CLASS

12

SAMPLE PAPER

SCIENCE OLYMPIAD FOUNDATION

National Science Olympiad

The actual test paper has 50 questions. Time allowed : 60 minutes. There are 2 sections: 20 questions in section I and 30 in section II.

SYLLABUS

Section – I (Mathematics) : Sets, Relations and functions, Mathematical induction, Logarithms, Complex numbers, Linear inequations, Quadratic equations, Sequences and series, Trigonometry, Cartesian system of rectangular coordinates, Straight lines and family of straight lines, Circles, Conic section, Permutations and combinations, Binomial theorem, Exponential and logarithmic series, Mathematical logic, Statistics & Probability, Three dimensional geometry, Vectors, Stocks, Shares and debentures, Average and partition values, Index numbers, Matrices and determinants, Limits, Differential calculus, Integral calculus, Verbal and nonverbal reasoning.

OR

Section – I (Biology) : Reproduction, Genetics and Evolution, Biology in Human Welfare, Biotechnology, Ecology.

Section – II (Physics & Chemistry) : *Physics:* Electricity and Magnetism, Electromagnetic induction, AC, E.M. Waves, Optics, Modern physics, Solids & semiconductor devices, 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.

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MATHEMATICS

1. A large watermelon weighs 20 kg with 98% of its weight being water. It is left to stand in the sun and some of the water evaporates so that now only 95% of its weight is water. What is its reduced weight?
(A) 17 kg (B) 19.4 kg (C) 10 kg (D) 8 kg

2. Four bags were to be weighed but the scale could weigh only weights in excess of 100 kg. If the bags were weighed in pairs and the weights were found to be 103, 105, 106, 107 and 109, then the weight of the lightest bag is
(A) 50 kg (B) 51 kg (C) 49 kg (D) 52 kg

3. A plane flies from A to B and back again with a constant engine speed. Turn-around time may be neglected. Will the travel time be more with a wind of constant speed blowing in the direction from A to B than in still air?
(A) Yes (B) No
(C) Depends on the engine (D) Insufficient data

4. Given four points in space which are not in a plane, the number of planes which are equidistant from all the four points is
(A) 7 (B) 3 (C) 5 (D) 6

OR

BIOLOGY

1. Gametophytic self incompatibility differs from sporophytic self incompatibility in that
(A) It allows germination of pollens
(B) It occurs due to incompatibility of stigma
(C) It occurs due to incompatibility of sporophytic tissues
(D) It occurs due to incompatibility of pollens.

2. XO-chromosomal abnormality in human beings causes
(A) Turner's syndrome (B) Down's syndrome
(C) Klinefelter's syndrome (D) None of these.

3. The best definition of an ecosystem is
(A) The inter-relationship between producers, consumers and decomposers of an environment
(B) A stable co-existence of dominant species in an environment
(C) A natural unit including plants, animals and non-living constituent of the environment
(D) A number of population of organisms of different species

4. The main reason why antibiotics could not solve all the problems of bacteria mediated diseases is
(A) Insensitivity of the individual following prolonged exposure to antibiotics
(B) Inactivation of antibiotics by bacterial enzymes
(C) Decreased efficiency of the immune system
(D) The development of mutant strains resistant to antibiotics.

PHYSICS & CHEMISTRY

5. 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

6. Mortar is a mixture of
(A) $Ca(OH)_2$, Silica and Water (B) $CaCO_3$ and SiO_2
(C) CaO and Silica (D) $CaCO_3$, SiO_2 and Water

7. 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) $2\sin^{-1}(\mu/2)$

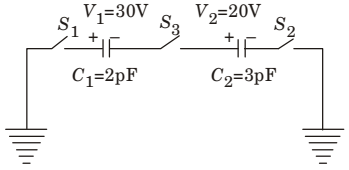
8. What causes the tail of the comet?
(A) Centrifugal force pushes away the gases (B) Lighter gases are left behind during the orbital motion
(C) Tail of comet always exists but becomes visible near the sun.
(D) The radiation pressure from the sun causes the tail

9. A freshly prepared radioactive source of half-life 2 hr. emits radiation of intensity which is 64 times the permissible safe level. The minimum time after which it would be possible to work safely with this source is
(A) 128 hr (B) 24 hr (C) 6 hr (D) 12 hr

10. A radio capacitor of variable capacitance is made of n plates each of area A and separated from each other by constant distance d. The alternate plates are connected together, one group of alternate plates is fixed while the other is movable. Find the maximum capacitance.
(A) $\frac{n\varepsilon_0 A}{2d}$ (B) $\frac{(n-1)\varepsilon_0 A}{d}$ (C) $\frac{2n\varepsilon_0 A}{d}$ (D) $\frac{2(n-1)\varepsilon_0 A}{d}$

11. 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

12. For the circuit shown in figure, which of the following statements is true?
(A) With S_1 closed, V_1 = 15 V, V_2 = 20 V
(B) With S_3 closed, $V_1 = V_2$ = 25 V
(C) With S_1 and S_2 closed, $V_1 = V_2 = 0$
(D) With S_1 and S_3 closed, V_1 = 30 V, V_2 = 20 V.



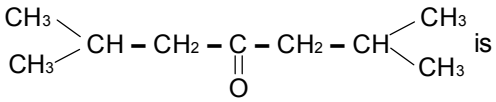
13. The solution in which the blood cells retain their normal form are with regard to the blood is
(A) Isotonic (B) Hypertonic
(C) Hypotonic (D) Suspension

14. An organic compound X contains Y and Z impurities. Their solubility differs slightly. They may be separated by
(A) Simple crystallisation (B) Fractional crystallisation
(C) Sublimation (D) Fractional distillation

15. A binary liquid solution of n-heptane and ethyl alcohol is prepared. Which of the following statements correctly represents the behaviour of this liquid solution?
(A) The solution formed is an ideal solution
(B) The solution formed is a non-ideal solution with negative deviation from Raoult's law
(C) The solution formed is a non-ideal solution with positive deviation from Raoult's law
(D) Normal heptane exhibits positive deviation whereas ethyl alcohol exhibits negative deviation from Raoult's law.

16. $(NH_4)_2Cr_2O_7$ on heating liberates a gas. The same gas will be obtained by
(A) Heating NH_4NO_2 (B) Heating NH_4NO_3
(C) Treating H_2O_2 with NaO_2 (D) Treating Mg_3N_2 with H_2O

17. 2.2 kW power is transmitted through a 10 Ω line at 22000 V. The power loss in the form of heat is
(A) 110 W (B) 10 W (C) 1 W (D) 0.1 W

18. The IUPAC name of  is
(A) 2,4-dimethylhexanone-3 (B) 2,6-dimethylheptanone-4
(C) 2,6-dimethylhexanone-4 (D) 2,6-dimethylheptanone-5

19. A planoconvex lens is 3 mm thick. When seen through the plane side, thickness appears to be 2.18 mm and when seen through the curved side it appears to be 2 mm. The refractive index of material of lens is
(A) 1.5 (B) 1.37 (C) 4/3 (D) 2

20. For a certain indicator HIn. $K_{In} = 1 \times 10^{-6}$ The undissociated HIn has a red colour; the anion In^- has a yellow colour. The colour of the indicator in a solution of pH = 8.0 will be
(A) Red (B) Orange
(C) Yellow (D) Green

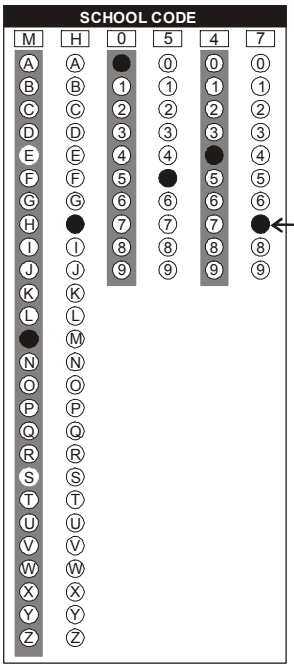
SAMPLE ANSWER SHEET

1. NAME : If your name is SACHIT A IYER, then you should write as follows :

S	A	C	H	I	T		A		I	Y	E	R													

2. Father's Name : If your father's name is SATISH KUMAR SHARMA, then you should write as follows :

S	A	T	I	S	H		K	U	M	A	R		S	H	A	R	M	A							

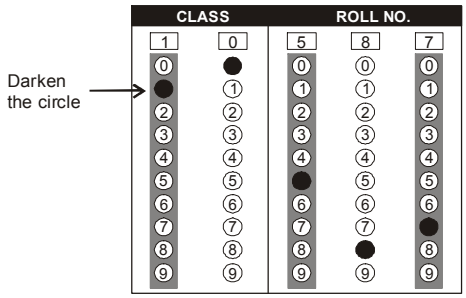


3. SCHOOL CODE
Write your school code i.e. if your school code is MH0547 darken as follows :

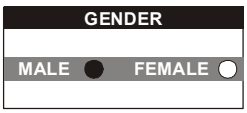
Darken the circle

4. CLASS
If you are in Class 10, then you should darken as follows :

5. ROLL NO.
If your roll no. is 587, then you should write and darken the circles as follows :



6. GENDER
If you are a boy, then darken **Male** circle



7. If your choice for Answer 1 is C, then you should darken the circle as follows : **1.** Ⓐ Ⓑ ● Ⓓ

MARK YOUR ANSWERS WITH HB PENCIL/BALL POINT PEN (BLUE/BLACK)

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1.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	**5.**	Ⓐ	Ⓑ	Ⓒ	Ⓓ	**9.**	Ⓐ	Ⓑ	Ⓒ	Ⓓ	**13.**	Ⓐ	Ⓑ	Ⓒ	Ⓓ	**17.**	Ⓐ	Ⓑ	Ⓒ	Ⓓ
2.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	**6.**	Ⓐ	Ⓑ	Ⓒ	Ⓓ	**10.**	Ⓐ	Ⓑ	Ⓒ	Ⓓ	**14.**	Ⓐ	Ⓑ	Ⓒ	Ⓓ	**18.**	Ⓐ	Ⓑ	Ⓒ	Ⓓ
3.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	**7.**	Ⓐ	Ⓑ	Ⓒ	Ⓓ	**11.**	Ⓐ	Ⓑ	Ⓒ	Ⓓ	**15.**	Ⓐ	Ⓑ	Ⓒ	Ⓓ	**19.**	Ⓐ	Ⓑ	Ⓒ	Ⓓ
4.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	**8.**	Ⓐ	Ⓑ	Ⓒ	Ⓓ	**12.**	Ⓐ	Ⓑ	Ⓒ	Ⓓ	**16.**	Ⓐ	Ⓑ	Ⓒ	Ⓓ	**20.**	Ⓐ	Ⓑ	Ⓒ	Ⓓ

ANSWERS

National Science Olympiad

MATHEMATICS : 1. (B) 2. (B) 3. (A) 4. (A)

BIOLOGY : 1. (D) 2. (A) 3. (C) 4. (D)

PHYSICS & CHEMISTRY : 5. (B) 6. (A) 7. (B) 8. (D) 9. (D) 10. (B) 11. (C) 12. (D) 13. (A) 14. (B) 15. (C) 16. (A) 17. (D) 18. (B) 19. (A) 20. (C)