School Name:	**UDAAN**
Test Name:	**Weekly Assessment Class XI Week 2**
Total Questions:	**45**
Marks:	**45**
Duration:	**90 minutes**

Instructions for Assessment:

- The test is of **1 1/2 hours (90 minutes) duration.**
- The test consists of **45 questions.**
- There are three parts in the question paper **A, B, C consisting of Physics, Chemistry and Mathematics** having 15 questions in each part of equal weightage.
- There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response.
- No candidate is allowed to use any textual material, printed or written, pager, mobile, any electronic device, etc

Section: Physics	
Questions: 15	**Marks: 15**

1.	A physical quantity X is given by $X = \frac{2K^3l^2}{m\sqrt{n}}$. The % error in measurement in K,l, m, n is 1%, 2%, 3%, 4% respectively. The value of X is uncertain by **a.** 2% **b.** 14% **c.** 12% **d.** None of these	**1.0**
2.	The focal length of two spherical lens is given as f_1 = (20±0.02) cm and f_2 = (10±0.01) cm. If these two lens are placed in contact with each other, what will be the % error of a combined lens? **a.** 0.10% **b.** 0.20% **c.** 0.30% **d.** 0.40%	**1.0**
3.	The length and breadth of a rectangular plate are measured to be (15.30 ± 0.05) cm and (12.80 ± 0.05) cm, respectively. The area of the plate and the approximate uncertainty in the calculated area are (in cm^2) **a.** 195.8 ± 0.7% **b.** 196.0 ± 0.7% **c.** 196.0 ± 0.07% **d.** 195.84 ± 1.4%	**1.0**
4.	If energy (E), velocity of light (c) and force (F) are chosen as fundamental units, which of the following could be the dimensions of time in this system? **a.** $E^{-1}C^{1}F^{-1}$ **b.** $E^{1}C^{-1}F^{-1}$ **c.** $E^{-1}C^{-1}F^{1}$ **d.** $E^{1}C^{1}F^{-1}$	**1.0**
5.	If x = at + bt2, where x is the distance travelled by the body in kilometers and t is the time in seconds. Which of the following could be the unit of a? **a.** *km/s* **b.** *kms* **c.** km/s^2 **d.** kms^2	**1.0**
6.	The displacement of a particle is given by y = A $\sin^2$ (wx) where x is position. The unit of w is **a.** m^{-2}	**1.0**

	b. m^{-1} **c.** hertz **d.** radian	
7.	What is the relation between the dimensions of ohm and those of h (Plank's constant) & e (electric charge)? **a.** $\frac{h}{e}$ **b.** $\frac{h^2}{e}$ **c.** $\frac{h}{e^2}$ **d.** $\frac{h^2}{e^2}$	**1.0**
8.	Dimension of $\frac{L}{RCV}$ are [where L, C, R & V are inductance, capacitance, resistance & voltage respectively] **a.** A^{-1} **b.** A^{-2} **c.** A **d.** A^2	**1.0**
9.	The magnetic energy stored in an inductor is given by $E = \frac{1}{2}L^aI^b$. Find the values of a and b. **a.** a=1, b=0 **b.** a = –2, b = 4 **c.** a = 1, b = –2 **d.** a = 1, b = 2	**1.0**
10.	A new system of a unit is chosen such that the unit of mass is u kg, unit of length is v m, and unit of time is w s. The value of 1N in the new unit is? **a.** $u^{-1}v^{-1}w^2$ new unit **b.** uvw^{-2} new unit **c.** $u^{-1}v^{-2}w^2$ new unit **d.** uv^2w^{-2} new unit	**1.0**
11.	A voltmeter has a least count of 0.1V & an ammeter has a least count of 0.1A. The voltage drop V across a resistance is measured as 10.0V and current through it is measured as 1.0A. Which of the following alternative is **incorrect**? **a.** The value of R is $(1.0 \pm 0.1) \times 10^2\Omega$ **b.** The relative error in measurement of current is $\frac{1}{10}$	**1.0**

	c. The accuracy in measurement of potential drop is $\frac{1}{1000}$ **d.** The value of R is $(10 \pm 0.2)\Omega$	
12.	A student performs an experiment to determine the Young's modulus of wire, exactly 2 m long, by Searle's method. In a particular reading, the student measures the extension in the length of the wire as 0.8 mm with an uncertainty of ±0.05 mm at a load of exactly 1.0 kg. The student also measures the diameter of the wire to be 0.4 mm with an uncertainty of ±0.01 mm. The Young's modulus obtained from the reading is (Take g = 9.8 m/s^2) **a.** $(2.0 \pm 0.3) \times 10^{11} \mathrm{N/m^2}$ **b.** $(2.0 \pm 0.2) \times 10^{11} \mathrm{N/m^2}$ **c.** $(2.0 \pm 0.1) \times 10^{11} \mathrm{N/m^2}$ **d.** $(2.0 \pm 0.05) \times 10^{11} \mathrm{N/m^2}$	**1.0**
13.	An athlete's coach told his team that muscle times speed equals power. What dimensions does he view to 'muscle'? **a.** $[ML^{-1}T^{-2}]$ **b.** $[ML^2T^{-2}]$ **c.** $[MLT^{-2}]$ **d.** L	**1.0**
14.	Which of the following quantities has not been expressed in proper units? **a.** Co-efficient of elasticity (Nm^{-2}) **b.** Surface tension (Nm^{-1}) **c.** Energy ($kgms^{-2}$) **d.** Pressure (Nm^{-2})	**1.0**
15.	The velocity of a particle 'v' is given in terms of time 't' as $$v = at + \frac{b}{t+c}$$ The dimensions of a, b & c , respectively are **a.** L^2, T, LT^{-2} **b.** LT^2, LT, L **c.** LT^{-2}, L, T **d.** L, LT, T^2	**1.0**

Section: Chemistry	
Questions: 15	**Marks: 15**

16.	A sugar syrup of weight 214.2g contains 34.2g of sugar ($C_{12}H_{22}O_{11}$). What is the mole fraction of sugar in syrup? **a.** 9.9×10^{-2} **b.** 0.0091 **c.** 9.9×10^{-3} **d.** 1.99	**1.0**
17.	A gaseous mixture contains oxygen and nitrogen in the ratio of is 1:4 by weight. What is the ratio of their number of molecules? **a.** 1:4 **b.** 7:32 **c.** 1:8 **d.** 3:16	**1.0**
18.	What is the molarity of NaOH solution, prepared by dissolving its 4g in enough water to form 250mL of the solution? **a.** 0.04 M **b.** 0.4M **c.** 0.004M **d.** 0.40M	**1.0**
19.	If 1 mL of water has 20 drops and N_A is the Avogadro's constant, the number of water molecules in one drop of water is $(\rho_{water} = 1\,g\ mL^{-1})$ **a.** 0.5 N_A / 18 **b.** 0.05 N_A **c.** 0.5 N_A **d.** 0.05 N_A / 18	**1.0**
20.	How many molecules of H_2O are present (at STP) in a drop of H_2O which has radius of 2.3mm? **a.** 1.7058×10^{21} molecules **b.** 1.7058×10^{23} molecules **c.** 6.022×10^{23} molecules **d.** 0.05098 molecules	**1.0**
21.	The atomic mass of two elements A and B are 40 and 80 respectively. If x_g of A contain y atoms, how many atoms are present in $2x_g$ of B?	**1.0**

	a. 2y **b.** 2x **c.** y **d.** y/2	
22.	From 392mg of H_2SO_4, 1.24×10^{21} molecules are removed. How many moles of H_2SO_4 are left behind? **a.** 2×10^{-3} **b.** 1.2×10^{-3} **c.** 4×10^{-3} **d.** 1.5×10^{-3}	**1.0**
23.	**Assertion**: Both 106*g* of sodium carbonate and 12*g* of carbon have same number of carbon atoms. **Reason**: Both contain 1*g* atom of carbon which contains 6.023×10^{23} carbon atoms. **a.** Both assertion and reason are true and reason is the true explanation of assertion **b.** Assertion is true, reason is false **c.** Both assertion and reason are false **d.** Both assertion and reason are true but reason is not the true explanation of assertion	**1.0**
24.	The equivalent weight of $MnSO_4$ is half of its molecular weight when it converts to **a.** Mn_2O_3 **b.** MnO_2 **c.** MnO_4^- **d.** MnO_4^{2-}	**1.0**
25.	0.2 g of a metal combines with 46.6 mL of O_2 at 273 K and 1 atm pressure. The equivalent mass of the metal is **a.** 6 **b.** 12 **c.** 24 **d.** 36	**1.0**
26.	50*g* of iron, 5*g* atoms of nitrogen , 0.1*g* atom of silver , 10^{23} atoms of carbon. Which of the following statements is correct? **a.** 5*g* atoms of nitrogen weigh most. **b.** 5*g* atoms of nitrogen weigh less than 50*g* of iron **c.** 10^{23} atoms of carbon weigh most **d.** 50*g* of iron weigh least	**1.0**
27.	A certain gaseous mixture contains methane and sulphur dioxide in the ratio of 1: 8 by mass. The ratio of number of their molecules in the mixture is: **a.** 1:8 **b.** 1:2 **c.** 1:1 **d.** 2:1	**1.0**
28.	A drop of water is about 0.05 mL. The density of water at room temperature is about 1.0 g / mL, the number of water molecules present in a drop of water are **a.** 1.67×10^{21}	**1.0**

	b. 3.01×10^{21} **c.** 6.023×10^{23} **d.** 3.01×10^{23}	
29.	The density of water at 4°C is 1.0×10^{3} kgm^{-3}. The volume occupied by one molecule of water is approximately **a.** 3.0×10^{-23} ml **b.** 6.0×10^{-22} ml **c.** 3.0×10^{-21} ml **d.** 9.0×10^{-23} ml	**1.0**
30.	By dissolving 1 mole each of following acids in 4L water, the acid which does not give a solution of 1N strength is **a.** H_3PO_4 **b.** $HClO_4$ **c.** HNO_3 **d.** H_3PO_3	**1.0**

Section: Mathematics	
Questions: 15	**Marks: 15**

31.	The set of values of *a* for which the quadratic equation: $(a+2)x^2-2ax-a = 0$ has two roots on the number line symmetrically placed about point 1 is: **a.** R **b.** $[-1,\infty)$ **c.** $(2,\infty)$ **d.** ϕ	**1.0**
32.	If α, $\beta$are roots of the equation $ax^2+bx+c = 0$, then roots of $ax^2-bx(x-2)+c(x-2)^2 = 0$ are: **a.** $\frac{\alpha-1}{\alpha+1}, \frac{\beta-1}{\beta+1}$ **b.** $\alpha-2, \beta-2$ **c.** $\frac{2\alpha}{\alpha+1}, \frac{2\beta}{\beta+1}$ **d.** $-\frac{2\alpha}{\alpha+1}, -\frac{2\beta}{\beta+1}$	**1.0**
33.	If $\alpha^2 = 7\alpha-5$ and $\beta^2 = 7\beta-5$, then equation whose roots are $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$ is: **a.** $7x^2-5x+7 = 0$ **b.** $39x^2-5x+39 = 0$ **c.** $5x^2+39x+5=0$ **d.** $5x^2-39x+5 = 0$	**1.0**
34.	The number of solutions of the equation $x^2-5\|x\|+6 = 0$ is: **a.** 2 **b.** 1 **c.** 4 **d.** 0	**1.0**
35.	If the quadratic equations $ax^2+cx-b=0$ and $ax^2-3bx+\frac{c}{3} = 0$ $(3b+c\neq 0)$, have a common root, then $a+3c-ab$ is equal to: **a.** -1 **b.** 0 **c.** 1/2	**1.0**

	d. 9/2	
36.	If $\tan 27^0$ and $\tan 18^0$ are roots of $x^2+2ax+b = 0$, then $2a-b$ is equal to: **a.** 0 **b.** 1 **c.** -1 **d.** $\frac{1}{\sqrt{5}}$	**1.0**
37.	If $y = \frac{x^2+3x+4}{x^2+3x+3}, x \in R$, then y lies in the interval **a.** $\left(1, \frac{7}{3}\right]$ **b.** $\left(\frac{7}{3}, \infty\right)$ **c.** $\left(\frac{4}{3}, \infty\right)$ **d.** $(1, \infty)$	**1.0**
38.	Suppose α, β are roots of $8x^2-14x+3 = 0$, then sum of the series $\sum_{n=1}^{\infty}\left(\alpha^n+\beta^n\right)$ is: **a.** 7 **b.** 3/8 **c.** 10 **d.** 10/3	**1.0**
39.	If the roots of $x^2+bx+c = 0$ are two consecutive odd numbers, then b^2-4c is equal to **a.** 1 **b.** -4 **c.** -1 **d.** 4	**1.0**
40.	Sum of the real roots of $(x+3)^4+(x+5)^4 = 16$ is: **a.** 0 **b.** -2 **c.** -4 **d.** -8	**1.0**
41.	If (1-p) is a root of the quadratic equation $x^2+px+(1-p)=0$, then its roots are: **a.** 0,1 **b.** $-1\pm\sqrt{2}$	**1.0**

	c. 0,-1 **d.** $-1+\sqrt{2}$	
42.	If one root of $5x^2+13x+k=0$ is reciprocal of the other, then **a.** $k=\frac{1}{5}$ **b.** k= 5 **c.** k= 13 **d.** k= -5	**1.0**
43.	Ramesh and Mahesh solve an equation. In solving Ramesh commits a mistake in constant term and finds the roots 8 and 2. Mahesh commits a mistake in the coefficient of x and finds the roots -9 and -1. The correct roots are **a.** -2, -8 **b.** 9, 1 **c.** 9, -1 **d.** 2, -8	**1.0**
44.	If α and β are the roots of quadratic equation $4x^2+3x+7=0$ then find the value of $\frac{1}{\alpha^3}+\frac{1}{\beta^3}$ **a.** $\frac{-279}{343}$ **b.** $\frac{279}{343}$ **c.** $\frac{225}{343}$ **d.** $\frac{-225}{343}$	**1.0**
45.	The equation $(b-c)x^2+(c-a)x+(a-b)=0$ has **a.** Equal roots **b.** Irrational roots **c.** Rational roots **d.** Only one root	**1.0**

Key

Question Number	Correct Option	Question Number	Correct Option	Question Number	Correct Option
1.	C	16.	C	31.	D
2.	C	17.	B	32.	C
3.	A	18.	B	33.	D
4.	B	19.	D	34.	C
5.	A	20.	A	35.	B
6.	B	21.	C	36.	C
7.	C	22.	A	37.	A
8.	A	23.	A	38.	D
9.	D	24.	B	39.	D
10.	A	25.	B	40.	D
11.	A	26.	A	41.	C
12.	B	27.	B	42.	B
13.	C	28.	A	43.	B
14.	C	29.	A	44.	C
15.	C	30.	A	45.	C

Explanation

Question Number	Explanation
1.	$X = \frac{2K^3l^2}{m\sqrt{n}}$ $\frac{\Delta x}{x}\times 100 = \frac{3\Delta K}{K}\times 100 + 2\frac{\Delta l}{l}\times 100 + \frac{\Delta m}{m}\times 100 + \frac{1}{2}\times\frac{\Delta n}{n}\times 100$ $= 3\times 1 + 2\times 2 + 3 + \frac{1}{2}\times 4$ $3 + 4 + 3 + 2 = 12\%$
2.	Since $\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$ or $f = \frac{f_1 f_2}{f_1 + f_2}$ So $\frac{\Delta f}{f} = \frac{\Delta f_1}{f_1} + \frac{\Delta f_2}{f_2} + \frac{\Delta f_1 + \Delta f_2}{f_1 + f_2}$ So $\frac{\Delta f}{f} = \left(\frac{.02}{20} + \frac{.01}{10} + \frac{.02+.01}{20+10}\right)$ $= (.001 + .001 + .001) = .003$ % error in f = .003 × 100 = 0.3%
3.	To solve this problem, recall the following: In multiplication or division, the final result should retain as many significant figures as they are there in the original number with least significant figures. When two or more experimentally obtained numbers are multiplied, the percentage uncertainty of the final result is equal to the sum of the percentage uncertainties of the original numbers. Area of the plate $= 15.30 \times 12.80 = 195.84$ Since the data is given only up to 4 significant figures, the answer should be only in 4 significant figures. The acceptable value of the area is 195.8 cm^2. The percentage error in the given data is $\frac{\Delta A}{A} = \left(\frac{\Delta L}{L}\times 100 + \frac{\Delta B}{B}\times 100\right)$ $= \left[\left(\frac{0.05}{15.3}\times 100\right) + \left(\frac{0.05}{12.8}\times 100\right)\right] = 0.7\%$ Here the given uncertainty has only one significant figure, the final percentage error has also one significant figure. The answer is 195.8 ± 0.7%. Therefore the correct choice is (1).
4.	Dimensions of energy [E] = $00^2 0^{-2}$. Dimensions of [c] = 00^{-1} and dimensions of

	[F] = $M0^{0}-^{2}$. Therefore dimensions of [T] in terms of these quantities chosen as fundamental units = $0^{1}C^{-1}0^{-1}$. Therefore Correct choice is (2).
5.	Compare $x = at + bt^2$ with $s = ut + 1/2\ at^2$ 'a' will have dimension as 'u' and hence unit of u or velocity i.e. km/s. ∴ Option (1) is correct
6.	In a trigonometric function such as $\sin\theta$, or $\sin^2\theta$, theta is an angle defined as arc divided by radius making it a dimension less quantity, so wx must be dimensionless. So, if x has a dimension of position or length (say metre) , w must have the unit of $\frac{1}{m}$ or m^{-1}.
7.	The dimensions of Planck's constant (h) = $[ML^2T^{-1}]$ And that of charge e is [AT] And Dimensions of resistance in terms of MLT & A works out to be $[R] = [ML^2T^{-3}A^{-2}]$ ∴ Putting dimensions of h & e in option (a), (b) (c) & (d) We get $\frac{h}{e^2} = \frac{[ML^2T^{-1}]}{[AT]^2} = [ML^2T^{-3}A^{-2}]$ = same as resistance So option (3) is correct
8.	Electric voltage = $\frac{work}{charge} = [ML^2T^{-3}A^{-1}]$ Resistance = $\frac{voltage}{current} = [ML^2T^{-3}A^{-2}]$ Capacitance = $\frac{charge}{voltage} = [M^{-1}L^{-2}T^4A^2]$ & Inductance = $\frac{voltage}{current/time} = [ML^2T^{-2}A^{-2}]$ So dimension of $\frac{L}{RCV}$ works out to be A^{-1}.

9.	By Principle of homogeneity: $[E]=\left[\frac{1}{2}L^{a}T^{b}\right]$ OR $\left[ML^{2}T^{-2}\right]=\left[\left(ML^{2}T^{-2}A^{-2}\right)^{a}A^{b}\right]$ $\left[ML^{2}T^{-2}\right]=\left[M^{a}L^{-2a}T^{-2a}A^{-2a+b}\right]$ Comparing powers of M, L, A and T a $=1$ $-2a+b=0\Rightarrow b=2$ Therefore, a = 1, b = 2
10.	$1N=1\ kg\ ms^{-2}$ New unit 1 u kg v m (w s)$^{-}$ $^{2}\ uvw^{-2}\ kg\ ms^{-2}=uvw^{-2}N$ $1N=\frac{1}{uvw^{-2}}\times(new\ unit)$ $1N=u^{-1}v^{-1}w^{2}\times new\ unit$
11.	The value of $R=\frac{V}{I}=\frac{10}{1}=10\Omega$ $\frac{\Delta R}{R}=\frac{\Delta V}{V}+\frac{\Delta I}{I}=\frac{0.1}{10}+\frac{0.1}{1.0}=0.01+0.1=0.11=0.1$ $\therefore \Delta R=0.1\times10=1\Omega$ So value of $R = (10\pm1)\ \Omega$ *or* $(1.0 \pm 0.1) \times 10\ \Omega$ Hence, option 1 A is correct choice.
12.	Use the formula for the Young's modulus of the wire. $Y=\frac{FL}{A\ell}=\frac{4MgL}{\pi d^{2}l}$ Where M = 1.0kg, g=9.8 ms^{-2}, L= 2m, I = 0.8mm=0.8×10^{-3} $\Delta I = \pm0.05mm$, d=0.4mm= 0.4×10^{-3} , $\Delta d=0.01mm$ First find the value of Y substituting the values of M, g, L, d and 1 in the above equation, which is obtained as Y = $2.0\times10^{11}\ Nm^{-2}$. Then write is above equation expressing the uncertainty in Y as $\frac{\Delta Y}{Y}=\frac{\Delta M}{M}+\frac{\Delta g}{g}+\frac{\Delta L}{L}+\frac{2\Delta d}{d}+\frac{\Delta l}{l}$. The value of M, g, L are exact. Therefore $\Delta M = 0$, $\Delta g = 0$ and $\Delta L = 0$. Thus, we have $\frac{\Delta Y}{Y}=\frac{2\Delta d}{d}+\frac{\Delta l}{l}=\frac{2\times0.01}{0.4}+\frac{0.05}{0.8}=0.05+0.0625.$ Therefore, $\Delta Y = 0.1125 \times Y = 0.0225\times10^{11} Nm^{-2}$. Since the value of Y is correct only up to the first decimal place, the value of ΔY must be rounded off to the place. The correct result is Y+ΔY

	= (2.0±0.2) $\times 10^{11} Nm^{-2}$. The correct choice is therefore (B).
13.	$\text{Power} = \frac{\text{Work done}}{\text{Time}} = \frac{\text{Force} \times \text{displacement}}{\text{Time}} = \text{Force} \times \text{velocity}$ = muscle times speed Muscle represents force = $[MLT^{-2}]$
14.	The unit of energy kgm^2s^{-2} Energy = $\vec{F}.\vec{S}$ = $(m.a)\vec{S}$ Kg (ms^{-2}).m Kgm^2s^{-2}
15.	Since c is added to t in RHS, so dimensions of c= dimension of t = [T] As $\frac{b}{t}$ is equal to v so dimension of $Vt = \left[LT^{-1}\right] \times T = L$ And at = v so dimension of $a = \frac{v}{t} = \frac{LT^{-1}}{T} = \left[LT^{-2}\right]$ So dimension of a, b, c works out to be $\left[LT^{-2}\right]$, L & T So option C is correct
16.	Moles of sugar = $\frac{34.2}{342} = 0.1$ Moles of water in syrup = 214.2 - 34.2 = 180g Moles (H_2O) = $\frac{180}{18} = 10$ $X_{sugar} = \frac{n_{sugar}}{n_{sugar} + n_{H_2O}} = \frac{0.1}{0.1+10} = 9.9 \times 10^{-3}$
17.	$\frac{\text{Weight of a compound(w)}}{\text{Molar mass(M)}} = \text{Moles(n)} = \frac{\text{Number of molecules(N)}}{\text{Avogadro number}(N_a)}$ $\Rightarrow \frac{W(O_2)}{32} = \frac{N(O_2)}{N_A}$ (1) $\Rightarrow \frac{W(N_2)}{28} = \frac{N(N_2)}{N_A}$ (2) (1) ÷ (2)

	$\frac{N(O_2)}{N(N_2)} = \frac{1}{4} \times \frac{28}{32} = \frac{7}{32}$
18.	$M = \frac{\text{Mass of NaOH} / \text{Molar mass of NaOH}}{0.250L}$ $= \frac{4g/40g}{.250L} = \frac{0.1mol}{.250}$ $= 0.4mol\ L^{-1}$ $0.4M$
19.	Volume of 1 drop of water = $\frac{mass}{density}$ Density= $1\frac{g}{ml}$ Volume of 1 drop= $\frac{1}{20}ml$ Mass of 1 drop of water = volume of one drop of water x density of water = 0.05mL x 1g mL^{-1} = 0.05g Moles of water in 1 drop =Number of molecules of water = $0.05\frac{N_A}{18}$
20.	radius = 2.3mm or 0.23 cm volume of droplet of water = $\frac{4}{3}\pi r^3$ $= \frac{4}{3} \times \frac{22}{7} \times 0.23 \times 0.23 \times 0.23$ = 0.05098 cm^3 Now, Assume density of water to be 1 gm/ cm^3 so $= .d = \frac{m}{u}$ or $m = d \times u$ $= 1 \times 0.05098$ =0.05098 gm Now, 18 gm water contains = 6.022×10^{23} molecules $\therefore$ 0.05098 gm water =0.17058×10^{23} molecules = 1.7058×10^{21} molecules

21.	No. of Moles of $A = \frac{x}{40}$ No. of atoms of $A = \frac{x}{40} \times N_A$ (Avogadro no.) = y $x = \frac{40y}{N_A}$ No. of Moles of B = $\frac{2x}{80}$ No. of atoms of B = $\frac{2x}{80} \times N_A$ $= \frac{2}{80} \times \frac{40y}{N_A} \times N_A$ = y
22.	No. of Moles of H_2SO_4 = $\frac{0.392}{98} = 0.004$ No. of Moles of H_2SO_4 removed = $\frac{1.24 \times 10^{21}}{6.02 \times 10^{23}}$ = 0.002 No. of Moles of H_2SO_4 left = 0.004 – 0.002 = 0.002 = 2×10^{-3}
23.	
24.	n factor $MnSO_4 \rightarrow \frac{1}{2}Mn_2O_3$ 1 $MnSO_4 \rightarrow MnO_2$ 2 $MnSO_4 \rightarrow MnO_4^-$ 5 $MnSO_4 \rightarrow MnO_4^{2-}$ 4
25.	Equivalent mass of oxygen = 8 g

	$At\ 1\ atm\ and\ 273\ K,\ 22400\ mL\ of\ O_2(g) = 1\ mol = 2\times16 = 32\ g$ $=\frac{32}{8} = 4\ equivalents$ $At\ 1\ atm\ and\ 273\ K,\ 46.6\ mL\ of\ O_2(g) = \frac{4}{22400}\times46.60 = .00832$ equivalents 1 equivalent of O_2 reacts with 1 equivalent of metal $\therefore$ 0.00832 equivalents of O_2react with 0.00832 equivalents of metal. Thus, mass of 0.00832 equivalents of metal = 0.1 g $\therefore$ Mass of 1 equivalent = Equivalent mass, *E*, of metal= $\frac{0.1}{0.00832} = 12.0g\ eqvt^{-1}$.
26.	5*g* atoms of nitrogen = 70*g*
27.	Molar mass of methane (CH_4) = (12 + 4 x1) = 16 g mol^{-1}. Molar mass of sulphur dioxide (SO_2) = (32 + 2 x16) = 64 g mol^{-1} Ratio of CH_4 and SO_2 in the mixture= 1:8 (w/w) Moles of CH_4 in the mixture = $\frac{1}{16}$ mol Mol of SO_2 in the mixture = $\frac{8}{64} = \frac{1}{8}$ mol Molar ratio of CH_4 and SO_2 in the mixture = $\frac{1}{16}:\frac{1}{8}$ = 1:2
28.	Mass of $H_2O = 18g$. No. of moles in $H_2O = \frac{given\ mass}{molar\ mass}$ ----(1) $d = \frac{m}{v}$ Given mass= density × volume = 0.05 ml × 1 = 0.05 g Put this in equation (1) $\frac{0.05}{18}\times6.022\times10^{23}$ No. of water molecules $=1.67\times10^{21}$
29.	$\text{Volume} = \frac{\text{mass}}{\text{density}}$

	Mass of one molecule of water = $\frac{18}{6.02\times10^{23}}$ Density = $1.0\times10^{3}\text{kgm}^{-3}$ $=1.0\times10^{3}\times1000\times10^{-6}\text{gcm}^{-3}$ So $V=\frac{18}{6.02\times10^{23}\times1.0}=3.0\times10^{-23}\text{ml}$
30.	H_3PO_4 is tribaric acid
31.	As the roots are symmetrically placed about point, we take roots to be $1-\alpha$, $1+\alpha$ Now, $(1-\alpha)+(1+\alpha)=\frac{2a}{a+2}$ $\Rightarrow a+2=a\Rightarrow 0=2$ Not possible. Thus, set of values of a is ϕ.
32.	We can write $ax^2-bx(x-2)+c(x-2)^2=0$ (1) $a\left(\frac{-x}{x-2}\right)^2+b\left(\frac{-x}{x-2}\right)+c=0$ as, $\therefore -\frac{x}{x-2}=\alpha,\beta$ $\Rightarrow x=\frac{2\alpha}{\alpha+1},\frac{2\beta}{\beta+1}$ Thus, roots of (1) are $\frac{2\alpha}{\alpha+1},\frac{2\beta}{\beta+1}$
33.	α, β are roots of $x^2-7x+5=0$ $\therefore \alpha+\beta=7,\ \alpha\beta=5$ Now, $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}=\frac{(\alpha+\beta)^2-2\alpha\beta}{\alpha\beta}$ $=\frac{49-2(5)}{5}=\frac{39}{5}$

	and $\left(\frac{\alpha}{\beta}\right)\left(\frac{\beta}{\alpha}\right)=1$ Thus, required equation is $x^2-\frac{39}{5}x+1=0$ or $5x^2-39x+5=0$
34.	$x^2-5\|x\|+6=0$ $\Rightarrow \|x\|^2-5\|x\|+6=0$ $\Rightarrow (\|x\|-3)(\|x\|-2)=0$ $\Rightarrow \|x\|=3$ or $\|x\|=2$ $\Rightarrow x=\pm 3$ or $x=\pm 2$
35.	If α is a common root, then $a\alpha^2+c\alpha-b=0$ (1) and $a\alpha^2-3b\alpha+\frac{c}{3}=0$ (2) Subtracting (2) from (1), we get $(c+3b)\alpha-b-\frac{c}{3}=0$ $\Rightarrow \alpha=\frac{1}{3} \because 3b+c\neq 0$ Putting in (1), we get $a\left(\frac{1}{9}\right)+c\left(\frac{1}{3}\right)-b=0$ $\Rightarrow a+3c-ab=0$
36.	$\tan 27^0+\tan 18^0=-2a$ $\tan 27^0 \tan 18^0=b$ Now, $1=\tan 45^0=\tan(27^0+18^0)$ $=\frac{\tan(27^0)+\tan(18^0)}{1-\tan 27^0 \tan 18^0}$ $=\frac{-2a}{1-b}$ $\Rightarrow 1-b=-2a$

	$\Rightarrow$ 2a–b = –1
37.	$y = 1+\frac{1}{x^2+3x+3} = 1+\frac{1}{\left(x+\frac{3}{2}\right)^2+\frac{3}{4}}$ $\Rightarrow y > 1$ Also, $\frac{1}{y-1} = \left(x+\frac{3}{2}\right)^2+\frac{3}{4} \geq \frac{3}{4}$ $\Rightarrow y-1 \leq \frac{4}{3} \Rightarrow y \leq \frac{7}{3}$ Thus, $1 < y \leq \frac{7}{3}$ [Maximum value $\frac{7}{3}$ is attained when $x = -\frac{3}{2}$]
38.	$8x^2–14x+3 = 0$ $\Rightarrow 8x^2–12x–2x+3 = 0$ $\Rightarrow$ 4x(2x–3) – (2x–3) = 0 $\Rightarrow$ (4x–1) (2x–3) = 0 $\Rightarrow x = \frac{1}{4}, \frac{3}{4}$ Now, $\sum_{n=1}^{\infty}\left(\alpha^n+\beta^n\right) = \frac{\alpha}{1-\alpha}+\frac{\beta}{1-\beta}$ $= \frac{1}{3}+3 = \frac{10}{3}$
39.	As the roots of x^2+bx+c = 0 are two consecutive odd numbers, We take α = 2m–1, β = 2m+1 Then $2 = \lvert\alpha-\beta\rvert = \sqrt{(\alpha+\beta)^2-4\alpha\beta}$ $2 = \lvert\alpha-\beta\rvert = \sqrt{(\alpha+\beta)^2-4\alpha\beta}$ $\Rightarrow 4 = (-b)^2-4c = b^2-4c$
40.	Put x+4 = t. The equation becomes $(t–1)^4 + (t+1)^4 = 16$ $\Rightarrow$ 2(t^4+6t^2+1) = 16 $\Rightarrow$ t^4+6t^2–7 = 0

	$\Rightarrow (t^2+7)(t^2-1)=0$ $\Rightarrow t^2=1,-7$ $\Rightarrow t=\pm 1, \pm\sqrt{7}\,i$ Thus, real roots of the equation are x = –4 ± 1 = –3, –5 and their sum is –8 .
41.	Since (1-p) is the root of the given equation, $\therefore (1-p)^2+p(1-p)+(1-p)=0$ $\Rightarrow (1-p)(1-p+p+1)=0$ $2(1-p)=0$ $\Rightarrow (1-p)=0 \Rightarrow p=1$ *substituting in the given equation* $x^2+1x+(1-1)=0$ $\Rightarrow x^2+x=0$ $\Rightarrow x(x+1)=0$ $\Rightarrow x=0,-1$
42.	Let the roots be α *and* $\frac{1}{\alpha}$ Since the equation is $x^2-5x+P=0$ $\Rightarrow \alpha+\frac{1}{\alpha}=-\frac{13}{5}$ *and* $\alpha.\frac{1}{\alpha}=\frac{k}{5}\Rightarrow \frac{k}{5}=1$ $\Rightarrow k=5$
43.	Let the correct equation be $x^2+ax+b=0 \quad -----(1)$ *Ramesh,* $S=10, \quad P=16$ $\therefore$ *Equation is* $x^2-10x+16=0 \quad ----(2)$ Since the committed mistake only in constant term $\therefore a=-10,$ *b is wrong* Mahesh, S=-10, P=9 $\therefore$ *Equation is* $x^2+10x+9=0$ Since the committed mistake in the coefficient of x $\therefore$ b=9, a was wrong $\therefore \; x^2-10x+9=0$

	Roots are (9,1)
44.	$4x^2+3x+7=0$ $\Rightarrow \alpha+\beta=\frac{-3}{4},\ \alpha\beta=\frac{7}{4}$ $\frac{\alpha^3+\beta^3}{\alpha^3\beta^3}=\frac{(\alpha+\beta)^3-3\alpha\beta(\alpha+\beta)}{(\alpha\beta)^3}$ $=\frac{\left(\frac{-3}{4}\right)^3-3\left(\frac{7}{4}\right)\left(\frac{-3}{4}\right)}{\left(\frac{7}{4}\right)^3}$ $=\frac{\frac{-27}{64}+\frac{63}{16}}{\frac{343}{64}}$ $=\frac{-27+252}{64}\times\frac{64}{343}$ $=\frac{225}{343}$
45.	$D=b^2-4ac$ $=(c-a)^2-4(b-c)(a-b)$ $=(c+a)^2-4ac-4(ab+bc-ca-b^2)$ $=(c+a)^2+4b^2-4b(c+a)$ $=(c+a-2b)^2$ =perfect square $\therefore$ Roots are rational