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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
INTERACTIVE
SCIENCE
OLYMPIAD**

N I S O

**12
Class**

**A1
Paper
Code**

L E V E L - 1

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SECTION-A : GENERAL I.Q.

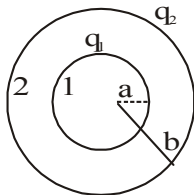
- In a box you have 13 white marbles and 15 black marbles. You also have 28 black marbles outside the box. Remove two marbles, randomly, from the box. If they are of different colours, put the white one back in the box. If they are the same colour, take them out and put a black marble back in the box. Continue this until only one marble remains in the box. What is the colour of the last marble?
(1) White (2) Black
(3) Can't say (4) None of these
- A number of children are standing in a circle. They are evenly spaced and the 7th child is directly opposite the 18th child. How many children are there altogether?
(1) 21 (2) 22
(3) 23 (4) None of these
- What is at the beginning of eternity, end of space and time, beginning to every end and the end to every place?
(1) The letter b (2) The letter i
(3) The letter e (4) None of these

- Asha is twice as old as her sister and half as old as her mother. And in 22 years, her sister will be half as old as the mother. How old do you think Asha is now?
(1) 22 (2) 25
(3) 28 (4) None of these
- There are 5 dogs Jumbo, Spike, Cuddles, Dodo and Pumpkin. Jumbo is heavier than spike. Cuddles weighs more than Dodo but weighs less than Pumpkin. Spike weighs more than Pumpkin and Pumpkin weighs less than Jumbo. Find the order of their weights, starting from the heaviest?
(1) Pumpkin, Spike, Jumbo, Cuddles, Dodo
(2) Jumbo, Spike, Pumpkin, Cuddles, Dodo
(3) Dodo, cuddles, Spike, Jumbo, Pumpkin
(4) None of these.
- Raju was on tour and he travelled first 160 km at 64 km/hr and the next 160 km at 80 km/hr. The average speed for the first 320 km of the tour was
(1) 35.5 km/hr (2) 36 km/hr
(3) 71.1km/hr (4) None of these

7. The average of four consecutive even numbers is 9. which of the following is the first number ?
 (1) 8 (2) 4
 (3) 6 (4) None of these
8. A person facing north walks 5m straight. He turns 90° in the anticlock wise direction and then 135° clockwise and walks another 10m straight. Which direction is he facing now ?
 (1) North-West (2) North-East
 (3) South-West (4) None of these
9. If the difference between a number and its three-fourth is 60, what will be the number ?
 (1) 360 (2) 320
 (3) 240 (4) None of these
10. $A + B$ means A is the son of B; $A - B$ means A is the wife of B; $A \times B$ means A is the brother of B; $A \div B$ means A is the mother of B and $A = B$ means A is the sister of B. What does $P + R - Q$ mean ?
 (1) Q is the father of P (2) Q is the son of P
 (3) Q is the uncle of P (4) None of these

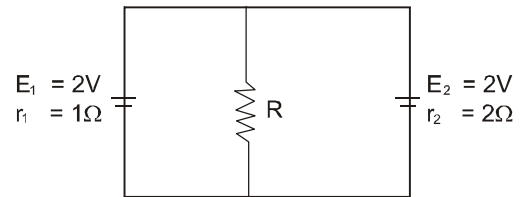
SECTION-B : PHYSICS & CHEMISTRY

11. Two conducting spheres having radii a and b charged to q_1 and q_2 respectively. The potential difference between 1 and 2 will be



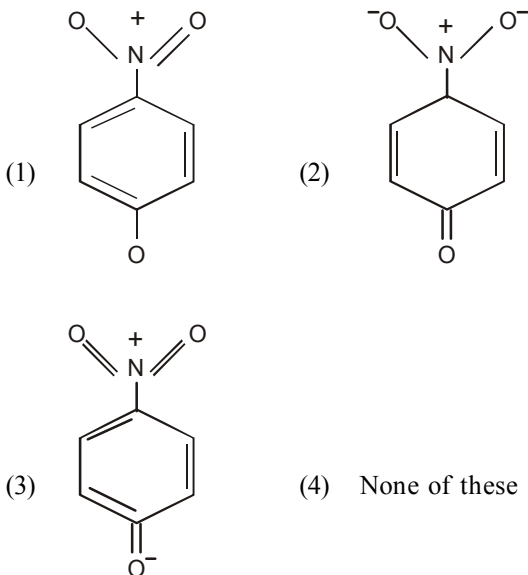
- (1) $\frac{q_1}{4\pi\epsilon_0 a} - \frac{q_2}{4\pi\epsilon_0 b}$ (2) $\frac{q_2}{4\pi\epsilon_0} \left(\frac{1}{a} - \frac{1}{b} \right)$
 (3) $\frac{q_1}{4\pi\epsilon_0} \left(\frac{1}{a} - \frac{1}{b} \right)$ (4) None of these
12. The de-Broglie's wavelength of a vehicle moving with velocity v is λ . Its load is changed so that the velocity as well as kinetic energy are doubled. What will be the de-Broglie's wavelength now ?
 (1) λ (2) 2λ
 (3) 4λ (4) None of these
13. Which of the following is not true about the nuclear force ?
 (1) Its range is very short
 (2) It is an exchanged force with π meson as the exchange particle.
 (3) Its value for a neutron-neutron pair is same as its value for a neutronproton pair
 (4) None of these

14. In the figure shown, if the current through E_1 is 1 A, the value of resistance R is



- (1) $\frac{1}{3}\Omega$ (2) $\frac{2}{3}\Omega$
 (3) 1Ω (4) None of these
15. Two infinitely long rectilinear conductors are arranged perpendicular to each other and are in mutually perpendicular planes. If $I_1 = 2A$ and $I_2 = 3A$ and $AM = 1cm$, $AB = 2cm$, the value of B at M is
 (1) $4.5 \times 10^{-5} T$ (2) $2 \times 10^{-5} T$
 (3) $6 \times 10^{-5} T$ (4) None of these
16. A soap bubble has a thickness of 100 nm and a refractive index of 1.35. Given that the wavelength of red light is about 700 nm and that of blue light is 400 nm, what colour does the bubble appear to be at the point on its surface closest to an observer when it is illuminated by the white light ?
 (1) Red (2) Green
 (3) Black (4) None of these
17. A candle is placed 20 cm from the surface of a convex mirror and a plane mirror is also placed so that the virtual images in the two mirror coincides. If the plane mirror is 12cm away from the object, what is the focal length of the convex mirror ?
 (1) 20 cm (2) 10 cm
 (3) 5 cm (4) None of these
18. α , β and γ -rays emitted by a radioactive substance are passed through a region containing a magnetic field at right angles to their path. The energy gained will be
 (1) Maximum for α -rays
 (2) Zero for all of them
 (3) Minimum for β -rays
 (4) None of these
19. According to the Le-Chatelier principle, the formation of NO_2 at equilibrium in the reaction $2NO + O_2 \rightleftharpoons 2NO_2 + \text{heat}$, should be favoured by
 (1) High temperature, high pressure
 (2) Low temperature, low pressure
 (3) Low temperature, high pressure
 (4) None of these

20. Which of the following acid possesses oxidising, reducing and complex forming properties ?
 (1) HNO_2 (2) HNO_3
 (3) H_2SO_4 (4) None of these
21. Quartz is an example of
 (1) Chain silicates (2) Infinite sheet silicate
 (3) Framework silicate (4) None of these
22. A compound alloy of gold and copper crystallises in a cubic lattice in which the gold atoms occupy the lattice points at the corners of a cube and the copper atoms occupy the centres of each of the cube faces. What is the empirical formula of this compound?
 (1) AuCu_3 (2) Au_3Cu
 (3) Au_2Cu_3 (4) None of these
23. Oxygen is more electronegative than sulphur, yet H_2S is acidic while H_2O is neutral. This is because
 (1) Molecular mass of H_2S is more than that of H_2O
 (2) H-S bond is weaker than H-O bond
 (3) H_2S is gaseous under ordinary conditions while H_2O is a liquid
 (4) None of these
24. The most unlikely representation of resonance structures of *p*-nitrophenoxide ion is



25. The standard reduction potential of Fe/Fe^{+2} and Cu/Cu^{+2} electrodes are 0.44 and 0.34 volts respectively. Then
 (1) Copper will reduce Fe^{+2} ions
 (2) Iron will reduce Cu^{2+} ions
 (3) Iron will oxidise copper metal
 (4) None of these
26. Water transported through lead pipes becomes poisonous due to the formation of
 (1) PbO (2) PbO_2
 (3) $\text{Pb}(\text{OH})_2$ (4) None of these

27. One recently discovered allotrope of carbon (e.g. C_{60}) is commonly known as
 (1) Flourine (2) Fullerene
 (3) Flourene (4) None of these
28. The reaction of benzaldehyde with alkali gives
 (1) Phenol + Sodium Benzoate
 (2) Benzene + Benzyl Alcohol
 (3) Benzyl Alcohol + Sodium Benzoate
 (4) None of these
29. After losing a number of α -particles and β -particles, U^{238} is changed to ${}_{82}\text{X}^{206}$. The total number of α particles produced in this process is
 (1) 5 (2) 8
 (3) 10 (4) None of these
30. A double convex lens is immersed in water. The focal length of the lens
 (1) Increases (2) Decreases
 (3) Remains the same (4) None of these

SECTION-C : MATHEMATICS

31. $\int \frac{\sqrt{\tan x}}{\sin x \cos x} dx$ is equal to
 (1) $2\sqrt{\tan x} + c$ (2) $2\sqrt{\cot x} + c$
 (3) $\frac{\sqrt{\tan x}}{2} + c$ (4) None of these
32. A box contains 24 identical balls of which 12 are white and 12 are black. The balls are drawn at random from the box one at a time with replacement. The probability that a white ball is drawn for the 4th time on the 7th draw is
 (1) $5/64$ (2) $27/32$
 (3) $5/32$ (4) None of these
33. If sets A and B are defined as
 $A = \{e^x, x \in \mathbb{Z}^+\}$
 $B = \{\sin x, x \in (\pi, 2\pi)\}$
 (1) B (2) $A \subset B$
 (3) $A \cap B = \phi$ (4) None of these
34. If $\begin{vmatrix} p & q-y & r-z \\ p-x & q & r-z \\ p-x & q-y & r \end{vmatrix} = 0$, then the value of $\frac{p}{x} + \frac{q}{y} + \frac{r}{z}$ is
 (1) 0 (2) 1
 (3) 2 (4) None of these

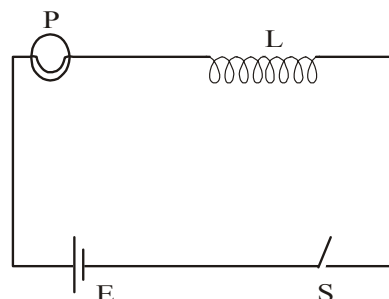
35. A plane which is perpendicular to two planes $2x - 2y + z = 0$ and $x - y + 2z = 4$, passes through $(1, -2, 1)$. The distance of the plane from the point $(1, 2, 2)$ is
 (1) $\sqrt{2}$ (2) $2\sqrt{2}$
 (3) 0 (4) None of these
36. If the planes $x + 2y + kz = 0$ and $2x + y - 2z = 0$, are at right angles to each other, then the value of k is
 (1) 2 (2) -2
 (3) $\frac{1}{2}$ (4) None of these
37. A student is to answer 10 out of 13 questions in an examination such that he must choose at least 4 from the first five questions. The number of choices available to him is
 (1) 196 (2) 280
 (3) 346 (4) None of these
38. The number of all possible triplets (a_1, a_2, a_3) such that $a_1 + a_2(\cos 2x) + a_3\sin^2 x = 0$ for all x is
 (1) Zero (2) Infinite
 (3) One (4) None of these
39. The value of the integral $\int \frac{dx}{x(1+\log x)^2}$ is equal to :
 (1) $\frac{-1}{1+x} + c$ (2) $\frac{1}{1+\log x} + c$
 (3) $\frac{-1}{1+\log x} + c$ (4) None of these
40. For any two events A and B, $P(A + B)$ equals
 (1) $P(A) + P(B) - P(AB)$
 (2) $P(A) + P(B)$
 (3) $P(A) + P(B) + P(AB)$
 (4) None of these
33. New strains of bacteria are becoming resistant to antibiotics at a high rate. Which genetic process is now responsible for most of this increase in the proportion of resistant bacteria?
 (1) Mutation (2) Transduction
 (3) Transformation (4) None of these
34. There are three alleles at the ABO antigen locus in humans. The A and B alleles produce A and B antigens, respectively, while the O allele produces no antigen. For which of the following phenotypes could you be certain that an individual with that phenotype is a homozygote ?
 (1) Type A only (2) Type B only
 (3) Type O only (4) None of these
35. Which one of the following is an end product of the Calvin cycle, the dark reaction of photosynthesis ?
 (1) ATP (2) A three-carbon sugar
 (3) Oxygen (4) None of these
36. The embryo of which of the following organisms does not have an amnion ?
 (1) A fish (2) A bird
 (3) An alligator (4) None of these
37. In a mammalian lung the rate at which oxygen could be obtained from the air would increase if
 (1) The cells lining the alveoli and capillaries were thinner
 (2) Tidal volume decreased
 (3) Blood haemoglobin content were lower
 (4) None of these
38. If 35% of the bases of a DNA molecule are thymine, it follows that it also contains
 (1) 30% adenine (2) 15% guanine
 (3) 30% cytosine (4) None of these
39. All of the following molecules are carbohydrates except
 (1) Lactose (2) Cellulose
 (3) Haemoglobin (4) None of these
40. The plant growth regulator involved in aging and ripening of fruit is
 (1) Ethylene (2) Cytokinin
 (3) Gibberellin (4) None of these

SECTION-C : BIOLOGY

31. The primary role of a lysosome is
 (1) Intracellular digestion (2) ATP synthesis
 (3) Lipid transport (4) None of these
32. Which statement best explains why protozoans that live in pond water must use exocytosis to get rid of excess water in their cytoplasm?
 (1) The pond water is hypertonic to the protozoan cytoplasm
 (2) The pond water is isotonic to the protozoan cytoplasm
 (3) The pond water is hypotonic to the protozoan cytoplasm
 (4) None of these

ETG INTERACTIVE SECTION

41. In the figure a lamp P is in series with an iron core inductor L. When the switch S is closed, the lamp brightness rises relatively slowly to its full brightness. This is due to

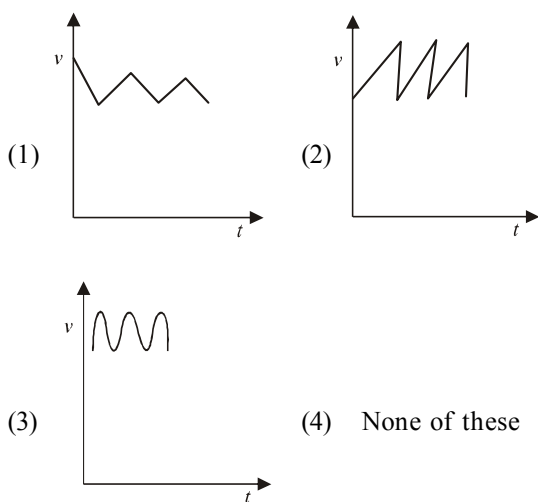


- (1) The low resistance of P
- (2) The low resistance of L
- (3) The back emf in L
- (4) None of these

42. A solution containing both Na_2CO_3 and NaHCO_3 was treated with excess of CaCl_2 solution and filtered. The precipitate weighed m_1 grams. On adding NaOH in drops to the filtrate avoiding excess, a further m_2 grams was precipitated. If after adding excess CaCl_2 , the solution had not been filtered but was simply boiled and then filtered, what would be the total weight of the precipitate ?

- (1) $(m_1 + m_2)$ grams
- (2) $(m_1 + m_2 / 2)$ grams
- (3) $(m_1 + m_2) / 2$ grams
- (4) None of these

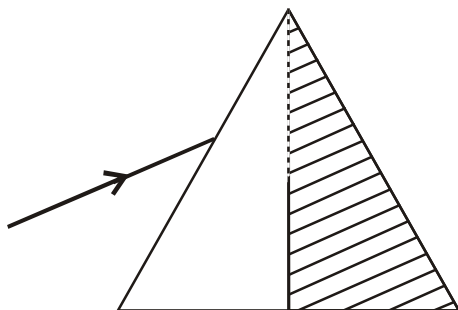
43. Thorium undergoes radioactive decay and is converted to lead. Which of the following graphs represents the growth of lead with time ?



44. The diagram shows an electrolysis cell which contains 1L of an aqueous 1M copper (II) sulphate solution. If 0.4 moles of electrons pass through the cell, the concentration of copper ions after passage of the charge will be

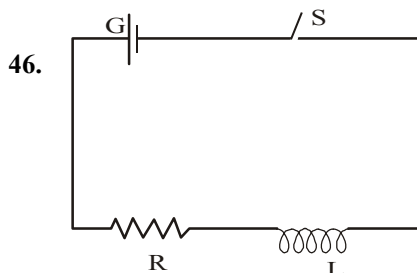
- (1) 0.4 M
- (2) 0.8 M
- (3) 1.0 M
- (4) None of these

45. A light ray is incident upon a prism in minimum deviation position and suffers a deviation of 39° . If the dotted half of the prism is knocked off, the same ray will

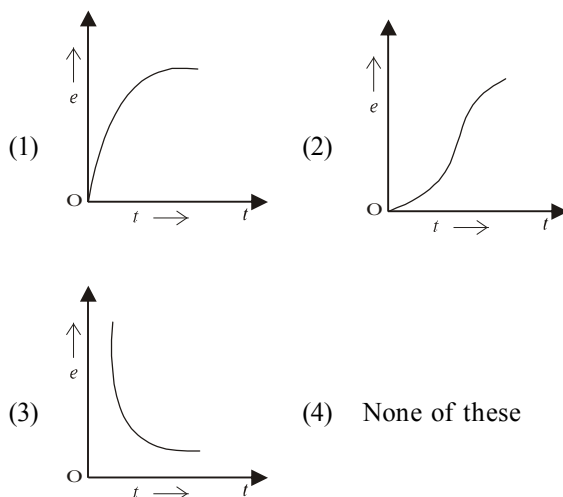


- (1) Suffer a deviation of 19.5°
- (2) Suffer a deviation of 30°

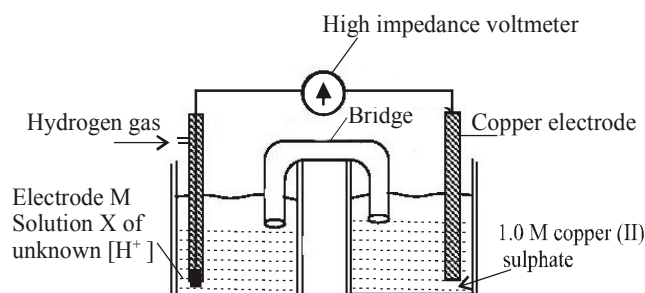
- (3) Suffer a deviation of 49.5°
- (4) None of these.



The diagram shows a cell E, connected to a pure resistor R and pure self induction L of negligible resistance. If at time $t = 0$, the switch S is closed, the self induced emf 'e' across the self inductor varies with time as in



47.

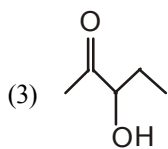


A student set up the above apparatus to determine the hydrogen ion concentration of solution X. The cell is $\text{M}[\text{H}_2(\text{g})] | 2\text{H}^+(\text{aq}) || \text{Cu}^{2+}(\text{aq}) | \text{Cu}(\text{s})$. The best material for electrode M would be

- (1) Platinum metal coated with finely divided platinum
- (2) Polished copper metal
- (3) Platinum metal coated with platinum oxide
- (4) None of these

48. Which of the following will be most readily dehydrated in acidic conditions ?





(4) None of these

49. A laser is a coherent source because it consists of
- (1) Co-ordinate waves of many wavelengths
 - (2) Co-ordinated waves of particular wavelength
 - (3) Co-ordinate wave of a particular wavelength
 - (4) None of these

50. An eye can detect 5×10^4 photons/m²s of light of wavelength 500 nm. The ear can detect 10^{-3} W/m². As a power detector, Which is more sensitive ?

- (1) Sensitivity of eye is one fifth of the ear
- (2) Sensitivity of eye is five times that of ear
- (3) Both are equally sensitive
- (4) None of these



END OF THE EXAM