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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

1. 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.
2. 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.
3. 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 IIT PMT OLYMPIAD

NIPO

9 Class **A1 Paper Code**

LEVEL - 1

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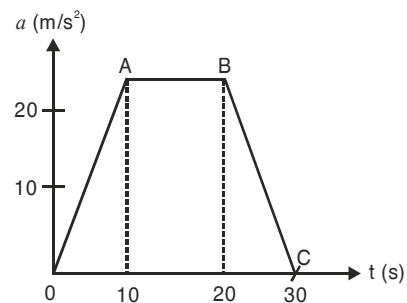
H THE HARVARD-MIT MATHEMATICS TORNAAMENT

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EDUCATION FOUNDATION

PHYSICS

1. The numerical ratio of average velocity to average speed is
 - (1) always less than one
 - (2) always equal to one
 - (3) always more than one
 - (4) equal to or less than one
2. A train of length 200 m travelling at 30 m/sec overtakes another train of length 300 m travelling at 20 m/sec. The time taken by the first train to pass the second is
 - (1) 30 sec
 - (2) 10 sec
 - (3) 50 sec
 - (4) 40 sec
3. The given figure shows the time acceleration graph for a particle in rectilinear motion. The average acceleration in first 20 seconds is



- (1) 45 m/s²
 - (2) 40 m/s²
 - (3) 15 m/s²
 - (4) 20 m/s²
4. Which of the following is not an example of linear motion ?
 - (1) a book at rest
 - (2) a body in uniform circular motion
 - (3) wheel rotating at uniform speed on road
 - (4) a body rolling down an inclined plane
 5. The correct statement from the following is
 - (1) a body having zero velocity will not necessarily have zero acceleration

- (2) a body having zero velocity will necessarily have zero acceleration
 (3) a body having uniform speed can have only uniform acceleration
 (4) a body having non-uniform velocity will have zero acceleration
6. Calculate velocity of a particle when its momentum is numerically equal to its K.E.
 (1) 2 m/s (2) zero
 (3) 4 m/s (4) 1 m/s
7. Tape recorder records the sound in the form of
 (1) electrical energy
 (2) magnetic field on the tape
 (3) variable resistance on the tape
 (4) sound wave held on the tape
8. The kinetic energy possessed by a body of mass m , moving with a velocity v is equal to $(1/2)mv^2$, provided
 (1) the body moves with velocities comparable to that of light
 (2) the body moves with velocities negligible compared to the speed of light
 (3) the body moves with velocities greater than that of light
 (4) none of the above statement is correct
9. A 12 HP motor has to be operated 8 hours/day. How much will it cost at the rate of 50 paise/kWh in 10 days?
 (1) ₹350 (2) ₹358
 (3) ₹375 (4) ₹397
10. Two spheres are made of same metal and have same mass. One is solid and the other is hollow. When heated to the same temperature, percentage increase in diameter will be
 (1) more for hollow sphere
 (2) less for hollow sphere
 (3) same for both
 (4) cannot say
11. A block of copper of 0.1 kg is placed for sufficient time in a vessel containing boiling water so that the block is at 100°C . It is then immediately transferred to another vessel containing 0.25 kg of water at 20°C . The temperature of water rises and attains a steady state at 23°C . What would be the specific heat capacity of copper ?
 (1) 0.507 kJ/kg $^\circ\text{C}$ (2) 1.407 kJ/kg $^\circ\text{C}$
 (3) 0.707 kJ/kg $^\circ\text{C}$ (4) 0.407 kJ/kg $^\circ\text{C}$
12. Human ear cannot hear those mechanical waves whose frequency lies in the frequency range
 (1) less than 1000 hz but greater than 10000 hz
 (2) between 1000 hz and 5000 hz
 (3) between 500 hz and 20000 hz
 (4) less than 16 hz and more than 20000 hz
13. Which of the following statements is correct ?
 (1) both sound and light waves in air are longitudinal
 (2) both sound and light waves in air are transverse
 (3) sound waves in air are transverse and light waves are longitudinal
 (4) sound waves in air are longitudinal and light waves are transverse
14. Choose the wrong statement
 (1) in wave motion all the particles of the medium are disturbed simultaneously
 (2) a medium is necessary for sound wave propagation
 (3) sound travels faster in hydrogen than nitrogen
 (4) the velocity of sound is independent of pressure
15. The main difference between sonar and radar is that
 (1) sonar uses sound waves whereas radar uses radiowaves
 (2) sonar uses radio waves whereas radar uses sound waves
 (3) sonar uses transverse waves while radar uses longitudinal waves
 (4) sonar uses longitudinal transverse waves, whereas radar uses transverse longitudinal waves

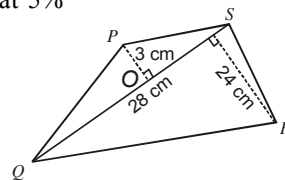
CHEMISTRY

16. Which of the following statement is not correct regarding cathode rays ?
 (1) cathode rays originate from the cathode
 (2) charge and mass of the particles constituting cathode rays depends upon the nature of the gas
 (3) charge and mass of the particles present does not depend upon the material of the cathode
 (4) the ratio charge/mass of the particles is much greater than that of anode rays.
17. Two nuclides X and Y are isotonic to each other with mass numbers 70 and 72 respectively. If the atomic number of X is 34, then that of Y would be
 (1) 32 (2) 34 (3) 36 (4) 38
18. An element A is a member of Group V of the periodic table and an element B is a member of Group I of the periodic table. When A and B combine, the compound so formed will have the following formula.
 (1) BA (2) B_2A
 (3) A_2B (4) AB_3
19. "When elements are arranged in increasing order of their atomic weights, the eighth element resembles the first one." Who propounded this law?
 (1) Moseley (2) Mendeleev
 (3) Graham (4) Newland
20. In Faraday-Tyndall effect the colloiddally suspended particles
 (1) trace out the path of strong beam of light
 (2) coagulate
 (3) show electrophoresis
 (4) show Brownian movement
21. An ionic compound A^+B^- is most likely to be formed when
 (1) the ionization energy of A is high and electron affinity of B is low
 (2) the ionization energy of A is low and electron affinity of B is high
 (3) both, the ionization energy of A and electron affinity of B is high
 (4) both, the ionization energy of A and electron affinity of B are low.

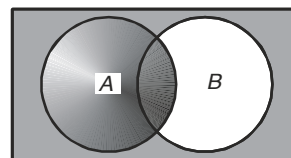
22. Which one of the following is not an electrovalent compound ?
 (1) common salt (2) sylvine
 (3) aluminium chloride (4) carbon tetrachloride
23. The reaction $2\text{H}_2\text{S} + \text{SO}_2 \rightarrow 2\text{H}_2\text{O} + \text{S}$ is an example of
 (1) an exothermic reaction
 (2) an oxidation reduction reaction
 (3) a complex formation reaction
 (4) displacement reaction
24. Which of the following properties would suggest that a compound under investigation is covalent?
 (1) it conducts electricity on melting
 (2) it is a non-electrolyte
 (3) it has a high melting point
 (4) it is a compound of a metal and a non-metal
25. Atomic mass of an element is
 (1) the actual mass of one atom of the element
 (2) the relative mass of an atom of the element
 (3) the average relative mass of different atoms of the element
 (4) much different from the mass number of the element
26. A compound contains 69.5% oxygen and 30.5% nitrogen and its molecular weight is 92. The formula of the compound is
 (1) N_2O (2) NO_2 (3) N_2O_4 (4) N_2O_5
27. Which pair of species have same percentage of carbon?
 (1) CH_3COOH and $\text{C}_6\text{H}_{12}\text{O}_6$
 (2) CH_3COOH and $\text{C}_2\text{H}_5\text{OH}$
 (3) HCOOCH_3 and $\text{C}_{12}\text{H}_{22}\text{O}_{11}$
 (4) $\text{C}_6\text{H}_{12}\text{O}_6$ and $\text{C}_{12}\text{H}_{22}\text{O}_{11}$
28. The valency of elements in the periodic table towards hydrogen
 (1) decreases regularly from 1 to 8
 (2) first increases from Group I to Group IV and then, decrease
 (3) first decreases from Group I to Group IV and then, increase
 (4) none of the above
29. Which one of the following statements is correct?
 (1) the metre is the length of the path travelled by light in vacuum during a time interval of $1/919\ 631\ 458$ of a second.
 (2) the kilogram is the unit of mass, it is equal to the mass of the international prototype of the milligram.
 (3) the meter is the length of the path travelled by light in vacuum during a time interval of $1/299\ 792\ 458$ of a second.
 (4) kilogram is equal to the mass of the international prototype of the gram
30. Which one of the following gave the long form of the periodic table?
 (1) Mendeelev (2) Dalton
 (3) Lothar Mayer (4) Mosley

MATHEMATICS

31. A person borrowed ₹5,500 from a moneylender at the rate of 24% per annum. He lent this amount to his friend at the rate of 36% per annum. After two years, he collected the amount from his friend and paid back the amount due to the moneylender. The amount he thus earned was
 (1) ₹8140 (2) ₹6820
 (3) ₹3960 (4) ₹1320
32. A boy takes 20 minutes to reach the school at an average speed of 12 km per hour. If he wants to reach the school in 5 minutes, his average speed, in km per hour, must be
 (1) 14 (2) 16
 (3) 48 (4) 20
33. A man had ₹2000. He lent a part of this sum at 5% interest and the rest at 4% interest. The total interest he received in one year was ₹92. The money he lent at 5% interest was
 (1) ₹1050 (2) ₹1100
 (3) ₹1150 (4) ₹1200



34. If n is a whole number greater than 1, then $n^2(n^2 - 1)$ is always divisible by
 (1) 12 only (2) 12, 24 and 36
 (3) 24 only (4) 36 only
35. The shaded region given in the venn diagram represents



- (1) $A - B$ (2) $B - A$
 (3) $(A - B)'$ (4) $(B - A)'$
36. If $A = \{Q, \{Q\}\}$, then the power set $P(I)$ of A is
 (1) A (2) $\{Q, \{Q\}, A\}$
 (3) $\{Q, \{Q\}, \{\{Q\}\}, A\}$ (4) none of these
37. A rational number between $\sqrt{2}$ and $\sqrt{3}$ is
 (1) $\frac{\sqrt{2} + \sqrt{3}}{2}$ (2) 1.5
 (3) 1.2 (4) $\sqrt{2} - \sqrt{3}$
38. The value of $\log_{10} \sqrt{10\sqrt{10\sqrt{10\sqrt{10\dots\infty}}}}$ is
 (1) 4 (2) 3
 (3) 2 (4) 1

39. What is the reciprocal of $\frac{1}{a-3b}$ when $b = \frac{a}{3}$?

- (1) $a-3b$ (2) 0
 (3) 1 (4) 6

40. If $\alpha + \beta = 90^\circ$ and $\alpha = 2\beta$, then $\cos^2 \alpha + \sin^2 \beta$ is equal to

- (1) 0 (2) 1
 (3) $\frac{1}{2}$ (4) $\frac{\sqrt{3}}{2}$

41. The value of $\sin 105^\circ$ is

- (1) $\frac{\sqrt{3}+1}{\sqrt{2}}$ (2) $\frac{\sqrt{3}-1}{2\sqrt{2}}$
 (3) $\frac{\sqrt{3}-1}{2\sqrt{2}}$ (4) $\sqrt{3}-1$

42. Evaluate $\cos 1485^\circ$

- (1) $\frac{1}{2}$ (2) $\frac{1}{\sqrt{2}}$
 (3) $2\sqrt{2}$ (4) 2

43. Solve the following equation for θ , $\theta \leq 90^\circ$: $4\operatorname{cosec} \theta + 2\sin \theta = 9$

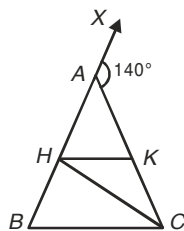
- (1) $\theta = 60^\circ$ (2) $\theta = 30^\circ$
 (3) $\theta = 90^\circ$ (4) solution is not possible

44. Three straight lines OA , OB and OC have been drawn from point O . OP is so drawn such that it bisects $\angle BOA$ and OQ is so drawn such that it bisects $\angle AOC$. Then $\angle POQ$ is equal to

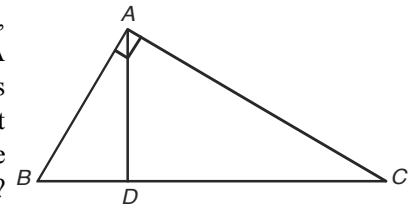
- (1) $2\angle BOC$ (2) $\frac{1}{2}\angle BOC$
 (3) $\angle BOC$ (4) $\frac{1}{3}\angle BOC$

45. In the given figure, $AB = AC$, $CH = CB$ and $HK \parallel BC$. If $\angle CAX$ is 140° , then $\angle HCK$ is

- (1) 40° (2) 30°
 (3) 45° (4) 60°



46. In a right triangle ABC , the right angle is at A . A perpendicular AD is drawn on BC so that it cuts BC in D . Which one of the following is true?



- (1) $AD^2 = BD \cdot DC$
 (2) $AD^2 = \frac{2BC}{DC}$
 (3) $AD^2 = \frac{BC^2 + DC^2}{2}$
 (4) $AD^2 = 2(BC^2 + DC^2)$

47. The sides of a triangle are in the ratio of 4 : 6 : 7. Then which one of the following is true?

- (1) the triangle is a right angled
 (2) the triangle is an obtuse angled
 (3) the triangle is an acute angled
 (4) none of these

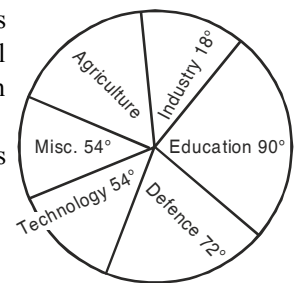
48. If the sides of a triangle are in the ratio of 5 : 12 : 13 and its perimeter is 60 m, then the area of the triangle is

- (1) 140 m^2 (2) 121 m^2
 (3) 120 m^2 (4) 125 m^2

49. A student gets marks in 5 subjects as follows : 2, 3, 4, 5 and 6. In these marks, 4 is the

- (1) mean and median
 (2) mean but not median
 (3) median but not mean
 (4) mode

50. Allocations to various sectors of the economy for the annual budget of ₹1000 cr have been shown in the given pie chart. The allocation for Agriculture is



- (1) ₹400 crore
 (2) ₹200 crore
 (3) ₹300 crore
 (4) ₹100 crore



END OF THE EXAM