

# Master JEE CLASSES

Kukatpally, Hyderabad.

## JEE-ADVANCE-2013-P1-Model Max.Marks:180

#### PHYSICS

Lenses and combination of lenses + experiments involving concave mirror, convex lens, concave lens (including optical bench) (Reference : JEE mains syllabus) (50%) (exclude problems involving relative motion and differential and integral calculus)

Refraction at plane surface, TIR and Prism,

Refraction at curved surface (50%) (exclude problems involving relative motion and differential and integral calculus)

#### CHEMISTRY

STOICHIOMETRY-I ( $8 \times 2=16$ ): Mole, significant figures, laws of chemical combination, Chemical calculations based upon weight, volume relations of chemical equations, percentage composition of mixtures, empirical and molecular formula, Concept of redox reactions - oxidation number - Types of redox reactions, Balancing Redox reactions, Equivalent weight, (60%)

De-Broglie Equation, Heisenberg's Uncertainity principle, Schrodinger's wave equation; Quantum numbers, Pauli's exclusion Principle; Hund's rule; Electronic configuration of the elements, (30%)

Cumulative syllabus (10%)

#### MATHS

Quadratic equation (30%); Properties of AP,AM,GP,GM; Sum of 'n' Terms of AP & GP, Properties of HP & HM; Sum of infinite GP & AGP, method of differences/Vn method (60%); Cumulative (10%)

## JEE-ADVANCE-2013-P1-Model IMPORTANT INSTRUCTIONS

Max Marks: 180

## **PHYSICS:**

Time: 3:00 Hours

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 1 – 10)	Questions with Single Correct Choice	2	0	10	20
Sec – II(Q.N : 11 – 15)	Questions with Multiple Correct Choice	4	-1	5	20
Sec – III(Q.N : 16 – 20)	Questions with Integer Answer Type	4	-1	5	20
	20	60			

# **CHEMISTRY:**

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec - I(Q.N : 21 - 30)	Questions with Single Correct Choice	2	0	10	20
Sec – II(Q.N : 31 – 35)	Questions with Multiple Correct Choice	4	-1	5	20
Sec – III(Q.N : 36 – 40)	Questions with Integer Answer Type	4	-1	5	20
	20	60			

# **MATHEMATICS:**

Section	Question Type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 41 – 50)	Questions with Single Correct Choice	2	0	10	20
Sec – II(Q.N : 51 – 55)	Questions with Multiple Correct Choice	4	-1	5	20
Sec – III(Q.N : 56 – 60)	Questions with Integer Answer Type	4	-1	5	20
	20	60			

space for rough work



parallel to the table is (assuming that the incident rays falling on the flat surface are close to the axis of cylinder but not on the axis)



4. The figure shows the cross-section of a hollow glass tube of inner radius r, outer radius R, centre O and refractive index n. ABC and ODE are two light rays emerging from the tube into outside air as shown, where BC and DE are parallel. The separation y between BC and DE is given by



- A)  $y = n^2 r$  B) y = (n-1)R C) y = nr D)  $y = n^2 R$
- 5. A source of light is located at a distance of 75 cm from a screen. A thin converging lens provides sharp image of the source when placed at two different positions between the source and the screen. If the size of the image at one position of the lens in 16 times larger than that at the other position, the focal length of the lens is

A) 18 cm	B) 15 cm	C) 30 cm	D) 12 cm	
space	for rough work			Page 5



8. A glass hemisphere  $(\mu = 1.5)$  has a radius of curvature of 8 cm. A small object O is located on its axis halfway between the plane and spherical surfaces. The distance between the two images when viewed along the axis from the sides of the hemisphere is



9. A convex lens of focal length f is placed between an object and a screen whereby the image produced has magnification m. The distance between the object and the screen is x. Then the value of f is

A) 
$$\frac{mx}{\left(m+1\right)^2}$$
 B)  $\frac{mx}{1+m^2}$  C)  $\frac{x}{m^2-1}$  D)  $\frac{mx}{\left(m-1\right)^2}$ 

space for rough work

10.	A given ray of light suffers minimum deviation in an equilateral prism P. Additional							
10.	identical minute O and D are now placed as shown. The new will now suffer							
	Identical prisitis Q and K are now placed as shown. The ray will now suffer							
	$\sqrt{0}$							
	$\langle P \rangle_{\chi} \langle B \rangle$							
	A) total internal reflection B) greater deviation							
	C) no deviation D) same deviation as before							
This se out of <b>Mark</b> i	SECTION – II (MULTIPLE CORRECT ANSWER TYPE) ection contains 5 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, f which ONE OR MORE than ONE option can be correct. ing scheme: +4 for correct answer, 0 if not attempted and -1 in all other cases.							
11.	A convex lens forms an image of an object placed in its axis on a screen. The height							
	of the image is 9 cm. Now the lens is displaced until an image is again obtained on the							
	screen. The height of the image is 4 cm. The distance between the object and the							
	screen is 90 cm. It follows that							
	A) the distance between the two positions of the lens is 30 cm							
	B) the focal length of the lens is 24 cm							
	C) the height of the object is 6 cm							
	D) the distance of the object from the lens in its first position is 36 cm.							
	space for rough work Page 8							

12. A ray of light travels from a medium of refractive index  $\mu$  to air. Its angle of incidence in the medium is  $\theta$  and the angle of deviation is  $\delta$ . Let  $\delta_1$  be the maximum deviation for  $\theta < C$  and  $\delta_2$  be the maximum deviation for  $\theta > C$  where C is the critical angle for the situation. Then

A) 
$$\delta_1 = \frac{\pi}{2} - \sin^{-1}\left(\frac{1}{\mu}\right)$$
  
B)  $\delta_2 = \mu \delta_1$   
C)  $\delta_2 = 2\delta_1$   
D)  $C = \sin^{-1}\left(\frac{1}{\mu}\right)$ 

13. A small plane mirror M is arranged parallel to a wall W at a distance  $\ell$  from it. The light produced by a point source S fixed on the wall is reflected by the mirror and produces a light spot on the wall. The mirror is now moved with velocity  $\upsilon$  towards the wall. Then



space for rough work

A) the spot of light will move with speed 2v on the wall

- B) the size of the light spot on the wall remain uncharged
- C) the spot of light will remain stationary on the wall
- D) as the mirror comes closer, the light spot will become larger
- 14. A ray OP of monochromatic light is incident at angle  $60^{\circ}$  on the face AB of prism ABCD near its vertex B as shown. The refractive index of the material of the prism is  $\sqrt{3}$ . Then, it follows that,



- A) the ray gets totally internally reflected at face CD
- B) the ray emerges through face AD
- C) the angle between the incident ray and the emergent ray is  $120^{\circ}$
- D) the angle of incidence of the ray with face AD is  $30^{\circ}$

space for rough work

A point object is placed at 30 cm from a convex lens  $\left(\mu = \frac{3}{2}\right)$  of focal length 20 cm. 15. Its final image will be formed at infinity if A) another convex lens of focal length 60 cm is placed at 30 cm from the first lens B) the whole system is immersed in a liquid of refractive index  $\frac{9}{2}$ C) a concave lens of focal length 60 cm is placed in contact with the first lens D) the whole system is immersed in a liquid of refractive index  $\frac{4}{3}$ SECTION – III **INTEGER TYPE** (This section contains **5 questions**. The answer to each question is a single digit integer ranging from 0 to 9. The correct digit below the question number in the ORS is to be bubbled). Marking scheme +4 for correct answer, 0 if not attempted and -1 in all other cases. A layer of benzene ( $\mu = 1.6$ ) of thickness 6 cm floats on water ( $\mu' = 1.33$ ) of 16. depth 4 cm in a vessel. When viewed vertically through air, find the apparent distance of the bottom of the vessel below the surface of benzene (to the nearest cm) An object is placed at a distance of  $\frac{5}{4}$  f from a concave mirror of focal length f. 17. The mirror produces a real image\_\_\_\_\_ times the size of the object space for rough work Page 11 18. A large glass slab (µ = 5/3) of thickness 8 cm is placed over a point source of light on a plane surface. The light from the source emerges out of the top surface of the slab from a circular area of radius R cm. What is the value of R?
19. Water (refractive index = 4/3) in a tank is 19 cm deep. Oil of refractive index 7/4 lying on water makes a convex surface of radius of curvature 6 cm and acts as a thin lens. An object S is placed 24 cm above the water surface. Its image is formed at x cm above the bottom of the tank. Then x = \_\_\_\_\_



20. The focal length of a thin biconvex lens is 20cm. When an object is moved from a distance of 25 cm to 50 cm in front of it, the magnification of its

image changes from  $m_1$  to  $m_2$ . The ratio  $\frac{m_1}{m_2}$  is \_\_\_\_\_

space for rough work

CHE	MISTRY			Max Marks: 60				
This of	ation contains 10	(SINGLE (	SECTION – I CORRECT ANSWER	TYPE)				
answe Marki	er, out of which ON ing scheme: +2 fo	ILY ONE option can b r correct answer, 0 i	be correct. f not attempted and 0	in all other cases.				
21.	In a "lead s	torage battery" t	he overall reaction	n (unbalanced) occurring can be				
	represented as							
	$Pb_{(s)} + PbO_{2(s)}$	$+ \operatorname{H}_2 SO_{4(aq)} \longrightarrow$	$PbSO_{4(s)} + H_2O_{(l)}$					
	Calculate the	equivalent mass of	f sulphuric acid in to	erms of its molecular mass M.				
	A) M	B) M/2	C) 2M	D) M/4				
22.	Identify the sp	becies in its element	ntal form, which wi	ll not undergo disproportionation in				
	alkaline medi	um						
	A) white phos	phorus	B) S <sub>8 (s)</sub>					
	C) Cl <sub>2 (g)</sub>		D) F <sub>2 (g)</sub>					
23.	The volume o	f oxygen produced	l from 3.0 Liters of	chlorine according to the following				
	reactions (unb	alanced) at STP is	5					
	$Cl_2 + NaOH \longrightarrow NaCl + NaClO_3 + H_2O$							
	$NaClO_3 \longrightarrow$	$NaCl + O_2$						
	A) 5L	B) 3L	C) 6L	D) 1.5L				

Which of the following is/are **true**? 24. A) Oxidation number can be fractional but not oxidation state B) Oxidation state may be in fraction in some cases like  $O_2^-$  and  $O_2^+$ C) The difference in the Oxidation numbers of the two types of sulphur atoms in  $Na_2S_4O_6$  is zero D) In the compound  $Fe_{0.92}O$  the oxidation number of all iron atoms is +2 The **largest** possible magnitude of the angular momentum for n = 4 is? 25. B)  $3.65 \times 10^{-34}$  J.s A) 3.65 x 10<sup>-34</sup> J.s<sup>-1</sup> D) 12.65 x 10<sup>-34</sup> J.s C) 9.65 x 10<sup>-34</sup> J.s The equivalent weight of HCl when it reacts with  $K_2Cr_2O_7$  to produce  $Cl_2$  as one of the 26. product is (where **M** is its Molecular mass) A)  $\frac{14M}{6}$ C)  $\frac{M}{14}$ D)  $\frac{6M}{14}$ B)  $\frac{M}{6}$  $2NH_3 + OCl^- \rightarrow N_2H_4 + Cl^- + H_2O$ . Starting with 3.6 moles of ammonia and 1.5 27. moles of hypochlorite, the maximum number of moles of hydrazine that can be obtained is? A) 1.5 B) 3.0 C) 1.8 D) 3.6 space for rough work Page 14

28.	0.531g of an ester (responsible for odour of pine apples) produced 1.21g of $CO_2$ and 0.492g of H <sub>2</sub> O on combustion. Its empirical formula is?								
	A) $C_2H_4O$	B) $C_2H_4O_2$	C) CH <sub>2</sub> O	D) $C_3H_6O$					
29.	A 3L mixture	of propane and buta	ne on combustion	produced 10L of CO <sub>2</sub> at	25 <sup>°</sup> C.				
	The percentag	ge composition of bu	tane is?						
	A) 66	B) 44	C) 22	D) 11					
30.	$Cu_{3}P + Cr_{2}O_{7}^{-2}$ is?	$+\mathrm{H^{+}} \rightarrow \mathrm{Cu^{+2}} + \mathrm{H_{3}PO_{4}} + \mathrm{H_{3}PO_{4}}$	-Cr <sup>+3</sup> the coefficie	nt for Cu <sub>3</sub> P in balanced e	quation				
	A) 2	B) 3	C) 6	D) 12					
Mark 31.	ing scheme: +4 fo Which among	or correct answer, 0 if n the following are tr	ot attempted and -1 rue regarding the c	in all other cases. compound phosphorous(\	/) oxide				
Mark 31.	ing scheme: +4 fo Which among	or correct answer, 0 if n the following are tr	ot attempted and -1 Tue regarding the c	in all other cases.	/) oxide				
	A) one mole of	of it on hydrolysis pr	oduces two moles	of phosphoric acid.					
	B) one mole of	one mole of it on hydrolysis gives a product equivalent to 12 moles of H <sup>+</sup> .							
	C) it is an anh	ydride of an acid wh	nose equivalent ma	ass can be 98.					
	D) its molecu	D) its molecular structure contains four six membered rings.							
	space f	or rough work			Page 15				

32.	Choose the <b>correct</b> statement (s)
	A) All quantum states with $l=0$ also have $m_l=0$ regardless of the values of n.
	B) For $l=2$ the maximum z-component of orbital angular momentum is $2\hbar$
	C) The fact that $(L_z)_{max} < L$ ( <i>Lis angular momentum vector</i> ) implies tilt angle is never zero
	D) The number of allowed values of <i>l</i> depends on n as well as $m_l$
33.	Choose the correct statement (s)
	A) Knowing precisely all the components of a non zero angular momentum of the
	electron in a hydrogen atom would violate Heisenberg's uncertainty principle
	B) The radial probability distribution function $P(r)$ is maximum at "r=a <sub>0</sub> " for the
	ground state of hydrogen atom, however, $ \psi ^2$ attains maximum value at a different
	value of "r"
	C) "s" orbital has angular independence, i.e. for "s" orbital wave function is
	independent of $\theta$ and $\varphi$
	D) In the radial probability distribution function plots, if "n" is the number of times
	the wave function changing its sign, then number of radial nodes for that orbital is
	"n+1"

<ul> <li>A) when the number 100 is expressed in scientific notation we can have either one, two or three significant figures depending on the way we represent it.</li> <li>B) The increasing order of energy of various orbitals depends on atomic number</li> <li>C) According to Heisenberg's uncertainty principle, it is not possible to measure energy and time coordinates of a particle with unlimited precision</li> <li>D) dz<sup>2</sup> orbital has its nodal plane in xy plane</li> <li>35. Choose the correct statement(s)</li> <li>A) Magnetic quantum number determines orientation of the orbital</li> <li>B) Magnetic quantum number also determines Z-component of orbital angular momentum</li> <li>C) de Broglie wavelength of an electron in the first Bohr orbit is equal to the Circumference of the orbit</li> <li>D) the number of significant figures that should be present in the number obtained from the following calculation is 5 0.028 × 298.15 × 0.11</li> </ul>	34.	Choose the <b>correct</b> statement(s)
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<ul> <li>A) Magnetic quantum number determines orientation of the orbital</li> <li>B) Magnetic quantum number also determines Z-component of orbital angular momentum</li> <li>C) de Broglie wavelength of an electron in the first Bohr orbit is equal to the Circumference of the orbit</li> <li>D) the number of significant figures that should be present in the number obtained from the following calculation is 5 0.028 × 298.15 × 0.11</li> </ul>	35.	Choose the correct statement(s)
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		from the following calculation is 5 $0.028 \times 298.15 \times 0.11$

#### SECTION – III INTEGER TYPE

(This section contains **5 questions.** The answer to each question is a single digit integer ranging from 0 to 9. The correct digit below the question number in the ORS is to be bubbled ). Marking scheme +4 for correct answer , 0 if not attempted and -1 in all other cases.

- 36. Atomic number of Hydrogen like species that has a wave length difference of 59.3 nm between first line of Balmer and first line of Lyman series is?
- 37. If the number of significant figures in 100, 100. and 100.0 are X, Y and Z

respectively. What is the value of X+Y-Z ?

- 38. The difference in the oxidation states of the two central atoms (N and Cl ) in pernitric acid and perchloric acid is
- 39. Chloride samples are prepared for analysis by using KCl, NaCl, NH<sub>4</sub>Cl separately or as mixtures. What minimum volume of a 5% (by weight) AgNO<sub>3</sub> solution (sp gravity=1.04) must be added to a sample weighing 0.1g in order to ensure complete precipitation of chloride in every possible case? Round off your answer to the nearest integer.

space for rough work

40.	An element forms a hydride containing 5.928% hydrogen. 0.1794g of the gaseous
	hydride occupies 118mL at STP. If equivalent weight of element is X and molecular
	weight of the hydride is Y; then report $\frac{X+Y}{10}$ to the closest integer

#### **MATHEMATICS** Max Marks: 60 **SECTION – I** (SINGLE CORRECT ANSWER TYPE) This section contains 10 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which ONLY ONE option can be correct. Marking scheme: +2 for correct answer, 0 if not attempted and 0 in all other cases. If *a*,*b*,*c*,*d* are four different real numbers and they are in A.P. If 41. $2(a-b)+x(b-c)^{2}+(c-a)^{3}=2(a-d)+(b-d)^{2}+(c-d)^{3}$ then all values of X satisfies A) $x \ge 16 \text{ or } x \le -8$ B) $x \ge -8 \text{ or } x \le 16$ C) $x \ge -8$ D) $x \le 16$ 42. If $\left\{3\left(1-\frac{1}{2}+\frac{1}{4}-\frac{1}{8}+\dots\right)\right\}^{\log_{10}x} = \left\{20\left(1-\frac{1}{4}+\frac{1}{16}-\frac{1}{64}+\dots\right)\right\}^{\log_{x}10}$ then x is A) 10 or $\frac{1}{10}$ B) 10<sup>2</sup> or $\frac{1}{10^2}$ C) 10<sup>3</sup> or $\frac{1}{10^3}$ D) 10<sup>4</sup> or $\frac{1}{10^4}$ If $\log_{14}^{\sqrt{5}}, \log_{3^{x}-11}^{\sqrt{5}}, \log_{3^{x}-\frac{61}{7}}^{\sqrt{5}}$ are in H.P then x is 43. A) 2 or 3 B) 1 or 4 C) 1 or 5 D) 4 or 5 If a, b, c are in G.P and the equations $ax^2 + 2bx + c = 0$ , $dx^2 + 2ex + f = 0$ have a common 44. root then $\frac{d}{a}, \frac{e}{b}, \frac{f}{c}$ are in ..... A) A.P B) G.P D) None of these C) H.P

space for rough work

50. If 
$$0 \le x \le 1000 and \left[\frac{x}{2}\right] + \left[\frac{x}{3}\right] + \left[\frac{x}{3}\right] = \frac{31}{30}x$$
 where [.] denotes the greatest integer function then the number values of x is  
A) 31 B) 33 C) 34 D) 35  
**SECTION - II**  
(MULTIPLE CORRECT ANSWER TYPE)  
This section contains 5 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which ONE OR MORE than ONE option can be correct.  
Marking scheme: +4 for correct answer, 0 if not attempted and -1 in all other cases.  
51. If  $p,q,r$  are positive and are in A.P, the roots of the quadratic equation  $px^2 + qx + r = 0$   
are real if  
A)  $\left|\frac{r}{p} - 7\right| \ge 4\sqrt{3}$  B)  $\left|\frac{q}{p} - 4\right| \ge 2\sqrt{3}$   
C)  $\left|\frac{p}{q} - 4\right| \ge 4\sqrt{3}$  D)  $\left|\frac{p}{q} - 1\right| \ge \frac{\sqrt{3}}{2}$   
52. The sum of the numerical series  $\frac{1}{\sqrt{3} + \sqrt{7}} + \frac{1}{\sqrt{7} + \sqrt{11}} + \frac{1}{\sqrt{11} + \sqrt{15}} + \dots$  up to n terms  
A)  $\frac{\sqrt{3+4n} - \sqrt{3}}{4}$  B)  $\frac{\sqrt{3+4n} + \sqrt{3}}{4}$   
C) less than 'n' D)  $\frac{\sqrt{3+4n} + \sqrt{3}}{4}$ 

If *a*,*b*,*c* are in H.P, then the expression  $E = \left(\frac{1}{b} + \frac{1}{c} - \frac{1}{a}\right) \left(\frac{1}{c} + \frac{1}{a} - \frac{1}{b}\right)$  equals to 53. B)  $\frac{1}{4} \left( \frac{3}{c^2} + \frac{2}{ca} - \frac{1}{a^2} \right)$ A)  $\frac{2}{bc} - \frac{1}{b^2}$ C)  $\frac{3}{h^2} - \frac{2}{ah}$ D)  $\frac{3}{c^2} - \frac{2}{ac}$ If  $|ax^2 + bx + c| \le 1$  for x in [0,1] then 54. A)  $|a| \leq 8$ B) |b| > 8C)  $|c| \leq 1$ D)  $|a| + |b| + |c| \le 17$ If a, b, c are in A.P and  $a^2, b^2, c^2$  are in H.P then which of the following can be true? 55. B)  $a, \frac{-b}{2}, c$  are in G.P A) a = b = cD)  $-\frac{a}{2}, b, c$  are in G.P C) a, b, c in G.P Page 23 space for rough work

#### SECTION – III INTEGER TYPE

(This section contains **5 questions**. The answer to each question is a single digit integer ranging from 0 to 9. The correct digit below the question number in the ORS is to be bubbled). Marking scheme +4 for correct answer, 0 if not attempted and -1 in all other cases. All the values of k for which the quadratic polynomial  $f(x) = -2x^2 + kx + k^2 + 5$  has two 56. different zeros and only one of them satisfying 0 < x < 2 lie in the minimum possible interval (a,b). Then the value of a+10b is 57. Concentric circles of radii 1,2,...100cm are drawn. The interior of the smallest circle is coloured red and angular regions are coloured alternately green and red so that no two adjacent regions are of the same colour. The total area of the regions coloured green is equals to k.  $(1010\pi)$  sq.cm then the value of k is \_\_\_\_\_ If  $2\log(x-2y) = \log x + \log y$  then the numerical value of  $\frac{x}{y}$  is \_\_\_\_\_ 58. The number of the roots of the equation  $2^{x} + 2^{x-1} + 2^{x-2} = 7^{x} + 7^{x-1} + 7^{x-2}$ 59. The integral solutions of the equation  $x-1=(x-[x])(x-\{x\})$  where [.] and {.} denotes 60. the greatest integer and fractional part function space for rough work Page 24



# Master JEE CLASSES Kukatpally, Hyderabad.

JEE-ADVANCE-2013-P1-Model Max.Marks:180

# **KEY SHEET**

PHYSICS										
1	С	2	A	3	D	4	С	5	D	
6	С	7	D	8	С	9	A	10	D	
11	CD	12	ACD	13	BC	14	ABD	15	BC	
16	7	17	4	18	6	19	3	20	6	

CHEMISTRY										
21	A	22	D	23	D	24	В	25	В	
26	D	27	А	28	D	29	A	30	С	
31	BCD	32	ABC	33	ABC	34	ABC	35	ABC	
36	3	37	0	38	2	39	6	40	5	

MATHS

41)	A	42)	В	43)	A	44)	A	45)	С
46)	В	47)	D	48)	В	49)	A	50)	С
51)	ABCD	52)	ABC	53)	ABC	54)	ACD	55)	ACD
56)	7	57)	5	58)	4	59)	1	60)	1



6. 
$$y = 16 - 16\left(1 - \frac{3}{4}\right) + 5 = 16 \times \frac{3}{4} + 5 = 17$$
cm

7.



9. 
$$\frac{1}{m} + 1 = \frac{u}{f} \left\{ \frac{x}{f} = 2 + m + \frac{1}{m} = \frac{(m+1)^2}{m} \Rightarrow f = \frac{mx}{(m+1)^2} \right\}$$

10.



 $h = \sqrt{9 \times 4} = 6cm$ 11.  $\frac{\frac{v}{u}}{\frac{v}{u}} = \frac{9}{h} \\ \frac{u}{v} = \frac{4}{h} \end{cases} \Rightarrow \frac{v}{u} = \sqrt{\frac{9}{4}} = \frac{3}{2}$  $u + v = 90 \Longrightarrow u + \frac{3}{2}u = \frac{5}{2}u = 90 \Longrightarrow u = 36cm$ 

12.



$$\frac{1}{20} \alpha \left(\frac{3}{2}-1\right) \\ \frac{1}{30} \alpha \left(\frac{3/2}{\mu}-1\right) \left\{\frac{1/2}{2\mu}-1 = \frac{3}{2} \Rightarrow 1 = \frac{9}{2\mu}-3 \\ \Rightarrow \frac{9}{2\mu} = 4 \text{ or } \mu = 9/8 \\ \text{OR } \frac{1}{20} + \frac{1}{f} = \frac{1}{30} \Rightarrow \frac{1}{f} = \frac{1}{30} - \frac{1}{20} = -\frac{1}{60} \Rightarrow f = -60 \text{ cm} \quad (\text{concave lens in contact}) \\ \text{16. Apparent depth } = \sum \frac{x}{\mu} = \frac{6}{1.6} + \frac{4}{4/3} = \frac{15}{4} + 3 = 7 \text{ cm} \\ \text{17. } |m| = \frac{f}{u-f} = \frac{f}{\left(\frac{5}{4}-1\right)f} = \frac{4}{5-1} = 4 \\ \text{18.} \\ \hline \frac{8}{8} = \frac{8}{8} = \frac{1}{20} = \frac{1}{20} + \frac{1}{20} = \frac{3}{20} = 1 \\ \text{18.} \\ \hline \frac{1}{f} = \left(\frac{7}{4}-1\right) \times \frac{1}{6} = \frac{3}{4} \times \frac{1}{6} = \frac{1}{8} \Rightarrow f = 8 \text{ cm} \\ \text{For first image due to lens }: \frac{1}{v_1} = \frac{1}{8} - \frac{1}{24} = \frac{1}{12} \Rightarrow v_1 = 12 \text{ cm} \\ \text{Apparent depth } = 12 \times \frac{4}{3} = 16 \text{ cm} \Rightarrow x = 19 - 16 = 3 \text{ cm} \\ \hline \frac{1}{m} = \frac{u}{f} - 1 \Rightarrow \frac{1}{m_1} = \frac{25}{20} - 1 \\ \frac{1}{m_2} = \frac{50}{20} - 1 \\ \hline \frac{m_1}{m_2} = \frac{50}{25 - 20} = \frac{30}{5} = 6 \\ \hline \end{array}$$

#### CHEMISTRY 21. А 22. **D**, fluorine canot be oxidized in alkaline medium 23. D 24. B (NCERT) 25. А 26. D $\mathsf{K_2Cr_2O_7} + 14\mathsf{HCl} \longrightarrow 2\mathsf{CrCl_3} + 2\mathsf{KCl} + 7\mathsf{H_2O} + 3\mathsf{Cl_2}$ n-factor for HCl = 14/627. А 28. D 29. Α 30. С $6Cu_{3}P + 11Cr_{2}O_{7}^{2} + 124H^{+} \rightarrow 18Cu^{+2} + 6H_{3}PO_{4} + 22Cr^{+3} + 53H_{2}O_{7}^{-2}$ ABCD, ANY COMPOUND OF HYDROGEN CAN BE CLASSIFIED AS 31. HYDRIDE ABC 32. 33. ABC 34. ABC 35. ABC 3 36. 37. 0 38. 2 39. 6 40. 5

#### MATHS

Let 'D' is the common difference 41. a-d=-3Db-d = -2Dc - a = 2D $\therefore$  given equation reduces to  $D \left[ 9D^2 + (x-4)D + 4 \right] = 0$  $D \neq 0$  ::  $9D^2 + (x-4)D + 4 = 0$ D is real  $(x-4)^2 - 4.94 \ge 0$  $\Rightarrow x \ge 16 \text{ or } x \le -8$ 42.  $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \dots = \frac{2}{3}$  $1 - \frac{1}{4} + \frac{1}{16} - \frac{1}{64} + \dots = \frac{4}{5}$  $\therefore (2)^{\log_{10}^{x}} = (16)^{\log_{x}^{10}}$ From given condition  $(3^x - 11)^2 = 14 \left(3^x - \frac{61}{7}\right)$ 43.  $\Rightarrow$  3<sup>x</sup> = 9 and 3<sup>x</sup> = 27 44.  $b^2 = ac$  and  $ax^2 + 2\sqrt{ac} x + c = 0$  $\Rightarrow x = -\frac{\sqrt{c}}{\sqrt{c}}$ Both the equation s have a common root  $\Rightarrow \frac{d}{a} - 2\frac{e}{b} + \frac{f}{c} = 0$ 45.  $F_n(x) = x.1 + x.10 + x.10^2 + \dots + x.10^{n-1} = \frac{x}{9} (10^n - 1)$  $\Rightarrow F_n^2(3) + F_n(2) = \frac{1}{9} \left[ 10^{2n} - 1 \right]$ 46.  $\frac{1}{\sin 1^0 \sin 2^0} = \frac{1}{\sin 1^0} \left( \frac{\sin 1^0}{\sin 1^0 \sin 2^0} \right)$  $=\frac{1}{\sin 1^{0}}\left(\frac{\sin (2-1)^{0}}{\sin 1^{0} \sin 2^{0}}\right)$ 47.  $T_r = \frac{2}{r(r+1)}$   $\therefore$   $S_n = \sum T_r = 2\left(1\frac{-1}{n+1}\right)$ 

48. When 
$$xy + yz + zx > 0$$
  
 $x^{2} + y^{2} + z^{2} - xy - yz - zx = \frac{1}{2} \left[ (x - y)^{2} + (y - z)^{2} + (z - x)^{2} \right]$   
 $\Rightarrow \frac{x^{2} + y^{2} + z^{2}}{xy + yz + zx} \ge 1$   
When  $xy + yz + zx < 0$   
 $(x + y + z)^{2} \ge 0$   
 $\Rightarrow \frac{x^{2} + y^{2} + z^{2}}{xy + yz + zx} \le -2$   
49. Let  $\left(\frac{1}{2}\right)^{x} = y$   
 $y^{2} + 2y + b = 0$   
 $\Rightarrow y = -1 \pm \sqrt{1 - b}$   
 $\Rightarrow x = -\log_{2}(\sqrt{1 - b} - 1)$   
 $\Rightarrow 0 < \sqrt{1 - b} - 1 < 1$   
50. L.H.S = integer  
R.H.S is also integer it x must be a multiple of 30  
51.  $2q = r + p$  and  $q^{2} - 4pr \ge 0$   
 $\Rightarrow (p + r)^{2} - 16pr \ge 0$   
 $\Rightarrow \left|\frac{r}{p} - 7\right| \ge 4\sqrt{3}$ 

$$q^2 - 4p(2q - p) \ge 0$$

$$\Rightarrow \left|\frac{r}{q} - 1\right| \ge \frac{r}{2}$$

- 52. rationalize given terms
- 53.  $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$  are in A.P

Let d is the common difference

$$E = \left(\frac{1}{c} + d\right) \left(\frac{1}{c} - d\right)$$
$$= \frac{1}{c^2} - d^2$$

$$Case i) \frac{1}{c^{2}} - \left(\frac{1}{c} - \frac{1}{b}\right)^{2} = \frac{2}{bc} - \frac{1}{b^{2}}$$

$$Case ii) \frac{1}{c^{2}} - \frac{1}{4} \left(\frac{1}{c} - \frac{1}{a}\right)^{2} = \frac{1}{4} \left[\frac{3}{c^{2}} + \frac{2}{ac} - \frac{1}{a^{2}}\right]$$

$$Case iii) \left(\frac{2}{b} - \frac{1}{a}\right)^{2} - \left(\frac{1}{b} - \frac{1}{a}\right)^{2} = \frac{3}{b^{2}} - \frac{2}{ab}$$
54. Put  $x = 0, 1, \frac{1}{2}$  and solve the inequalities we get  $|a| \le 8 |b| \le 8 |c| \le 1$ 
55.  $b = \frac{a+c}{2}; b^{2} = \frac{2a^{2}c^{2}}{a^{2}+c^{2}}$ 
Eliminate 'b' we get  $(a-c)^{2} \left[ (a+c)^{2} + 2ac \right] = 0$ 
 $\Rightarrow a = c \Rightarrow a = b = c$  & are in G.P
 $(a+c)^{2} + 2ac = 0$ 
 $b^{2} = -\frac{ac}{2}$ 
56.  $D > 0 = 9k^{2} + 40 > 0$  always true
 $f(0) f(2) < 0$ 
 $\Rightarrow k \in (-3,1)$ 
57. Area of all green regions
 $= \pi \left[ (2^{2} - 1^{2}) + (4^{2} - 3^{2}) + \dots (100^{2} - 99^{2}) \right]$ 
5050 $\pi$ 
58.  $x > 0, y > 0, x > 2y$  and  $(x - 2y)^{2} = xy$ 
 $\Rightarrow \left(\frac{x}{y} - 4\right) \left(\frac{x}{y} - 1\right) = 0$ 
59.  $\left(\frac{7}{2}\right)^{4} = \frac{343}{228}$  By graph
60.  $x = 1 + \{x\} | X |$ 
 $\Rightarrow ([x] - 1)(1 - \{x\}) = 0$ 
Where [.] greatest integer traction {.}