



EDUHEAL FOUNDATION



INTERACTIVE OLYMPIADS

EDUHEAL FOUNDATION CONDUCTS 8 OLYMPIADS ANNUALLY REACHING OUT TO 3,500 + SCHOOLS
• 4 LAKH + STUDENTS • 50,000 COORDINATING TEACHERS AND HAVING 500 RESOURCE PERSONS
IN ENGLISH / MATHS / SCIENCE / BIOTECH / COMPUTER / G.K. / ARTS / CRICKET & 300 REGIONAL COORDINATORS.

WEBSITE : WWW.EDUHEALFOUNDATION.ORG • E-MAIL : EDUHEALFOUNDATION@GMAIL.COM

ICO INTERNATIONAL CYBER OLYMPIAD	NISO NATIONAL INTERACTIVE SCIENCE OLYMPIAD	NIMO NATIONAL INTERACTIVE MATHS OLYMPIAD	NBTO NATIONAL BIOTECHNOLOGY OLYMPIAD	IEO INTERNATIONAL ENGLISH OLYMPIAD	IGO INTERNATIONAL G.K. OLYMPIAD
---	---	---	--	---	--

**NATIONAL
INTERACTIVE
SCIENCE
OLYMPIAD**

N I S O

12
Class **A1**
Paper
Code

LEVEL - 1

Level - 1 : Level-1 winners will get certificate, aptitude report, medals for the school toppers and online subscription.

Level - 2 : Top 10 % including 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, aptitude report, medals, Mp3 player, watches, educational CDs, laptop, scholarship, online subscription etc.

Level - 3 : Top 1% 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.

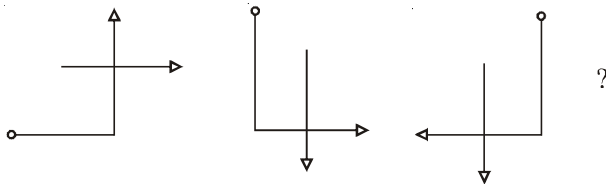
Prizes ranges from cash (millions of \$), gadgets, foreign trips, publicity, fame, scholarships, Internships, conference participation and more.

- You are allowed additional 10 minutes to fill the required details in the **RESPONSE SHEET**.
- 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 coordinator 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.



SECTION-A : GENERAL I.Q.

- The given question consists of three figures shown as below. Choose the correct option which fits the best for the continuation of the given pattern of figures.



- (1)
- (2)
- (3)
- (4) None of these

- If in a certain code language BOSTON can be written as SNSNSN, then how would you write CALIFORNIA in the same code language?

- (1) LONLONLON (2) LOILOILOI
(3) OAOAOA (4) None of these

- $M + N$ means M is the son of N; $M - N$ means M is the wife of N; $M \times N$ means M is the brother of N; $M \div N$ means M is the mother of N and $M = N$ means M is the sister of N. What does $O + P - S$ mean?


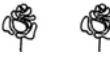


- (1) S is the father of O (2) S is the son of O
(3) S is the uncle of O (4) None of these

- Choose the correction option in place of question mark (?) in the following series :

91, 85, 94, 83, 97, 81, (?), 79.

- (1) 120 (2) 100
(3) 105 (4) None of these

5.

colour	
	
	
	
	No. of flowers

There are 15 flowers in a garden as shown in the above table. The flowers are red, yellow, blue and orange. Most of the flowers are red, there are more blue flowers than orange. There are fewer yellow flowers than any other colour. The least number of flowers are yellow. Now find out how many flowers are there of each colour ?

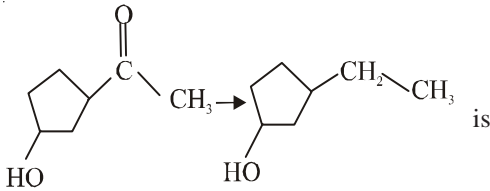
Red = —, Blue = —, Orange = —, Yellow = —

- (1) Red = 3, Blue = 6, Orange = 2, Yellow = 4
 (2) Red = 4, Blue = 2, Orange = 6, Yellow = 3
 (3) Red = 6, Blue = 4, Orange = 3, Yellow = 2
 (4) None of these.
6. Which is greater - half of quarter or quarter of half?
 (1) Half (2) Quarter
 (3) Both are same (4) None of these
7. If you drop a 10kg iron bar and a 10kg bag of cotton from a height of 50m, which will reach the ground first?
 (1) Iron bar (2) Both
 (3) Cotton (4) None of these
8. At noon and midnight on a clock, the hour and minute hands are pointing in the exact same direction. How many other times between noon and midnight do the hour and minute hands cross?
 (1) 10 times (2) 8 times
 (3) 6 times (4) None of these
9. In a wrestling team there are 8 wrestlers. The coach is trying to separate the wrestlers by their 'weight class' for their competition. The wrestlers are A, B, C, D, E, F, G, H.
 F is in the same weight class as H.
 G is in a heavier weight class than F.
 A is in a heavier weight class than D and C.
 E is in a heavier weight class than A.
 B is in a lighter weight class than C.
- Which one of the following must be false?
 (1) G is in a heavier weight class than H.
 (2) C is in a heavier weight class than D.
 (3) B is in the same weight class as E.
 (4) None of these.
10. Standing on a platform, Anil told Shreya that Qutab Minar was more than ten kilometre but less than fifteen kilometres from there. Shreya knew that it was more than twelve kilometres but less than fourteen kilometres from there. If

both of them were correct, which of the following could be the distance of Qutab Minar from the platform ?

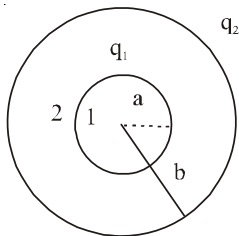
- (1) 12 km (2) 13 km
 (3) 11 km (4) None of these

SECTION-B : PHYSICS & CHEMISTRY

11. The dimension of force is given as
 (1) MLT^{-2} (2) MLT^{-1}
 (3) MLT^{-3} (4) None of these
12. Daltons law of partial pressures is not applicable to gases like
 (1) O_2 and He (2) CO_2 and Cl_2
 (3) NH_3 and HCl (4) None of these
13. According to VSEPR theory the shape of $SiCl_4$ will be
 (1) Tetrahedral (2) Linear
 (3) Pyramidal (4) None of these
14. In the reaction between HNO_3 and KOH , the nature of the solution will be
 (1) Acidic (2) Neutral
 (3) Basic (4) None of these
15. $N_2O_4(g) \rightleftharpoons 2NO_2(g)$. The concentrations of N_2O_4 and NO_2 at equilibrium are 4.8×10^{-2} and $1.2 \times 10^{-2} \text{ mol L}^{-1}$ respectively. The Kc for the reaction is
 (1) $3 \times 10^3 \text{ mol L}^{-1}$ (2) $3.3 \times 10^2 \text{ mol L}^{-1}$
 (3) $3 \times 10^{-3} \text{ mol L}^{-1}$ (4) None of these
16. The IUPAC name of the compound $CH_2 = CH - CH(CH_3)_2$ is
 (1) 2 - vinyl propene (2) 3 - methyl - 1 - butene
 (3) 1 isopropyl ethylene (4) None of these
17. Ammonia has abnormally high boiling point because it has
 (1) Hydrogen bonding (2) sp^3 hybridisation
 (3) Alkaline nature (4) None of these
18. An electron is present in 4f sub-shell. The possible values for all the quantum numbers n, l, m, s can be
 (1) $n = 2$ $l = 3$ $m = 0, -1, -2, -3, +1, +2, +3$ $s = +1/2$
 (2) $n = 3$ $l = 4$ $m = -1, -2, -3, 0, +3, +2, +1$ $s = +1/2$ or $-1/2$
 (3) $n = 4$ $l = 3$ $m = -3, -2, -1, 0, +1, +2, +3$ $s = +1/2$ or $-1/2$
 (4) None of these
19. The appropriate reagent for the conversion of
- 
- (1) $Zn-Hg/HCl$ (2) NH_2NH_2, OH^-
 (3) H_2, Ni (4) None of these

20. The oxidation number of Oxygen in OF_2 is
 (1) +2 (2) -2
 (3) +1 (4) None of these
21. A solution is obtained by dissolving 6g of urea (molecular weight 60) in a litre of water. Another solution is obtained by dissolving 34.2 g of cane sugar (molecular weight 342) in 1 litre of water at the same temperature. The lowering of vapour pressure in the first solution is
 (1) Nearly one-seventh of the second solution
 (2) Double that of the second solution
 (3) Same as that of the second solution
 (4) None of these
22. 6.022×10^{20} molecules of urea are present in 100ml of its solution. The concentration of urea solution is
 (1) 0.1 M (2) 0.01 M
 (3) 0.001 M (4) None of these
23. At 500°C , the equilibrium constant for the reaction $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$ is $6.02 \times 10^{-2} \text{ litre}^{-2} \text{ mol}^{-2}$. What is the value of K_p at the same temperature?
 (1) 1.5×10^{-5} (2) $15 \times 10^{-5} \text{ atm}^{-2}$
 (3) $\approx 15 \times 10^{-6}$ (4) None of these
24. Which of the following is a primary alkyl halide?
 (1) $\text{C}_6\text{H}_5\text{CHClCH}_3$ (2) $\text{CH}_3\text{CHClCH}_2\text{CH}_3$
 (3) $(\text{CH}_3)_2\text{CHCH}_2\text{Cl}$ (4) None of these

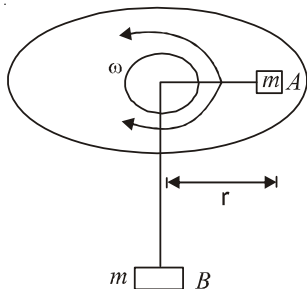
25.



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) $\frac{q_1}{4\pi\epsilon_0} \left(\frac{1}{a} - \frac{1}{b} \right)$
 (3) $\frac{q_2}{4\pi\epsilon_0} \left(\frac{1}{a} - \frac{1}{b} \right)$ (4) None of these
26. A bullet is fired from a rifle. If the rifle recoils freely, the kinetic energy of rifle is
 (1) Less than that of bullet
 (2) More than that of bullet
 (3) Same as the bullet
 (4) None of these

27. Two particles A and B, each of mass m , are interconnected by an inextensible such that the particle B hangs below a table as shown in the above figure and particle A is on a rough rotating disc at a distance r



from the axis of rotation of the disc. If the angular speed of the disc is $\omega = \sqrt{g/r}$, the frictional force developed at the interface of the particle and the disc is equal to

- (1) $< mg/2$ (2) Zero
 (3) $mg/\sqrt{2}$ (4) None of these
28. Some important conjugate Acid. Base pairs are given below. Arrange them in the order of increasing strength of the base.
 (I) $\text{H}_2\text{SO}_4 \rightarrow \text{H}^+ + \text{HSO}_4^-$
 (II) $\text{HCO}_3^- \rightarrow \text{H}^+ + \text{HCO}_3^-$
 (III) $\text{H}_3\text{PO}_4 \rightarrow \text{H}^+ + \text{H}_2\text{PO}_4^-$
 (IV) $\text{H}_2 \rightarrow \text{H}^+ + \text{H}^-$
 (1) $\text{I} < \text{III} < \text{II} < \text{IV}$ (2) $\text{II} < \text{III} < \text{IV} < \text{I}$
 (3) $\text{I} < \text{III} < \text{II} < \text{IV}$ (4) None of these
29. A cylindrical tube, open at one end and closed at the other is in acoustic unison with an external source of frequency, held at the end of open end, in its fundamental mode. Then
 (1) The wave from the source gets reflected with a phase change of π at the closed end.
 (2) The wave reflected from the closed end again gets reflected at the open end.
 (3) Both 1 and 2
 (4) None of these
30. The bond energy of which of the following is the highest?
 (1) H-H bond (2) Cl-Cl bond
 (3) H-Cl bond (4) None of these

SECTION-C : MATHEMATICS

31. The range of a real function $f(x) = x^2 + 1$ is
 (1) $[1, \infty]$ (2) $[\infty, 1]$
 (3) $[1, 1]$ (4) None of these
32. If $A = \begin{pmatrix} a & c \\ b & d \end{pmatrix}$ find $\text{adj } A$.
 (1) $\begin{pmatrix} d & -c \\ -b & a \end{pmatrix}$ (2) $\begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$
 (3) $\begin{pmatrix} a & d \\ b & c \end{pmatrix}$ (4) None of these
33. The solutions of the quadratic equation $ax^2 + bx + c = 0$ where $a, b, c, \in \mathbb{R}$, $a \neq 0$, $b^2 - 4ac < 0$ are given by
 (1) $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ (2) $x = \frac{-b \pm \sqrt{4ac - b^2}i}{2a}$
 (3) $x = \frac{-b}{a}$ (4) None of these

34. A coin is tossed twice, what is the probability that atleast one tail occurs?
- (1) $\frac{4}{3}$ (2) $\frac{2}{3}$
 (3) $\frac{3}{4}$ (4) None of these
35. Find the sum to infinity of the GP?
 $\frac{-5}{4}, \frac{5}{16}, \frac{-5}{64}, \dots$
- (1) 1 (2) -1
 (3) 2 (4) None of these
36. In the series 357, 363, 369, what will be the 10th term ?
- (1) 411 (2) 405
 (3) 413 (4) None of these
37. $\cot(x - y) = \square$ then \square
- (1) $\frac{\cot x + \cot y + 1}{\cot y - \cot x}$ (2) $\frac{\cot y - \cot x}{\cot x \cot y + 1}$
 (3) $\cot x - \cot y$ (4) None of these
38. Equation of a line is $3x - 4y + 10 = 0$. Find its slope
- (1) $\frac{4}{3}$ (2) $\frac{2}{6}$
 (3) $\frac{3}{4}$ (4) None of these
39. Pipes A and B can fill a tank in 5 & 6 hours respectively. Pipe C can empty it in 12 hours. If all the three pipes are opened together, then the tank will be filled in
- (1) $1\frac{13}{17}$ hours (2) $3\frac{9}{17}$ hours
 (3) $2\frac{8}{11}$ hours (4) None of these
40. In how many ways a committee, consisting of 5 men and 6 women can be formed from 8 men and 10 women?
- (1) 266 (2) 11760
 (3) 5040 (4) None of these

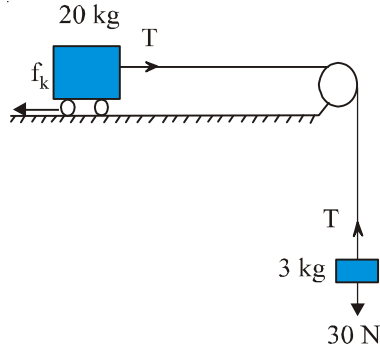
SECTION-C : BIOLOGY

31. Multiple-fission is an asexual mode of reproduction. Which of the following organisms reproduces through binary fission?
- (1) Amoeba (2) Planaria
 (3) Leishmania (4) None of these
32. The growth of pollen tubes towards ovules is an example for
- (1) Chemotropism (2) Hydrotropism
 (3) Geotropism (4) None of these
33. If we suddenly remove all the protein molecules from the plasma membrane of a cell (without destroying the cell). Which of the following would you expect to happen?
- (1) Transport of all molecules across the plasma membrane would stop

- (2) Transport of most ions across the plasma membrane would stop
- (3) Amino acids would rapidly aggregate on the plasma membrane and replace the missing proteins.
- (4) None of these
34. In evolutionary terms, we have more in common with a
- (1) Dog (2) Bear
 (3) Chimpanzee (4) None of these
35. The involuntary actions like blood pressure, salivation and vomiting are controlled by which part of the brain ?
- (1) Cerebrum (2) Medulla
 (3) Cerebellum (4) None of these
36. Which of the following statement is false?
- (1) In a hypertonic solution, a cell from a multicellular animal usually will swell and burst.
 (2) Chloroplasts and mitochondria are each bounded by two membranes
 (3) If a lysosome bursts its contents can seriously damage the cytoplasm of a cell.
 (4) None of these
37. Which of the following, circulating in the blood, help in clot formation at the points of injury?
- (1) Platelets (2) Polymorphs
 (3) Monocytes (4) None of these
38. One of Mendel's laws states the following : Units of inheritance which control different aspects of the phenotype may be inherited independently. Which of the following true statements best restates this conclusion in modern terms?
- (1) In the first stage of meiosis, chromosomes pair with their homologues.
 (2) During fertilization, which sperm combines with which egg is a matter of chance.
 (3) In the first stage of meiosis, the segregation of one pair of chromosome does not affect the segregation of other chromosomes.
 (4) None of these
39. Which of the following produces negative pressure with in your thoracic cavity?
- (1) Contraction of the muscles in the wall of the stomach.
 (2) Contraction of the diaphragm muscles.
 (3) Relaxation of the muscles between the ribs.
 (4) None of these
40. Individuals afflicted with haemophilia suffer from excessive bleeding due to the failure of the normal clotting mechanism. The disease is associated with a sex linked recessive gene. Two brothers are haemophiliacs; their parents do not suffer from excessive bleeding. The probability that their sister inherited the gene for haemophilia is most likely.
- (1) $\frac{1}{4}$ (2) $\frac{1}{2}$
 (3) $\frac{3}{4}$ (4) None of these

EtG INTERACTIVE SECTION

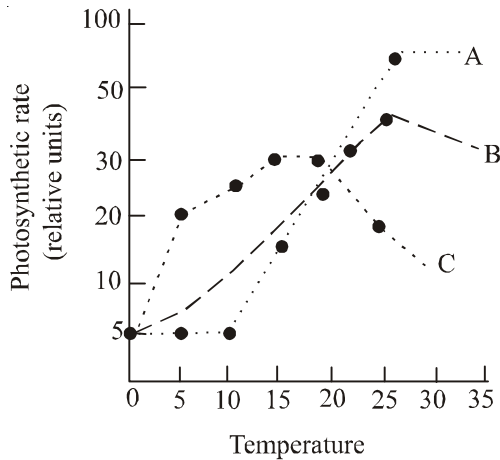
41.



What is the acceleration of the block and trolley system shown in the above figure? The coefficient of kinetic friction between the trolley and the surface is 0.04.

- (1) 0.86 ms^{-2} (2) 0.96 ms^{-2}
 (3) 0.78 ms^{-2} (4) None of these

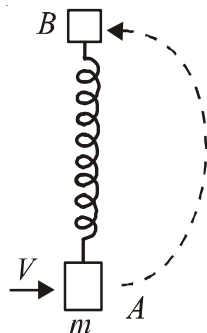
42.



The given graph shows the relationship between photosynthetic rate and temperature. Based on these results, which species is best adapted to arctic conditions where the mean temperature does not exceed 8°C during the growing season?

- (1) Species A (2) Species B
 (3) Species C (4) None of these

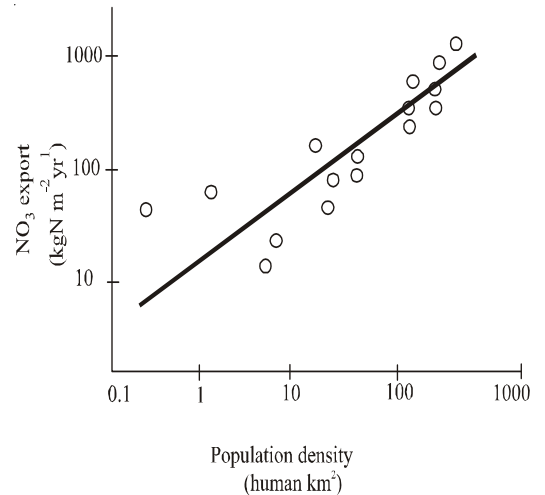
43.



Mass m suspended by a spring of unextended length R and spring constant k . The horizontal velocity that has to be imparted at point A so that the mass reaches the point B is

- (1) $\sqrt{(mgR)}$ (2) $\sqrt{(mgR^3)}$
 (3) $\sqrt{(Kx^2 + 2mgR)}$ where x is the extension of the spring.
 (4) None of these

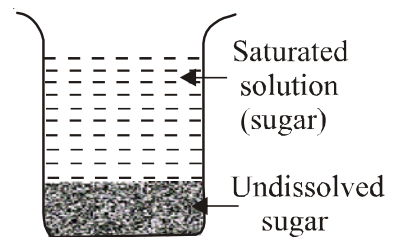
44.



The graph given above shows how much nitrate (NO_3^-) is exported from the continent towards the ocean by 16 major rivers in the world compared to the density of human populations living in those drainage basins. Nitrate exported through rivers causes eutrophication and has been implicated in the development of toxic algal blooms in marine coastal regions. What conclusion drawn from the graph is correct?

- (1) Large drainage basins exported more NO_3^-
 (2) Drainage basins with higher population densities export more NO_3^-
 (3) Small drainage basins export more NO_3^-
 (4) None of these

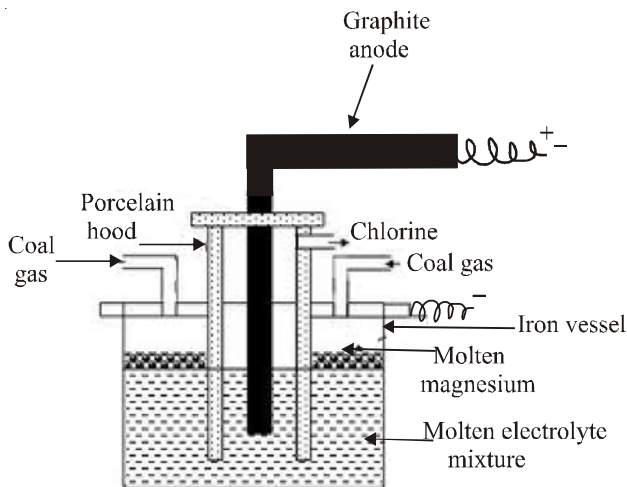
45.



The equilibrium between a solid and its solution is indicated by the saturated solution. Then solubility is defined as

- (1) The minimum amount of the solute in grams which dissolves in 100g of the solvent at a given temperature to form the saturated solution.
 (2) The minimum amount of the solute in grams which dissolves in 100 g of the solution at a given temperature to form the saturated solution.
 (3) The maximum amount of the solute in grams which dissolves in 100 g of the solvent at a given temperature to form the saturated solution.
 (4) None of these.

46.



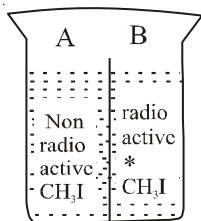
Anhydrous $MgCl_2$ is melted and mixed with molten $NaCl$ and $CaCl_2$ in order to reduce its melting point. This molten mixture is electrolysed in an iron vessel which acts as the cathode. A graphite rod dipped in the molten electrolyte mixture acts as the anode. Which are the products obtained during electrolysis?

- (1) HCl
- (2) KCl and $MgCl_2$
- (3) Mg and Cl_2
- (4) None of these

47. In the above apparatus, a stream of inert gas like coal gas is kept circulated in the cell to

- (1) Check the oxidation of Magnesium
- (2) Check the oxidation of chlorine
- (3) Check the oxidation of sodium
- (4) None of these

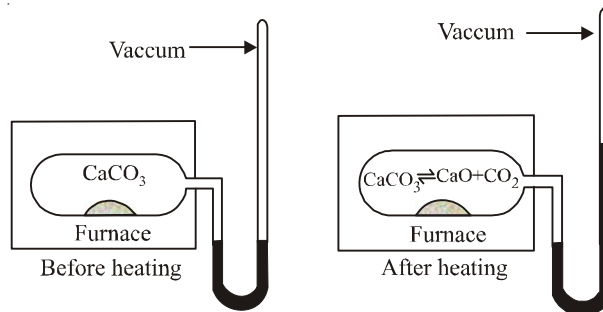
48.



A vessel has 2 compartments connected at the top. In compartment A normal methyl iodide is placed while in compartment B radio active methyl iodide is placed. We will find that

- (1) The vapours over both the compartments will become radio active.
- (2) The vapours over B will remain radio active and there is no change over the vapours of A.
- (3) The vapours over both the compartments will condense.
- (4) None of these.

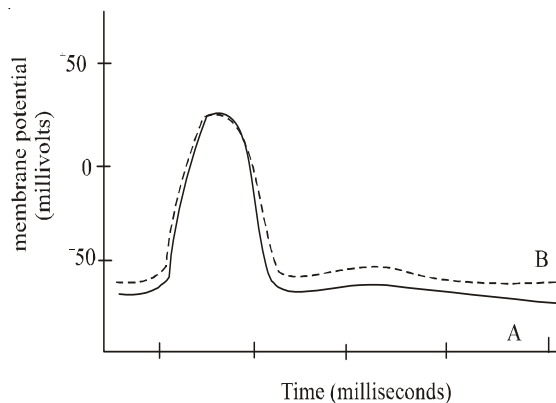
49.



The decomposition of $CaCO_3$ has reached equilibrium. In the above heterogeneous system we can see that

- (1) The reactants and products are in the same phase.
- (2) The reactants and products are in different phase.
- (3) The rate at which $CaCO_3$ decomposes to form CaO and CO_2 is different at which the products combine to give the reactants.
- (4) None of these

50.



The above graph shows two nerve action potential recorded intracellularly in response to stimulating an axon. What experimental manipulation would most likely have caused the change from curve A (Solid line) to curve B (dashed line)?

- (1) a decrease in stimulus intensity
- (2) a decrease in sodium concentration in the extracellular fluid
- (3) a decrease in the potassium concentration inside the neuron
- (4) None of these



END OF THE EXAM