



ADITYA JUNIOR COLLEGES

KAKINADA - RAJAMAHENDRAVARAM - BHIMAVARAM - AMALAPURAM - PALAKOL
NARASAPURAM - TADEPALLIGUDEM - MANDAPETA - ELURU - SRIKAKULAM - VISAKHAPATNAM

Test Type : Full Syllabus

Time : 8.00 A.M. to 11.00 A.M.

JEE(MAIN) PRACTICE TEST - 1

TEST DATE : 22-03-2020

IMPORTANT INSTRUCTIONS

- ❖ Immediately fill in the form number on this page of the Test Booklet with Blue/Black Ball Point Pen. Use of pencil is strictly prohibited.
- ❖ The test is of 3 hours duration.
- ❖ The Test Booklet consists of 75 questions. The maximum marks are 300.
- ❖ There are three parts in the question paper 1, 2, 3 consisting of Mathematics, Physics and Chemistry having 25 questions in each subject and each subject having Two sections.
 - i) **Section-I** : This section contains TWENTY questions. Each Question carries **4 marks** for **correct answer**. For **incorrect answer (-1) mark will be deducted**. If not attempted no mark and no deduction will be made.
 - ii) **Section-II** : This section contains **Five Numeric Value** Questions in each subject. Each Question carries **4 marks** for correct answer.

For **incorrect answer** and unattempted questions **no mark** and no deduction will be made. For each Numeric question, enter the correct numerical value **in decimal notation, truncated/rounded-off to second decimal place**. (e.g. 6.25, 7.00, 0.33, .30, 30.27, 127.30, -32.50, -40.3, -30.27).
- ❖ Use Blue/Black Ball Point Pen only for writing particulars/markings responses on the Answer Sheet. Use of pencil is strictly prohibited.
- ❖ No candidate is allowed to carry any textual material, printed or written, bits of papers, mobile phone any electronic device etc, except the Identity Card in the examination hall/room.
- ❖ Rough work is to be done on the space provided for this purpose in the Test Booklet only.
- ❖ On completion of the test, the candidate must hand over the Answer Sheet to the invigilator on duty in the Room/Hall. However, the candidates are allowed to take away this Test Booklet with them. Do not fold or make any straymarks on the Answer Sheet.

Name of the Student :

Sec :

R.No.

BEWARE OF NEGATIVE MARKING

PART (A) - MATHEMATICS

SECTION - I (Single Correct Answer Type)

- Let $y=y(x)$ and $xdy+y(1-xy)dx=0$. If $y(1)=1$, then $\left[y\left(\frac{1}{e}\right) \right]$ is equal to (where $[\cdot]$ denotes Greatest Integer Function)

1) 1 2) 2 3) 3 4) 0
- If $\vec{a}, \vec{b}, \vec{c}$ are three non-zero and non-coplanar vectors, then

$$(\vec{a} \cdot \vec{a})(\vec{b} \times \vec{c}) + (\vec{a} \cdot \vec{b})(\vec{c} \times \vec{a}) + (\vec{a} \cdot \vec{c})(\vec{a} \times \vec{b}) =$$

1) $[\vec{a} \vec{b} \vec{c}]\vec{a}$ 2) $[\vec{a} \vec{c} \vec{b}]\vec{a}$ 3) $[\vec{a} \vec{b} \vec{c}]\vec{b}$ 4) $[\vec{a} \vec{c} \vec{b}]\vec{c}$
- If co-ordinates of mid points of sides BC, AB and AC of ΔABC are $(\ell, m, 0), (\ell, 0, n)$ and $(0, m, n)$ respectively, then $\frac{(AB)^2 + (BC)^2 + (CA)^2}{\ell^2 + m^2 + n^2}$ is equal to

1) 8 2) 6 3) 4 4) 2
- Let R be the relation defined in set of natural numbers by $aRb \Rightarrow ab$ is square of a natural number, then relation R is

1) Reflexive only 2) Reflexive but not symmetric
3) Equivalence 4) Not transitive
- The negation of the statement $(\sim p \rightarrow q)$ is

1) $\sim p \vee \sim q$ 2) $\sim(p \vee q) \vee (p \vee (\sim p))$
3) $\sim(p \vee q) \wedge (p \vee (\sim p))$ 4) $(\sim p \vee q) \wedge (p \vee \sim q)$
- If $\int_0^1 e^{x^2} (x - \alpha) dx = 0$, then (α being a real number)

1) $\alpha \in (1, 2)$ 2) $\alpha < 0$ 3) $\alpha \in (0, 1)$ 4) $\alpha = 0$
- Let $S \equiv \{-2, -1, 0, 1, 2, 3, 4\}$ be a set. If λ takes any value of set S with equal probability then probability that the equation $x^2 - 4|x| + 3 = \lambda$ possesses exactly four solutions, given that it possesses atleast three solutions.

1) $\frac{3}{4}$ 2) $\frac{3}{7}$ 3) $\frac{3}{5}$ 4) $\frac{4}{7}$

• Space for Rough Work •

8. Let $f:R \rightarrow R$ is a function satisfying following conditions : (i) $f(0)=2$
 (ii) $f(1)=1$ (iii) $f(x)$ has minimum value at $x = \frac{5}{2}$ (iv) For all x .

$$f'(x) = \begin{vmatrix} 2ax & 2ax-1 & 2ax+b+1 \\ b & b+1 & -1 \\ 2(ax+b) & 2ax+2b+1 & 2ax+b \end{vmatrix},$$

then $f(x)$ can take the value

- 1) $-\frac{1}{2}$ 2) $\frac{1}{4}$ 3) $\frac{1}{3}$ 4) $\frac{3}{4}$

9. Sum of the series $\sum_{r=0}^{10} (-1)^r 10 C_r \left(\frac{1}{3^r} + \frac{8^r}{3^{2r}} \right)$ is

- 1) $\frac{2^{10}+1}{3^{20}}$ 2) $\left(\frac{2}{3}\right)^{10} - \left(\frac{1}{9}\right)^{10}$ 3) $\frac{3^{10}-1}{3^{20}}$ 4) $\frac{6^{10}+1}{3^{20}}$

10. If three distinct normals can be drawn to the parabola $y^2 - 2y = 4x - 9$ from the point $(2a, 1)$ then range of values of 'a' is

- 1) no real values possible 2) $(2, \infty)$
 3) $(-\infty, 2)$ 4) $(4, \infty)$

11. The centre of family of circles cutting the family of circles

$$x^2 + y^2 + 4x \left(\lambda - \frac{3}{2} \right) + 3y \left(\lambda - \frac{4}{3} \right) - 6(\lambda + 2) = 0 \text{ orthogonally, lies on}$$

- 1) $x - y - 1 = 0$ 2) $4x + 3y - 6 = 0$ 3) $4x + 3y + 7 = 0$ 4) $3x - 4y - 1 = 0$

12. The greatest integral value of 'a' for which the equation $(x^2 + x)^2 + a(x^2 + x) + 4 = 0$ has 4 distinct real roots.

- 1) -4 2) -3 3) 3 4) -5

13. Water is leaking at the rate of $2m^3/\text{sec}$ from bottom of an inverted cone of semi-vertical angle 45° . If the rate at which periphery of water surface changes when the height of the water in the cone is 2 metres is d m/sec, then $|5d|$ is equal to

- 1) 4 2) 5 3) 6 4) 7

14. If Z_1, Z_2, Z_3 represent the vertices of an equilateral triangle ABC and

$$\sqrt{\frac{|Z_2 - Z_1|^2 + |Z_3 - Z_1|^2}{|Z_2 + Z_3 - 2Z_1|^2 + |Z_3 - Z_2|^2}} = \sin \theta, \text{ then } \theta \text{ is } (0 < \theta < \pi)$$

- 1) $\frac{\pi}{4}$ 2) $\frac{2\pi}{3}$ 3) $\frac{\pi}{6}$ 4) $\frac{\pi}{3}$

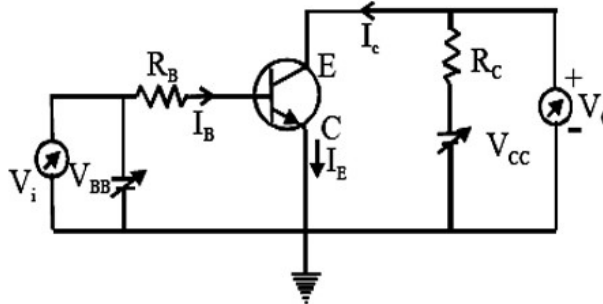
15. Let sequence a_1, a_2, \dots, a_{18} be some permutation of numbers 1, 2, 3, ..., 18 such that 3 divides $|a_i - i| \forall i = 1, 2, 3, \dots, 18$, then number of such permutations is

- 1) $18!$ 2) $(6!)^3$ 3) $\frac{18!}{3!}$ 4) 3

● *Space for Rough Work* ●

PART (B) - PHYSICS**SECTION - I (Single Correct Answer Type)**

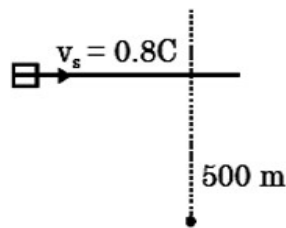
26. In the given figure, the V_{BB} supply can be varied from 0 V to 5.0 V. The Si transistor has $\beta_{DC} = 250$, $R_B = 100\text{ K}\Omega$, $R_C = 1\text{ K}\Omega$, $V_{CC} = 5.0\text{ V}$. Assume that when the transistor is saturated, $V_{CE} = 0\text{ V}$ and $V_{BE} = 0.8\text{ V}$. The minimum base current required for the transistor to reach in saturation region is :



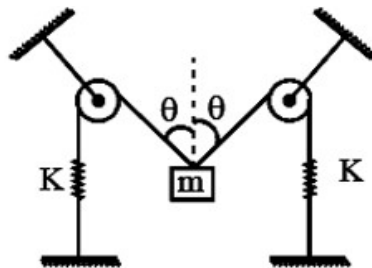
- 1) $5\ \mu\text{A}$ 2) $10\ \mu\text{A}$ 3) $20\ \mu\text{A}$ 4) $40\ \mu\text{A}$
27. To establish an instantaneous displacement current of 2A in the space between two parallel plates of $1\ \mu\text{F}$ capacitor, the potential difference across the capacitor plates will have to be changed at the rate of :
- 1) $4 \times 10^4\ \text{V/s}$ 2) $4 \times 10^6\ \text{V/s}$ 3) $2 \times 10^4\ \text{V/s}$ 4) $2 \times 10^6\ \text{V/s}$
28. If the length and breadth of a thin rectangular sheet are measured using a metre scale as 16.2 cm and 10.1 cm respectively, its surface area will be written as :
- 1) $164 \pm 3\ \text{cm}^2$ 2) $163.62 \pm 2.6\ \text{cm}^2$ 3) $164 \pm 2.6\ \text{cm}^2$ 4) $163 \pm 3\ \text{cm}^2$
29. An unpolarized beam of light of intensity $8\ \text{W/m}^2$ is passed through two polaroids such that no light is emitted from the second polaroid. If a third polaroid whose polarization axis makes an angle ' β ' with the polarization axis of the first polaroid, is placed between these polaroids, then the intensity of light emerging from the last polaroid will be :
- 1) $2 \sin^2 \beta$ 2) $\sin^2 2\beta$ 3) $\frac{\sin^2 2\beta}{2}$ 4) $2 \cos^2 \beta$
30. A man can swim with speed u with respect to river. The width of river is d . The speed of the river is zero at the banks and increases linearly to v_0 till mid stream of the river then decreases to zero to the other bank. When man crosses the river in shortest time, drift is equal to : (given $u > v_0$)
- 1) $\frac{ud}{v_0}$ 2) $\frac{ud}{2v_0}$ 3) $\frac{v_0 d}{2u}$ 4) $\frac{v_0 d}{u}$

• Space for Rough Work •

31. A metal surface has work function 1.1 eV. Photon of wavelength 6200 \AA is absorbed by an electron which makes a collision with lattice before coming to surface. If it is observed that it comes out with kinetic energy 0.4 eV then percentage loss of kinetic energy during collision, is :
- 1) 5% 2) 10% 3) 1% 4) 25%
32. Two radioactive samples of different elements (half-lives 1 hr and 2 hr respectively) have same number of nuclei at $t=0$. The time after which their activities are same is :
- 1) 1 hr 2) 2 hr 3) 3 hr 4) 4 hr
33. A source of sound of frequency 1.8 kHz moves uniformly along a straight line at a distance 500 m from observer as shown in figure. The velocity of source is $0.8C$ where C is the velocity of sound. Find out the frequency of sound received by observer (in kHz) at the moment when the source gets closest to him :



- 1) 1.8 kHz 2) 5 kHz 3) 0.8 kHz 4) 10 kHz
34. In the situation as shown in figure time period of small vertical oscillation of block will be - (String, springs and pulley are ideal)



- 1) $2\pi \cos\theta \sqrt{\frac{m}{2k}}$ 2) $2\pi \sec\theta \sqrt{\frac{m}{2k}}$ 3) $2\pi \sin\theta \sqrt{\frac{m}{2k}}$ 4) $2\pi \operatorname{cosec}\theta \sqrt{\frac{m}{2k}}$
35. Two spherical bodies A (radius 6 cm) and B (radius 18 cm) are at temperature T_1 and T_2 respectively. The maximum intensity in the emission spectrum of A is at 500 nm and in that of B is at 1500 nm. Considering them to be black bodies, find the ratio of the rate of total energy radiated by A to that of B.
- 1) 9:1 2) 3:1 3) 27:1 4) 81:1

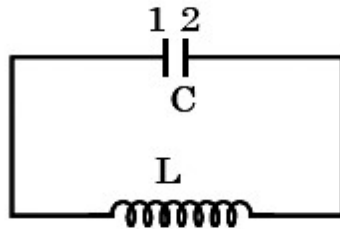
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36. A spherical soap bubble is blown such that its radius increase at the constant rate of $\frac{dr}{dt} = \alpha$. Surface tension of the film is S . When radius of the bubble is r , power required to

increase the radius of the bubble is :

- 1) $16\pi rS\alpha$ 2) $8\pi rS\alpha$ 3) $4\pi rS\alpha$ 4) $2\pi rS\alpha$

37. Consider a L - C oscillation circuit. Circuit elements has zero resistance. Initially at $t = 0$ all the energy is stored in the form of electric field and plate - 1 is having positive charge. At time $t = t_1$ plate - 2 attains half of the maximum +ve charge for the first time. Value of t_1 is



- 1) $\frac{2\pi}{3}\sqrt{LC}$ 2) $\frac{\pi}{3}\sqrt{LC}$ 3) $\frac{4\pi}{3}\sqrt{LC}$ 4) $\frac{5\pi}{6}\sqrt{LC}$

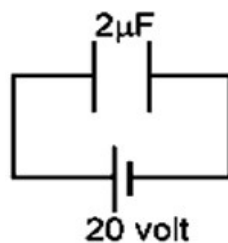
38. For a LCR series circuit with an A.C. source of angular frequency ω , choose the correct option.

- 1) circuit will be capacitive if $\omega > \frac{1}{\sqrt{LC}}$ 2) circuit will be inductive if $\omega = \frac{1}{\sqrt{LC}}$
 3) power factor of circuit will by unity if capacitive reactance equals inductive reactance.
 4) current will be leading voltage if $\omega > \frac{1}{\sqrt{LC}}$

39. A Series RLC circuit has inductance $L = 12 \text{ mH}$, capacitance $C = 1.6 \mu\text{F}$ and Resistance $R = 1.5 \text{ ohm}$. At what time the amplitude of the charge oscillation in the circuit be 50% of its initial value?

- 1) 0.011 sec 2) 0.1 sec 3) 0.5 sec 4) 1 sec

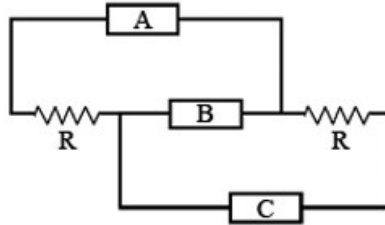
40. In the figure a capacitor of capacitance $2 \mu\text{F}$ is connected to a cell of emf 20 volt. The plates of the capacitor are drawn apart slowly to double the distance between them. The work done by the external agent on the plates is



- 1) $-200 \mu\text{J}$ 2) $200 \mu\text{J}$ 3) $400 \mu\text{J}$ 4) $-400 \mu\text{J}$

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41. A circuit is shown below. If A is an ideal ammeter, B an ideal Battery of voltage V , and C an ideal voltmeter, what will be the $\frac{\text{reading of C}}{\text{reading of A}}$?



- 1) R 2) $2R$ 3) $\frac{R}{2}$ 4) 0
42. Total electric force on an electric dipole placed in an electric field of a point charge is :
- 1) always zero
 2) never zero
 3) zero when mid point of dipole coincides with the point charge
 4) zero when dipole axis is along any electric line of force
43. If a prism having refractive index $\sqrt{2}$, has angle of minimum deviation equal to the refracting angle of the prism, then the angle of refraction of the prism is :
- 1) 30° 2) 45° 3) 60° 4) 90°
44. You are provided four converging lenses with following specifications (All dimension in cm)

	L_1	L_2	L_3	L_4
Focal length	100	100	5	5
Diameter of aperture	2	30	20	1

Which of the following pair will be preferred to construct telescope?

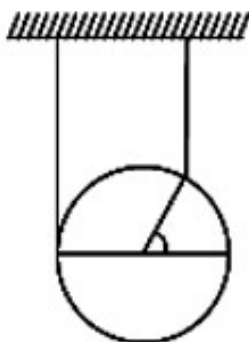
- 1) L_1 and L_2 2) L_1 and L_3 3) L_2 and L_4 4) L_3 and L_4

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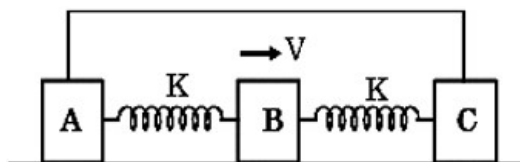
45. Consider an ideal gas in rigid container. On increasing temperature of gas :
- 1) mean free path decreases
 - 2) average velocity of molecules increase
 - 3) most probable speed of molecules increases
 - 4) average kinetic energy of molecules remains constant

SECTION - II (Numeric Value Correct Type)

46. A monoatomic gas expands following a thermodynamic law $P=C_1V+C_2$, where C_1, C_2 are constants, from state $A(V_0, 3P_0)$ to $B(3V_0, P_0)$. The volume of the gas upto which it absorbs heat is nV_0 . Find value of n .
47. An uniform sphere is at rest and in equilibrium with the help of two vertical strings of unequal length. Larger string has length ' 2ℓ ' and shorter string has length $\frac{7\ell}{5}$ and connected as given arrangement. Radius of sphere is ℓ . If ratio of fundamental frequency in longer wire to shorter wire is K then $5\sqrt{5}K$ is (both strings are of same material) :

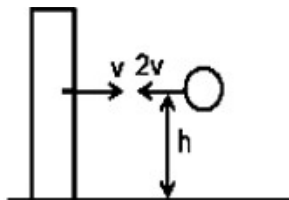


48. The diagram shows three blocks and two springs (both having $K = 100 \text{ N/m}$) on smooth horizontal surface. A massless rigid rod connects the end blocks. The middle block is given a velocity ' $v = 2 \text{ m/s}$ '. The maximum deformation of the spring connecting B and C is (in cm) (mass of A = $2M$; mass of B = $M = 6 \text{ kg}$; mass of C = M).

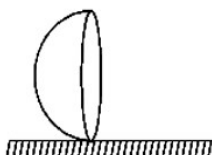


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49. A ball collides elastically ($e = 1$) with a massive wall moving towards it with a velocity of $v = 1 \text{ m/s}$ as shown. The collision occurs at a height of 20 m above ground level and the velocity of the ball just before collision is $2v$ in horizontal direction. The distance between the foot of the wall and the point on the ground where the ball lands will be (in metre) :
($g = 10 \text{ m/s}^2$)



50. An uniform hollow hemisphere of mass $m = 0.1 \text{ kg}$ and radius r is released from rest on a smooth horizontal surface with its open face vertical initially. Maximum normal reaction (in N) between hemisphere and ground during motion is : (use $g = 10 \text{ m/s}^2$)



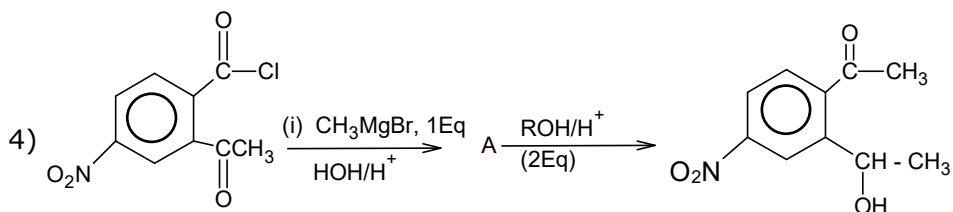
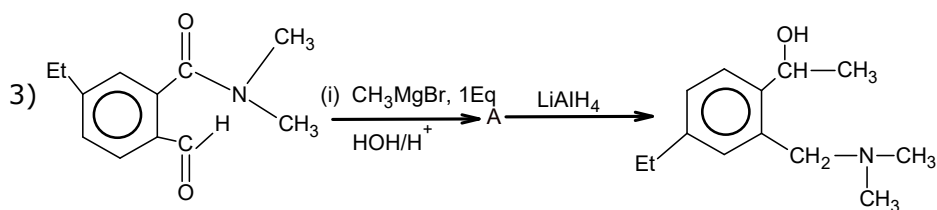
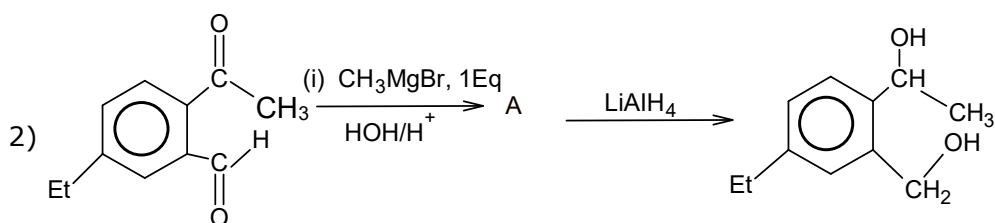
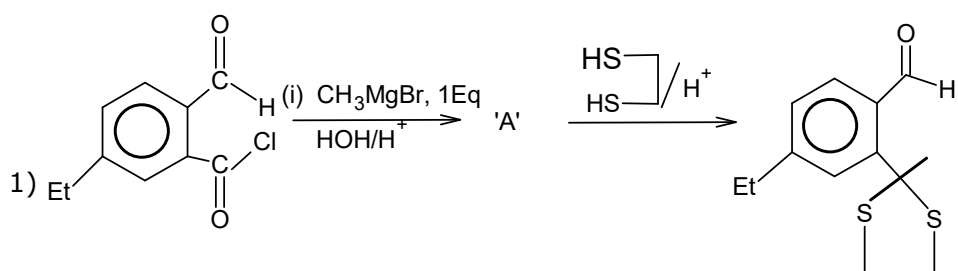
PART (C) - CHEMISTRY

SECTION - I (Single Correct Answer Type)

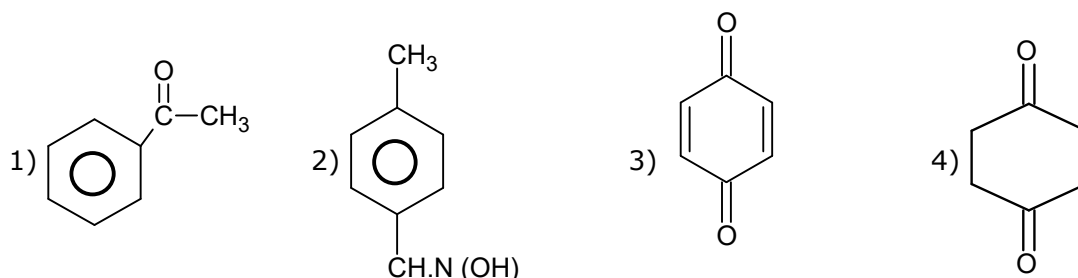
51. Buffer capacity of a buffer solution is x . The volume of 1 M NaOH solution added to 100 mL of this solution if change the pH by 1 is :
- 1) $0.1 x \text{ mL}$ 2) $10 x \text{ mL}$ 3) $100 x \text{ mL}$ 4) $x \text{ mL}$
52. Δ_m^0 Value cannot be determined by extrapolating, the plot between Δ_m verses $C^{1/2}$ for the compound :
- 1) KCl 2) K_2SO_4 3) NH_4OH 4) NaNO_3
53. Select correct statement regarding lyophilic sols.
- 1) They are self stabilizing
2) They are irreversible sols
3) Coagulate easily by adding electrolytes
4) They are prepared mostly from inorganic compound
54. The order of a reaction $A \rightarrow \text{product}$ in which half the reagent is reacted in half an hour, three quarters in one hour and seven-eighth in one and half hours is
- 1) 2 2) 1 3) zero 4) -1

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55. Correctly matched reaction with its major product in the sequence of reaction given below.

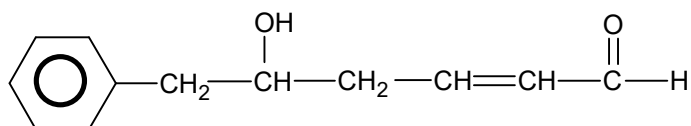
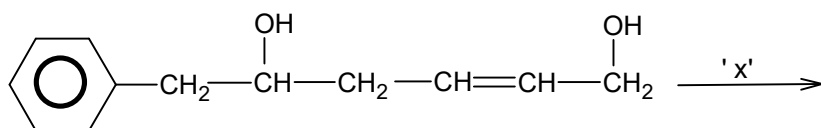


56. Which will not show Tautomerism?



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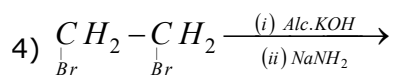
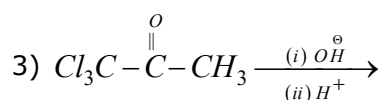
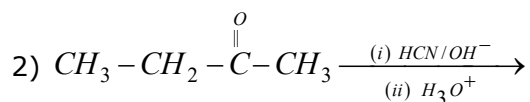
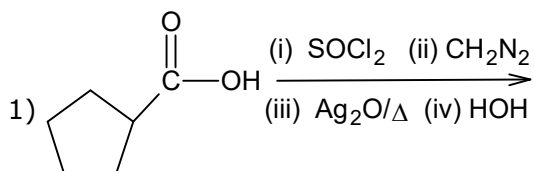
57. Most appropriate reagent to carry out the given conversion is



'X' is

- | | |
|---|--|
| 1) Collin's Reagent | 2) $\text{PCC} / \text{CH}_2\text{Cl}_2$ |
| 3) TsCl , DMSO and NaHCO_3 | 4) $\text{MnO}_2 \cdot \Delta$ |

58. Ascent in parent carbon chain while preparation of carboxylic acid observed in



59. In the given how many atoms have greater first ionisation energies than Boron?

Li Be C N O F He

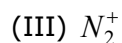
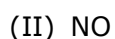
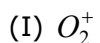
- | | | | |
|------|------|------|------|
| 1) 5 | 2) 6 | 3) 4 | 4) 7 |
|------|------|------|------|

60. Number of shortest P-O bonds present in triphosphate ion $\text{P}_3\text{O}_{10}^{5-}$ is

- | | | | |
|------|------|------|------|
| 1) 2 | 2) 3 | 3) 5 | 4) 4 |
|------|------|------|------|

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61. Which the following molecules / species have identical bond order and same magnetic properties?

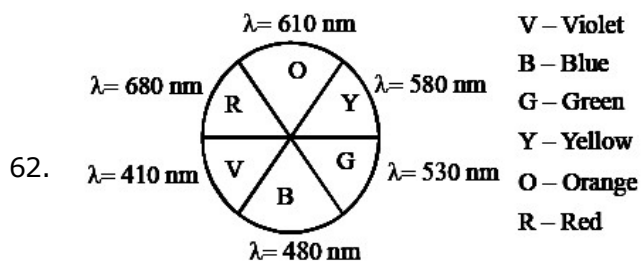


1) I, II only

2) I and III only

3) I, II and III

4) II, and III only



Complex $[FeL_6]^{2+}$ is yellow in colour then expected magnetic moment (in BM) of complex will be (L → monodentate neutral ligand) Paring energy is $500nm^{-1}$

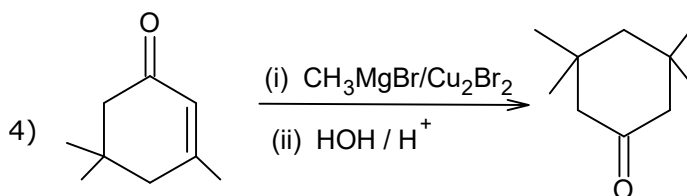
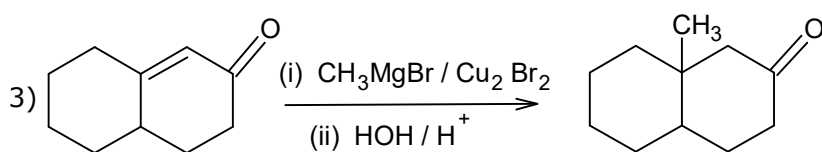
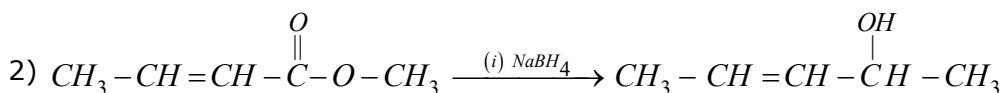
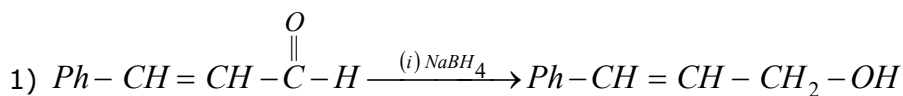
1) 0

2) $\sqrt{8}$

3) $\sqrt{15}$

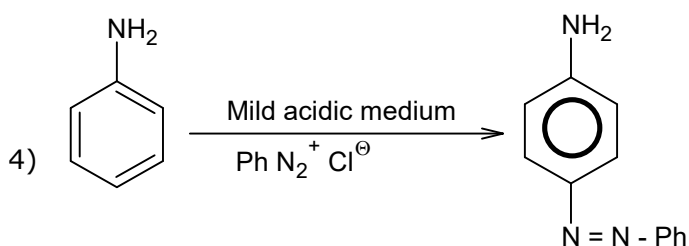
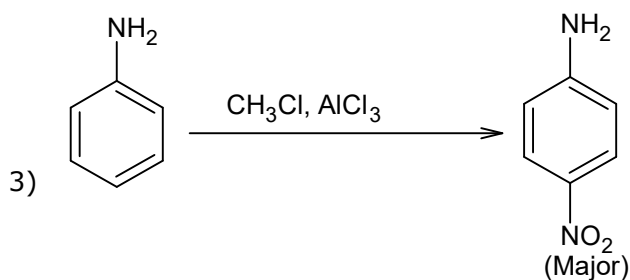
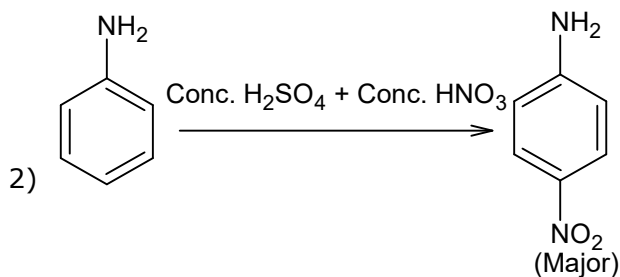
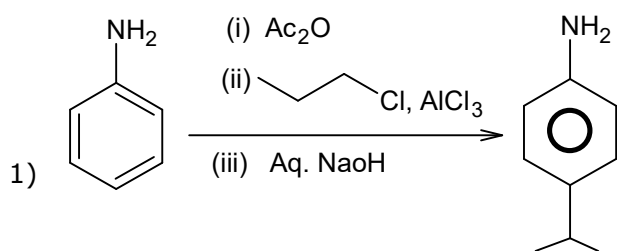
4) $\sqrt{24}$

63. Which of the given reaction is not correctly matched with its major product ?



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64. Which reaction is not correctly matched with its major product.



65. For a particular reaction $\Delta H^\circ = -76.6 \text{ KJ}$ and $\Delta S^\circ = -226 \text{ JK}^{-1}$. This reaction is :

- 1) Spontaneous at all temperatures
- 2) Non spontaneous at all temperatures
- 3) Spontaneous at temperature below 66°C
- 4) Spontaneous at temperature above 66°C

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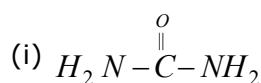
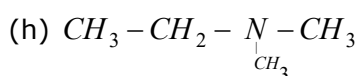
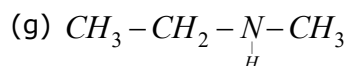
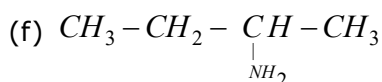
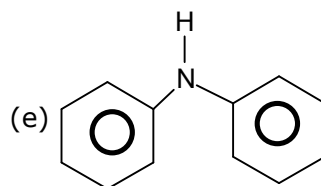
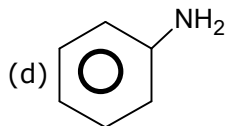
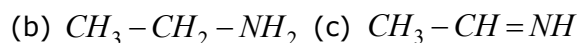
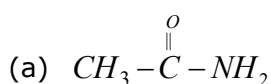
66. Osmotic pressure of blood is 7.40 atm at 27°C . Number of moles of glucose to be used per litre for an intravenous injection that is to have the same osmotic pressure as blood is :
- 1) 0.3 2) 0.2 3) 0.1 4) 0.4
67. How many isomeric forms are possible for the octahedral complex.
- $[\text{Rh}(\text{en})_2(\text{SCN})]^+$?
- 1) 8 2) 10 3) 12 4) 14
68. Choose the correct option using the code regarding roasting process.
- (I) It is the process of heating the ore in air in a reverberatory furnace to obtain the oxide.
(II) It is an exothermic process.
(III) It is used for the concentration of sulphide ore,
(IV) It removes easily oxidisable volatile impurities present in the concentrated ore.
- 1) I, II and III 2) I, II and IV 3) I, III and IV 4) I, II, III and IV
69. Calculate the compressibility factor for CO_2 , if one mole of it occupies 0.4 litre at 300 K and 40 atm. Which of the following are true.
- 1) 0.40, CO_2 is more compressible than ideal gas.
2) 0.65, CO_2 is more compressible than ideal gas.
3) 0.55, CO_2 is more compressible than ideal gas.
4) 0.62, CO_2 is more compressible than ideal gas.
70. The detergent which is used as germicide is
- 1) Sodium lauryl sulphate
2) lauryl alcohol ethoxylate
3) Cetyl trimethyl ammonium bromide
4) Sodium -2-dodecyl benzene sulphonate

SECTION - II (Numeric Value Correct Type)

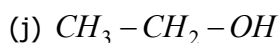
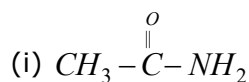
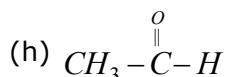
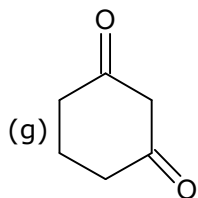
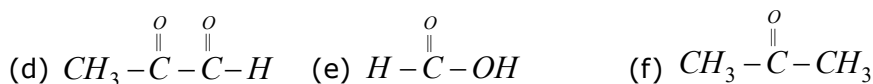
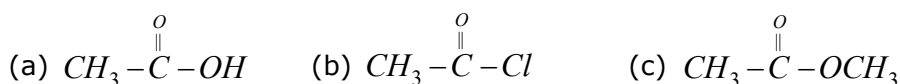
71. A certain buffer solution contains equal concentration of X^- and HX , the K_b for X^- is 10^{-10} . The pH of the buffer is

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72. How many compounds will show +ve carbylamine test among the following [i.e., formation of pungent smelling isocyanide].



73. How many of the following will show +ve Haloform test when treated with $\text{NaOH} + \text{Cl}_2$.



74. $\text{FeC}_2\text{O}_4 \xrightarrow{\Delta}$ Product

Number of diamagnetic products = a.

Number of unpaired electrons in paramagnetic product = b

Report your answers (a + b)

75. Excess NaOH is added to Pb^{+2} , Sn^{+4} and Al^{+3} ions solutions separately. Find the total number of moles of NaOH required to make one mole of each cation into their soluble hydroxo complex form.

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