# IIT-JEE-2011
# CHEMISTRY PAPER II SOLUTION
# PAPER CODE 4

**Paper II**

| | | | |
|---|---|---|---|
| **Section I** (+3,-1) | | | |
| 1. D | 2. A | 3. C | 4. B |
| 5. B | 6. D | 7. C | 8. A |
| **Section II** (+4,0) | 9. A, B, C, D | 10. A, C, D | 11. B, C, D |
| 12. A, B, D | | | |
| **Section III** (+4,0) | | | |
| 13. 8 | 14. 8 | 15. 6 | 16. 5 |
| 17. 6 | 18. 7 | | |
| **Section IV** (+8,-0) | | | |
| **19. A**- R, S, T | **B**- P, S, T | **C**- R, S | **D**- R, Q |
| **20. A**- P, R, S | **B**- R, S | **C**- T | **D**- Q, R, T |

## Detailed Answers:-

**Paper II**

**1.** **D** Apply formula and then put the values as $E_{cell} = E^0{}_{cell} - [(0.0591/4)\log(10^7)]$ then find the answer.

**2.** **A** $\Delta T^0_f = k_f molality$ Put values in equation and take vant hoff's factor=4

**3.** **C**

**4.** **B** Alcohol adds on the double bond of cyclic ether forming acetal.

**5.** **B** We will calculate the number of carbon atoms and then find the answer as aldohexose.

**6.** **D** $Fe_2O_3$ has the Fe Oxidation state as +3 and $Fe_3O_4$ ($Fe_2O_3$ + FeO) has Oxidation state as +3 & +2.

**7.** **C** As per the type of ligands in the complexes and the no; of unpaired electrons.

**8.** **A** Group II precipitation.

**9.** **A, B, C, D -** $NH_2$ & COOH together forms amide linkage in the condensation polymer.

**10.** **A, C, D -** As per the theory of $KMnO_4$

**11.** **B, C, D** precipitates formed with $Cu^+$ are CuCl, CuSCN, CuCN.

**12.** **A, B, D** as per the First order equation $k = \frac{2.303}{t} Log(\frac{A_0}{A_t})$ and then get the answer.

**13.** **8** As per the sturcture octahedron.

**14.** **8** One of the carbons on mono-chlorination get choral and forms stereoisomer. Rest carbons on substitution are not forming chiral carbons.

**15.** **6** As per the number of alpha hydrogen atoms.

**16.** **5** $SO_2$, $H_2O$, $H_2SO_4$, $P_4O_{10}$

**17.** **6** Do $M_1V_1=M_2V_2$ and find the answer with exactly two chlorine atoms participation.

**18.** **7** As per the principle of dissoultion and precipitation of CuCl (s) .

$$CuCl_{(s)} \rightleftharpoons Cu^+{}_{(aq)} + Cl^-{}_{(aq)}$$

**19. Matrix Match I : -**

A - R, S, T

B - P, S, T

C - S, R

D - R, Q

**20. Matrix Match II :-**

A - P, R, S

B - R, S

C - T

D - Q, R, T

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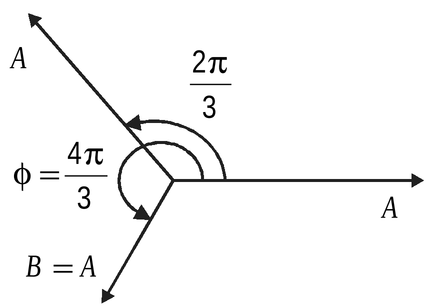
| | | | | |
|---|---|---|---|---|
| 21. B | 22. C | 23. D | 24. C | 25. A |
| 26. C | 27. B | 28. A | 29. A, C | 30. A, B, D |
| 31. B | 32. C, D | 33. 2 | 34. 4 | 35. 7 |
| 39.<br>(A) –> p, t<br>(B) –> p, s<br>(C) -> q, s<br>(D) -> q | 40.<br>(A) -> p,r,t<br>(B) -> p,r<br>(C) -> q, s<br>(D) -> r,t | | | |

**21. (B)**




**22. (C)**

Only induced (non-conservative) electric field can be circular and magnetic field is always circular

**23. (D)**

Time taken by ball and the bullet to hit ground is $\sqrt{\frac{2\times5}{10}} = 1\text{sec}$. Therefore horizontal velocity of the ball after collision is v= 20/1 =20 and the velocity of the bullet is v=100/1 = 100 m/s.

0.01v=0.01X100+0.2x20, we get v = 500 m/s.

**24. (C)**

**30. (A), (B), (D)**

Since there is tension in the string, sphere A has the tendency to move up and therefore the condition A and B. Considering sphere A and sphere B as the whole system, net buoyancy force must balance the gravitational force on A and B and this condition implies $d_A + d_B = 2d_F$ .

**31. (B)**

$$I_R^A = \frac{E}{\sqrt{R^2 + \frac{1}{\omega^2 C^2}}}\,; I_R^B = \frac{E}{\sqrt{R^2 + \frac{1}{16\omega^2 C^2}}} \quad \text{Hence } I_R^B > I_R^A$$

Further; $V_C^A = \frac{I_R^A}{\omega C}$ *and* $V_C^B = \frac{I_R^B}{4\omega C} \Rightarrow 4V_C^B > V_C^A$

**32. (C), (D)**

Applying the gauss law on a uniformly charged sphere considering that electric field varies as $r^{-0.25}$, we find that it does not satisfy the gauss law equation. Any Gaussian surface enclosing the dipole will have total charge zero and hence it is not possible to calculate the electric field at a point. If the charges are of opposite sign, electric field between two charges get added for any point in between. Work done by the external force is defined as change in potential energy.

**33. 2**

The image due to the oil lense is formed 12 cm below the water level, which after undergoing refraction through water is focused at 16 cm below the water level, i.e., 2 cm above the bottom.

**34. 4**

Impedance of the RC circuit $= \sqrt{\left(\frac{1}{\omega C}\right)^2 + R^2} = R\sqrt{1.25}$ , from this equation, the value of time constant of **RC = 4.**

**35. 7**

$$\left[\frac{hc}{\lambda} - \phi\right] e = \frac{1}{4\pi\varepsilon_0}\frac{ne^2}{r} \Rightarrow \left[\frac{1240}{200} - 4.7\right] = 9\times10^9 \times \frac{ne}{10^{-2}} \Rightarrow n = 7$$

**36. 5**

Time taken by the ball to move up and come back to the same height from where it was thrown is given $t = \frac{2u}{g} = \frac{2 \times 10 \times \sin(60)}{10} = \sqrt{3}$, Ball will have deceleration of a because of the pseudo force acting and hence the distance travelled by the ball in the horizontal direction in the above time is

$S = 10\cos(60) \times \sqrt{3} - \frac{1}{2}a\left(\sqrt{3}\right)^2 = 1.15$. Solving this, we get a = 5 m/S$^2$.

**37. 4**

Work done friction force + work done by spring = change in kinetic energy. 0.1x0.18xg + 1/2x 2x(0.06)$^2$ = 1/2x0.18xv$^2$. Solving this, we get v = 0.4 and so N = 4.

**38. 5**

Applying kirchoff's law, we get 6-3-i-2i=0. This means i = 1A. Therefore potential difference is 6-1xi = 6-1=5.

**39. (A) -> p,t (B)-> p,s (C)-> q,s (D) q,r**

For pipe closed at one end, the fundamental mode wavelength will be 4L and only sound wave (longitudinal) can have standing wave in the pipe.

For pipe open at both ends, the fundamental mode wavelength will be 2L and only sound wave (longitudinal) can have standing wave in the pipe.

Only transverse wave can be set up in a stretched wire. For wire fixed at both the ends, fundamental vibration mode wavelength will be L.

**40. (A)-> p,r,t (B)->p,r (C)-> q,s (D) r,t**

Process A-> B is an isobaric compression process. Work done by the gas is -6PV and change in internal energy is -3PV. Hence $\Delta Q = -6PV - 3PV = -9PV$

Process B-> C is an isochoric cooling process. Hence internal energy decreases and heat is lost to the system.

Process C-> D is an isobaric expansion and hence internal energy increases. Work done by the gas is positive. Hence heat is gained during the process.

Process D-> A is an isothermal compression process. No change in internal energy. Work is done on the gas is lost from the system during the process.

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| | | | | |
|---|---|---|---|---|
| 41 –D | 42 –D | 43 –C | 44 –A | 45 –C |
| 46 –B | 47 –B | 48 –A | 49 –C,D | 50 –A,B,C,D |
| 51 –A,D | 52 –A,B,D | 52 –A,B,D | 53 – 9 | 55 – 2 |
| 59 -<br>(A) – P,R,S<br>(B) – R,T<br>(C) – R<br>(D) – R | 60-<br>(A) – Q<br>(B) – P<br>(C) – S<br>(D) – S | | | |

**41.** Let Centre of circle C(h,k)
P(-1,0), Q(0,2) are points on circumference
So PC+CQ, also radius of circle = h, find (h,k), then use options.

**42.** $\lim_{x\to 0}[1+x\ln(1+b^2)]^{\frac{1}{x}} = e^{\lim_{x\to 0}\frac{1}{x}(1+x\ln(1+b^2)-1)} = 1+b^2 = 2b\sin^2\theta \Rightarrow \sin^2\theta \geq 1$

$\Rightarrow \sin^2\theta = 1$

**43.** $R_1 = \int_{-1}^{2} xf(x)dx = \int_{-1}^{2}(1-x)f(x)dx \Rightarrow 2R_1 = R_2$

**44.** $fogogof(x) = \sin^2\sin x^2$

$gogof(x) = \sin\sin x^2$

$\Rightarrow \sin^2\sin x^2 = \sin\sin x^2$

$\Rightarrow \sin\sin x^2 = 0,1$

**45.**

$x = 4h,\ y = 4k \Rightarrow k^2 = h$

$m_n = -1 = -2\frac{a^2}{a^2}$

**46.**

$\Rightarrow \frac{b^2}{b^2} = \frac{1}{2} = e^2 - 1$

**47.** $bx - 1 = x + b \Rightarrow x = \frac{b+1}{b-2}$

Put this value of x in any of 2 equation, and solve for b

**48.** Solving determinant

$1 - (a+c)w + acw^2 \neq 0$

Only possible for $a = c = w, b = w, w^2$

**49.** $f(x) = f^{-1}(x) = x \forall \in (0,1)$

**50.** Check function at given values from both left and right sides

**51.** Prob that exactly one of them occurs $= x(1-y) + y(1-x) = \frac{11}{25}$

None of them occurs $= 1 - (1-x)(1-y) = \frac{2}{25}$

Solve for x,y or use options.

**52.** Equation of normal at (x,y) is $y = mx - 2m - m^3$ put (9,6) on this equation

$\rightarrow m = 1, 2, -3$

**53.** $M = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix} = \begin{pmatrix} 0 & 3 & 2 \\ -1 & 2 & 3 \\ 1 & -5 & 7 \end{pmatrix}$

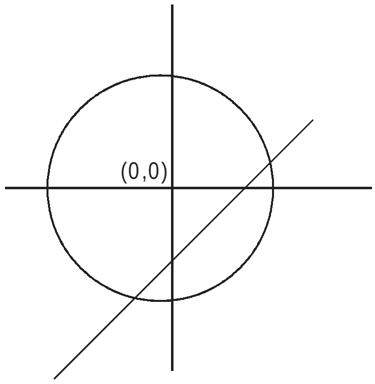
**54.**

$\vec{r} = \vec{c} + \lambda \vec{b}$

$\vec{r}.\vec{a} = \vec{c}.\vec{a} + \lambda \vec{b}.\vec{a}$

$\Rightarrow \lambda = 4$

$\Rightarrow \vec{r} = \vec{c} + 4\vec{b}$

55. 


Check position of (0,0) wrt line, smaller part is side which is not containing origin, also check distance of given points from centre should not be more than radius.

56. $w^3 = -1$ take mod of x,y and z and use $\overline{z}z = |z|^2$

57. $f''(x) = 12x^2 - 24x + 24 \Rightarrow D < 0$

So $f(x)$ has 2 real roots

58. This is a first order linear diff. eqn, solve according using Integrating Factor.

59. **(A):** $z = \cos\theta + i\sin\theta$

**(B)** Take $3^{x-1} = t \Rightarrow -1 \le \dfrac{\frac{8t}{3}}{1-t^2} \le 1$

**(C)** $f(\theta) = 2\sec^2\theta \ge 0$

**(D)** Put $f'(x) \ge 0$

60. **(A)** $\cos\theta = \pm\dfrac{|a|^2 + |b|^2 - |c|^2}{2|a||b|} = \pm\dfrac{1}{2}$

But will take only $\cos\theta = -\dfrac{1}{2}$ as positive will make triangle equilateral which is not the case.

**(B)** $f(x) = x$ satisfies the given condition.

**(C)** Put $\pi x = t,$ integrate function using $\int \sec t\,dt = \ln|\sec t + \tan t|$

**(D)** $\left|\arg\left(\dfrac{1}{1-z}\right)\right| = \left|\dfrac{\pi}{2} - \dfrac{\theta}{2}\right|$ by putting $z = \cos\theta + i\sin\theta,$ which is maximum at $\theta = -\pi$