the disk drive until they are printed is called _____.

(A) Buffering (B) Spooling
(C) Paging (D) Indexing

ACHIEVERS SECTION

9. Given below is a process state diagram of time sharing system. Which of the following conditions has put the job in Blocked state?



(A) It has completed its execution.
(B) Job is waiting for I/O completion.
(C) Scheduler picks up the current process. It is being process by scheduler.
(D) Input output become available for the job.

10. Identify the following.

– It is a Windows 7 utility program.
– It is used to create new characters that can be inserted into documents using character maps.
– It can be accessed by typing eudcedit.exe in the run box.

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

National Science Olympiad

PHYSICS AND CHEMISTRY

1. Read the given statements and select the correct option.

Statement 1 : The formula connecting u,v and f for a spherical mirror is valid only for mirrors whose sizes are very small compared to their radii of curvature.

Statement 2 : Laws of reflection are strictly valid for plane surfaces, but not for large spherical surfaces.

(A) Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.

(B) Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.

(C) Statement 1 is true but statement 2 is false.

(D) Statement 1 is false but statement 2 is true.

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2. A boy throws a table tennis ball of mass 20 g upwards with a velocity of u_0 = 10 m/s at an angle θ_0 with the vertical. The wind imparts a horizontal force of 0.08 N, so that the ball returns to the starting point. Then, the angle θ_0 must be such that, tan θ_0 is

(A) 0.2 (B) 0.4

(C) 2.5 (D) 1.2

---

3. A weight is attached to the free end of a sonometer wire. It gives resonance at a length 40 cm when it is resonanced with a tuning fork of frequency 51 Hz. The weight is then immersed wholly in water, the resonant length is reduced to 30 cm. The relative density in which weight suspended is

(A) 16/9 (B) 16/7

(C) 16/5 (D) 16/3

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4. Hydrogen sulphide (H_2S) contains 94.11% sulphur, water (H_2O) contains 11.11% hydrogen and sulphur dioxide (SO_2) contains 50% oxygen. Find the ratio of all given elements. After your calculations which law has been verified?

(A) Law of multiple proportions

(B) Law of reciprocal proportions

(C) Law of constant compositions

(D) Law of combining volumes

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5. The number of structural and geometrical isomers for an alkene with the molecular formula C_5H_{10} is

(A) 4 (B) 6

(C) 3 (D) 5

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6. In the reaction,

$$4NH_{3(g)} + 5O_{2(g)} \rightarrow 4NO_{(g)} + 6H_2O_{(l)}$$

when 1 mole of ammonia and 1 mole of O_2 are made to react to completion :

(A) 1.0 mole of H_2O is produced

(B) 2.0 mole of NO will be produced

(C) All the oxygen will be consumed

(D) All the ammonia will be consumed

ACHIEVERS SECTION

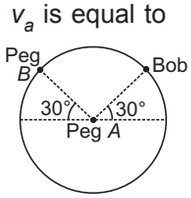
7. A bob is attached to one end of a string other end of which is fixed at peg A. The bob is taken to a position where string makes an angle of 30° with the horizontal. On the circular path of the bob in vertical plane there is peg B at a symmetrical position with respect to the position of bob as shown in the figure. If v_c and v_a be the minimum speeds in clockwise and anticlockwise directions respectively, given to bob in order to hit the peg B, then ratio $v_c : v_a$ is equal to

(A) 1 : 1

(B) 1: $\sqrt{2}$

(C) 1 : 2

(D) 1 : 4



8. A natural gas was containing mixture of methane and ethane only. On complete combustion of 10 litres of gas at STP, the heat evolved was 474.6 kJ. Assuming $\Delta H_{comb}CH_{4(g)}$ = –894 kJ/mol and $\Delta H_{comb}C_2H_{6(g)}$ = –1500 kJ/mol. The percentage of CH_4 and C_2H_6 will be respectively

(A) 30%, 70%

(B) 22%, 78%

(C) 72%, 28%

(D) 70%, 30%.

MATHEMATICS

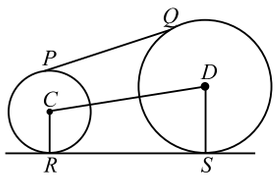
9. In the diagram, *PQ* and *RS* are common tangents to the two circles with centres *C* and *D*. The circles with centre *C* has a radius of 4 cm and the circle with centre *D* has a radius of 7 cm. Given that *CD* = 15 cm, calculate the approximate length of *RS*.

(A) 14.85 cm

(B) 13.70 cm

(C) 14.70 cm

(D) 15.30 cm



10. The value of

$$\cos\frac{\pi}{15}\cos\frac{2\pi}{15}\cos\frac{3\pi}{15}\cos\frac{4\pi}{15}\cos\frac{5\pi}{15}\cos\frac{6\pi}{15}\cos\frac{7\pi}{15} \text{ is}$$

(A) $\frac{1}{164}$

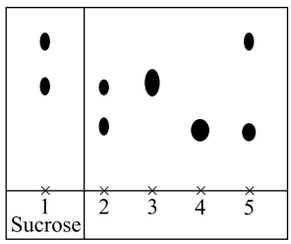
(B) $\frac{1}{138}$

(C) $\frac{1}{60}$

(D) $\frac{1}{128}$

BIOLOGY

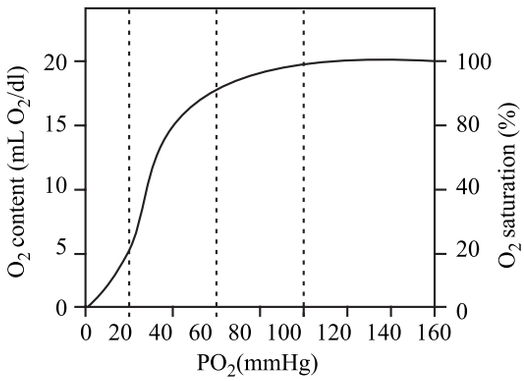
9. Five disaccharides were each hydrolysed with dilute acid, and the purified products were separated by one-dimensional chromatography. The final chromatogram is shown in the diagram below.



If spot 1 represents the products obtained from the hydrolysis of sucrose, which one of the following indicates the results obtained from the hydrolysis of lactose and maltose?

	Lactose	Maltose
(A)	2	3
(B)	2	4
(C)	5	2
(D)	5	3

10. Refer to the given graph and select the correct option for the question that follows.



How much oxygen will be released to the tissues by blood on passing from lungs to tissues?

(A) 15 mL of O_2/100 mL of blood

(B) 70 mL of O_2/100 mL of blood

(C) 5 mL of O_2/ 100 mL of blood

(D) 20 mL of O_2/ 100 mL of blood

IMO International Mathematics Olympiad

LOGICAL REASONING

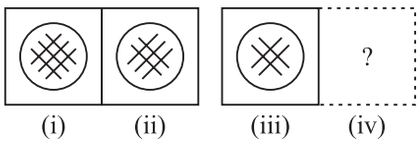
1. Mohit and Kunal are good in Hockey and Volleyball. Sachin and Mohit are good in Hockey and Baseball. Gaurav and Kunal are good in Cricket and Volleyball. Sachin, Gaurav and Rohit are good in Football and Baseball.

Who is good in Baseball, Cricket, Volleyball and Football?

(A) Sachin (B) Kunal

(C) Gaurav (D) Mohit

2. There is a certain relation between fig. (i) and (ii). Establish the same relationship between fig. (iii) and (iv) by selecting a suitable figure from the options which will replace the (?) in fig. (iv).



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

3. Select a figure from the options which satisfies the same conditions of placement of the dots as in Fig.(X).

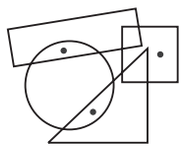
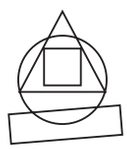
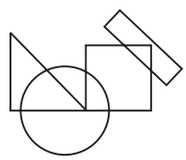
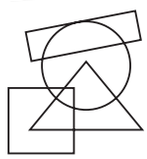
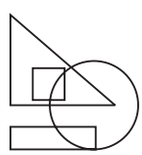


Fig.(X)

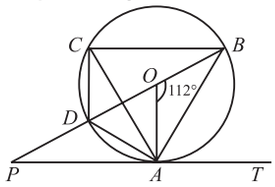
(A) 
(B) 
(C) 
(D) 

MATHEMATICAL REASONING

4. The value of the expression $3(\sin\theta - \cos\theta)^4 + 6(\sin\theta + \cos\theta)^2 + 4(\sin^6\theta + \cos^6\theta)$ is

(A) 1 (B) –1
(C) 13 (D) 0

5. In the given figure (not drawn to scale), a circle with centre *O* passes through *A*, *B*, *C* and *D*. *PDOB* is a straight line and *PAT* is a tangent to the circle. If $\angle AOB = 112°$ and $AD = DC$, then find $\angle APO$ and $\angle ACB$ respectively.



(A) 20°, 60° (B) 28°, 56°
(C) 22°, 56° (D) 38°, 68°

6. If $\frac{(a+ib)^2}{a-ib} - \frac{(a-ib)^2}{a+ib} = x + iy$, then the value of x is

(A) 0

(B) $\frac{6a^2b}{(a^2+b^2)^2}$

(C) $\frac{-2b^3}{(a^2+b^2)^2}$

(D) None of these

EVERYDAY MATHEMATICS

7. Rajan got married 8 years ago. His present age is $\frac{6}{5}$ times his age at the time of his marriage. Rajan's sister was 10 years younger to him at the time of his marriage. The present age of Rajan's sister is

(A) 32 years (B) 36 years
(C) 38 years (D) 40 years

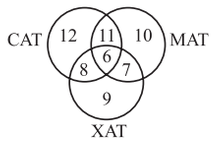
8. A toothed wheel of diameter 50 cm is attached to a smaller wheel of diameter 30 cm. How many revolutions will the smaller wheel make when the larger one makes 15 revolutions?

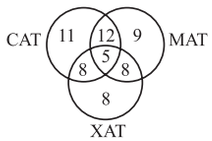
(A) 18
(B) 20
(C) 25
(D) 30

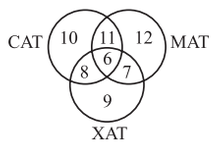
ACHIEVERS SECTION

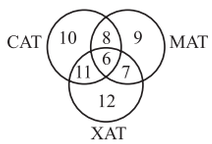
9. Which of the following Venn diagrams represent the given question?

A survey was conducted at a coaching institution and it was found that there were 34 students who appeared in MAT. There were 37 students who appeared in CAT of which 17 students appeared in MAT. 30 students appeared in XAT of which 13 students appeared in MAT. Of the XAT applicants (i.e., appeared students) 14 appeared in CAT and 6 appeared in all three.

(A) 

(B) 

(C) 

(D) 

10. Consider the following statements:

Statement-1 : Three non-zero real numbers a, b, c are in G.P., if $b^2 = ac$.

Statement-2 : If the quadratic equation $(a^2 + b^2)x^2 - 2(ab + bc)x + (b^2 + c^2) = 0$ has equal roots, then a, b, c are in G.P., a, b, c being non-zero real numbers.

Which of the following options is correct?

(A) Statement-1 is true, statement-2 is false.

(B) Statement-1 is false, statement-2 is true.

(C) Both statements are false.

(D) Both statements are true.

IEO International English Olympiad

WORD AND STRUCTURE KNOWLEDGE

Direction (Q. No. 1 and 2) : Choose the correct option.

1. The project manager wanted to know the _____ of the project I was working on.

(A) Hunky-dory (B) Spic and span

(C) Nook and cranny (D) Nitty-gritty

2. My father always _____ my mother's decision.

(A) Stand up (B) Stands by

(C) Calls off (D) Takes after

Direction : Choose one word that would fit in both the blanks.

3. (i) During the cyclone the _____ of the tree fell off.

(ii) The new bank has opened three _____ in rural areas.

(A) Leaves (B) Offices

(C) Branches (D) Routes

Direction : For each pair of words, find two words with the same sound but different spelling.

4. I cannot ___ to see any animal suffering. The giant pulled the roof off the house with his ____ hands.

(A) Bare,Beer (B) Bare, Bear

(C) Bear, Bare (D) Bear, Beer

READING

Direction (Q. No. 5 and 6) : Read the extract and answer the following questions.

Department stores in the capital region, suffering from a prolonged slump in sales, are changing tactics by marketing new products and making their displays more interesting.

Some stores are reducing the amount of floor space devoted to name brands in order to display more of their own house brands. Others are using existing floor space for their own speciality shops. Still others are targeting special segments of the population.

Stores that are developing their own brands are able to offer quality clothing at 30 percent off name-brand prices.

5. What has caused department stores to alter marketing strategies?

(A) Poor sales

(B) New tax regulations

(C) Lack of storage space

(D) Production costs

6. Which strategy is not being implemented?

(A) Marketing to specific groups

(B) Developing in-store brands

(C) Purchasing additional floor space

(D) Making displays more interesting.

SPOKEN AND WRITTEN EXPRESSION

Direction : Guess what the word in italics mean.

7. The ***precocious*** lad quickly mastered the German, Latin and principal Slavonic languages, frequently acting as his father's interpreter.

(A) Someone who is highly intelligent
(B) A boy who cannot focus
(C) A fit boy
(D) Someone who easily learns languages.

Direction : Choose the incorrect part of the sentence.

8. (A) The new brochures describing
(B) all our services were delivered
(C) to our late yesterday
(D) and were shipped out early tomorrow morning.

ACHIVERS SECTION

Direction : Choose the most appropriate option.

9. Everyone should have periodic eye examinations to make sure problems are quickly _____.

(A) Prepared (B) Discover
(C) Responded (D) Discovered

Direction : Reorder the jumbled sentences to make a cohesive paragraph.

10.

a. On the other hand, my mother is not so tall; she is a little fat, has brown hair and a fair complexion.

b. My father is dark, very tall and of medium weight.

c. However, they look nice together. Our parents' differences start with their appearance.

d. They don't look similar at all.

(A) cdab (B) bacd
(C) bdac (D) dbac

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK

ANSWERS

National Cyber Olympiad

1.	(B)	2.	(C)	3.	(D)
4.	(C)	5.	(A)	6.	(D)
7.	(A)	8.	(B)	9.	(B)
10.	(D)				

National Science Olympiad

PHYSICS AND CHEMISTRY

1.	(C)	2.	(B)	3.	(B)
4.	(B)	5.	(B)	6.	(C)
7.	(C)	8.	(C)		

MATHEMATICS

9.	(C)	10.	(D)

BIOLOGY

9.	(A)	10.	(C)

International Mathematics Olympiad

1.	(C)	2.	(C)	3.	(C)
4.	(C)	5.	(C)	6.	(A)
7.	(C)	8.	(C)	9.	(A)
10.	(D)				

International English Olympiad

1.	(D)	2.	(B)	3.	(C)
4.	(C)	5.	(A)	6.	(C)
7.	(A)	8.	(D)	9.	(D)
10.	(B)				