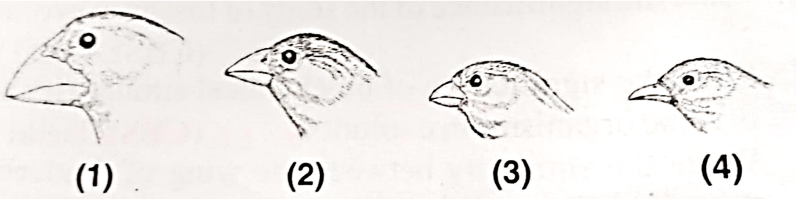
# NEW STANDARD ACADEMY

**SEMRI KOTHI SUPER MARKET, RAEBARELI**

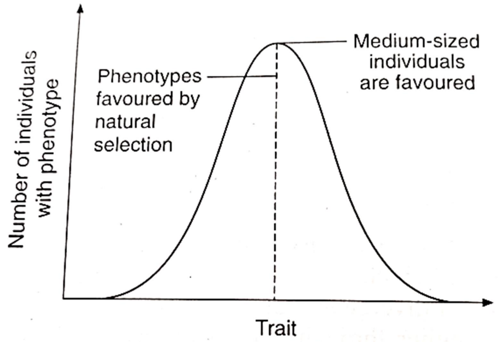
**CLASS 12 (BIOLOGY) DPP (Academy) 15/07/2024**

1. (i) Write your observations on the variations seen in the Darwin's finches shown below.




(ii) How did Darwin explain the existence of different varieties of finches on Galapagos Island?

2. How does the Hardy-Weinberg's expression ($p^2+2pq+q^2=1$), explain that genetic equilibrium is maintained in a population?
3. Convergent evolution and divergent evolution are the two concepts explaining organic evolution. Explain each one with the help of an example.
4. (a) Differentiate between analogous and homologous structures.
(b) Select and write analogous structures from the list given below:
(i) Wings of butterfly and birds.
(ii) Vertebrate heads
(iii) Tendrils of Bougainvillea and Cucurbita
(iv) Tubers of sweet potato and potato
5. Explain the salient features of Hugo de Vries theory of mutation. How is Darwin's theory of natural selection different from it? Explain.
6. (i) Highlight the role of thymus as a lymphoid organs.
(ii) Name the cells that are released from the above mentioned gland. Mention, how they help in immunity?
7. Mention a product of human welfare obtained with the help of each one of the following microbes.
(i) LAB
(ii) Saccharomyces cerevisiae
(iii) Propionibacterium shermanii
8. (a) Write the Hardy-Weinberg principle.
(b) Explain the three different ways in which natural selection can affect the frequency of a heritable trait in a population shown in the graph given below.
9. Explain the different steps involved in sewage treatment before it can be released into natural water bodies.
10. 8. Name the genus to which baculoviruses belong. Describe their role in the




Integrated Pest Management (IPM) programme.

11. What are fermentors?
12. Name any genetically modified crop.
13. Why are some molecules called bioactive molecules?
14. What is a broad spectrum antibiotic? Name one such antibiotic.
15. Why is aerobic degradation more important than anaerobic degradation for the treatment of large volumes of waste waters rich in organic matter? Discuss.
16. Match the microbes in column I with their commercial/industrial products in column II and select the correct answer:

| Column I | Column II |
|---|---|
| A *Aspergillus niger* | 1 Ethanol |
| B *Clostridium butylicum* | 2 Statins |
| C *Saccharomyces cerevisiae* | 3 Citric acid |
| D *Trichoderma polysporum* | 4 Butyric acid |
| E *Monascus purpureus* | 5 Cyclosporine |

17. 17. Name the parasite that causes filaria is in humans. Mention its two diagnostic transmitted to others? symptoms. How is this transmitted to others?
18. Name and explain the two types humans. of immune responses in humans.
19. Name the two special types of lymphocytes in humans. How do they differ in their roles in immune response?
20. Name the group of virus response for causing AIDS in humans. Why are these virus so, named?

# NEW STANDARD ACADEMY

**SEMRI KOTHI SUPER MARKET, RAEBARELI**

**CLASS 12 (CHEMISTRY) DPP (Academy) 15/07/2024**

1. On dissolving 0.25 g of a non volatile substance in 30 ml. benzene (d = 0.8g / mL ) the freezing point of solution decreases by 0.4°C. If $K_f$ = 5.12 K/m what is the molar mass of the solute ?
2. How much naphthalene should be added to 20 g benzene to depress its freezing point by 0.27 K? $K_f$ for benzene 5.4 K kg/mol and molecular mass of naphthalene = 128
3. A solution of organic compound in nitrobenzene freezes at a temp. 0.84°C below the freezing point of pure solvent. $K_f$ for solvent = 51.2 K/mol per 100 g What is the molality of the solution ?
4. A solution of 2.95 g of sulphur in 1kg of cyclohexane has depression in freezing point of 0.232 K. What is the molecular formula of sulphur? K, for cyclohexane 20.2 K kg/mol.
5. An aqueous solution contains 7.5g urea (molar mass = 60) in 100 g water. Another aqueous solution contains 42.75 g of a non-volatile solute in 100 g water Both the solutions have same freezing point. What is the molar mass of solute?
6. At a hill station, temperature is -5°C. Molar mass of ethylene glycol is 62. Is a 20% by mass aqueous solution of ethylene glycol suitable for car radiator? K = 1.86 K kg/mol.
7. A 0.5 molal urea solution causes freezing point depression of two degrees, what is the molal depression constant?
8. Calculate the osmotic pressure of an aqueous solution obtained by dissolving 11.1 g Call in one litre solution at 27°C Molar mass of $CaCl_2$=111 and R = 0.0821L atm $K^{-1}$ /mol Salt is completely dissociated in water
9. 7.45 g of KCl are dissolved in 100 g water. KCl dissociates completely in water. What is the boiling point of solution? $K_b$ for water is 0.52 K kg/mol?
10. Calculate the freezing point of 0.1 molal NaCl aqueous solution. Assume complete dissociation of the salt. $K_f$ for water is 1.8 K/m.
11. Osmotic pressure of decimolar aqueous solution of NaCl at 300K is 4.62 atm. What is the degree of dissociation of the salt?
12. A decimolar solution of potassuum ferrocyanide is 50% dusociated at 300K Calculate osmotic pressure of the solution. R = 8.314J$K^{-1}$ mol
13. How many grams of KCI should be dissolved in 1kg water to make the solution to freeze at 8°C? K, for water = 1.86.K kg/mol.
14. What mass of NaCl (molar mass 58.5 g/mol) must be dissolved in 65 gram of water to lower the freesing point by 7.5°C ? The freezing point depression constant ($K_f$) for water is 1.86K kg $mol^{-1}$ Assume the van't Hoff factor for Nail is 1.87
15. At 300K, 5% glucose and 1.1% KCl solution are isotonic. Calculate the degree of dissociation of KCL. Percentage given is in mass/volume.
16. Kl and sucrose solution with 1 M concentration harve osmotic pressure of 0.465 atm and 0.245 atm respectively. Find van't Hoff factor of Kl and its degree of dissociation.
17. The degree of dissociation of $Ca(NO_3)_2$ in a dilute solution containing 7 gram of the sale per 100 g of water is 70%. If the vapour pressure of water at 100°C 760mm, Calculate the vapour pressure of solution
18. 0.85% (w / V) aqueous solution of $NaNO_3$ is 90% dissociated at 27°C. Calculate the osmotic pressure of solution.
19. The freezing point of a solution containing 0.2g acetic acid in 20g of benzene is lowered by 0.45°C. Calculate the degree of association of acetic acid. $K_f$ for benzene u 5.12 K kg/mol
20. Calculate the freezing point of one molar aqueous solution (d = 1.04g / mL) of KCl. For water $K_f$ = 1.86 K kg/mol.
21. 2 gram benzoic acid dissolved in 25 g benzene shows depression in freezing point equal to 1.62 K. If K_{j} of benzene is 4.9 K kg/mol, what is the % association of the acid?
22. Calculate the b.p. of 1 molar aqueous KCl (d = 1.04g / mL) $K_b$ for water = 0.52 K kg/mol.
23. A 0.001 molal solution of a complex with molecular formula $[Pt(NH_3)_2Cl_4]$ in water showed a freezing point depression of 0.0054°C. If $K_f$ for water is 1.80, what is the correct formulation of the molecule with a proper coordination sphere?
24. Xg of a non-electrolyte compound (molar moss = 200) are dissolved in 1.0 litre of 0.05 M NaCl aqueous solution. The osmatic pressure of this solution is found to be 4.92 atm at 27°C Calculate the value of X. Assume complete dissociation of NaCl and ideal behaviour of this solution. ( R = 0.082 litre atm $mol^{-1}$ $K^{-1}$
25. 3.9 g of benzoic acid dissolved in 49 g of benzene shows a depression in freezing point of 1.62 K Calculate the van't Hoff factor and predict the nature of solute (associated or dissociated) (Given: Molar mass of benzoic acid = 122 g $mol^{-1}$ $K_f$ for benzene = 4.9 K kg $mol^{-1}$).

26. 0.6 ml. of acetic acid having density 1.06g/ml is dissolved in one litre water. The depression of freezing point observed for this strength of acid was 0.0205°C Calculate the van't Hoff factor and the dissociation constant of the acid. $K_f = 1.86$K kg/mol.
27. Calculate the freezing point depression expected for 0.0711m aqueous solution of $Na_2SO_4$ If this solution actually freezes at - 0.32$^0$C,what would be the value of van't Hoff factor? ($K_f$ for water is 1.86 $^0$C / mol )
28. Calculate the grams of KCl to be dissolved in 1kg water that freezing point is depressed by 2K. For water $K_f = 1.86$K kg/ mol
29. Calculate the degree of dissociation of 1.25% NaCl aqueous solution which is isotonic with 7.5% aqueous solution of glucose. Percentage given mass/volume. is by
30. Phenol associates in benzene to form dimer. A solution containing $20\times10^{-3}$ kg of phenol in 1kg of benzene has its freezing point depressed by 0.69K. If $K_f$ for benzene is 5.12 K kg / mol, what is the degree of association of phenol?

# NEW STANDARD ACADEMY

**SEMRI KOTHI SUPER MARKET, RAEBARELI**

**CLASS 12 (MATH's) DPP (Academy) 15/07/2024**

1. The function *f(x )* is discontinuous only at x = 0 such that $f^2(x)= 1 \forall\, x \in R$. Then find the total of such functions.
2. Let *f(x)* $\begin{cases} \{1+|sinx|\}^{a/|\sin x} & ; \frac{\pi}{6} < x < 0 \\ b & ; x = 0 \\ e^{tan2x/tan2x} & ; 0 < x < \frac{\pi}{6} \end{cases}$ Determine a and b such that *f(x)* is continuous at x = 0
3. *If(x)* = $\begin{cases} \left(\frac{3}{2}\right)^{(\cot 3x)/(cot2x)} & ; 0 < x < \frac{\pi}{2} \\ b+3 & ; x = \frac{\pi}{2} \\ (1+|\cot x|)^{(a|\tan x| \quad )/b} & ; \frac{\pi}{2 < x < \pi} \end{cases}$ is continuous at x $= \pi/2$, find the value of a and b.
4. If $f(x)=\frac{x^2-bx+}{x^2-7x+10}$ for x≠ 5 is continuous at x =5 then find the value of *f(5).*
5. If *f(x)* = $\begin{cases} \frac{1-cos\left(1-cos\frac{x}{2}\right)}{2^m x^n}, & x \neq 0 \\ 1, & x = 0 \end{cases}$ is continuous at x=0 then find the value of m and n
6. What type of discontinuity $f(x)= sin(log_e|x|)$, x ≠ 0, and 1 if x = 0 has at x = 0?
7. If *f(x)* = x and g(x) = [x], where[.] is greatest integer function.
8. $f(x) = x^3$ *and* $g(x) = sgn(x)$
9. *If f(x)*=$\begin{cases} |x+1| & ; x \le 0 \\ x & ; x > 0 \end{cases}$ and *g(x)* =$\begin{cases} |x|+1 ; x \le 1 \\ -|x-2| ; x > 1 \end{cases}$. Then discuss continuity of *f(x)+g(x)*
10. *Discuss the continuity of functions.([.] represents greatest integer)*
    $f(x)=\left[\frac{2}{1+x^2}\right], x \ge 0$
11. Find the set of points where $x^2|x|$ is thrice differentiable.
12. If *f(x)* $\begin{cases} (sin^{-1}x)^2 . \cos\left(\frac{1}{x}\right) ; x \neq 0 \\ 0 \quad ; x = 0 \end{cases}$ then discuss differentiability at x = 0
13. Let *f(x)* be defined in the interval [-2,2] such that *f(x)*= $\begin{cases} -1, -2 \le x \le 0 \\ x-1, 0 < x \le 2 \end{cases}$ and = *f(|x|)=|f(x)|*. Test the differentiability of g(x) in (-2,2)
14. $f(x)=[x]+\sqrt{\{x\}}$, where [.] and {.} denote the greatest integer function and fractional part respectively, then discuss the differentiability of *f(x).*
15. Discuss differentiability of function f(x) = maximum{2 sin x,1- cosx) $\forall\, x \in (0, \pi)$
16. The left – hand derivatives of f(x) =[x] sin (πx) at x = k,k is an integer ,is.
17. Let *f* : R→R be a function defined by $f(x)= max\{x,x^3\}$. The set of all points where *f(x)* is not differentiable is
18. The function $f(x) =(x^2-1)|x^2-3x+2|+ \cos(|x|)$ is not differentiable at
19. If *f(x)* is a continuous and differentiable function and $f(1/n)=0 \ \forall\ n \ge 1$ *and* $n \in$ I, then
20. Let *f(x)*=$\begin{cases} x^2 \left|cos\frac{\pi}{x}\right|, & x \neq 0 \\ 0, & x = 0 \end{cases}$, $x \in$ I. Then *f is*

# NEW STANDARD ACADEMY

**SEMRI KOTHI SUPER MARKET, RAEBARELI**

**CLASS 12 (PHYSICS) DPP (Academy) 15/07/2024**

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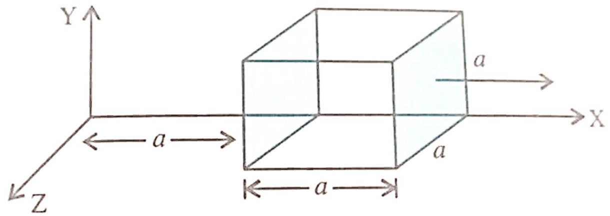
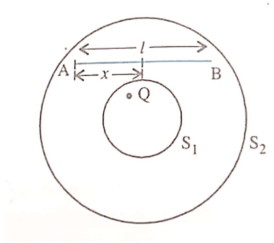
1. The force experienced by a unit charge when placed at a distance of 0.01 m from the middle of an electric dipole on its axial line is 0.025 N and when it is placed at a distance of 0.2 m, the force is reduced to 0.002 N. Calculate the dipole length.
2. Two charges, one of + 5μC and other -5μC are placed 1mm apart. Calculate the dipole moment.
3. An electric dipole, when held at an angle of 30° with respect to a uniform electric field of $10^4$ NC experiences a torque of $9\times10^{-26}$ Nm. Calculate dipole moment of the dipole.
4. An electric dipole consists of two opposite charges each of magnitude $8\times10^{-9}$ C separated by a distance $8\times10^{-2}$ m. The dipole is placed in an external field of $5\times10^5$ NC$^{-1}$.What maximum torque will the field exert on the dipole?
5. A dipole consisting of an electron and a proton separated by a distance of $4\times10^{-10}$ m is situated in an electric field of intensity $3\times10^5$ N C$^{-1}$ at an angle of 30° with the field. Calculate the dipole moment and torque acting on dipole. Charge e on electron $= 1.6\times 10^{-19}$ C
6. An electric dipole of dipole moment $4\times10^{-5}$ Cm is placed in a uniform electric field of $10^{-3}$ NC$^{-1}$ making an angle of 30° with the direction of field. Determine the torque exerted by the electric field on dipole.
7. Two point charges each of 5μC but opposite in sign are placed 4 cm apart. Calculate the electric field intensity at a point distant 4 cm from the midpoint on the axial line of the dipole.
8. Two charges of 0.2 μμC and 0.2 μμC are placed $10^{-6}$ cm apart. Calculate the electric field at an axial point at a distance of 10 cm from their mid point. Use standard value of $\epsilon_0$.
9. 8. Two charges of +25 nC and -25 nC are placed 6 m apart. Find the electric field at a point 4 m from the centre of the electric dipole (i) on axial line (ii) on equatorial line.
10. Calculate the electric field due to an electric dipole of length 20 cm consisting of charges $\pm150\ \mu$C at a point 30 cm from each charge.
11. A dipole consists of an electron and a proton separated by distance of $5\times10^{-9}$ m. The dipole is aligned in a uniform electric field of $1.44\times10^4$ NC$^{-1}$ Calculate the potential energy of dipole to hold it at 60° with the direction of electric field.
12. An electric dipole consists of two charges of $+16\times10^{-19}$ C and $-16\times10^{-19}$ C separated by a distance of $3.9\times10^{-12}$ m . The dipole is placed in a uniform electric field of $10^5$ N C$^{-1}$ . Calculate (i) the electric dipole moment (ii) potential energy of dipole in stable equilibrium.
13. A molecule of a substance has permanent electric dipole moment equal to $10^{-29}$ Cm. A mole of this substance is polarised (at low temperature) by applying a strong field of magnitude $10^6$ Vm$^{-1}$ .The direction of electric field suddenly changed by an angle of 60°. Estimate the heat released by the substance in aligning its dipoles along the new direction of the field. For simplicity, assume 100% polarisation of sample.
14. An electric dipole consists two opposite charges each of 1μ C separated by a distance of 2 cm. The dipole is placed in a uniform electric field of $10^5$ Vm$^{-1}$ Calculate the work done in rotating the dipole through 180° starting from theta = $0^0$
15. An electric dipole of moment $5\times10^{-8}$ Cm is aligned in a uniform electric field of $1.44\times10^4$ NC$^{-1}$ Calculate potential energy of the dipole to hold the dipole at 60° with the direction of electric field.
16. An electric dipole of length 10 cm having charges$\pm6\times10^{-3}$ C placed at 30° with respect to a uniform electric field, experiences a torque of $6\sqrt{3}$ Nm .Calculate (a) magnitude of electric field (b) the potential energy of the dipole.
17. An electric dipole of length 4 cm is placed with its axis making an angle of 60° with a uniform electric field experiences a torque $4\sqrt{3}$ Nm, calculate the potential energy of dipole, if it has a charge of $\pm8$ nC.
18. Given fig. shows three charges $q_1$, $q_2$, $q_3$ enclosed in gaussian surface. How much is the flux of electric field through Gaussian surface if $q_1$= +4n C, $q_2$ = - 7n C and $q_3$ = 9nC.
19. If a charge of 1C is placed at the centre of a cube of side 10 cm, then calculate flux coming out of any face of cube. If charge is placed at one vertex then calculate flux also.
20. A spherical gaussian surface encloses a charge of $8.85\times10^{-8}$ C (i) Calculate the electric flux passing through the surface (ii) If the radius of the Gaussian surface is doubled, how would the flux changes?

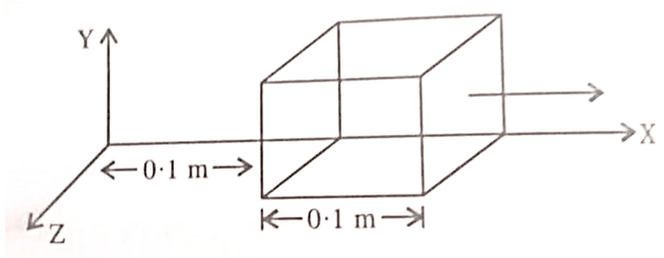
21. The electric field components in fig. are $E_x = \alpha x^{1/2}$, $E_y = E_z = 0$ in which $\alpha = 800 N / Cm^2$ Calculate (i) the flux $\phi_E$ through the cube and (ii) the charge with in the cube. Assume that a = 0.1 m.




22. In fig., calculate the total flux of the electrostatic field through the sphere $S_1$ and $S_2$ The wire AB shown here has a linear charge density $\lambda$ given by $\lambda$ = kx where x is distance measured along the wire from end A.




23. The electric field components due to a charge inside the cube of side 0.1 m are $E_x = \alpha x$ wherea $\alpha$ = 500 N/C m $E_y = 0$ $E_Z = 0$ calculate the flux through the cube and charge inside the cube.




24. An electric field is uniform, and in the positive x-direction for positive x and uniform with the same magnitude in the negative x-direction for negative x. It is given that

$\vec{E}$=200 $\hat{\imath}$ $NC^{-1}$ for x > 0

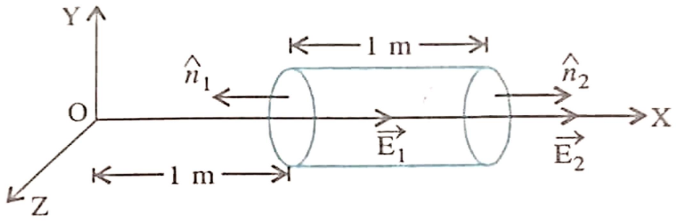
$\vec{E}$=-200 $\hat{\imath}$ $NC^{-1}$ for x < 0.

A right circular cylinder of length 20 cm and radius 5 cm has its centre at the origin and its axis along the x-axis so that one face is x = $\pm$10 cm and the other is at x = - 10 cm.

(i) What is the net outward flux through each flat face?
(ii) What is the flux through the side of the cylinder?
(iii) What is net outward flux through cylinder?
(iv)What is the net charge inside the cylinder?

25. A hollow cylindrical box of length 1 m and area of cross-section 25 c $m^2$ is placed in a three dimensional co-ordinate system as shown in fig. The electric field in the region is given by E =50 x$\hat{\imath}$ , where E is in $NC^{-1}$ and x is in metre. Find

(i) Net flux through the cylinder
(ii) Charge enclosed by cylinder.




26. Consider the electric field $\vec{E}$=6 $\hat{\imath}$+3 $\hat{\jmath}$ +4$\hat{k}$ hat k the electric flux through a surface of area 20 units in Y-Z plane.

27. Calculate the number of electric lines of force originating from a charge of I C

28. A positive charge of 17.7 μ C is placed at the centre of a hollow sphere of radius 0.5 m. Calculate the flux density through the surface of sphere.

29. A circular plane sheet of radius 10 cm is placed in a uniform .electric field $5\times10^5$ $NC^{-1}$ making an angle of 60° with the field. Calculate electric flux through the sheet.

30. The flux of the electrostatic field through the closed spherical surface S' is found to be four times that through the closed surface S as shown in fig. Find the magnitude of the charge Q. Given $q_1$ = 1 μ C, $q_2$ = - 2$\mu$ C and $q_3$ = 9.854$\mu$C.