9. SOLUTIONS

30. Take 10g of common salt and dissolve it in 40g of water. Find the concentration of solution in terms of weight percent? (E-141, T-151)

Wt % =Wt percent of solute/ (Wt of solute + Wt of solvent) ×100
=10/ (10+40) ×100= **20%**

30. 2g of Potassium sulphate was dissolved in 12.5ml of water. On cooling, the first crystals appeared at 60^{o}C. What is the solubility of Pottassium shlphate in water at 60^{o}c**? K_2SO_4** (E-141, T-151)

12.5 ml of water weights 12.5 g,

In 12.5 g of water, amount of potassium sulphate dissolved is 2 g

In 1g of water, amount of potassium sulphate dissolved is 2/12.5 g

Hence in 100grm of water, amount of **K_2SO_4** dissolved is
=(2×100)/12.5=**16 g**

The solubility of potassium sulphate in water at 60^{0}C is **16g.**

30. 50g of saturated solution NaCl at 30^{0}C is evaporated to dryness when 13.2 g of dry NaCl was obtained. Find the solubility of NaCl at 30^{0}C in water. (E-141, T-151)

Mass of watr solution =50-13.2=36.8 g

Solubility of NaCl =Mass of NaCl/Mass of water×100

=13.2/36.8×100= **36 g**

Solubility of NaCl = **36 g (appx.)**

30. An empty evaporating dish weighs 20.0g. On the addition of saturated solution of $NaNO_3$, the dish weighs 66.0g. When evaporated to dryness, the dish with crystals weighs 41.5 g. Find the solubility of $NaNO_3$ at 20^{0}C. (E-141, T-151)

Weight of saturated solutions of $NaNO_3$ = (66.0-20.0)g=46.0g

Weight of crystals of $NaNO_3$ = (41.5-20.0)g=21.5g

Weight of water in saturated solution = (46.0-21.5)g=24.5g

Solubility of $NaNO_3$ =Wt of $NaNO_3$ Crystals/wt of water×100

=21.5/24.5×100=87.7g

The solubility of $NaNO_3$ at 20^{0}C is = **87.7g in100g H_2O**

30. Find the concentration of solution in terms of weight percent if 20 gram of common salt (NaCl) is dissolved in 50 gram of water (H_2O)? (E-142, T-152)

$$\text{Wt \%} = \frac{\text{Wt percent of solute}}{\text{(Wt of solute + Wt of solvent)}} \times 100 = 20/(20+50)\times 100 = \mathbf{28.57\%}$$

10. ATOMS AND MOLECULES

32. Find the gram molecular mass of water (H_2O)? (E-149, T-160)

2(H) =2×1=2
1(O) =1×16=16
H_2+O=2+16=18
Gram molecular mass of H_2O= 18 g

32. Find the gram molecular mass of Carbon dioxide (CO_2)? (5) (E-149, T-160)

1(C) =1×12=12
2(O) =2×16=32
C+O_2=12+32 =44g
Gram molecular mass of CO_2= 44 g

32. Calculate the mass of 0.5 mole of iron? (E-150, T-162)

Mass of Fe =atomic mass × number of moles=55.9×0.5= **27.95 g**

32. Calculate the number of molecules in 11g of CO_2**? (50)** (E-150, T-162)
Solution: gram molecular mass of CO_2 = 44 g ((16×2) +12)
Number of molecules =6.023 x 10^{23} x 11/44
= **1.51 x 10^{23} molecule**

32. Calculate the number of moles in i) 81g of aluminium ii) 4.6g sodium iii) 5.1g of Ammonia iv) 90g of water v) 2g of NaOH. *When the mass of the substance is given:(T- 162, E -150)*

Number of moles in Aluminium = given mass/ atomic mass=81/27 =**3 moles of Al**

Number of moles in Sodium = given mass/ atomic mass=4.6/23 =0.2 **moles of Na**

No. of moles in Ammonia = given mass/ at. Mass=5.1/ (14+3) = **0.3 moles of NH_3**

Number of moles in H_2O = given mass/ at. Mass=90g/(2+16)= **5 moles of H_2O**

No. of moles in NaOH = given mass/ at. Mass=2g/ (23+16+1) = **0.05 moles of NaOH**

(Gram atomic mass of hydrogen = 1g Gram atomic mass of carbon = 12g
Gram atomic mass of nitrogen = 14g Gram atomic mass of oxygen = 16g
Gram atomic mass of sodium = 23g) (E-150, T-162)

50. Mole concept is introduced to express the quality of a substance. If 90 g of water is taken in a beaker. Find the number of moles in it. (E-150, T-162) as above

50. Calculate the no. of moles a) 12.046×10^{22} atoms of Copper b) 27.95g of iron
C) 1.51x10^{23} moles of CO_2 (T – 164, E – 152)
a) No. of moles of Copper =1x12.046x10^{22}/6.023 x 10^{23} = **2 moles**
b) Atomic mass of Fe 55.9, mass/atomic mass = 27.95g / 55.9 = **0.5 moles**
c) No. of moles of CO_2 = 1.51x10^{23}/6.023 x 10^{23} = **0.25 mole**

32. Calculate the number of molecules in 360g of glucose. ((E-150, T-162)
Solution: gram molecular mass of $C_6H_{12}O_6$ = 180g ((12 x6) + (1×12) + (16×6))
Number of molecules = 6.023 x 10^{23} x 360/180
= **12.046 x 10^{23} molecules**

32. One mole of any substance contains 6.023 x 10^{23} particles. If **3.0115 x 10^{23}** particles are present in CO_2. Find the number of moles? (50q)

= 3.0115 x 10^{23}/ 6.023 x 10^{23} = **0.5 moles**

32. Calculate the number of moles in **24.092 x 10^{22}** molecules of water?

= 24.092 x 10^{22}/6.023 x 10^{23}**=4/10=0.4 moles**

32. Calculation of mass when number of particles of a substance is given:

$$\text{Mass of a substance} = \frac{\text{Gram molecular mass x number of particles}}{6.023 \times 10^{23}}$$

Calculate the mass of 18.069 x 10^{23} molecules of SO_2?

Sol: Gram molecular mass SO_2 = 64g ((16*2) +32)

$$\text{Mass of } SO_2 = \frac{64 \times 18.069 \times 10^{23}}{6.023 \times 10^{23}} = \mathbf{192\ g}$$

32. Calculate the mass of 2.5 moles of Oxygen atoms?

Mass = molecular mass × number of moles

=16×2.5= **40g**

Calculate number of particles when the mass of the substance is given.

Number of particles = Avogadro number ×given mass/gram molecular mass

= 6.023×10^{23}×40/2.5= **96.368×10^{23}**

32. Analyse the table and fill up the blanks?

Gas	Number of Moles	Mass of Gas
N_2	2 moles	**56 g**
O_2	**10 moles**	320 g

2x2x14= 56 2x10x16= 320

11. CHEMICAL REACTIONS

7. pH + pOH = 14 If the value of pOH of a substance is 3, its pH is (3, 11, 14, 1)

pH + pOH = 14
pH + 3 = 14
pH = 14 – 3 = **11**

33. The hydroxyl ion concentration of a solution is 1.0×10^{-4}M. Find the pH of the solution.

(OH) = 1×10^{-4} M
p(OH) = - log (1×10^{-4}) = 4
pH + pOH = 14
pH + 4 = 14
pH = 14 – 4 = **10**

33. The hydrogen ion concentration of a solution is 0.001M. What is the pH of the solution? (E - 169)

$pH = -\log_{10}[H^+]$
$pH = -\log_{10}(0.001)$
$pH = -\log_{10}(10^{-3})$
$= -(-3)\log_{10} 10$ [log 10 = 1]
pH = 3

33. The hydrogen ion concentration of a solution is 1.0×10^{-9} M. What is the pH of the solution? Predict whether the given solution is acidic, basic or neutral. (E - 169)

$pH = -\log_{10}[H^+]$
$pH = -\log_{10}(1.0 \times 10^{-9})$
$pH = -(\log_{10}1.0 + \log_{10}10^{-9})$ [$\log_{10} 1 = 0$]
$= -(0 - 9\log_{10} 10)$
pH = – (0 – 9) = 9
pH = 9 i.e. pH >7 Therefore the given solution is basic.

33. The hydroxyl ion concentration of a solution is 0.001M. What is the pH of the solution? (E - 169)

$pOH = -\log_{10}[OH^-]$
$pOH = -\log_{10}(10^{-3})$
pOH = 3
pH = 14 – pOH
pH = 14 – 3 = 11

pH + pOH = 14
pH = 14 – pOH

33. The hydroxyl ion concentration of a solution is 1.0×10^{-9} M. What is the pH of the solution? (E - 169)

$pOH = -\log_{10}[OH^-]$
$pOH = -\log_{10}(1.0 \times 10^{-9})$
pOH = 9
pH = 14 – pOH
pH = 14 – 9 = 5

14. The hydroxyl ion concentration of a solution is 1.0×10^{-8}M. What is the pH of the solution? (p-173) – bq

$pOH = -\log_{10}[OH^-]$
$pOH = -\log_{10}(1.0 \times 10^{-8})$
pOH = 8
pH = 14 – pOH
pH = 14 – 8 = 6

12. PERIODIC CLASSIFICATION OF ELEMENTS

8. The percentage of purity of Gold is calculated for making ornaments? (p – 181)
= 22/24×100 = 91.6∆ **(Bis mark)**

15. LAWS OF MOTION AND GRAVITATION

52. Which object has more momentum; a car travelling at 10 km/hr or a Base ball pitched at 150 km/hr? Explain your answer. {Where: Momentum = mass x velocity; p = mv }

Momemtum has both direction & Magnitude. Vector quantity in same direction. Base ball doesnot have impact but car can because low speed but high mass. Unit $Kgms^{-1}$

38. A bullet of mass 15g is horizontally fired with velocity $100ms^{-1}$ from a pistol of mass 2kg. What is the recoil velocity of the pistol? (p – 223)
M1=15g or 0.015 Kg, M2=2Kg u1=0, u2=0
V1=100m/s, V2=V1
Therefore m1u1+m2u2=(0.15x0)+(2x0)=0kgm/s
=(0.015x100)+(2xv1)
= (1.5+2v)Kgm/s or Kg ms^{-1}
(1.5+2v)=0
2v=-1.5 V=-1.5/2=0**.75m/s or ms^{-1}**

11. The weight of 50 Kg person at the surface of earth is (50 N, 35 N, 380 N, 490 N)
w= m*g 9.8 m/s^2 =50Kg x9.8 m/s^2 = **490N** (E-231, T-249)

38. From the expression $g = GM/R^2$, the mass of the Earth can be calculated as follows:

$$M = \frac{gR^2}{G}$$

$$M = 9.8 \times (6.38 \times 10^6)^2 / 6.67 \times 10^{-11}$$

$$M = 5.98 \times 10^{24} \text{ kg.}$$

38. A constant force acts on an object of mass 10 kg for a duration of 4 s. It increases the objects velocity from 2 m s^{-1} to 8 m s^{-1} Find the magnitude of the applied force.(p-221)
Given, mass of the object m = 10 kg
Initial velocity u = 2 m s^{-1}
Final velocity v = 8 m s^{-1}

We know, force $F = \frac{m(v-u)}{t}$

$$F = \frac{10\,(8-2)}{4} = \frac{10 \times 6}{4} = \frac{60}{4} = \mathbf{15\ N}$$

38. Which would require a greater force for accelerating a 2 kg of mass at 4 m s^{-2} or a 3 kg mass at 2 m s^{-2}? (p-221)
We know, force F = ma
Given, $m_1 = 2$ kg $a_1 = 4$ m s^{-2}
$m_2 = 3$ kg $a_2 = 2$ m s^{-2}
Thus, $F_1 = m_1 a_1 = 2 \text{ kg} \times 4 \text{ m s}^{-2} = \mathbf{8\ N}$
and $F_2 = m_2 a_2 = 3 \text{ kg} \times 2 \text{ m s}^{-2} = \mathbf{6\ N}$
$\Rightarrow F_1 > F_2$
Thus, accelerating a 2 kg mass at 4m s^{-2} would require a greater force.

16. ELECTRICITY AND ENERGY

40. A current of 0.75 A is drawn by a filament of an electric bulb for 10 minutes. Find the amount of electric charge that flows through the circuit. (p- 234)

I = 0.75 A,
t = 10 minutes = 600 s
$Q = I \times t$
$= 0.75\ A \times 600\ s$
Q = 450 C

40. How much work is done in moving a charge of 5 C across two points having a potential difference 10 V ? (p- 235)

Given charge, Q = 5 C
Potential difference, V = 10 V
The amount of work done
in moving the charge, $W = V \times Q$
$W = 10\ V \times 5C$ **= 50 J**

40. The potential difference between the terminals of an electric heater is 60 V when it draws a current of 5 A from the source. What current will the heater draw if the potential difference is increased to 120 V? (p- 236)

Given the potential difference, V = 60 V
Current, I = 5 A,
According to ohm's law,
$R = V/I = 60\ V / 5\ A = 12\ \Omega$
When the potential difference is increased to 120 V, the current is given by
$I = V/R = 120\ V / 12\ \Omega = 10\ A$

40. Two resistances 18 Ω and 6 Ω are connected to a 6 V battery in series. Calculate (a) the total resistance of the circuit, (b) the current through the circuit. (p- 238)

(a) Given the resistance, $R_1 = 18\ \Omega$,
$R_2 = 6\ \Omega$
The total resistance of the circuit $R_S = R_1 + R_2$
$R_S = 18\ \Omega + 6\ \Omega =$ **24** Ω
(b) The potential difference across the two terminals of the battery V = 6 V
Now the current through the circuit,
$I = V/R_S = 6\ V / 24\ \Omega =$ **0.25 A**

40. Three resistances having the values 5 Ω, 10 Ω, 30 Ω are connected parallel with each other. Calculate the total circuit resistance. (p- 239)

Given, $R_1 = 5\ \Omega$, $R_2 = 10\ \Omega$, $R_3 = 30\ \Omega$
These resistances are connected parallel
Therefore, $1 / R_p = 1 / R_1 + 1 / R_2 + 1 / R_3$

$$\frac{1}{R_p} = \frac{1}{5} + \frac{1}{10} + \frac{1}{30} = \frac{10}{30}$$

$$R_p = \frac{30}{10} = \mathbf{3\ \Omega}$$

40. A potential difference 20 V is applied across a 4 Ω resistor. Find the rate of production of heat. (p- 240)

Given potential difference, V = 20 V
The resistance, R = 4 Ω
The time, t = 1 s
According to ohm's law, I = V / R
I = 20 V / 4 Ω = 5 A
The rate of production of heat, $H = I^2RT$
$H = 5^2 \times 4 \times 1$ J = **100 J**

40. The potential difference between the terminals of an electric heater is 60V when it draws a current of 5A from the source. What current will the heater draw if the potential difference is increased to 120V? (E -236, T-256)

R=V/I = 60/5 = 12Ω
V= 120V, I=V/R = 120/12 = 10A

40. Calculate the energy produced when 1 kg of substance is fully converted into energy. (p- 250)

Energy produced, $E = mc^2$
Mass, m = 1 kg
Velocity of light, $c = 3\times10^8$ m s^{-1}
$E = 1\times(3\times10^8)^2$
$E = 9 \times 10^{16}$ J

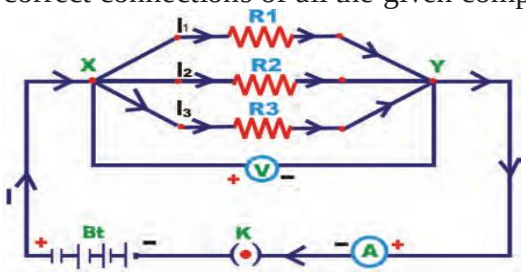
40. An electric bulb is connected to a 220 V generator. The current is 0.50 A. what is the power of the bulb? (p- 241)

Electric generator
voltage, V = 220 V, the current, I = 0.50 A
The power of the bulb,
P = VI = 220 x 0.50 = 110 W

40. Fill in the blanks (E-249)

$_{92}U^{235} + {}_0n^1 \longrightarrow \underline{_{56}Ba^{141}} + {}_{36}Kr^{92} + \underline{3\,{}_0n^1} + 200$ Mev

41. You are given three resistors of 10Ω, 20Ω, 15Ω connected in parallel with a battery of 2.5V, a key, an ammeter and a voltmeter. Draw the circuit diagram showing the correct connections of all the given components.(E-253, T-274)



42. A 3V torch bulb draws a current 0.6A. Calculate the resistance of the bulb when glowing.(additional qs) R=V/I = 3/0.6 = 5 Ω

41. Three resistances having the values 5, 10, 30 ohms are connected parallel with each other. Calculate the total circuit resistance. (T – 258, E – 239)

$1/Rp = 1/R_1 + 1/R_2$…..
$1/Rp = (1/5)+(1/10)+(1/30) = 6+3+1/30 = 1/3 = 1/3 = 3$ Ω

12. The potential difference required to pass a current 0.2 A in a wire of resistance 20 ohm is (100 V, 40 V, 0.1 V, 4V) (T – 273, E – 252)

R=V/I, 20=V/0.2 V=20*0.2 = 4V

17. MAGNETIC EFFECT OF CURRENT AND LIGHT

14. The focal length of a concave lens is -2.m then the power of the lens is (0.2D, -O.2D, 0.5 D, -0.5D) (E- 279, T – 300)

p=1/f D or dioptre (in m) p = 1/-2 = - 0.5D

41. A concave lens has focal length of 15cm. At what distance should the object be placed so that it forms an image 10cm from the lens.(E – 276, T – 300)

v = -10 cm, f = - 15 cm, u = ?

1/v-1/u = 1/f

1/u = 1/v-1/f

1/u = (1/-10) – (1/-15)

1/u = (-3+2) / 30

= -1/30

u = - 30 cm. Thus, the object distance is 30 cm.

38. Light year is the distance travelled by light in one year in vacuum. Distance traveled by light in one year in vacuum = Velocity of light x I year (in seconds) (p- 2)

$= 3 \times 10^8 \times 365.25 \times 24 \times 60 \times 60$

$= 9.467 \times 10^{15}$ m

Therefore, 1 light year = 9.467×10^{15} m

41. An object is placed at a distance of 30 cm from a concave lens of focal length 15 cm. An erect and virtual image is formed at a distance of 10 cm from the lens.Calculate the magnification.(p – 278)

Object distance, u = -30 cm

Image distance, v = -10 cm

Magnification, m = v/u

$$m = \frac{-10 \text{ cm}}{-30 \text{ cm}} = \frac{1}{3} = \mathbf{+\ 0.33}$$

41. A convex mirror used for rear-view on an automobile has a radius of curvature of 3 m. If a bus is located at 5 m from this mirror, find the position and nature of the image.

Radius of curvature, R = +3.00 m

Object distance u = - 5.00 m Image distance v = ?

Focal length , f = R/2 = + 3.00 m/2 = 1.5 m

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f} \quad \text{or}$$

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$$

$$= \frac{1}{1.5} - \frac{1}{-5.00} = \frac{1}{1.5} + \frac{1}{5.00}$$

$$= \frac{5.00 + 1.50}{7.50} = \frac{6.50}{7.50}$$

$$V = \frac{7.50}{6.50} = 1.15 \text{ m}$$

The image is 1.15 m at the back of the mirror. The image is virtual.