

Competishun

52/6, Opposite Metro Mas Hospital, Shipra Path, Mansarovar

Date: 20/12/2024

Time: 3 hours

Max. Marks: 300

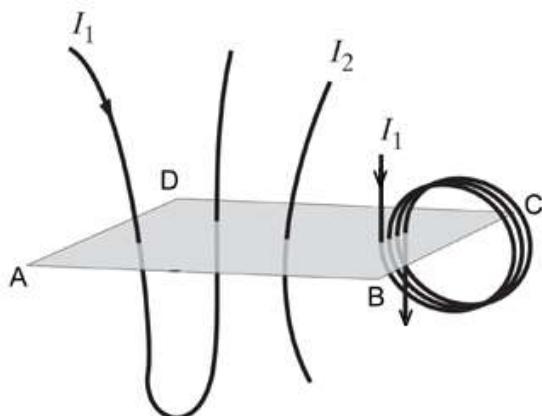
UTS-1_MT-11 (24-25)

Physics

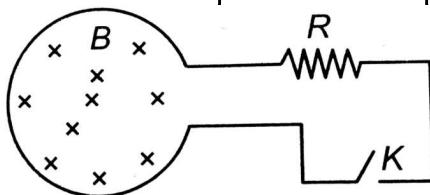
Single Choice Question

- Q1** A uniform chain of 6 m length is placed on a table such that a part of its length is hanging over the edge of the table. The system is at rest. The co-efficient of static friction between the chain and the surface of the table is 0.5, the maximum length of the chain hanging from the table is _____ m.
 a) 1 b) 2 c) 3 d) 4
- Q2** The following data are given for a crown glass prism ;
 refractive index for blue light $n_b = 1.521$
 refractive index for red light $n_r = 1.510$
 refractive index for yellow light $n_y = 1.550$
 Dispersive power of a parallel glass slab made of the same material is :
 a) 0.01 b) 0.02 c) 0.03 d) 0
- Q3** Two coaxial dipoles of dipole moments P_1 & P_2 are separated by a distance ‘r’. The magnitude of electric force on P_1 due to P_2 is: ($k = 1/4 \pi \epsilon_0$)
 a) $\frac{2 k P_1 P_2}{r^3}$ b) $\frac{2 k P_1 P_2}{r^2}$ c) $\frac{6 k P_1 P_2}{r^4}$ d) zero
- Q4** Two racing cars of masses m_1 and m_2 are moving in circles of radii r and $2r$ respectively and their angular speeds are equal. The ratio of the time taken by cars to complete one revolution is :
 a) $m_1 : m_2$ b) 1 : 2 c) 1 : 1 d) $m_1 : 2m_2$
- Q5** The displacement current of $4.425 \mu\text{A}$ is developed in the space between the plates of parallel plate capacitor when voltage is changing at a rate of 10^6 Vs^{-1} . The area of each plate of the capacitor is 40 cm^2 . The distance between each plate of the capacitor is $x \times 10^{-3} \text{ m}$. The value of x is,
 (Permittivity of free space, $E_0 = 8.85 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$)
 a) 2 b) 5 c) 6 d) 8

- Q6** Three distinct current carrying wires intersect a finite rectangular plane ABCD . The current in left wire and the loop is I_1 . The direction of current in left most wire and right most loop is downwards as shown in figure. The current I_2 through middle wire is adjusted so that the path integral of the total magnetic field along the perimeter of the rectangle is zero, that is, $\oint \vec{B} \cdot d\vec{\ell} = 0$. Then the current I_2 is -

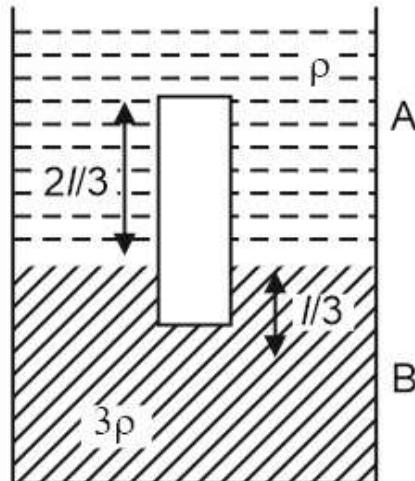


- a)** $2 I_1$ and upwards **b)** $2 I_1$ and downwards
c) $4 I_1$ and upwards **d)** $3 I_1$ and downwards
- Q7** Shown in the figure is a circular loop of radius r and resistance R . A variable magnetic field of induction $B = B_e e^{-t}$ is established inside the coil. If the key (K) is closed, the electrical power developed right after closing the switch is equal to



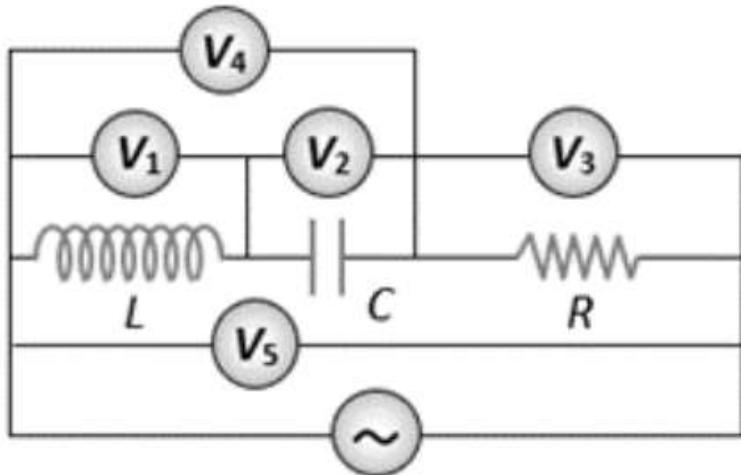
- a)** $\frac{B_0^2 \pi r^2}{R}$ **b)** $\frac{B_0 10r^3}{R}$ **c)** $\frac{B_0^2 \pi^2 R^4 R}{5}$ **d)** $\frac{B_0^2 \pi^2 r^4}{R}$

- Q8** A solid cylinder of length l is in equilibrium in two different liquids A and B as shown in the figure. The density of the cylinder is (Density of liquid A = ρ and density of liquid B = 3ρ)



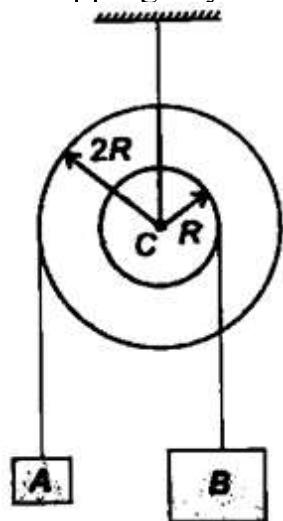
- a) $\frac{5}{2}\rho$ b) $\frac{5}{3}\rho$ c) $\frac{3}{5}\rho$ d) $\frac{2}{5}\rho$

- Q9** In the adjoining A.C. circuit the voltmeter whose reading will be zero at resonance is-



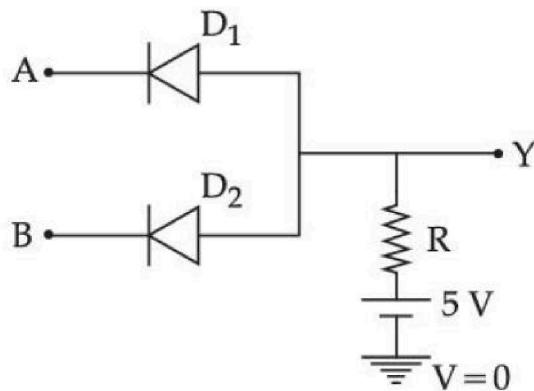
- a) V₁ b) V₂ c) V₃ d) V₄

- Q10** In the given arrangement, a spool of moment of inertia $I_C = 4mR^2$ is connected with two blocks A and B of masses $2m$ and $3m$ respectively and released. Assuming there is no slipping anywhere, then the acceleration of block A is



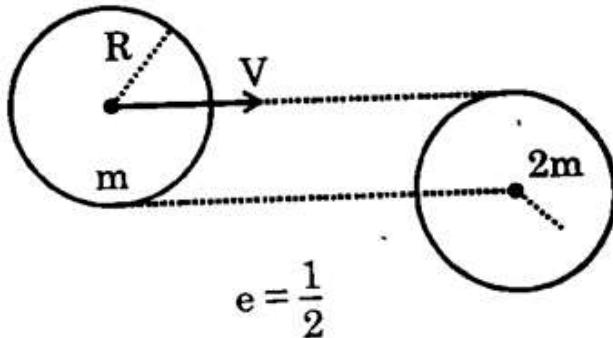
- a) $\frac{g}{5}$ b) $\frac{2g}{7}$ c) $\frac{2g}{15}$ d) $\frac{4g}{13}$
- Q11** A photon is incident upon a hydrogen atom ejects an electron with a kinetic energy 10.7 eV. If the ejected electron was in the first excited state. Energy of photon incident nearly will be :
- a) 14.5 eV b) 20.9 eV c) 24.3 eV d) 14.1 eV

- Q12** In the circuit, the logical value of A = 1 or B = 1 when potential at A or B is 5V and the logical value of A = 0 or B = 0 when potential at A or B is 0 V. The truth table of the given circuit will be :



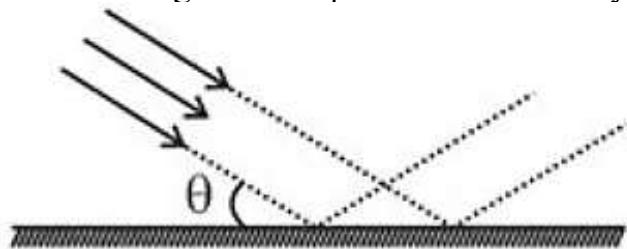
a)	A	B	Y	b)	A	B	Y	c)	A	B	Y	d)	A	B	Y
	0	0	0		0	0	0		0	0	0		0	0	1
	1	0	0		1	0	1		1	0	0		1	0	1
	0	1	0		0	1	1		0	1	0		0	1	1
	1	1	1		1	1	1		1	1	0		1	1	0

- Q13** A ball of mass m is moving with a speed V as shown in the figure. It undergoes inelastic collision with a ball of mass 2m which was initially at rest. The velocity of ball 2m after collision will be given by



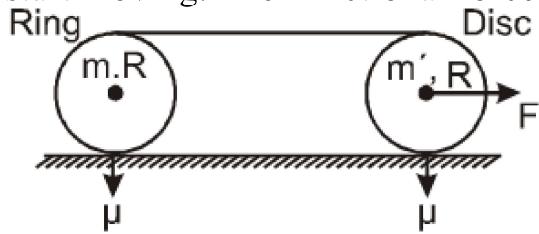
a)	$\frac{3V}{8}$	b)	$\frac{3V}{4}$	c)	$\frac{3\sqrt{3}V}{4}$	d)	$\frac{\sqrt{3}V}{4}$
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- Q14** A beam of light of intensity I is incident on a plane mirror and get reflected fully as shown in figure. The pressure exerted by beam on the mirror is (c : speed of light)



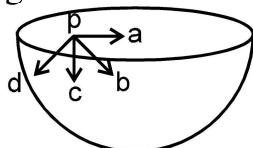
- a) $\frac{2 / \cos^2 \theta}{c}$ b) $\frac{2I \sin^2 \theta}{c}$ c) $\frac{I \sin \theta \cos \theta}{c}$ d) $\frac{2I \sin^2 \theta}{c \cos \theta}$

- Q15** A disc and a ring having different masses and same radius are connected with an ideal string as shown in the figure. Both are placed on rough surface of coefficient of friction μ . A force F is applied on the centre of disc horizontally. Assume that initially both the bodies were at rest and they would be rolling without slipping when they start moving. Then frictional force acting on the ring is.



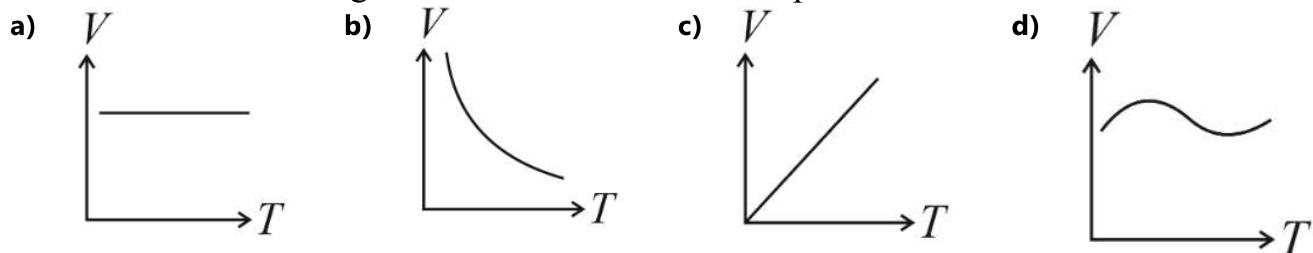
- a) $\frac{2F}{3}$ b) $\frac{F}{3}$ c) zero d) None of these

- Q16** Figure show a hemispherical shell having uniform mass density. The direction of gravitational field intensity at point P will be along:



- a) a b) b c) c d) d

- Q17** Which of the following is a V-T curve for isobaric process?



Q18

The distance travelled by an object is given by $x = at + \frac{bt^2}{(c+a)}$ where t is time and a, b, c are constants. The dimensions of b and c respectively are

- a) $[LT^{-2}]$, $[LT^{-1}]$
- b) $[L^2 T^{-3}]$, $[LT^{-1}]$
- c) $[LT^{-1}]$, $[L^2 T^{-1}]$
- d) $[LT^{-1}]$, $[LT^{-2}]$

Q19 A capillary tube made of glass of radius 0.15 mm is dipped vertically in a beaker filled with methylene iodide (surface tension = 0.05 Nm^{-1} , density = 667 kg m^{-3}) which rises to height h in the tube. It is observed that the two tangents drawn from liquid-glass interfaces (from opp. sides of the capillary) make an angle of 60° with one another. Then h is close to ($g = 10 \text{ ms}^{-2}$)

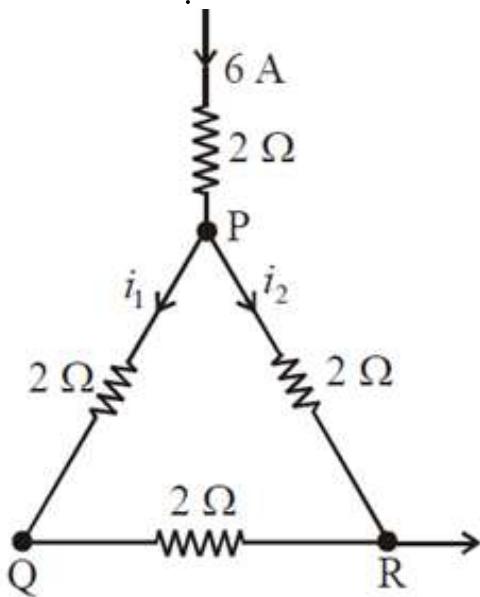
- a) 0.049 m
- b) 0.087 m
- c) 0.137 m
- d) 0.172 m

Q20 Time period of a simple pendulum of length L is T_1 and time period of a uniform rod of the same length L pivoted about one end and oscillating in a vertical plane is T_2 . Amplitude of oscillations in both the case is small. Then T_1/T_2 is

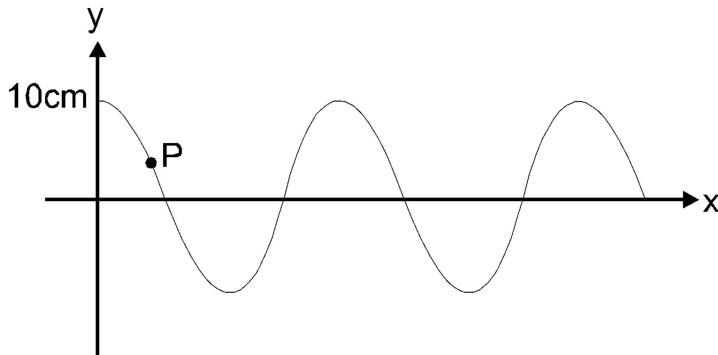
- a) $\sqrt{\frac{4}{3}}$
- b) 1
- c) $\sqrt{\frac{3}{2}}$
- d) $\sqrt{\frac{1}{3}}$

Numerical

Q21 A current of 6 A enters one corner P of an equilateral triangle PQR having 3 wires of resistance 2Ω each and leaves by the corner R. The currents i_1 in ampere is

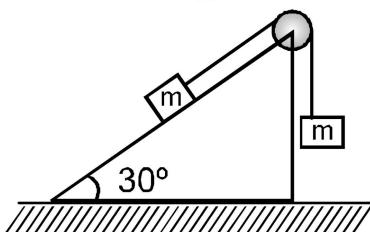


- Q22** A transverse sinusoidal wave moves along a string in the positive x-direction at a speed of 10 cm/s. The wavelength of the wave is 0.5 m and its amplitude is 10 cm. At a particular time t, the snap-shot of the wave is shown in figure. The speed of point P is $x\sqrt{2}\pi$ cm/s when its displacement is $\frac{10}{\sqrt{2}}$ cm, then the value of x is :



- Q23** A position dependent force $F = \frac{1}{2}|x - 4|$ is acting along x-axis, where x is in meter and F is in Newton. Find the work done (in joule) by the force in moving a particle from origin to $x = 8$ m rectilinearly along x-axes.

- Q24** Two blocks of equal mass 'm' are connected by massless string and pulley as shown in figure. Now the blocks are left to move. Then the force exerted by pulley on the clamp is $\frac{3\sqrt{3}Mg}{k}$. Find the value k ?



- Q25** On an inclined plane of inclination 30° , a ball is thrown at an angle of 60° with the horizontal from the foot of the incline with a velocity of $10\sqrt{3}$ ms $^{-1}$. If $g = 10$ ms $^{-2}$, then the time in which ball will hit the inclined plane is -

Chemistry

Single Choice Question

- Q26** At 35°C, the vapour pressure of CS_2 is 512 mm Hg and that of acetone is 344 mm Hg. A solution of CS_2 in acetone has a total vapour pressure of 600 mm Hg. The false statement amongst the following is
- Raoult's law is not obeyed by this system
 - A mixture of 100 mL CS_2 and 100 mL acetone has a volume < 200 mL
 - Heat must be absorbed in order to produce the solution at 35°C
 - CS_2 and acetone are less attracted to each other than to themselves
- Q27** Ratio of C_p and C_v of a gas X is 1.4, the number of atom of the gas 'X' present in 11.2 litres of it at NTP will be
- 6.02×10^{23}
 - 1.2×10^{23}
 - 3.01×10^{23}
 - 2.01×10^{23}
- Q28** K_a for the reaction; $\text{Fe}^{3+}(\text{aq.}) + \text{H}_2\text{O}(l) \rightleftharpoons \text{Fe(OH)}^{2+}(\text{aq.}) + \text{H}_3\text{O}^+(\text{aq.})$ is 6.5×10^{-3} . What is the max. pH value which could be used so that at least 80% of the total iron (III) in a dilute solution exists as Fe^{3+} ?
- 2
 - 2.41
 - 2.79
 - 1.59
- Q29** The electronic configuration of four elements are :
(I) [Kr] 5s¹ (II) [Rn]5f¹⁴ 6d¹ 7s² (III) [Ar] 3d¹⁰ 4s² 4p⁵ (IV) [Ar] 3d⁶ 4s²
Consider the following statements :
(i) I shows variable oxidation state
(ii) II is a d-block element
(iii) The compound formed between I and III is covalent
(iv) IV shows single oxidation state
Which statement is True (T) or False (F)?
- FTFF
 - FTFT
 - FFTF
 - FFFF
- Q30** Consider the partial decomposition of A as
- $$2\text{A(g)} \rightleftharpoons 2\text{B(g)} + \text{C(g)}$$
- At equilibrium 700mL gaseous mixture contains 100 mL of gas C at 10 atm and 300 K. What is the value of K_p for the reaction?
- $\frac{40}{7}$
 - $\frac{1}{28}$
 - $\frac{10}{28}$
 - $\frac{28}{10}$

Q31 Select the incorrect statement(s) :

- a) The phenomena of diffraction of light can only be explained by assuming that light behaves as waves
- b) de-Broglie postulate the dual character existed with matter
- c) In his atomic model Bohr considered electron as a particle
- d) Wave nature of electrons was obtained when diffraction rings were observed photographically when a stream of photons was passed through a metal foil.

Q32 Complex A has a composition of $H_{12}O_6Cl_3Cr$. If the complex on treatment with conc. H_2SO_4 loses 13.5% of its original mass, the correct molecular formula of A is [Given : atomic mass of Cr = 52 amu and Cl = 35 amu]

- a) $[Cr(H_2O)_6]Cl_3$
- b) $[Cr(H_2O)_4Cl_2]Cl \cdot 2H_2O$
- c) $[Cr(H_2O)_3Cl_3] \cdot 3H_2O$
- d) $[Cr(H_2O)_5Cl]Cl_2 \cdot H_2O$

Q33 The pH of 0.1 M – N_2H_4 solution is (For N_2H_4 , $K_{b1} = 3.6 \times 10^{-6}$, $K_{b2} = 6.4 \times 10^{-12}$, $\log 2 = 0.3$, $\log 3 = 0.48$)

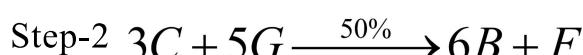
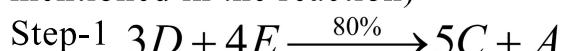
- a) 3.22
- b) 2.72
- c) 10.78
- d) 11.22

Q34 For the real gases reaction $2 CO(g) + O_2(g) \rightarrow 2CO_2(g)$; $\Delta H = -560$ kJ. In 10 litre rigid vessel at 500 K the initial pressure is 70 bar and after the reaction it becomes 40 bar.

The change in internal energy is :

- a) -557 kJ
- b) -530 kJ
- c) -563 kJ
- d) none of these

Q35 9 moles of "D" and 14 moles of E are allowed to react in a closed vessel according to given reactions. Calculate number of moles of B formed in the end of reaction, if 4 moles of G are present in reaction vessel. (Percentage yield of reaction is mentioned in the reaction)



- a) 2.4
- b) 30
- c) 4.8
- d) 1

Q36 Given below are two statements:

Statement (I) : Oxygen being the first member of group 16 exhibits only -2 oxidation state.

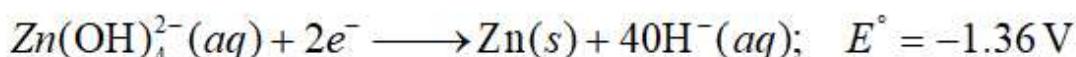
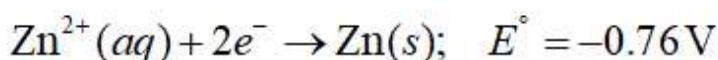
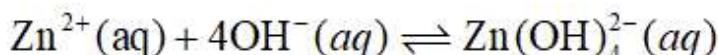
Statement (II) : Down the group 16 stability of +4 oxidation state decreases and +6 oxidation state increases.

In the light of the above statements, choose the most appropriate answer from the options given below:

- a) Statement I is correct but Statement II is incorrect
- b) Both Statement I and Statement II are correct
- c) Both Statement I and Statement II are incorrect
- d) Statement I is incorrect but Statement II is correct

Q37 Calculate the value of equilibrium constant (K_f) for the reaction :

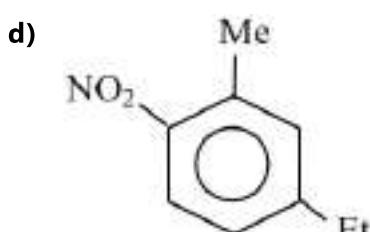
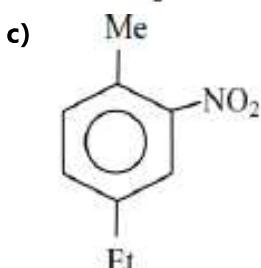
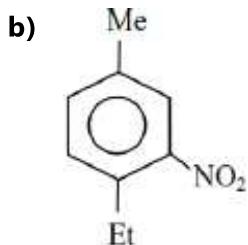
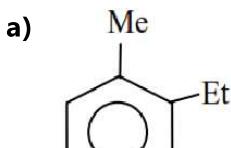
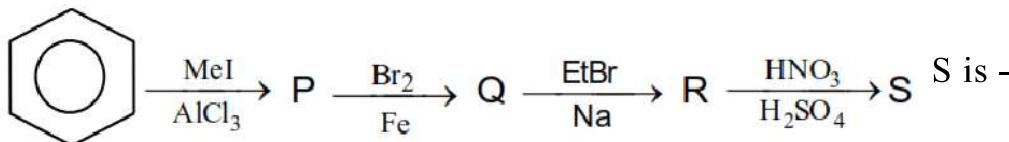
Given :



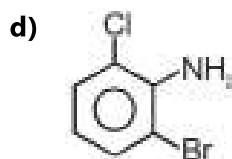
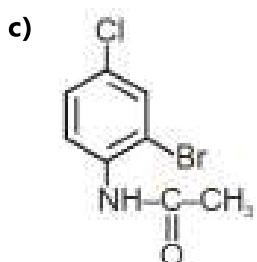
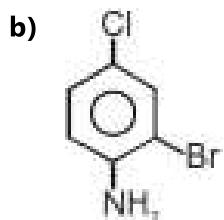
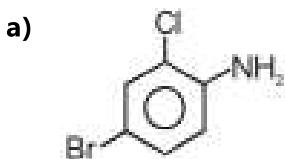
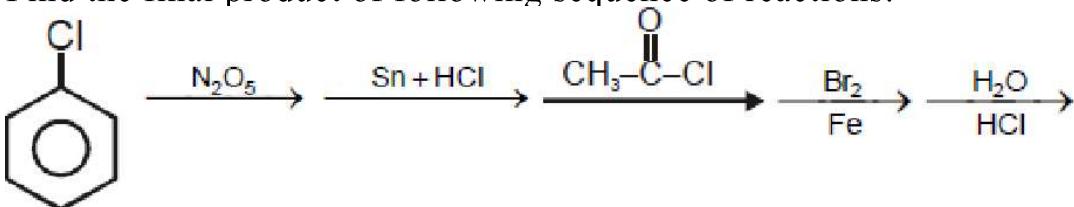
$$2.303 \frac{RT}{F} = 0.06$$

- a) 10^{10}
- b) 2×10^{10}
- c) 10^{20}
- d) None of these

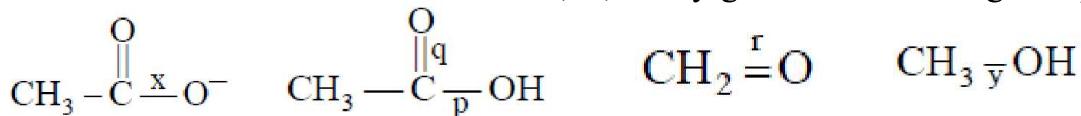
Q38 The major product in the reaction



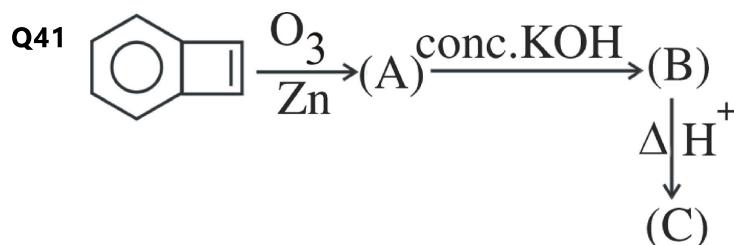
Q39 Find the final product of following sequence of reactions:



Q40 Correct order of bond length of p, q , r , x & y given in following compound is

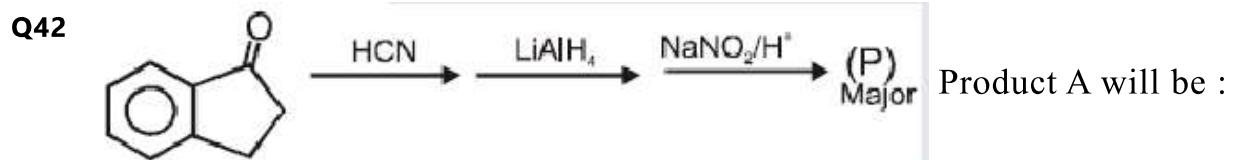


- a) $y > x > p > q > r$ b) $y > p > x > q > r$ c) $p > y > x > q > r$ d) $p > y > x > q > r$



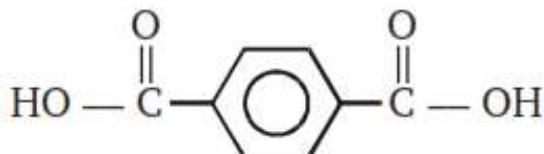
Product (C) is :

- a)
- b)
- c)
- d)

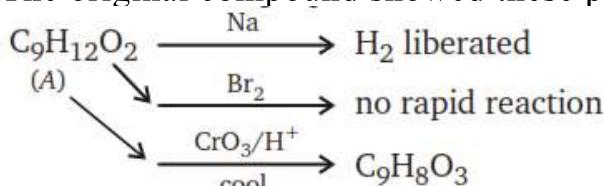


- a)
- b)
- c)
- d)

Q43 An optically active alcohol of formula $C_9H_{12}O_2$ produced the following compound when refluxed with $KMnO_4$.



The original compound showed these properties also



What is structure of (A) ?

- a)
- b)
- c)
- d) Both (a) and (b)

Q44 Which of the following conformations of butane is most stable?

- a) Skew
- b) Anti
- c) Gauche
- d) Eclipsed

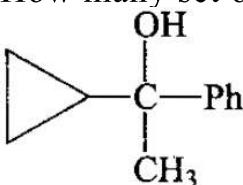
Q45 $\xrightarrow[\text{h}\nu]{Cl_2}$

A mixture of all isomers possible from the mono-chlorination of the structure is subjected to fractional distillation, then how many fractions will be obtained?

- a) 2
- b) 3
- c) 4
- d) 5

Numerical

Q46 How many set of carbonyl compound and $RMg X$ can produce 3° alcohol.



- Q47** Consider the following reactions $A \xrightarrow[(ii) H_3O^+]{(i) CH_3MgBr} B \xrightarrow[573K]{Cu} 2\text{-methyl-2-butene}$. The mass percentage of carbon in A is _____. If your answer is x% then what will be the value of 3x.
- Q48** A and B decompose via first order kinetics with half-lives 54.0 min and 18.0 min respectively. Starting from an equimolar non reactive mixture of A and B, the time taken for the concentration of A to become 16 times that of B is ____ min. (Round off to the Nearest Integer).
- Q49** A bond X–Y has a dipole moment of 1.8×10^{-29} Cm and a bond length 150 pm. What will be the percentage of ionic character is given bond.
- Q50** How many of the following show variable oxidation states in their compounds ? Sc, Cr, Cu, Zn, Fe, Hg

Mathematics

Single Choice Question

Q51 Sum of three numbers in G.P. be 14. If one is added to first and second and 1 is subtracted from the third, the new numbers are in A.P. The smallest of them is
 a) 2 b) 4 c) 6 d) 10

Q52 Given $a = x/(y-z)$, $b = y/(z-x)$ and $c = z/(x-y)$, where x, y and z are not all zero, then the value of $ab + bc + ca$ is
 a) 0 b) 1 c) -1 d) None of these

Q53 Let $f(x) = ([a]^2 - 5[a] + 4)x^3 - (6\{a\}^2 - 5\{a\} + 1)x - (\tan x) \times \operatorname{sgn} x$ be an even function for all $x \in \mathbb{R}$. Then the sum of all possible values of a is (where $[\cdot]$ and $\{ \cdot \}$ denote greatest integer function and fractional part function, respectively)
 a) $\frac{17}{6}$ b) $\frac{53}{6}$ c) $\frac{31}{3}$ d) $\frac{35}{3}$

Q54 Two parallel chords of a circle of radius 2 are at a distance $\sqrt{3} + 1$ apart. If the chords subtend at the center, angles of $\frac{\pi}{K}$ and $\frac{2\pi}{K}$, where $K > 0$, then the value of $[K]$ is:-

(Where $[K]$ denotes the greatest integer less than or equal to K)

- a) 1 b) 2 c) 3 d) 4

Q55 Let $\frac{d}{dx}(g(x)) = \frac{e^{\cos x}}{x}$, $x > 0$, $g(1) = 3a_1$, $g(2) = 6a_2$, $g(8) = 10a_3$ (where a_1, a_2, a_3 are

constants) then $\int_1^2 \frac{3e^{\cos x^3}}{x} dx$ is equal to

- a) $6a_2 - 3a_1$ b) $10a_3 - 6a_2$ c) $10a_3 - 3a_1$ d) $10a_3 - 6a_2 - 3a_1$

Q56

If $\omega \neq 1$ is cube root of unity and $x + y + z \neq 0$, then

$$\begin{vmatrix} \frac{x}{1+\omega} & \frac{y}{\omega+\omega^2} & \frac{z}{\omega^2+1} \\ \frac{y}{\omega+\omega^2} & \frac{z}{\omega^2+1} & \frac{x}{1+\omega} \\ \frac{z}{\omega^2+1} & \frac{x}{1+\omega} & \frac{y}{\omega+\omega^2} \end{vmatrix}$$

equal to zero if

- a) $x^2 + y^2 + z^2 = 0$
 b) $x + y\omega + z\omega^2 = 0$ or $x = y = z$
 c) $x \neq y \neq z \neq 0$
 d) $x = 2y = 3z$

Q57 In a conference 10 speakers are present. If S_1 wants to speak before S_2 and S_2 wants to speak after S_3 , then the number of ways all the 10 speakers can give their speeches with the above restriction if the remaining seven speakers have no objection to speak at any number is-

- a) ${}^{10}C_3$ b) ${}^{10}P_8$ c) ${}^{10}P_3$ d) $\frac{10!}{3}$

Q58 If α_k , ($k = 1, 2, 3, 4$) be the roots of the equation $px^4 + qx + p = 0$, then the equation

whose roots are $\frac{\alpha_1^5}{(\alpha_2 + \alpha_3 + \alpha_4)^2 \cdot \alpha_2 \alpha_3 \alpha_4}$, $\frac{\alpha_2^5}{(\alpha_1 + \alpha_3 + \alpha_4)^2 \cdot \alpha_1 \alpha_3 \alpha_4}$, $\frac{\alpha_3^5}{(\alpha_1 + \alpha_2 + \alpha_4)^2 \cdot \alpha_1 \alpha_2 \alpha_4}$,
 $\frac{\alpha_4^5}{(\alpha_1 + \alpha_2 + \alpha_3)^2 \cdot \alpha_1 \alpha_2 \alpha_3}$ is :

- a) $p_4x_4 + 4p^3qx^3 + 6p^2q^2x^2 + (4pq^3 - q^4)x + q^4 = 0$
 b) $q^4x^4 + 4p^3x^3 + 6p^2x^2 + (4q - p^4)x + 1 = 0$
 c) $p^4x^4 - 4p^3qx^3 + 6p^2q^2x^2 - (4pq^3 - q^4)x + 1 = 0$
 d) None of these

Q59 If $p(x)$ be a polynomial of degree three that has a local maximum value 8 at $x = 1$ and a local minimum value 4 at $x = 2$; then $p(0)$ is equal to

- a) -24 b) 6 c) 12 d) -12

Q60

If a function $f(x)$ defined by $f(x) = \begin{cases} ae^x + be^{-x}, & -1 \leq x < 1 \\ cx^2, & 1 \leq x \leq 3 \\ ax^2 + 2cx, & 3 < x \leq 4 \end{cases}$ be continuous for some a, b, c ,

c, ∞ and $f'(0) + f'(2) = e$, then the value of a is

- a) $\frac{e}{e^2 + 3e + 13}$ b) $\frac{e}{e^2 - 3e - 13}$ c) $\frac{1}{e^2 - 3e + 13}$ d) $\frac{e}{e^2 - 3e + 13}$

Q61

If $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} \frac{\sqrt{3}}{2} & \frac{1}{2} \\ -\frac{1}{2} & \frac{\sqrt{3}}{2} \end{bmatrix}$, then $(BB^\top A)^5$ is equal to

- a) $\begin{bmatrix} 2+\sqrt{3} & 1 \\ -1 & 2-\sqrt{3} \end{bmatrix}$ b) $\frac{1}{2} \begin{bmatrix} 1 & 5 \\ 0 & 1 \end{bmatrix}$ c) $\begin{bmatrix} 1 & 5 \\ 0 & 1 \end{bmatrix}$ d) $\begin{bmatrix} 5 & 1 \\ 0 & 1 \end{bmatrix}$

Q62 6 girls and 5 boys sit together randomly in a row, the probability that no two boys sit together is

- a) $\frac{|6|5}{|11|}$ b) $\frac{|6|6}{|11|}$ c) $\frac{|6|7}{|2|11|}$ d) $\frac{|5|7}{|2|11|}$

Q63 Let $a, b, c \in N$ and $a < b < c$. Let the mean, the mean deviation about the mean and the variance of the 5 observations 9, 25, a, b, c be 18, 4 and $\frac{136}{5}$, respectively. Then $2a + b - c$ is equal to

- a) 33 b) 39 c) 93 d) 66

Q64 The integral $\int e^{\left(x^2 + \frac{1}{x^2}\right)} \left(1 + 2\left(x^2 - \frac{1}{x^2}\right)\right) dx$ is equal to :

- a) $\left(e^{x^2 + \frac{1}{x^2}}\right) + C$ b) $xe^{\left(x^2 + \frac{1}{x^2}\right)} + C$ c) $x^2 e^{\left(x^2 + \frac{1}{x^2}\right)} + C$ d) $e^{\left(x^2 + \frac{1}{x^2}\right)} + x^2 + C$

Q65 Let $y = y(x)$ be the solution of the differential equation $(1-x^2) \frac{dy}{dx} - xy = 1$, $x \in (-1, 1)$. If $y(0) = 0$, then $y\left(\frac{1}{2}\right)$ is equal to :

- a) $\frac{\pi}{3\sqrt{3}}$ b) $\frac{\pi}{\sqrt{3}}$ c) $\frac{\pi}{6}$ d) $\frac{\pi}{3}$

Q66 A vector $\vec{\alpha} = a\hat{i} + b\hat{j} + c\hat{k}$ is said to be rational vector if a, b, c are all rational. If this vector $\vec{\alpha}$ having magnitude as positive integer, makes an angle $\frac{\pi}{4}$ with vector $\vec{\beta} = \sqrt{2}\hat{i} + 3\sqrt{2}\hat{j} + 4\hat{k}$, then $\vec{\alpha}$ always -

- a) lies in xy plane b) lies in xz plane c) lies in yz plane d) lies on x-axis

Q67 A variable point 'P' is moving such that its distances from a line $\frac{x+1}{3} = \frac{y-2}{4} = \frac{z-7}{2}$ and a point (4, 5, 8) are equal, then vertex of the locus of P, is :

- a) $\left(3, \frac{11}{2}, \frac{17}{2}\right)$ b) (6, 4, 7) c) (2, 6, 9) d) $\left(5, \frac{9}{2}, \frac{15}{2}\right)$

Q68 Let $y = f(x) = \sin^3\left(\frac{\pi}{3}\left(\cos\frac{\pi}{3\sqrt{2}}(-4x^3 + 5x^2 + 1)^{3/2}\right)\right)$. Then, at $x = 1$,

- a) $2y' + \sqrt{3}\pi^2 y = 0$ b) $2y' + 3\pi^2 y = 2$ c) $\sqrt{2}y' - 3\pi^2 y = 0$ d) $y' + 3\pi^2 y = 0$

Q69 Let P be a point on the parabola, $y^2 = 12x$ and N be the foot of the perpendicular drawn from P on the axis of the parabola. A line is now drawn through the mid-point M of PN, parallel to its axis which meets the parabola at Q. If the y-intercept of the line NQ is $\frac{4}{3}$, then :

- a) $MQ = \frac{1}{4}$ b) $PN = 3$ c) $PN = 4$ d) $MQ = \frac{1}{3}$

Q70 A rectangle is inscribed in a circle with a diameter lying along the line $3y = x + 7$. If the two adjacent vertices of the rectangle are $(-8, 5)$ and $(6, 5)$, then the area of the rectangle (in sq. units) is :

- a) 84 b) 78 c) 88 d) 75

Numerical

Q71 If $(2^{35} \cdot 3^{16})$ is divided by 11, then the remainder is :

Q72 If $y = \sum_{k=1}^6 k \cos^{-1} \left\{ \frac{3}{5} \cos kx - \frac{4}{5} \sin kx \right\}$, then $\frac{dy}{dx}$ at $x = 0$ is

Q73 If $\lim_{x \rightarrow 0} \left\{ \frac{1}{x^8} \left(1 - \cos \frac{x^2}{2} - \cos \frac{x^2}{4} + \cos \frac{x^2}{2} \cos \frac{x^2}{4} \right) \right\} = 2^{-k}$, then the value of k is

Q74 If area bounded by curve $y = \left| \cos^{-1}(\sin x) \right| + \left| \frac{\pi}{2} - \cos^{-1}(\cos x) \right|$, x-axis and $\frac{\pi}{2} \leq x \leq \pi$ is equal to $\frac{\pi^2}{k}$ (where $k \in \mathbb{N}$), then k is

Q75 Number of solution(s) of $\ln |\sin x| = -x^2$ if $x \in \left[-\frac{\pi}{2}, \frac{3\pi}{2} \right]$

Answer Key

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	B	B	C	C	D	C	D	B	D	C
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	D	A	D	B	C	C	C	B	B	C
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	2	2	8	4	2	B	A	D	D	C
Que.	31	32	33	34	35	36	37	38	39	40
Ans.	D	B	C	B	A	C	C	C	B	B
Que.	41	42	43	44	45	46	47	48	49	50
Ans.	A	A	D	B	B	3	200	108	75	4
Que.	51	52	53	54	55	56	57	58	59	60
Ans.	A	C	D	C	C	B	D	D	D	D
Que.	61	62	63	64	65	66	67	68	69	70
Ans.	C	C	A	B	A	A	A	B	A	A
Que.	71	72	73	74	75					
Ans.	8	91	8	4	4					