

IIT-JEE-2011
CHEMISTRY PAPER II
PAPER CODE g 4

Paper II:

<u>Section I (+3,-1)</u>			
1. D	2. A	3. C	4. B
5. B	6. D	7. C	8. A
<u>Section II (+4,0)</u>	9. A, B, C, D	10. A, C, D	11. B, C, D
12. A, B, D			
<u>Section III (+4,0)</u>			
13. 8	14. 8	15. 6	16. 5
17. 6	18. 7		
<u>Section IV (+8,-0)</u>			
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

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

2. **A** $\Delta T_f^0 = k_f \text{ molality}$ 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 ($\text{Fe}_2\text{O}_3 + \text{FeO}$) has Oxidation state as +3 & +2.

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

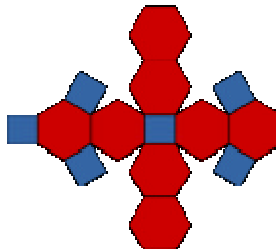
8. **A** Group II precipitation.

9. **A, B, C, D** Condensation Polymers are formed by the condensation of a diols or diamine with dicarboxylic acids. Hence, X may be -COOR, -CONH₂ or -CN

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 $k = \frac{2.303}{t} \text{Log}\left(\frac{A_0}{A_t}\right)$ and then get the answer.



13. **8** As per the structure of truncated octahedron.

14. **8**

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

16. **5** CO_2 , 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 participating in the precipitation.

18. **7** As per the principle of dissolution and precipitation of $\text{CuCl}_{(s)}$. $\text{CuCl}_{(s)} \rightleftharpoons \text{Cu}^+_{(aq)} + \text{Cl}^-_{(aq)}$

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

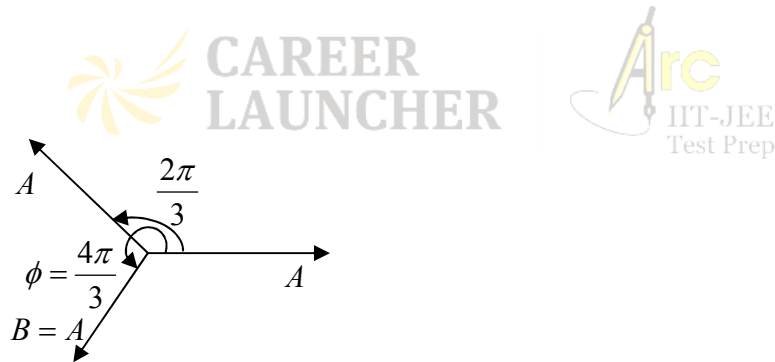
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PHYSICS PAPER 2

Paper Code: $\gamma-4$

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
36. 5	37. 4	38. 5		
39. (A) $\rightarrow p, t$ (B) $\rightarrow p, s$ (C) $\rightarrow q, s$ (D) $q,$	40. (A) $\rightarrow p, r, t$ (B) $\rightarrow p, r$ (C) $\rightarrow q, s$ (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 $\sqrt{\frac{2 \times 5}{10}} = 1 \text{ sec}$. Therefore horizontal velocity

of the ball after collision is $v = 20/1 = 20$ and the velocity of the bullet is $v = 100/1 = 100 \text{ m/s}$. Applying conservation of momentum during collision, we get

$0.01v = 0.01 \times 100 + 0.2 \times 20$, we get $v = 500 \text{ m/s}$.

24. (C)

Diameter, d of the ball = $2.5 + 20 \times \text{least count}$; $\text{least count} = \frac{0.5}{50} = 0.01 \text{ mm}$

Hence, $d = 2.5 + 0.01 \times 20 = 2.5 + 0.20 = 2.70 \text{ mm}$, error in $d = 0.01 \text{ mm}$

$$\text{As, } \rho = \frac{m}{\frac{4}{3}\pi\left(\frac{d}{2}\right)^3} \quad \text{Hence, } \frac{\Delta\rho}{\rho} = \frac{\Delta m}{m} + 3\frac{\Delta d}{d} = \frac{2}{100} + 3\frac{0.01}{2.70} = \frac{3.1}{100}$$

Hence %error in density = 3.1%

25. (A)

Frequency of the spring mass system does not depend on external forces. External forces only changes the mean position.

26. (C)

Light is completely transmitted when incidence angle is zero and light is completely reflected when incidence angle is more than critical angle.

27. (B)

Object will escape if the total energy becomes zero, that is, $K.E + P.E = 0$

Therefore, $K.E = -P.E = -(-GMm/h) = mv^2$ (applying centripetal force).

28. (A)

Magnetic field due a circular loop of radius r carrying current i is $\mu_0 i / 2r$. Consider a small ring of radius r and thickness dr . Magnetic field due to this ring is $\mu_0 i / 2r$ and the current of this ring is $INdr/(b-a)$. Thus integrating the magnetic field from a to b , we get

$$\frac{\mu_0 NI}{2(b-a)} \ln\left(\frac{b}{a}\right).$$

29. (A),(C)

Direction of impulse provided by the ball on the sphere is towards the center and so there is no rotational impulse provided and so only CM velocity changes. Total horizontal impulse provided by the ball to right is $0.1 \times 20 = 2$. Momentum of the ring before the collision is $2 \times 1 = 2$ to the left and hence the velocity of CM after collision is zero but it continues to rotate about its axis just after the collision because of no rotational impulse. Bottom most point of the sphere is moving to the right and hence the friction acts to the left.

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

Since there is tension in the string, sphere A has the tendency to move up and sphere B has the tendency to move down 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)

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

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 lens 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 circuit is $RC = 4$.

35. 7

$$\left[\frac{hc}{\lambda} - \phi\right] e = \frac{1}{4\pi\epsilon_0} \frac{ne^2}{r} \Rightarrow \left[\frac{1240}{200} - 4.7\right] = 9 \times 10^9 \times \frac{ne}{10^{-2}} \Rightarrow n = 7$$

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

37. 4

Work done friction force + work done by spring = change in kinetic energy

$$0.1 \times 0.18 \times g + \frac{1}{2} \times 2 \times (0.06)^2 = \frac{1}{2} \times 0.18 \times v^2. \text{ Solving this, we get } v = 0.4 \text{ and so } N=4.$$

38. 5

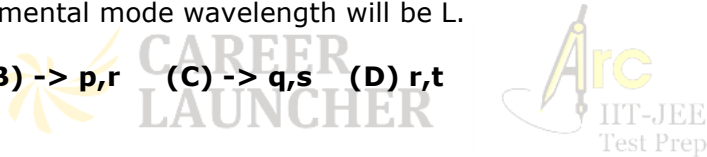
Applying kirchoff's law, we get $6-3-i-2i=0$. This means $i = 1A$. Therefore potential difference is $6-1 \times i = 6-1=5$.

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 is equal to $2L$. For wire fixed at both the ends and at the middle, fundamental 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 change in internal energy 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 and is lost from the system during the process.

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MATHS PAPER II Solutions Paper Code- $\gamma 4$

PAPER II

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	53—9	54—9	55—2
56—3	57—2	58—0		
59- (a)—P,R,S (b)—R,T (c)—R (d)—R	60- (a)—Q (b)—P (c)—S (d)—S			

CAREER
LAUNCHER

Arc
IIT-JEE
Test Prep

QN 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.

QN42:

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

QN43: $R_1 = \int_{-1}^2 xf(x)dx = \int_{-1}^2 (1-x)f(x)dx$
 $\Rightarrow 2R_1 = R_2$

$$f \circ g \circ g \circ f(x) = \sin^2 \sin x^2$$

Q44: $g \circ g \circ f(x) = \sin \sin x^2$
 $\Rightarrow \sin^2 \sin x^2 = \sin \sin x^2$
 $\Rightarrow \sin \sin x^2 = 0, 1$

Q45: $x = 4h, y = 4k \Rightarrow k^2 = h$

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

Q46: $\Rightarrow \frac{b^2}{a^2} = \frac{1}{2} = e^2 - 1$

Q47: $bx - 1 = x + b \Rightarrow x = \frac{b+1}{b-1}$

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

Q48: solving determinant

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

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

Q49: $f(x) = f^{-1}(x) = x \quad \forall x \in (0,1)$

Q50 check function at given values from both left and right sides

Q51: 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

Q52: Equation of normal at (x,y) is $y = mx - 2m - m^3$

Put (9,6) on this equation $\rightarrow m=1, 2, -3$



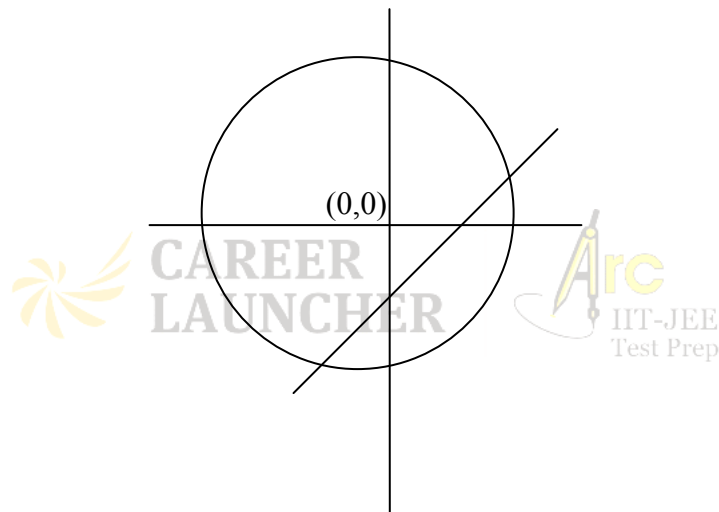
$$\text{QN53: } M = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix} = \begin{pmatrix} 0 & 3 & 2 \\ -1 & 2 & 3 \\ 1 & -5 & 7 \end{pmatrix}$$

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

$$\text{QN54: } \vec{r} \cdot \vec{a} = \vec{c} \cdot \vec{a} + \lambda \vec{b} \cdot \vec{a}$$

$$\Rightarrow \lambda = 4$$

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



QN55:

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.

$$\text{QN56: } w^3 = -1, \text{ take mod of } x, y \text{ and } z \text{ and use } z\bar{z} = |z|^2$$

$$\text{QN57: } f''(x) = 12x^2 - 24x + 24$$

$$\Rightarrow D < 0$$

So $f(x)$ has 2 real roots

QN58: this is a first order linear diff.

eqn, solve according using Integrating Factor

QN59:

(A): put $z = \cos \theta + i \sin \theta$

(B) take $3^{x-1} = t \Rightarrow -1 \leq \frac{8t}{1-t^2} \leq 1$

(C) $f(\theta) = 2 \sec^2 \theta \geq 2$

(D) Put $f'(x) \geq 0$

QN60:

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

But will take only $\cos \theta = -\frac{1}{2}$ 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) $\left| \arg\left(\frac{1}{1-z}\right) \right| = \left| \frac{\pi}{2} - \frac{\theta}{2} \right|$ by putting $z = \cos \theta + i \sin \theta$, which is maximum at $\theta = -\pi$