NEW STANDARD ACADEMY

SEMRI KOTHI SUPER MARKET, RAEBARELI

CLASS 12 (CHEMISTRY) DPP (Academy) 01/07/2024

1. The vapour pressure of benzene and toluene at 293 K is 75 mm and 22 mm Hg respectively. 23.4 g of benzene and 64.4 g of toluene are mixed. If the two form an ideal solution, calculate the mole fraction of benzene in the vapour phase assuming that vapours are in equilibrium with the liquid mixture.
2. The vapour pressure of pure benzene at a certain temperature is 0.850 bar. A non-volatile, non-electrolyte solid weighing 0.5g when added to 39.0 g of benzene, vapour pressure of the solution is 0.845 bar. What is the molar mass of the solid substance?
3. The vapour pressure of a 5% aqueous solution (by weight) of a non-volatile organic compound at 373 K is 745 mm Hg. Calculate the molar mass of the solute.
4. Vapour pressure of water at 17°C is 17.51 mm. Lowering of vapour pressure of an aqueous solution of urea is 0.0614 mm. Calculate relative lowering of vapour pressure and mole fraction of water.
5. Vapour pressure of an aqueous solution of glucose is 750 mm at 100℃. Calculate the molality and mole fraction of solute.
6. Vapour pressure of carbon disulphide at 320 K is 854 mm of Hg. A solution of 3 gram sulphur in 150 g carbon disulphide has vapour pressure equal to 849 mm of Hg. What is the molecular formula of sulphur?
7. The V.P. of a solution containing n propyl alcohol and ethyl alcohol at a constant temp. is 290 mm. The mole fraction of ethyl alcohol is 0.65 in liquid mixture If VP of pure n-propyl alcohol is 210 mm, calculate the VP of pure ethyl alcohol.
8. How much urea (molar mass = 60) should be dissolved in 50 g water so that its vapour pressure is reduced by 25%? Calculate the molality of the solution obtained.
9. An ideal solution containing 1 mole of A and 3 moles of B has vapour pressure equal to 550 mm at 300k.When one mole of B is added to the above solution vapour pressure is increased by 10 mm at the same temperature. What is the vapour pressure of liquid A and liquid B?
10. A solution is prepared by dissolving 10 g of non volatile solute in 200 g of water. it has a vapour pressure of 31.84 mm Hg at 308 K. Calculate the molar mass of the solute.
11. When 10 g of a non volatile solute are dissolved in 80 g of acetone at 300 K the lowering in vapour pressure is 12 mm Hg. If vapour pressure of pure acetone at 300K is 283 mm Hg, calculate the molar mass of solute.
12. At 298K the vapour pressure of water is 23.75 mm Hg. Calculate the vapour pressure of 5% aqueous solution (by weight) of urea (NH_2 $CONH_2$) at this same temperature.
    [Hint: w=5, W = 95]
13. How many moles of a non-volatile solute should be dissolved in 100 g of n-heptane (n-C_7 H_{16}) to lower its vapour pressure by 2% ?
14. Vapour pressure of water at 300K is 31.82 mum Hg. Calculate the mole fraction of glucose and water if the vapour pressure of solution is 30.95 mm Hg.

15. Calculate the vapour pressure of 0.1M urea solution Vapour pressure of water at the given temp. is 20 torr. Assume molarity and molality to be equal.
16. Vapour pressure of two liquids A and B is 500 and 200 torr respectively: Calculate the mole fraction of B at which both liquids have equal partial vapour pressure.
17. Vapour pressure of two liquids A and B is 100 mm and 160 mm of Hg. What are the mole fractions of A and B in the solution if vapour pressure of the solution is 130 mm at the same temperature?

18. At 298 K vapour pressure of pure water is 23.76 mm Hg and that of an aqueous solution of urea is 22.98 mm Hg. Calculate the molality of the solution
19. A solution is made by mixing 32 g methanol and 23 g ethanol. If vapour pressure of pure methanol and ethanol is 90 mm and 51 mm Hg, calculate the mole fraction of ethanol in vapour phase assuming that vapours are in equilibrium with the liquid mixture.

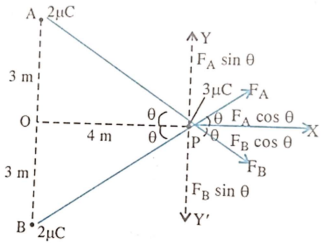
20. What mass of sucrose (molar mass 342) need to be dissolved in 1000 g of water in order to decrease the vapour pressure of water by 30% ?
21. 18.1 gram of a compound are dissolved and volume is made 100 ml. by adding water. Vapour pressure of the solution is 87 mm of Hg. If vapour pressure of water at this temperature is 92 mm of Hg, then what is the molecular weight of the compound?
22. Vapour pressure of pure benzene is 640 mm of Hg 2.175 gram of a non-volatile non-electrolyte solid are dissolved in 39 gram benzene Vapour pressure of solution at the same temperature is 600 mm of Hg Calculate the molecular weight of the solid.

23. The vapour pressure of pure liquids X and Y are 120 and 160 mm of Hg respectively. If equal moles of X and Y are mixed together to form an ideal solution. Calculate the vapour pressure of solution.
24. The total pressure of a mixture of non-reacting gases X (0.6 g) and Y (0.45 g) in a vessel is 740 mm of Hg. If molar mass of X and Y are 20 and 45 g/mol, the partial vapour pressure of the gas X is (nearest integer). mm of Hg
25. 10 g of an organic substance when dissolved in 2 litres of aqueous solution gave an osmotic pressure of 0.6 atm at 27°C. If R = 0 0.0821 L atm K^{-1}/mol, what is the molar mass of organic compound?
26. Calculate the osmotic pressure of an aqueous solution containing 4 grams of a non-volatile solute in one litre solution at 27°C. Molar mass of solute is 40.
27. Calculate the osmotic pressure of a solution obtained by mixing 100 cm_3 of 3.4% (w/V) aqueous solution of urea (NH_2 $CONH_2$) and 100cm^3 of 1.6% (W/V) aqueous solution of sugar$C_{12}H_{22}O_{11}$ at 20°C
28. A solution is prepared by dissolving 9.2 g of a non-volatile solute (molar mass 176) in water and making the volume 302c * m ^ 3 Osmotic pressure of this solution at 288.5 K is 4.1 atm. What is the value of solution constant?
29. 10 g of glucose (molar mass 180) and 10 g of sucrose (molar mass 342) are dissolved in one litre aqueous solution at 298K.What is the osmotic pressure of the solution?
30. 1.5% (mass/volume) aqueous solution of glucose (molar mass 180) and solution containing 7.65g glycerine per litre are isotonic, calculate the molar mass of glycerine

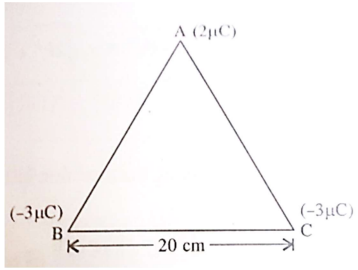
NEW STANDARD ACADEMY

SEMRI KOTHI SUPER MARKET, RAEBARELI
CLASS 12 (PHYSICS) DPP (Academy) 01/07/2024

1. Two particles, each having a mass of 5g and charge 1.0×10^{-7} C stay in limiting equilibrium on a horizontal table with a separation of 10 cm between them. The coefficient of friction between each particle and the table is same. Find μ.
2. Two small spheres, each of mass m kg and charge q coulombs are suspended from a point by insulating threads each of length / metre but of negligible mass. If O is the angle each string makes with the vertical when equilibrium has been reached, show that
   $q^2 = (4mg\, l^2 \sin^2\theta \tan\theta)\ 4\pi \in_0$
3. Two identically charged spheres are suspended in air by strings of equal weights and make an angle of 30° with each other. When suspended in a liquid of density 800 kg/m³ angle remains same. What is the dielectric constant of the liquid? The density of the material of the sphere is 1600 kg/m³.
4. Two identical spheres, having charges of opposite sign attract each other with a force of 0.108 N when separated by 0.5m The spheres are connected by a conducting wire, which then removed, and thereafter they repel each other with a force of 0.036 N. What were initial charges on the spheres?
5. Three point charges are placed at following points on x-axis, 3μC at x = 0 - 4 μC at x = 50 cm and -5μC at x 120 cm. Calculate the force on -4μC charge.
6. Three point charges each of + qC are kept at the vertices of an equilateral triangle of side 'l' . Determine the magnitude and sign of the charge to be kept at its centroid so that the charges at the vertices remains in equilibrium.
7. Consider three charges q_1. q_2.q_3 each equal to q at the vertices of an equilateral triangle of side l. What is the force on a charge Q (With same sign as q) placed at the centroid of the triangle?
8. Two equal positive charges, each of 2μC interact with a third positive charge of 3μC situated as shown in figure. Calculate the magnitude and direction of the force on the 3μC charge.



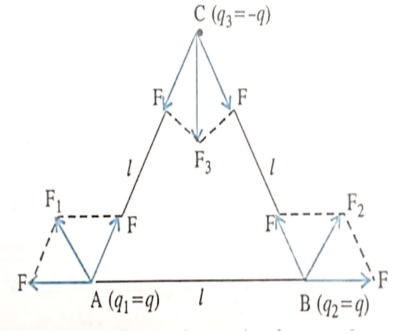
9. Three point charges of +2μC, -3μC and - 3μC are kept at the vertices ABC of an equilateral triangle of side 20 cm as shown in figure (a). What would be the sign and magnitude of the charge to be placed at the midpoint (M) of side BC so that charge at A remains in equilibrium?



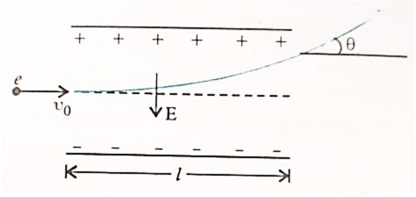
   Ans[$3.9\mu C$]
10. Point charges having values +q,+q,-q and -q are placed at the four corners A, B, C and D of a square having side a. Calculate the force on charge Q placed at the centre of square.
11. An infinite number of charges each equal to $4\mu C$ are placed along x-axis at x = 1 m, x=2m, x=4m and x = 8 m and so on. What will be total force on a charge of 1 C placed at the origin?
12. How much electric field strength is required to just support a water drop of mass 10^{-3} kg and having a charge 1.6×10^{-19} C ?
13. A pendulum of mass 80 mg and carrying a charge of 20 nC is at rest in a horizontal uniform electric field of 2×10^4 V m^{-1} Find the

tension in the thread of pendulum and angle it makes with the vertical.

14. Consider the charges q, q and-q are placed at the vertices of an equilateral triangle as shown in Fig. What is the force on each charge?



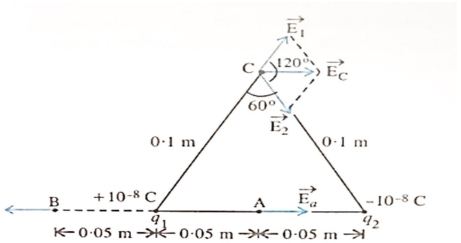
15. An electron is liberated from the lower of two large parallel metal plates separated by a distance of 0.02m. The upper plate has a potential of 2.4×10^{3} V relative to lower plate. How long does the electron take to reach the upper plate? Take e/m of electrons 1.8×10^{11} C kg^{-1}
16. A particle of mass m and charge o is released frons rest in a uniform electric field of intensity E. Calculate the kinetic energy in attains after moving a distance between the plates.
17. A particle of mass 10^{-4} kg and charge 5 μC is thrown at a speed of 20 ms^{-1} against a uniform electric field of strength 2×10^{5} N C^{-1} How much distance will be travelled by it before coming to rest momentarily ?
18. . An electron falls through a distance of 1.5 cm in a uniform electric field of magnitude 2.0×10^{4} NC^{-1} as shown in Fig. (a). The direction of the field is reversed keeping its magnitude unchanged and a proton fails through the same distance Fig. (b). Compute the time of fall in each case. Contrast the situation (a) with that of Free fall under gravity.
19. An electric field E is set up between two parallel plates of a capacitor as shown in Fig. An electron enters the field symmetrically between the plates with a speed v_o. The length of each side is l. Find the angle of deviation of the path of the electron as it comes out of field.



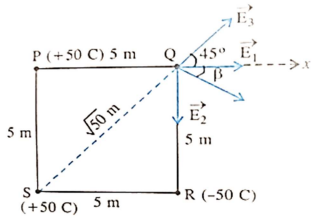
20. A liquid drop having 6 excess stationary under a uniform electric field of 25.5k V m^{-1} The density of liquid is 1.26×10^{3} kg m^{-3} Find the radius of the drop.
21. A wall which is uniformly charged and providing a uniform electric field normally of 4×10^{4} NC^{-1} A charged particle of mass 2g is suspended through a silk thread of length 24 cm and stay at a distance of 12 cm from wall. Find the charge on particle. ($g = 10ms^{-2}$)

22. Two point charges +2 μC and - 2μC are located 10 cm apart in air. (a) Calculate the electric field at the mid point P of the line RS joining the two charges. (b) If a negative charge of 1.6×10^{-19} C is placed at that point, find the force experienced by this charge.
23. Two point charges +4μC and +1μC are separated by a distance of 2m in air. Find the point on the line joining charges at which the net electric field of the system is zero.
24. Two point charges of 16×10^{-6} c and -9×10^{-6} C placed 8 cm apart in air. Determine the position of the point at which the resultant field is zero.
25. Four charges +q, q, -q, -q are placed respectively at the four corners of a square of side a. Find the magnitude and direction of the electric field at the centre of square.
26. Two point charges +q and -2q are placed at the vertices B and C of an equilateral triangle ABC of side a. Obtain expression for magnitude and direction of resultant electric field at the vertex A due to these two charges.

27. Two point charges q_1 and q_2 of 10^{-8} C and -10^{-8} C respectively are placed 0.1 m apart. Calculate the electric fields at points A, B and C as shown in Fig .



28. PQRS is a square having side 5 m. If charges +50 C,- 50C and + 50 C are placed at P, R and S respectively. What will be the resultant electric field at Q?



29. A drop of liquid has a mass 10^{-14} kg charge +2e. Calculate the magnitude of the electric field in vertically upward direction so the droplet is in equilibrium near the surface of earth.
30. 30 An electron moves a distance of 6 cm when accelerated from rest by an electric field of strength 2×10^{4} NC^{-1} Calculate the time of travel. The mass of electron is $m_e = 9.1 \times 10^{-31}$ kg and charge on electron = 1.6×10^{-19} C

NEW STANDARD ACADEMY

SEMRI KOTHI SUPER MARKET, RAEBARELI

CLASS 12 (MATHS) DPP (Academy) 01/07/2024

1. If the function $f(x) = \begin{cases} \frac{k\cos x}{\pi - 2x}, when\ x \neq \frac{\pi}{2} \\ 3, \quad When\ x = \frac{\pi}{2} \end{cases}$ is continuous when x = $\frac{\pi}{2}$

2. Let $f(x) = \begin{cases} \frac{x^3+x^2-16x+20}{(x-2)^2}, if\ x \neq 2 \\ k \qquad\qquad , if\ x = 2 \end{cases}$. If $f(x)$ is continuous for all x ,then k =?

3. Let $f(x) = \begin{cases} x^2 + k, when\ x \geq 0 \\ -x^2 - k, when\ x < 0 \end{cases}$. If the function $f(x)$ is continuous at x =0, then k=

4. If $f(x) = \begin{cases} \left(\frac{x^2}{a}\right) - a, when\ x < a \\ 0, when\ x = a, then \\ a - \left(\frac{x^2}{a}\right), when\ x > a \end{cases}$

5. If $f(x) = \begin{cases} \frac{x^2-4x+3}{x^2-1}, for\ x \neq 1 \\ 2, for\ x = 1 \end{cases}$,then

6. If the function $f(x) = \begin{cases} 1 + sin\frac{\pi x}{2}, for - \infty < x \leq 1 \\ ax + b, for\ 1 < x < 3 \\ 6\tan\frac{x\pi}{12}, for\ 3 \leq x < 6 \end{cases}$ *is* continuous in the interval $(-\infty, 6)$, then the values of a and b are respectively,

7. If $f(x) = \begin{cases} \frac{x^2+3x-1}{x^2+2x-15}, when\ x \neq -5 \\ a \qquad\qquad , when\ x = -5 \end{cases}$ is continuous at x = -5, then the value of a will be

8. $f(x) = \begin{cases} \frac{|x|-1}{\sqrt{1-x}}, x < 1 \\ 0 \quad , x = 1 \\ \frac{|1-x|}{1-\sqrt{x}}, x > 1 \end{cases}$

9. Let $f(x) = \begin{cases} \frac{x^4-5x^2+4}{|(x-1)(x-2)|}, x \neq 1,2 \\ 6, x = 1 \\ 12, x = 2 \end{cases}$

Then $f(x)$ is continuous on the set

10. The value of $f(0)$, so that the function $f(x) = \frac{(27-2x)^{1/3}-3}{9-3(243+5x)^{1/5}}, (x \neq 0)$ is continuous , is given by

11. If $f(x) = \begin{cases} \frac{x^2}{|x|}, x \neq 0 \\ 0, x = 0 \end{cases}, then$

12. If order that the function $f(x) = (x = 1)^{\cot x}$ is continuous at x =0 , $f(0)$ must be defined as

13. If $f(x) = \frac{x^2-10x+25}{x^2-7x+10}$ for x $\neq$ 5 and f is continuous at x = 5 ,then f(5)

14. Let $f(x) = \begin{cases} \frac{\sin \pi x}{5x}, x \neq 0 \\ k \quad , x = 0 \end{cases}$. If $f(x)$ is continuous at x=0 then k =

15. If $f(x) = \begin{cases} \frac{x^2-9}{x-3}, if x \neq 3 \\ 2x + k \ , otherwise \end{cases}$, is continuous at x=3 then k =

16. If $f: R \to R$ is defined by $F(x) = \begin{cases} \frac{2\sin x - \sin 2x}{2x\cos x}, if\ x \neq 0 \\ a, \qquad if\ x = 0 \end{cases}$, then the value of a so that f is continuous at x= 0 is

17. If $f(x) = \begin{cases} \frac{1-sin^3 x}{3\ cos^2 x}, x < \frac{\pi}{2} \\ a, \qquad x = \frac{\pi}{2} \\ \frac{b(1-\sin}{(\pi-2x)^2}, x < \frac{\pi}{2} \end{cases}$ is continuous at $x = \frac{\pi}{2}$, then the value of $\left(\frac{b}{a}\right)^{5/3}$ is

18. The value of $f(0)$ so that $f(x) = \frac{(4^x-1)^3}{sin\left(\frac{x}{4}\right)log\left(1+\frac{x^2}{3}\right)}$ is continuous everywhere is

19. If $f(x) = \begin{cases} \frac{8^x-4^x-2^x+1}{x^2} \qquad , x > 0 \\ e^x sinx + \pi x + \lambda\ In\ 4, x \leq 0 \end{cases}$ is continuous at x=0. Then the value of λ is

20. If $f(x) = \begin{cases} e^{x^2} + x, x > 0 \\ ax + b, x \leq 0 \end{cases}$ *is* $differentiable\ \ at\ x = 0\ then$

NEW STANDARD ACADEMY

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CLASS 12 (BIOLOGY) DPP (Academy) 01/07/2024

1. Milk starts to coagulate when Lactic Acid Bacteria (LAB) is added to warm milk as a starter. Mention any other two benefits LAB provide .
2. Name the group of organisms and the substrate that act on to produce biogas.
3. Why is sewage water treated until the BOD is reduced? Give a reason .
4. Name the bacterium responsible for the large holes seen in swiss cheese. What are these holes due to?
5. Give the scientific name of the microbes from which cyclosporin A and statin are obtained. Write one medical use of each one of these drugs.
6. Why are some molecules called bioactive molecules? Give two examples of such molecules.
7. Name the source of streptokinase. How does this bioactive molecule function in our body?
8. How do mycorrhizae act as biofertiliser Explain. Name a genus of fungi that forms a mycorrhizal association with plants.
9. What are methanogens? Name the animals, in which methanogens occur the role they play there.
10. Distinguish between the roles of flocks and anaerobic sludge digesters in sewage treatments.
11. Name a genus of baculovirus. Why are they considered good biocontrol agents?
12. (i)Why do farmers prefer biofertilisers to chemical fertilisers these days? Explain.
    (ii) How do Anabaena and mycorrhiza act as biofertilisers?
13. How are baculoviruses and Bacillus thuringiensis used as biocontrol agents? Why are they preferred over readily available chemical pesticides?
14. Describe how do 'flocs' and 'activated sludge' help in sewage treatment.
15. What for nuclear polyhedrosis viruses are being used now a day?
16. Why is distillation required for producing certain alcoholic drinks?
17. Give any two microbes that are useful in biotechnology.
18. What is the economic value of Spirulina?
19. How do mycorrhizal fungi help the plants harbouring them?
20. What is the chemical nature of biogas? Name an organism which is involved in biogas production?