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**Level - 1** : All Level-1 successful\* participants will get certificate, aptitude report and online subscription, and school toppers will be eligible for school hero medals.

**Level - 2** : School toppers\* will be selected for level-2-National level - online computer based interactive test held at exam centres all over India. Besides selection for level-3, winner will get merit certificate, medals, educational CDs, laptop, scholarship and other prizes. There is no level 2 in G.K. and Biotech.

**Level - 3** : Toppers will qualify# for level 3-International level-where you will compete with students globally. Get selected for EHF's International Olympiad training camp. Only Indian organization giving students exposure to global competitions. Represent India & win laurels. Guidance by top scientists. Prizes ranges from cash (millions of \$), gadgets, foreign trips, publicity, fame, scholarships, Internships, conference participation and more. Level 3 is in Maths, Science & Cyber only.

\* See prospectus/website for details

- You are allowed additional 10 minutes to fill the required details in the **RESPONSE SHEET (OMR)**. **STUDENTS OF CLASS 1 & 2 HAVE TO UNDERLINE** THE CORRECT ANSWER IN THE QUESTION PAPER ITSELF. THEY ARE NOT REQUIRED TO USE THE RESPONSE SHEET (OMR). THEY HAVE TO FILL THEIR NAME, ROLL NUMBER, CLASS, SCHOOL NAME IN THE SPACE PROVIDED IN THE QUESTION PAPER.
- The question paper is made as per syllabus guidelines & pattern given in the information Booklet. The Question Paper for Classes 1 to 6 contains 25 Questions each to be answered in 40 minutes. The Question paper for classes 7 to 12 contains 50 Questions each to be answered in 60 minutes. All questions are compulsory. Further instructions are given in the instruction letter to the teacher.
- Use the response sheet to mark your responses by darkening the required circle. The response sheet has to be returned to the foundation, duly filled in. The student can retain the Question Paper except for classes 1 and 2.

**NATIONAL  
BIOTECHNOLOGY  
OLYMPIAD**

**N B T O**

**12**  
Class

**A1**  
Paper  
Code

**L E V E L - 1**



## GENERAL KNOWLEDGE

- The piece of equipment that introduces DNA into cells via DNA-coated micro projectiles is known as
  - Laser
  - DNA probe
  - Gene run
  - None of these
- An animal, that has gained new genetic information from the acquisition of foreign DNA, is considered as
  - A chimera
  - A transgenic animal
  - A vector
  - None of these
- The advantage of using DNA polymerases from thermophilic organisms in PCR is that
  - The DNA polymerases of these bacteria are much faster than those from other organisms
  - The DNA polymerase of these bacteria can withstand the high temperatures needed to denature the DNA strands
  - The DNA polymerases of these bacteria never make mistakes while replicating DNA
  - All of these
- Which of the following enzyme is used to synthesise DNA using mRNA template
  - Taq polymerase
  - Alkaline phosphatase
  - Reverse transcriptase
  - None of these
- Which of the following is used to cut DNA molecule internally?
  - Restriction enzymes
  - Restriction endo-nuclease
  - Restriction exonuclease
  - Ribonuclease H
- The water pollution in rivers is measured by the dissolved amount of
  - Nitrogen
  - Oxygen
  - Chlorine
  - None of these

7. Klenow enzyme is the product of enzymatic breakdown of
- (1) DNA polymerase I
  - (2) DNA polymerase II
  - (3) DNA polymerase III
  - (4) RNA polymerase
8. Which one of the following plants is effective in reducing water pollution and is also useful for producing biogas?
- (1) Water hyacinth
  - (2) Salvinia
  - (3) Lotus
  - (4) None of these
9. 'Green house effect' means
- (1) Pollution in houses in tropical region
  - (2) Trapping of solar energy due to atmospheric oxygen
  - (3) Trapping of solar energy due to atmospheric carbon dioxide
  - (4) None of these
10. Which of the following is a non-conventional source of energy present in rural India ?
- (1) Biogas
  - (2) Cow-dung cake
  - (3) Wood
  - (4) None of these.
- (2) At an angle of  $19^\circ$  with the vertical towards the west.
  - (3) At an angle of  $20^\circ$  with the vertical towards the east.
  - (4) None of these
14. After the first photons of light are produced, which process is responsible for amplification of the light?
- (1) Blackbody radiation
  - (2) Stimulated emission
  - (3) Planck's radiation
  - (4) Einstein oscillation
15. Breaking of a larger hydrocarbon molecule into a smaller one by heating in the presence of a catalyst is called
- (1) Cracking
  - (2) Orthofugation
  - (3) Centrifugation
  - (4) Thermogenation
16. A metallic bond is an
- (1) Ionic bond
  - (2) Electrostatic bond
  - (3) Polar covalent
  - (4) None of these
17. Consider the reaction  $A + B \rightleftharpoons 2C$  The initial molar concentration of the reactants A and B were 0.1M and 0.2M respectively. When equilibrium was attained, the concentration of A in the reaction mixture was found to be 0.06 M. Then the equilibrium constant will be
- (1) 0.69
  - (2) 0.68
  - (3) 0.67
  - (4) None of these
18. The oxidation number of hydrogen in NaH will be
- (1) -1
  - (2) +1
  - (3) +2
  - (4) None of these
19. Propene when heated with chlorine at about  $500^\circ\text{C}$  forms
- (1)  $\text{CH}_3\text{-CHCl-CH}_2\text{Cl}$
  - (2)  $\text{CH}_2\text{Cl-CH=CH}_2$
  - (3)  $\text{CH}_2\text{CL-CHCl-CH}_2\text{Cl}$
  - (4) None of these.
20. Combustion is an exothermic reaction and the enthalpy of combustion is always
- (1) Positive
  - (2) Negative
  - (3) Zero
  - (4) None of these

## SECTION B : PHYSICS & CHEMISTRY

11. Which is the only vector quantity out of the following?
- (1) Moment of a spinning
  - (2) Charge of a gold leaf electroscope
  - (3) Electrostatic potential
  - (4) None of these
12. A body is attached to a spring balance suspended from a stand. The reading on the balance is 0.5 kg. The two together are detached from the stand and allowed to fall through a height. While falling the reading in the balance will be
- (1) More than 0.5 kg
  - (2) Less than 0.5 kg but not zero
  - (3) Zero
  - (4) None of these
13. Rain is falling vertically with a speed of 35 m/s. A girl rides a bicycle with a speed of 12 m/s in the east to west direction. What is the direction in which she should hold her umbrella?
- (1) At an angle of  $18^\circ$  with the vertical towards the east.



34. Two balls are drawn at random from a bag containing 2 white, 3 red, 5 green and 4 black balls, one by one without replacement. Find the probability that both the balls are of different colours.

- (1) 0.68                      (2) 0.78  
 (3) 0.88                      (4) None of these

35. Find the equation of a line which divides the line joining (1, 0) and (3, 0) in the ratio 2:1 and perpendicular to it.

- (1)  $4x = 6$                       (2)  $3x = 7$   
 (3)  $5x = 8$                       (4) None of these

36. How many different signal can be made from 4 red, 2 white and 3 green flags by arranging all of them vertically on a flagstaff?

- (1) 1450                      (2) 1368  
 (3) 1260                      (4) None of these

37. Find the domain and range of the following real valued function  $f(x) = \sqrt{x-1}$

- (1) Domain =  $(1, \infty)$ , Range =  $(0, \infty)$   
 (2) Domain =  $(\infty, 1)$ , Range =  $(\infty, 2)$   
 (3) Domain =  $(-1, \infty)$ , Range =  $(0, \infty)$   
 (4) None of these

38. If  $\sin \theta = \frac{12}{13}$  and  $\theta$  lies in the second quadrant, find the value of  $\sec \theta + \tan \theta$

- (1) -13                      (2) -12  
 (3) 5                      (4) None of these

39. In how many ways can 21 identical books on English and 19 identical books on Hindi be placed in a row on a shelf so that two books on Hindi may not be together?

- (1) 1540                      (2) 1450  
 (3) 1360                      (4) None of these

40. Find the square root of the complex number  $1 - i$

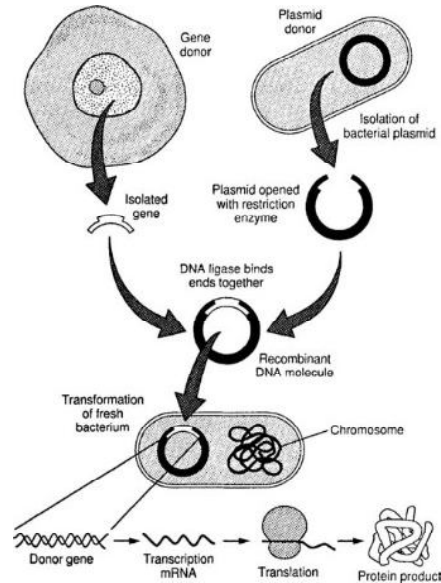
- (1)  $\pm \left\{ \left( \frac{\sqrt{3}+1}{2} \right) - \left( \frac{\sqrt{3}-1}{2} \right) i \right\}$   
 (2)  $\pm \left\{ \left( \frac{\sqrt{2}+1}{2} \right) - \left( \frac{\sqrt{2}-1}{2} \right) i \right\}$

(3)  $\pm \left\{ \left( \frac{\sqrt{1}+1}{2} \right) - \left( \frac{\sqrt{1}-1}{2} \right) i \right\}$

- (4) None of these

**SECTION C : BIOLOGY**

21. Restriction endonucleases (Restriction enzymes) are used for



- (1) Used for invitro DNA synthesis  
 (2) Synthesized by bacteria  
 (3) Used in genetic engineering  
 (4) Present in mammalian cells for degradation of DNA

22. Transgenic animals are those which have receptivity

- (1) Foreign RNA in all its cells  
 (2) Foreign DNA in all its cells  
 (3) Foreign DNA in some of its cells  
 (4) Both 1 and 2

23. Which of the following structure is associated with reflex arc?

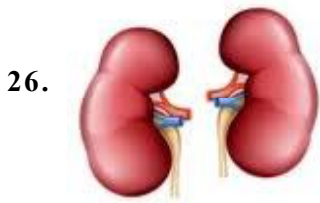
- (1) Cerebrum                      (2) Cerebellum  
 (3) Spinal cord                      (4) None of these

24. All of the following molecules are carbohydrates except:

- (1) Lactose                      (2) Haemoglobin  
 (3) Cellulose                      (4) None of these

25. A humming bird feeds on the nectar of a flowering plant. In this process the bird gains nutrition and spreads the plants pollen to other flowers. The relationship by which hummingbirds and flowering plants can be described as.

- (1) Mutualism                      (2) Commensalism  
(3) Parasitism                      (4) None of these



A portion of the human excretory system is represented in the above diagram. The order in which urine flows through the system is

- (1) Kidney → Ureter → Bladder → Urethra  
(2) Ureter → Kidney → Bladder → Urethra  
(3) Urethra → Bladder → Ureter → Kidney  
(4) None of these

27. Phenylketonuria is an example of an inborn error of metabolism. The “error” refers to

- (1) Mutation in the gene for hepatic enzyme  
(2) Atrophy of endocrine glands  
(3) Hormonal overproduction  
(4) None of these

28. Poison glands of snakes are homologous to

- (1) Salivary glands of vertebrates  
(2) Sebaceous glands of mammals  
(3) Electric organs of fishes  
(4) None of these

29. The most complex multi-enzymes are active at acidic pH of?

- (1) Ribosomes  
(2) Biological membrane  
(3) Both of the above  
(4) None of these

30. One of the conditions for self pollination in flowers is

- (1) Flowers should be chasmogamous so that perianth should open  
(2) Flowers may be bisexual but with sterile anthers  
(3) Dehiscence of anthers and receptivity of stigma should be simultaneous  
(4) None of these

31. Nucleoside is formed by

- (1) Nitrogenous base and pentose sugar  
(2) Nitrogenous base and phosphate  
(3) Nitrogenous base, fructose sugar and phosphate group  
(4) None of these

32. Which of the following organelles are associated with photorespiration and detoxification?

- (1) Ribosomes                      (2) Lysosomes  
(3) Peroxisomes                      (4) None of these.

33. Pollination induces the abscission of all floral organs except

- (1) Pistil                                      (2) Ovary  
(3) Sepal                                      (4) None of these.

34. Purple cabbage leaves do not lose their colour in cold water but do so in boiling water because

- (1) The pigment is not soluble in boiling water  
(2) The plasma membrane gets killed in boiling water  
(3) Hot water can enter the cells readily  
(4) None of these

35. The decrease in the rate of photosynthesis at high concentration of oxygen is called

- (1) Pasteur effect  
(2) Warburg effect  
(3) Emerson effect  
(4) None of these

36. The diagrammatic representation of chromosomes of an organism arranged according to their size is called

- (1) Genotype                      (2) Idiogram  
(3) Karyotype                      (4) None of these

37. The generalization that cell arise only from pre-existing cells was made by

- (1) Rudolf Virchow  
(2) Schleiden and Schwann  
(3) Anton Van Leeuwenhock  
(4) None of these.

38. The amount of DNA present in a cell

- (1) Is at a constant level during the life of the cell.  
(2) Continues to increase during mitosis  
(3) Increases sharply during the period  
(4) None of these

39. Which of the following is an example for a fresh water ecosystem?  
 (1) Estuary (2) Ocean  
 (3) Pond (4) None of these
40. Which statement about chloroplasts is false?  
 (1) They are organelles with a double membrane  
 (2) They are found in prokaryotic and eukaryotic cells  
 (3) They contain ATP  
 (4) None of these
- ETG INTERACTIVE SECTION**
41. The initial step in the biosynthesis of ATP by chemiosmosis in the mitochondrion is the  
 (1) Accumulation of sufficient inorganic phosphate by active transport  
 (2) Removal of phosphate from glucose-6-phosphate  
 (3) Pumping of protons into the outer compartment  
 (4) None of these
42. Which statement best explains the decreased effectiveness of the insecticide?  
 (1) The insecticide caused mutations that resulted in immunity in the mosquito.  
 (2) Mosquitoes resistant to the insecticide lived and produced offspring  
 (3) The insecticide reacted chemically with the DNA of the mosquitoes  
 (4) None of these
43. A molecular technique in which DNA sequences between two obigonucleotide primers can be amplified is known as  
 (1) Southern blotting  
 (2) Northern blotting  
 (3) Polymerase chain reaction  
 (4) DNA replication
44. What does the term gene pool mean ?  
 (1) Total number of different kinds of genes pooled by all the members of a population  
 (2) Harmful micro-organisms in a pool  
 (3) Total number of micro-organisms found in a swimming pool  
 (4) None of these.
45. The southern blotting technique depends on  
 (1) Similarities between the sequences of probe DNA and experimental DNA  
 (2) Similarities between the sequences of probe RNA and experimental RNA  
 (3) Similarities between the sequences of probe protein and experimental protein  
 (4) None of these.
46. Problems in obtaining large amount of proteins encoded by recombinant gene can often be overcome by using  
 (1) BACS (2) Expression vectors  
 (3) YACS (4) All of these
47. In monoclonal antibody technology, tumor cells that can replicate endlessly are fused with mammalian cells that produce an antibody. The result of this cell fusion is a  
 (1) Hybridoma (2) Myeloma  
 (3) Natural Killer cell (4) Lymphoblast
48. Agrobacterium tumefaciens is  
 (1) A disease in humans that causes lose of sight  
 (2) A bacterium that can be used to introduce DNA into plants  
 (3) A fungi that is used to produce antibiotics in large amount  
 (4) None of these
49. In genetic engineering, a chimera is  
 (1) An enzyme that links DNA molecules  
 (2) A plasmid that contains foreign DNA  
 (3) A virus that infects bacteria  
 (4) None of these
50. In an attempt to improve the efficiency of photosynthesis and increase crop yield, biotechnologists have focussed their efforts on the process of carbon fixation. What is the most logical strategy that would improve this process?  
 (1) Genetically modify the plant to reduce the loss of CO<sub>2</sub> by eliminating respiration  
 (2) Genetically modify the plant to change it from one using C<sub>4</sub> carbon fixation to C<sub>3</sub> carbon fixation  
 (3) Modify the protein RuBP to increase its affinity for CO<sub>2</sub>  
 (4) None of these



**END OF THE EXAM**

