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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 Art, G.K. and Biotech.

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*# See prospectus/website for details

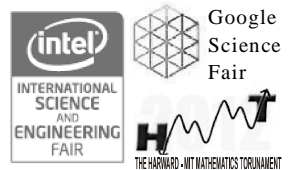
- You are allowed additional 10 minutes to fill the required details in the **RESPONSE SHEET (OMR)**. **STUDENTS OF CLASS 1 & 2 HAVE TO UNDERLINE** THE CORRECT ANSWER IN THE QUESTION PAPER ITSELF. THEY ARE NOT REQUIRED TO USE THE RESPONSE SHEET (OMR). THEY HAVE TO FILL THEIR NAME, ROLL NUMBER, CLASS, 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.**
- Students can attempt either Maths or Biology as optional.

EHF
NATIONAL
BIOTECHNOLOGY
OLYMPIAD

N B T O

11
Class **A1**
Paper Code

L E V E L - 1



GENERAL KNOWLEDGE

- Which technique is used to introduce genes into dicots?
 - Electroporation
 - Microinjection
 - Ti plasmid infection
 - None of these
- Plants containing genes encoding cytokines and blood clotting factors are used in:
 - Nutrition improvement
 - Pharmaceutical production
 - Vaccine production
 - None of these
- If we want to create a plant resistant to an insecticide, which cell based plant technology would be most effective?
 - Cybridization
 - Mutant selection
 - Protoplast fusion
 - None of these
- Which gene was used for creating the delayed ripening tomato?
 - Silenced gene
 - Altered gene
 - Relocated gene
 - None of these
- Creating a portion of an ecosystem in a laboratory:
 - Mibridization
 - Rhizosecretion
 - Microcosm
 - None of these
- Two genes from a bacterium *Alcaligenes eutrophus* and a cotton gene produce:
 - A vaccine against the bacterium
 - A pharmaceutical product
 - A plastic
 - None of these
- What does Antisense technology do?
 - It selectively blocks expression of a gene
 - It combines genetic material from different species
 - It alters or transfers cells
 - None of these

8. In a _____ protocol, bacteria with engineered abilities to detoxify pollutants are intentionally released in an area:
- (1) Rhizosecretion (2) Bioremediation
(3) Microcosm (4) None of these
9. Which recyclable commodity is most valuable?
- (1) Paper (2) Plastic
(3) Aluminium (4) None of these
10. Which human activity causes ozone depletion?
- (1) Smoke from vehicles
(2) Cigarette smoking
(3) Industrial halocarbons
(4) None of these

SECTION B : PHYSICS & CHEMISTRY

11. Two coils of self-inductances L_1 and L_2 are placed so close together that effective flux in one coil is completely linked with the other. If M is the mutual inductance between them then:
- (1) $M = \sqrt{L_1 L_2}$ (2) $M = L_1/L_2$
(3) $M = (L_1 L_2)^2$ (4) None of these
12. Chlorine can be liberated from potassium chloride solution by the action of:
- (1) Potassium iodide (2) Sodium chloride
(3) Fluorine (4) None of these
13. The molecular weight of a gas is 128. The weight of 8.21 litres at 3 atmospheric pressure and 27°C is:
- (1) 64 g (2) 128 g
(3) 82.1 g (4) None of these
14. Cloudy nights are usually warmer because:
- (1) Clouds do not radiate heat
(2) Clouds have low thermal conductivity
(3) Clouds do not absorb heat
(4) None of these
15. Let R be the radius of a soap bubble and σ be the surface tension of it. If p be the excess of pressure inside the soap bubble, then:
- (1) $P \propto R \sigma$ (2) $P \propto \frac{R}{\sigma}$
(3) $P \propto \frac{\sigma}{R}$ (4) None of these
16. Ammonia is considered to be a lewis base because of:
- (1) Polarity of the molecule
(2) High volatility

- (3) Presence of lone pair of electrons
(4) None of these
17. When a colourless gas is passed through bromine water only decolourisation takes place. The gas will be:
- (1) HCl (2) SO_2
(3) HBr (4) None of these
18. If g is the acceleration due to gravity on the earth's surface, the gain in potential energy of an object of mass m raised from the surface of the earth to a height equal to the radius R of the earth is:
- (1) $2 mg R$ (2) $\frac{1}{2} mg R$
(3) $\frac{1}{4} mg R$ (4) None of these
19. A beam of electrons passes undeflected through mutually perpendicular electric and magnetic fields. If the electric field is switched off and the same magnetic field is maintained, the electrons move:
- (1) Along a parabolic path
(2) Along a straight line
(3) In a circular orbit
(4) None of these
20. In radioactive decay process, the negatively charged emitted β -particles are:
- (1) The electrons produced as a result of collisions between atoms
(2) The electrons orbiting around the nucleus
(3) The electrons produced as a result of the decay of neutrons inside the nucleus
(4) None of these

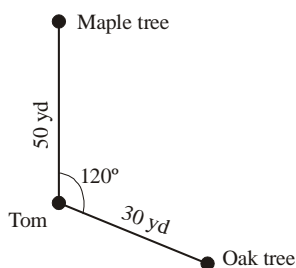
SECTION C : BIOLOGY

21. Which of the following is a bacterial disease?
- (1) Tuberculosis (2) Rabies
(3) Measles (4) None of these
22. The fertilized secondary nucleus of the ovule during double fertilization establishes the:
- (1) Embryo plant (2) Endosperm
(3) Pericarp (4) None of these
23. What happens by spraying of phenyl mercuric acetate of abscisic acid on leaves?
- (1) Transpiration rate decreases
(2) Transpiration rate increases
(3) Guttation rate increases
(4) None of these

24. Protonema is a stage in the life cycle of :
 (1) Funaria (2) Cycas
 (3) Rhizopus (4) None of these
25. What is common to whale, seal and shark?
 (1) Homoeiothermy
 (2) Seasonal migration
 (3) Convergent evolution
 (4) None of these
26. Which mammalian cell is not capable of metabolising glucose to carbon dioxide aerobically?
 (1) Liver cells (2) WBC
 (3) Platelets (4) None of these
27. Lysozyme present in saliva and tears destroy:
 (1) Most virus infected cells
 (2) Certain types of bacteria
 (3) Certain fungi
 (4) None of these
28. The finches of Galapagos islands provide an evidence in favour of:
 (1) Biogeographical evolution
 (2) Retrogressive evolution
 (3) Evolution due to mutation
 (4) None of these
29. A person who is on a long hunger strike and is surviving only on water will have
 (1) More sodium in his urine
 (2) Less urea in his urine
 (3) More glucose in his blood
 (4) None of these
30. Male gametes in angiosperms are formed by the division of
 (1) Vegetative cell (2) Generative cell
 (3) Microspore (4) None of these
31. In the leaves of C_4 plants, malic acid formation during CO_2 fixation occurs in the cells of:
 (1) Epidermis (2) Mesophyll
 (3) Phloem (4) None of these
32. Which forests are found near the equator?
 (1) Tropical forests
 (2) Evergreen forests
 (3) Deciduous forests
 (4) None of these
33. A nitrogen fixing bacteria found free in soil
 (1) Pseudomonas aeruginosa
 (2) Azotobacter
 (3) Thiobacillus
 (4) None of these
34. Which is the correct statement about taxonomic relationships?
 (1) A order can contain more than one family
 (2) A class can contain more than one phylum
 (3) A genus can contain more than one order
 (4) None of these
35. Which of the following is a characteristic of an open circulatory system?
 (i) Heart (ii) Arteries (iii) Capillaries (iv) Veins
 (1) (i) and (iii)
 (2) (i), (iii) and (iv)
 (3) (i), (ii) and (iv)
 (4) None of these
36. Which process is used to transport glucose into animal cells?
 (1) Active transport
 (2) Facilitated diffusion
 (3) Osmosis
 (4) None of these
37. A student observed an animal cell under a light microscope using a 100X objective. Which of the following organelles could not be observed by the student?
 (1) Lysosomes (2) Ribosomes
 (3) Peroxisomes (4) None of these
38. Which is directly responsible for separating chromatids at the beginning of anaphase in mitosis?
 (1) Centrioles
 (2) Centromeres
 (3) Kinetochore microtubules
 (4) None of these
39. Which of the following is known as 'animal starch'?
 (1) Raffinose (2) Glycogen
 (3) Maltose (4) None of these
40. Principal component of the exoskeleton of insects and crustaceans:
 (1) Chitin (2) Inulin
 (3) Cellulose (4) None of these

SECTION C : MATHEMATICS

21. The product of two complex numbers each of unit modulus is also a complex number of:
- Unit modulus
 - Greater than unit modulus
 - Less than unit modulus
 - None of these
22. In the first 1000 natural numbers, how many integers exist such that they leave a remainder 4 when divided by 7 and a remainder 9 when divided by 11?
- 12
 - 13
 - 14
 - None of these
23. The range of the function $f(x) = {}^{7-x}P_{x-3}$ is
- {1, 2, 3}
 - {1/5, 1}
 - $R - \{1/5, 1\}$
 - None of these
24. A bag contains 4 red and 5 black ball. A ball is drawn at random and put it again into the bag with one more ball of same colour. What is the probability of red ball in the bag?
- 4/9
 - 1/2
 - 1/4
 - None of these
25. Discriminant i.e $B^2 - 4AC$, which of the following condition represents the equation of a circle?
- $A = B$
 - $A = B = C$
 - $A = C$ and $B = 0$
 - None of these
26. Tom is standing 50 yards from a maple tree and 30 yards from an oak tree in the park. His position is shown in the diagram. If he is looking at the maple tree, he needs to turn his head 120° to look at the oak trees. How many yards apart are the two trees?



- 58.3
 - 65.2
 - 75
 - None of these
27. In a class of 120 students numbered 1 to 120, all even numbered students opt for physics, whose numbers are divisible by 5 opt for chemistry and those whose numbers are divisible by 7 opt for maths. How many opt for none of the three subjects?
- 19
 - 41

- 35
 - None of these
28. At which point, standard deviation is minimum?
- Mean
 - Median
 - Mode
 - None of these
29. In how many ways a President, VP and water boy can be selected from a group of 10 people.
- ${}^{10}C_3$
 - ${}^{10}P_3$
 - 240
 - None of these
30. Limit $\sin x$ as x approaches very large value ($+\infty$) is $+1$ or -1 . The given statement is true or false?
- True
 - False
 - Can't say
 - None of these
31. If the transformation occur in all the values of the sample (random variable 'X') ie X is transformed to $ax + b$; a and b are constant then the mean of the given sample would be, if the old mean is 'M':
- M
 - $aM + b$
 - aM
 - None of these
32. A and B are two events. Then the probability $P(B) - P(A \cap B)$ is equals to:
- $P(\bar{A})$
 - $P(\bar{B})$
 - $P(B \cup A)$
 - None of these
33. Which of the following changes their sign at the point of inflection?
- First derivative
 - Second derivative
 - Both (1) and (2)
 - None of these
34. If we drop a tennis ball onto a horizontal floor, it will bounce back up part of the way. The ratio between the heights of consecutive bounces is constant, these heights follow
- G.P
 - A.P
 - Logarithmic series
 - None of these
35. Six parallel lines are intersected by 5 other parallel lines. The total number of parallelogram formed is
- 130
 - 170
 - 190
 - None of these
36. The range of the given function $f(x) = |x + 3| - 2$ is
- $[2, \infty)$
 - $[-2, \infty)$
 - $(\infty, 2]$
 - None of these

37. Find the limit: $\lim_{x \rightarrow 0} \frac{\sqrt[3]{1+x} - 1}{x}$
- (1) 0 (2) 1/3
 (3) 3 (4) None of these

38. What is the argument of the complex number $\frac{(1+i)(2+i)}{3-i}$ (where $i = \sqrt{-1}$) ?
- (1) 0 (2) $\pi/4$
 (3) $\pi/2$ (4) None of these

39. What is the value of $\cos 36^\circ$?
- (1) $\frac{\sqrt{5}-1}{4}$ (2) $\frac{\sqrt{5}+1}{4}$
 (3) $\frac{\sqrt{10+2\sqrt{5}}}{4}$ (4) None of these

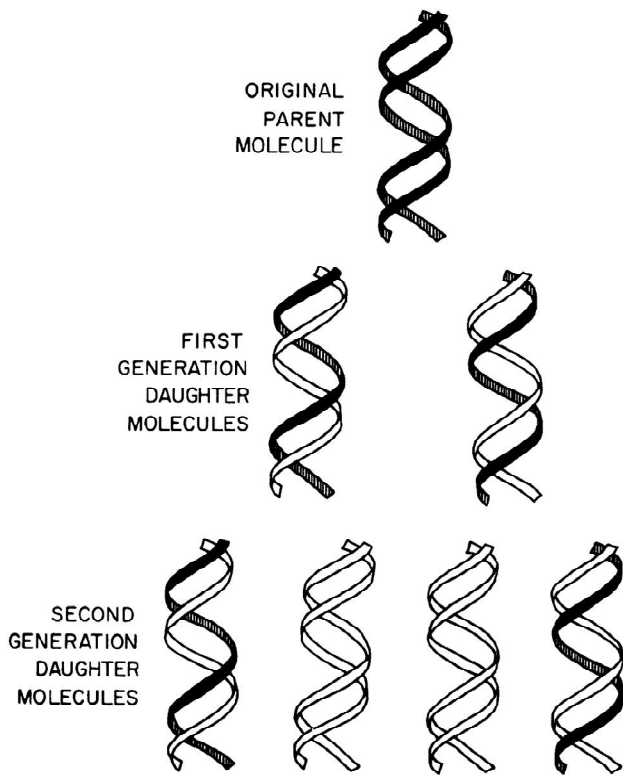
40. Consider an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$
- What is the area included between the ellipse and the greatest rectangle inscribed in the ellipse?
- (1) $ab(\pi-2)$ (2) $2ab(\pi-1)$
 (3) $ab(\pi-1)$ (4) None of these

INTERACTIVE SECTION

41. An evolutionary biologist studied two populations of orchids. She wants to know whether the two populations belong to the same species or two different species. What is the best way to determine if they are of two different species?
- (1) Map the distribution of the two orchids and find areas where they co-exist but do not interbreed
 (2) Identify morphological differences between orchids from the two populations
 (3) Show that they both have the same pollinator
 (4) None of these
42. A taxonomist found an organism while hiking through a tropical rainforest. Upon close examination, he finds that the organism has chitin and acquires nutrients through absorption. The organism mostly belongs to the kingdom of:
- (1) Animalia (2) Fungi
 (3) Protista (4) None of these

43. The golden age of dinosaurs :
- (1) Palaeozoic
 (2) Archaeozoic
 (3) Mesozoic
 (4) None of these
44. A grided tree may survive for sometime but it will eventually die because:
- (1) Water will not move downwards
 (2) Sugars and other organic materials will not move upwards
 (3) Sugars and other organic materials will not move downwards
 (4) None of these
45. John gave his mother a plant that had a single stem, pairs of oval leaves and an elaborate network of purple veins. He thought that it would look better if the plant was more bushy and he cuts off the tip. Why did he do so?
- (1) Cutting off the tip of a monocot stem makes more bulb forms in the soil
 (2) Removing the terminal meristem of a dicot removes the source of auxin which suppresses the growth of the apical shoot meristems
 (3) Cutting a stem releases ethylene which triggers bud formation along the stem
 (4) None of these
46. Stimulation by the parasympathetic nervous system promotes an increase in which bodily response?
- (1) Smooth muscle activity
 (2) Breathing rate
 (3) Heart rate
 (4) None of these
47. The basic difference between actinomyces and nocardia group of bacteria is that:
- (1) Former is a filamentous bacteria while latter is spiral
 (2) Former is anaerobic while latter is aerobic
 (3) Former is gram negative while latter is gram positive
 (4) None of these
48. DNA can be damaged by mutagens which include:
- (1) X-rays
 (2) Ultraviolet rays
 (3) Both (1) and (2)
 (4) None of these

49. The given diagram represents:



- (1) DNA replication
- (2) Transcription
- (3) Translation
- (4) None of these

50. Which technique uses the unique molecular recognition properties of DNA and other nucleic acids to create self-assembling branched DNA complexes with useful properties?

- (1) Bioinformatics
- (2) Anthropology
- (3) DNA nanotechnology
- (4) None of these



END OF THE EXAM