SCIENCE OLYMPIAD FOUNDATION

SAMPLE PAPER SYLLABUS 2016-17

NCO | NSO | IMO | IEO | ICSO

CLASS 12

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 : 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.

LOGICAL REASONING

1. If × stands for 'addition'; < stands for 'subtraction'; > stands for 'multiplication'; + stands for 'division'; – stands for 'equal to'; ÷ 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"?
   (A) 
   (B) 
   (C) 
   (D) 

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) Modem

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

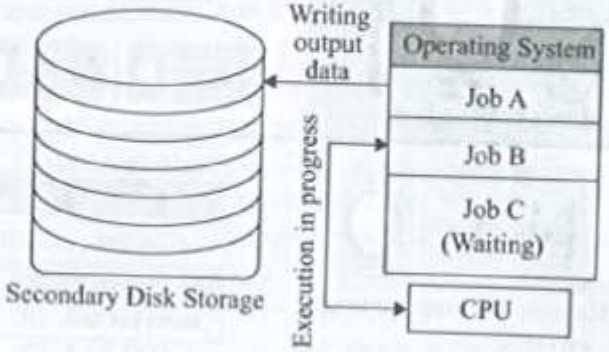
8. Aero shake feature of Windows 7 requires _____ shakes only in order to perform the task.
   (A) 3 (B) 2
   (C) 10 (D) 7

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

NSO
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* : 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.

PHYSICS AND CHEMISTRY

1. A ray of light passes from vacuum into a medium of refractive index μ, 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) $2\sin^{-1}(\mu/2)$

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) $C_0\left[\left(\frac{V_0}{V}\right)^{n}-1\right]$

3. 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.

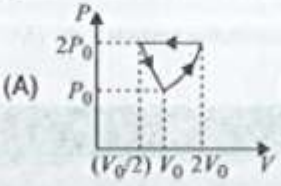
4. A metal X is prepared by the electrolysis of fused chlorides. It reacts with hydrogen to form a colourless solid from which hydrogen is released on treatment with water. The metal is
   (A) Al (B) Ca
   (C) Cu (D) Zn

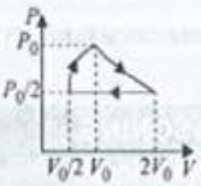
5. A 0.008 M solution of M_2SO_4 is isotonic with a 0.02 M solution of glucose at the same temperature. The apparent degree of dissociation is
   (A) 0.5 (B) 0.75
   (C) 1 (D) 0.25

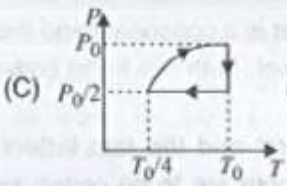
6. A compound 'X' when reacted with PCl_5 and then with NH_3 gives 'Y'. When 'Y' is treated with Br_2 and KOH, it produced 'Z'. 'Z' on treatment with $NaNO_2$ and HCl at 0°C and then warmed with water produced *ortho*-cresol. Compound 'X' is
   (A) *o*-toluic acid (B) *o*-chlorotoluene
   (C) *o*-bromotoluene (D) *m*-toluic acid

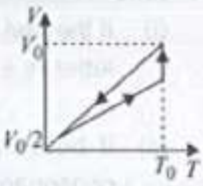
ACHIEVERS SECTION

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

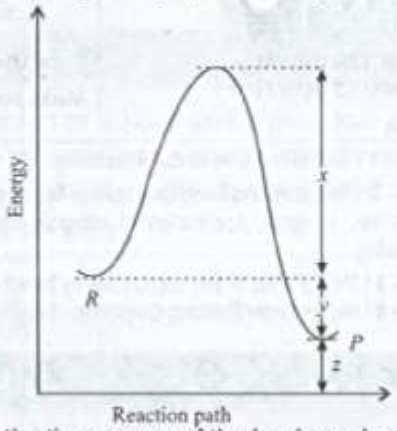
(A) 

(B) 

(C) 

(D) 

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 $\frac{dy}{dx} = f(x, y)\sqrt{\left(\frac{1-y^6}{1-x^6}\right)}$, 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

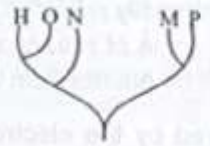
9. The allele for pea comb (P) in chickens is completely dominant to the allele for single comb (p). The alleles for black feather colour (B), and white feather colour (B') show codominance, so that BB' individuals possess blue feathers. If chickens heterozygous for both pairs of genes are mated, what proportion of offspring are expected to be pea combed and white feathered?

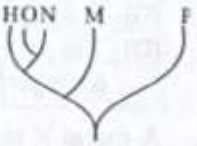
(A) 9/16 (B) 3/16
(C) 1/16 (D) 2/16

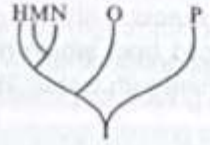
10. Human blood, when mixed with antibodies to human blood, will give maximum precipitation.
If another animal's blood is mixed with antibodies to human blood, the percentage of precipitation indicates evolutionary relationship with that animal. The following experimental results were obtained :

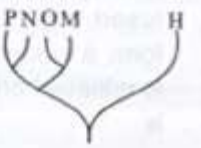
Species: Human (H) - 100%; M - 37%; N - 75%; O - 79%; P - 17%

Which phylogenetic tree would best represent these results?

(A) 

(B) 

(C) 

(D) 

IMO
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 : 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.

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_cbc_

(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/ Symbol:	4	8	5	$	*	1	2	6	%	©	7	@	3	9	#

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.

P Q R S

(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?

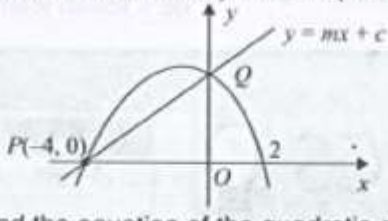
(A) Both statement 1 and statement 2 are true.

(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

IEO

SOF INTERNATIONAL ENGLISH OLYMPIAD

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.

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.

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 closest in meaning to the underlined word.

9. <u>Dappled</u> 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

ICSO

SOF INTERNATIONAL COMPANY SECRETARIES OLYMPIAD

Total Questions : 50 Time : 1 hr.

PATTERN & MARKING SCHEME					
Section	(1) Quantitative Aptitude & Reasoning	(2) Economics	(3) Business Studies	(4) Accountancy	(5) Achievers Section
No. of Questions	15	10	10	10	5
Marks per Ques.	1	1	1	1	3

SYLLABUS

Section – 1 : Sets and Relations, Functions, Complex numbers & Quadratic Equations, A.P & G.P, Permutations & Combinations, Probability, Linear Inequality, Matrices & Determinants, Limits & Derivatives, Applications of Derivatives, Verbal and Non- Verbal Reasoning.

Section – 2 : Indian Economics, Statistics, Micro, Macro.

Section – 3 : Nature and Significance of management, Principles of management, Business environment, Planning, Function of management, Financial Management.

Section – 4 : Introduction to Accounting, Theory Base of Accounting, Recording of Transaction, Bank Reconciliation Statement, Depreciation, Provision and Reserves, Bills of Exchange, Rectification of Errors, Financial statement for sole proprietorship/Not-For-Profit organisation, Accounting for Partnership Firms, Accounting for Companies, Analysis of Financial Statements and Ratio Analysis, Cash Flow Statements.

Section – 5 : Higher Order Thinking Questions - Syllabus as per Section – 2, Section – 3 and Section – 4.

QUANTITATIVE APTITUDE & REASONING

1. A die is thrown twice and the sum of the numbers appearing is observed to be 9. What is the conditional probability that the number 4 has appeared atleast once?
   (A) 1/2 (B) 2/3
   (C) 3/4 (D) None of these

2. Divide 20 into four parts which are in A.P. and such that the product of the first and fourth is to the product of the second and third in the ratio 2:3. Find the product of the first and fourth terms of the A.P.
   (A) 12 (B) 16
   (C) 20 (D) 25

3. Mehul went to the market and bought a few apples, mangoes and bananas. He bought a total of 42 fruits. The details of the fruits purchased is as follows :
   (i) The number of bananas is less than half the number of apples.
   (ii) The number of mangoes is more than 1/3rd the number of apples.
   (iii) The number of mangoes is less then 3/4th the number of bananas.
   How many apples and mangoes did Mehul buy?
   (A) 17 (B) 21
   (C) 26 (D) None of these

ECONOMICS

4. A consumer buys 17 units of a good at a price ₹ 10 per unit. When price falls to ₹ 8 per unit, the consumer buys 23 units. Using the expenditure approach, what will you say about price elasticity of demand of the good?
   (A) More than unit elastic
   (B) Less than unit elastic
   (C) Unit elastic
   (D) Perfectly elastic

5. Why externalities are a limitation of taking GDP as an index of welfare?
   (A) It helps GDP to rise.
   (B) GDP fails to value the cost of such factors.
   (C) It results in a decrease in GDP.
   (D) It will have no effect on GDP.

6. From the following data about government, find revenue deficit, fiscal deficit and primary deficit :
   Plan capital expenditure = 120
   Revenue expenditure = 100
   Non plan capital expenditure = 80
   Revenue receipts = 70
   Capital receipts net of borrowings = 140
   Interest payments = 30
   (A) Revenue deficit = 40, Fiscal deficit = 90, Primary deficit = 60
   (B) Revenue deficit = 30, Fiscal deficit = 90, Primary deficit = 60
   (C) Revenue deficit = 40, Fiscal deficit = 60, Primary deficit = 30
   (D) Revenue deficit = 30, Fiscal deficit = 60, Primary deficit = 30

BUSINESS STUDIES

7. Management is a process of
   (A) getting things done
   (B) achieving goals effectively
   (C) achieving goals efficiently
   (D) all of the above

8. The principles of management are significant because of
   (A) increase in efficiency
   (B) initiative
   (C) optimum utilization of resources
   (D) adaptation to changing technology

9. Planning may not guarantee success because
   (A) top level plans and middle level management implements
   (B) dynamics of business, environment may change
   (C) planning is futuristic
   (D) all of the above

10. *X*, *Y* and *Z* are partners sharing profit in the ratio of 5 : 3 : 2. They decide to share future profits in the ratio of 2 : 3 : 5 with effect from 1st April, 2016. They also decide to record the effect of following revaluations without affecting the book values of assets and liabilities, by passing single adjusting entry :

	Book Figure (in ₹)	Revised Figure (in ₹)
Land and Building	3,00,000	4,50,000
Plant and Machinery	4,50,000	4,20,000
Trade Creditors	1,50,000	1,35,000
Outstanding Rent	1,35,000	1,80,000

The necessary single adjusting entry will be :

(A) Dr. *Z* and Cr. *X* by ₹ 27,000
(B) Dr. *X* and Cr. *Z* by ₹ 27,000
(C) Dr. *Y* and Cr. *X* by ₹ 27,000
(D) Dr. *X* and Cr. *Y* by ₹ 27,000

11. *M* Ltd issued 10,000 shares of ₹ 50 each. The amount of share was payable as follows :

₹ 15, on application, ₹ 10 on allotment and balance of first and final call. Applications for 15,000 shares were received and allotment was made to all the applicants of pro-rata basis. Directors decided to adjust excess application money towards allotment. Calculate the amount transferred to Share Allotment.

(A) ₹ 60,000 (B) ₹ 70,000
(C) ₹ 85,000 (D) None of these

12. Depreciation is charged on

(A) Current Assets
(B) Fixed Assets
(C) Both Current and Fixed Assets
(D) None of these

ACHIEVERS SECTION

13. From the following information, calculate return on investment (or return on capital employed) :

Particulars	₹
Share Capital	5,00,000
Reserves and Surplus	2,50,000
Net Fixed Assets	22,52,000
Non-current Trade Investments	2,50,000
Current Assets	11,00,000
10% Long-term Borrowings	20,00,000
Current Liabilities	8,50,000
Long-term Provisions	NiL

Net Profit before Tax is ₹ 6,00,000.

(A) 29.09% (B) 39.09%
(C) 49.09% (D) 9.09%

14. Liberalisation means

(A) Integration among economies
(B) Reduced government controls and restrictions
(C) Policy of planned Disinvestments
(D) None of these

15. Explain how the production possibility curve is affected when resources are inefficiently employed in an economy?

(A) PPC will shift downward.
(B) PPC will shift upward.
(C) No change in PPC.
(D) Will move from one point to another on the same PPC.

SPACE FOR ROUGH WORK

ANSWERS

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

NSO – (PHYSICS AND CHEMISTRY) 1. (B) 2. (B) 3. (C) 4. (B) 5. (B) 6. (A) 7. (C) 8. (C)
(MATHEMATICS) 9. (D) 10. (D)
(BIOLOGY) 9. (B) 10. (A)

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

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

ICSO – 1. (A) 2. (B) 3. (D) 4. (A) 5. (B) 6. (D) 7. (D) 8. (A) 9. (B) 10. (C) 11. (D) 12. (B) 13. (A) 14. (B) 15. (C)