Competishun

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

Date: 07/12/2023

Time: 3 hours **Max. Marks:** 300

MFST-2 (23-24)

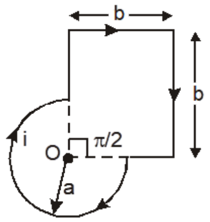
Physics

Single Choice Question

Q1 A uniform rod of mass 6M and length 6l is bent to make an equilateral hexagon. Its M.I. about an axis passing through the centre of mass and perpendicular to the plane of hexagon is:

a) $5ml^2$ **b)** $6ml^2$ **c)** $4ml^2$ **d)** $ml^2/12$

Q2 The magnitude of magnetic field at O (centre of the circular part) of the current carrying coil as shown is:



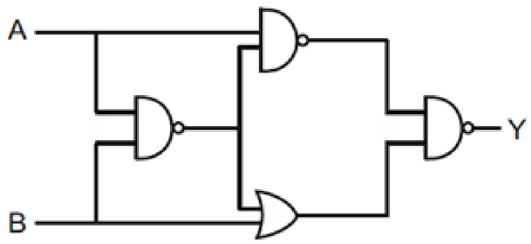
a) $\frac{\mu_0 i}{4\pi}\left(\frac{3\pi}{a}+\frac{\sqrt{2}}{b}\right)$

b) $\frac{\mu_0 i}{2\pi}\left(\frac{3\pi}{2a}+\frac{\sqrt{2}}{b}\right)$

c) $\frac{\mu_0 i}{2\pi}\left(\frac{\pi}{3a}+\frac{3}{\sqrt{2}b}\right)$

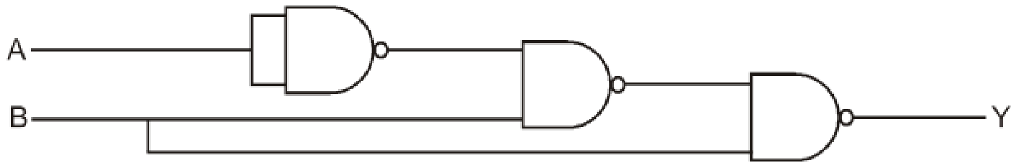
d) $\frac{\mu_0 i}{4\pi}\left(\frac{3\pi}{2a}+\frac{\sqrt{2}}{b}\right)$

Q3 The output of the given logic circuit is



a) $A\overline{B}+\overline{A}B$ **b)** $A\overline{B}$ **c)** $AB+\overline{AB}$ **d)** $\overline{A}B$

Q4 The arrangement of NAND gates shown below effectively works as

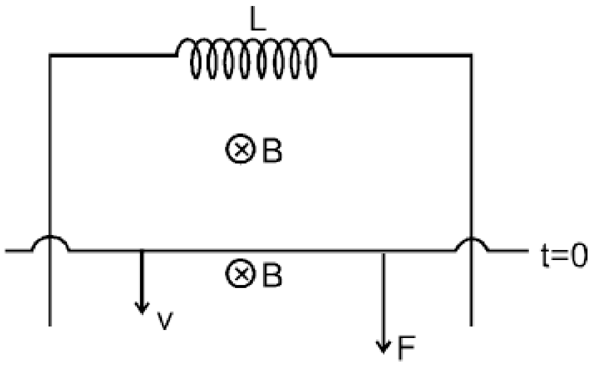


a) AND gate **b)** OR gate **c)** NAND gate **d)** NOR gate

Q5 In a hydrogen like atom, when an electron jumps from the M-shell to the L-shell, the wavelength of emitted radiation is λ. If an electron jumps from N-shell to the L-shell, the wavelength of emitted radiation will be:

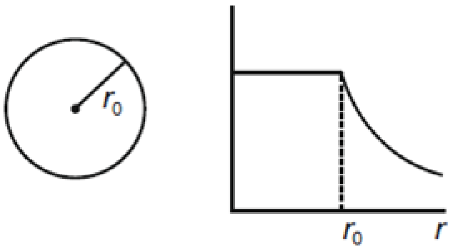
a) $\frac{25}{16}\lambda$ **b)** $\frac{16}{25}\lambda$ **c)** $\frac{20}{27}\lambda$ **d)** $\frac{27}{20}\lambda$

Q6 As shown in the figure a variable force F is applied on conducting wire of length ℓ such that its velocity remains constant. There is no resistance in any branch in the circuit. Consider the motion of wire from
t = 0 initially there is no current in inductor. Now when wire has covered a distance x (from initial position) then at that time energy of inductor will be: (Neglect gravity)



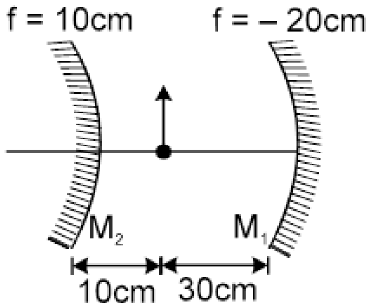
a) independent of x
b) directly proportional to x
c) directly proportional to x^2
d) directly proportional to $x^{1/2}$

Q7 The given graph shows variation (with distance r from centre) of



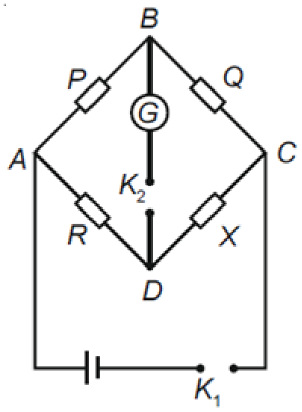
a) Potential of a uniformly charged spherical shell
b) Electric field of a uniformly charged sphere
c) Electric field of uniformly charged spherical shell
d) Potential of a uniformly charged sphere

Q8 In the figure shown find the total magnification after two successive reflections first on M_1 and then on M_2



a) +1 b) –2 c) +2 d) –1

Q9 In a Wheatstone bridge (see fig.), Resistances P and Q are approximately equal. When R = 400 Ω, the bridge is balanced. On interchanging P and Q, the value of R, for balance, is 405 Ω. The value of X is close to



a) 404.5 ohm b) 401.5 ohm c) 402.5 ohm d) 403.5 ohm

Q10 The ratio of translational and rotational kinetic energies at 100 K temperature is 3 : 2. Then the internal energy of one mole gas at that temperature is [R = 8.3 J/mol-K]

a) 1175J b) 1037.5 J c) 2075 J d) 4150J

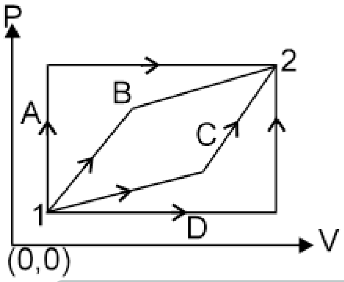
Q11 A simple harmonic motion is represented by :

$$y = 5(sin3\pi t + \sqrt{3}cos3\pi t)cm$$

The amplitude and time period of the motion are:

a) $10cm, \frac{2}{3}s$ b) $5cm, \frac{2}{3}s$ c) $10cm, \frac{3}{2}s$ d) $5cm, \frac{3}{2}s$

Q12 An ideal gas is taken from state 1 to state 2 through optional path A, B C & D as shown in the PV diagram. Let Q, W & U represent the heat supplied, work done and change in internal energy of the gas respectively. Then,



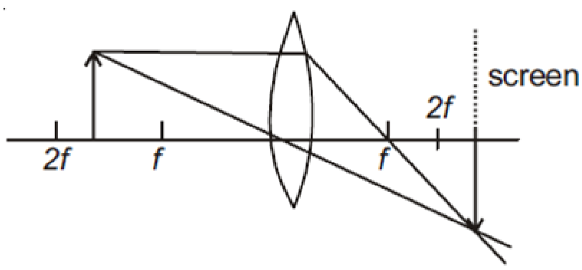
a) $Q_A - Q_D = W_A - W_D$

b) $Q_B - W_B > Q_C - W_C$

c) $W_A - W_B < W_C - W_D$

d) $Q_A - Q_B < Q_C - Q_D$

Q13 Formation of real image using a biconvex lens is shown below:



If the whole set up is immersed in water without disturbing the object and the screen positions, what will one observe on the screen?

a) Erect real image

b) No change

c) Image disappears

d) Magnified image

Q14 An electron of mass m and magnitude of charge |e| initially at rest gets accelerated by a constant electric field E. The rate of change of de-Broglie wavelength of this electron at time t ignoring relativistic effects is

a) $-\frac{h}{|e|E\sqrt{t}}$

b) $\frac{-h}{|e|Et^2}$

c) $\frac{|e|Et^2}{h}$

d) $-\frac{h}{|e|Et}$

Q15 The angular momentum of an electron in first orbit of Li^{++} ion is :

a) $\frac{3h}{2\pi}$

b) $\frac{9h}{2\pi}$

c) $\frac{h}{2\pi}$

d) $\frac{h}{6\pi}$

Q16 Two coherent sources of different intensities send waves which interfere. The ratio of the maximum intensity to the minimum intensity is 25. The intensities are in the ratio :

a) 25 : 1

b) 5 : 1

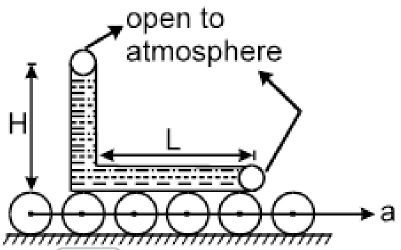
c) 9 : 4

d) 625 : 1

Q17 An electric dipole is placed in a non-uniform electric field making an angle 30^o with the direction of the electric field, what acts on it ?

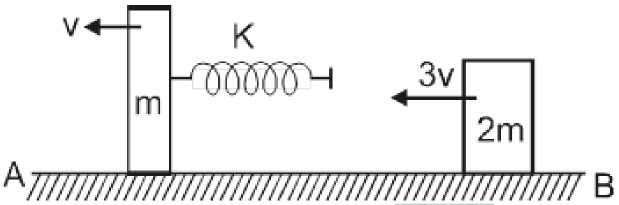
a) only torque b) only force c) both (1) and (2) d) none of these

Q18 A narrow tube completely filled with a liquid is lying on a series of cylinders as shown in figure. Assuming no sliding between any surfaces, the value of acceleration of the cylinders for which liquid will not come out of the tube from anywhere is given by



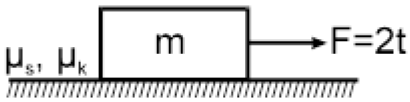
a) $\frac{gH}{2L}$ b) $\frac{gH}{L}$ c) $\frac{2gH}{L}$ d) $\frac{gH}{\sqrt{2}L}$

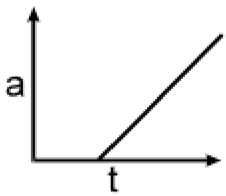
Q19 AB is a long friction less horizontal surface. One end of an ideal spring of spring constant K is attached to a block of mass m, which is being moved left with constant velocity v, and the another end is free. Another block of mass 2m is given a velocity 3v towards the spring. Work done by external agent in moving m with constant velocity v in long time will be :

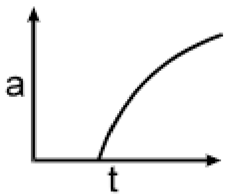


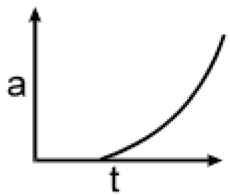
a) $-5\ mv^2$ b) $-8mv^2$ c) $-3\ mv^2$ d) None of these

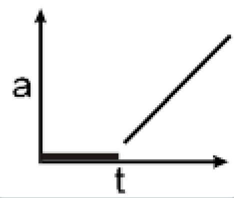
Q20 A force F = 2t (where t is time in seconds) is applied at t = 0 sec. to the block of mass m placed on a rough horizontal surface. The coefficient of static and kinetic friction between the block and surface are μ_s and μ_k respectively. Which of the following graphs best represents the acceleration vs time of the block. ($\mu_s > \mu_K$)



a)


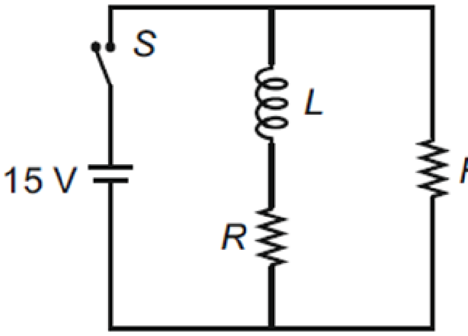
b)


c)


d)


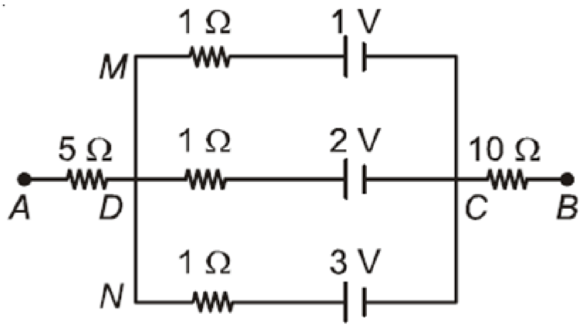
Numerical

Q21 In the figure shown, a circuit contains two identical resistors with resistance R = 5 Ω and an inductance with L = 2 mH. An ideal battery of 15 V is connected in the circuit. What will be the current (in A) through the battery long after the switch is closed?



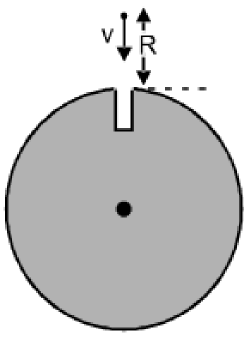
Ans. 6

Q22 In the circuit shown, the potential difference (in V) between A and B is:



Ans. 2

Q23 A fixed sphere of radius R and charge Q(uniformly) has a small groove of length $\frac{R}{4}$ as shown in figure. Another point charge of mass 'm' and charge 'q' is projected towards the groove with some velocity in given direction. If maximum value of v so that it does not strike to sphere is $\frac{1}{8}\sqrt{\frac{KQq}{mR\pi\varepsilon_0}}$, then find k. (Neglect gravity). (Both charges are of same nature)

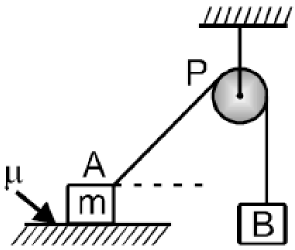


Ans. 23

Q24 A comet is in elliptical orbit around the sun. In this orbit the comet's smallest distance from the sun is
72×10^6 m and its largest distance from the sun is 144×10^6 m. The ratio of comet's maximum speed to the minimum speed in the orbit is : (Neglect the presence of all bodies other than the sun and comet).

Ans. 2

Q25 In figure shown minimum mass of block B (at a particular angle between horizontal and string AP) to just slide the block A on rough horizontal surface is $\frac{m}{2}$ as shown in figure. If μ is the coefficient of friction between block A and ground then $\frac{1}{\mu^2}$ will be :



Ans. 3

Q26 Minimum energy of proton to ionize He^+ ion (which is in ground state and is at rest) is 17x eV, then x is : (consider mass $m_{He+} = 4\ m_p$)

Ans. 4

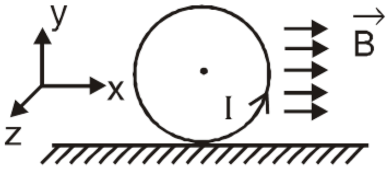
Q27 A man weighing 50 kg standing at the edge of a platform of mass 100 kg rotating at 20 RPM moves towards its centre. If the radius of the platform (taken as disc) is 1.5 m, what is the total work done by the man, when the person reaches the centre. Find value in the form of $X \times \pi^2$ joule and fill value of X.

Ans. 50

Q28 A solid not conducting sphere of uniformly distributed charge Q and of radius 'R' has potential energy stored in it's volume is $\frac{1}{x} \times \frac{Q^2}{8\pi\varepsilon_0 R}$ find the value of x.

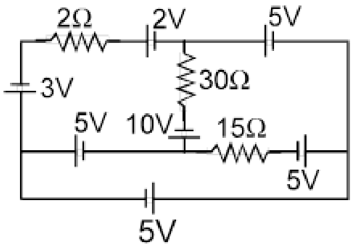
Ans. 5

Q29 In the shown figure a conducting ring of mass m = 2kg and radius R = 0.5 m. lies on a smooth horizontal plane with its plane vertical. The ring carries a current of $I = \frac{1}{\pi}A$. A horizontal uniform magnetic field of B = 12T is switched on at t = 0. The initial angular acceleration α in rad./sec^2 of the ring will be 4x if x is :



Ans. 3

Q30 In the circuit shown, current through the resistance 2Ω is i_1 and current through the resistance 30Ω is i_2. Find the ratio $\frac{i_1}{i_2}$.

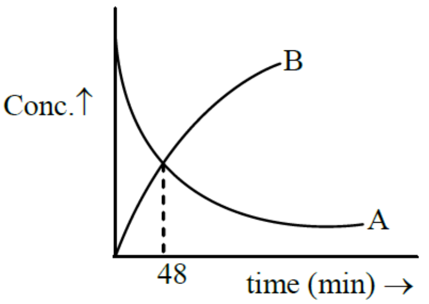


Ans. 9

Chemistry

Single Choice Question

Q31 For a Ist order reaction nA $\longrightarrow$ B whose concentration V_s time curve as shown below

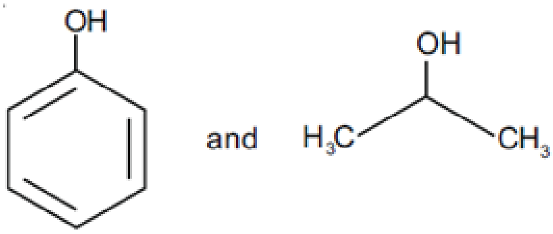


If half life for the reaction is 24 mins the value of n is

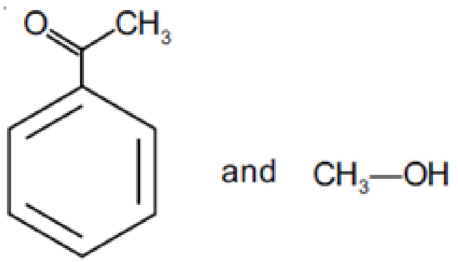
a) 1 **b)** 2 **c)** 3 **d)** 4

Q32 The products formed in the reaction of cumene with O_2 followed by treatment with dil. HCl are :

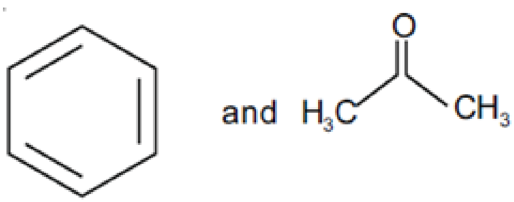
a)



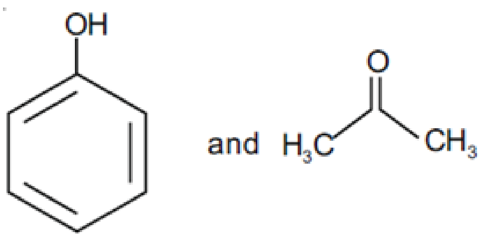
b)



c)



d)



Q33 Electrolysis is carried out in three cells :

In cell (1) : 1(M) $CuSO_4$ solution is electrolysed using Pt electrodes.

In cell (2) : 1(M) $CuSO_4$ solution is electrolysed using Cu electrodes.

In cell (3) : 1(M) KCl solution is electrolysed using Pt electrodes.

Which of the following is/are correct ?

a) In cell (1) : the pH of the solution is decreased

b) In cell (2) : the pH of the solution remain/constant

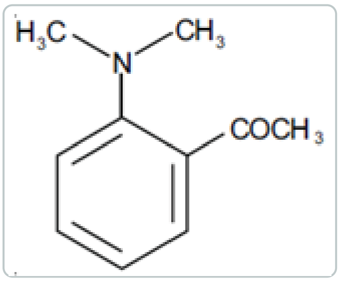
c) In cell (3) : the pH of the solution is increased

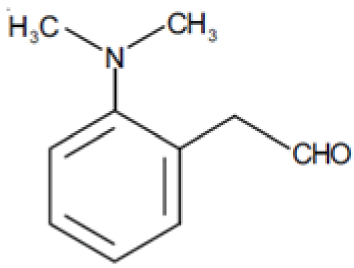
d) All of the given are correct

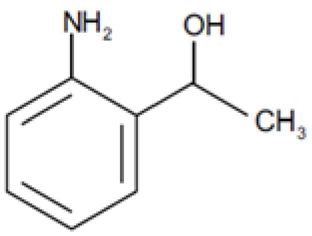
Q34 The tests performed on compound X and their inferences are :

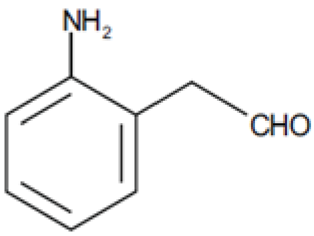
Test	Inference
(1) 2,4-DNP test	Coloured precipitate
(2) Iodoform test	Yellow precipitate
(3) Azo-dye test	No dye formation

Compound 'X' is :

a) 

b) 

c) 

d) 

Q35 The stepwise formation of $[Cu(NH_3)_4]^{2+}$ is given below

$$Cu^{2+} + NH_3 \xrightleftharpoons{K_1} [Cu(NH_3)]^{2+}$$

$$[Cu(NH_3)]^{2+} + NH_3 \xrightleftharpoons{K_2} [Cu(NH_3)_2]^{2+}$$

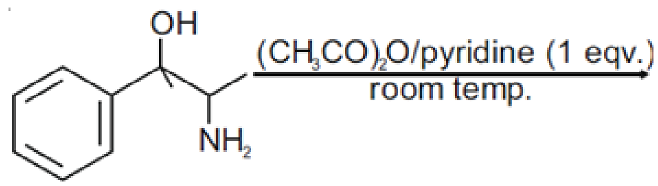
$$[Cu(NH_3)_2]^{2+} + NH_3 \xrightleftharpoons{K_3} [Cu(NH_3)_3]^{2+}$$

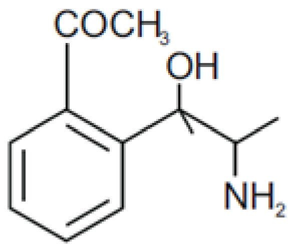
$$[Cu(NH_3)_3]^{2+} + NH_3 \xrightleftharpoons{K_4} [Cu(NH_3)_4]^{2+}$$

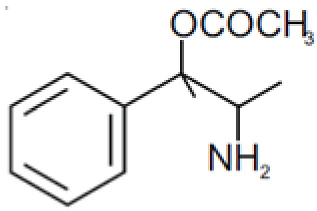
The value of stability constants K_1, K_2, K_3 and K_4 are 10^4, 1.58×10^3, 5×10^2 and 10^2 respectively. The overall equilibrium constants for dissociation of $[Cu(NH_3)_4]^{2+}$ is

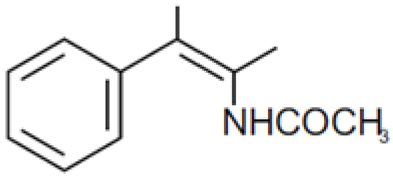
a) 1.26×10^{-12} **b)** 9.28×10^{-12} **c)** 1.26×10^{12} **d)** 9.28×10^{-14}

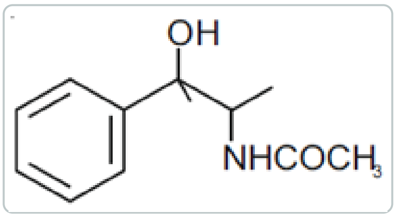
Q36 The major product obtained in the following reaction is :



a) 

b) 

c) 

d) 

Q37 Some of the following gases are soluble in water due to formation of their ions

I. CO_2 II. NH_3 III. HCl IV. CH_4 V. H_2

Water insoluble gases can be

a) I, IV, V
b) I, V
c) I, II, III
d) IV, V

Q38 Given below are two statements : One is labeled as **Assertion A** and the other is labeled as **Reason R**

Assertion A : Zero orbital overlap is an out of phase overlap.

Reason R : It results due to different orientation/ direction of approach of orbitals. In the light of the above statements. Choose the correct answer from the options given below

a) Both **A** and **R** are true and **R** is the correct explanation of **A**
b) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**
c) **A** is true but **R** is false
d) **A** is false but **R** is true

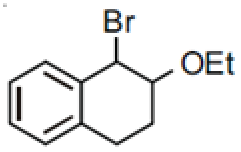
Q39 The number of stereoisomers possible for 1,2- dimethyl cyclopropane is :

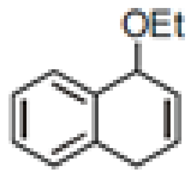
a) One
b) Four
c) Two
d) Three

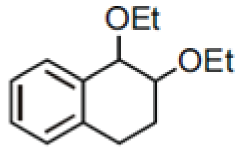
Q40 Two radioactive materials X_1 and X_2 have decay constants 10λ and λ respectively. If initially they have the same numbers of nuclei, then the ratio of the nuclei of X_1 to that of X_2 will be $1/e$ after a time:

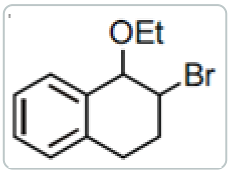
a) $\frac{1}{10\lambda}$
b) $\frac{1}{11\lambda}$
c) $\frac{11}{10\lambda}$
d) $\frac{1}{9\lambda}$

Q41 The major product of the following reaction is

a) 

b) 

c) 

d) 

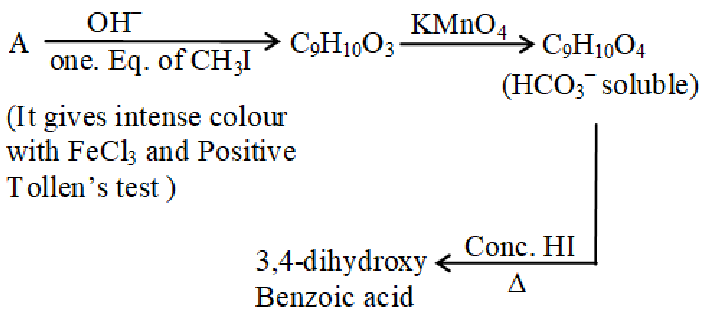
Q42 Arrange the following anions in decreasing leaving ability in SN^2 reaction -
(I) $CF_3CO_2^-$ (II) $CH_3SO_3^-$ (III) $CF_3SO_3^-$ (IV) p-nitrobenzenesulphonate

a) III > IV > II > I b) III > I > II > IV c) IV > III > I > II d) IV > III > II > I

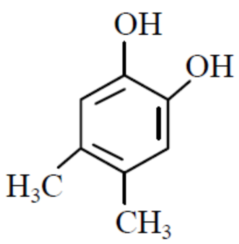
Q43 Amylopectin is composed of

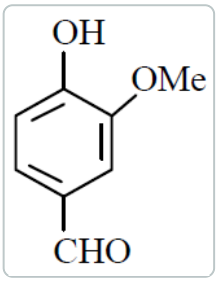
a) β-D-glucose, $C_1 — C_4$ and $C_2 — C_6$ linkages
b) α-D-glucose, $C_1 — C_4$ and $C_2 — C_6$ linkages
c) β-D-glucose, $C_1 — C_4$ and $C_1 — C_6$ linkages
d) α-D-glucose, $C_1 — C_4$ and $C_1 — C_6$ linkages

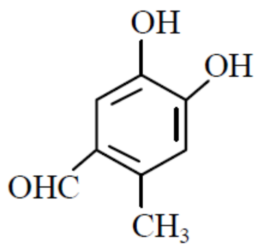
Q44

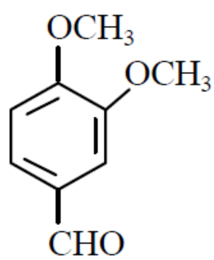


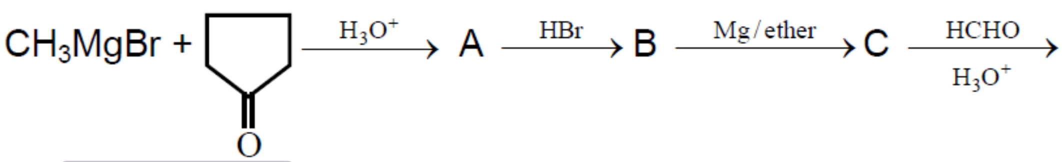
Starting substrate 'A' is -

a) 

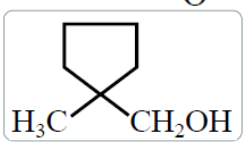
b) 

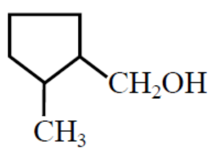
c) 

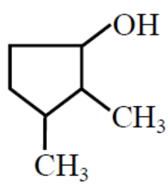
d) 

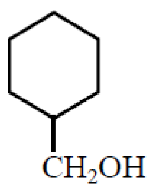
Q45 

D, D is :

a) 

b) 

c) 

d) 

Q46 In the flame test of a mixture of salts, a green flame with blue centre was observed. Which one of the following cations may be present?

a) Cu^{2+} b) Sr^{2+} c) Ba^{2+} d) Ca^{2+}

Q47 Which of the following is not optically active ?

a) $[Co(en)_3]^{3+}$ b) $[Cr(ox)_3]^{3-}$

c) $cis - [CoCl_2(en)_2]^+$ d) $trans - [CoCl_2(en)_2]^+$

Q48 $(NH_4)_2\ Cr_2O_7$ on heating gives a gas which is also given by :

a) Heating NH_4NO_2 b) Heating NH_4NO_3

c) $Mg_3N_2 + H_2O$ d) $Na(comp.) + H_2O_2$

Q49 The correct order of M – C π-bond strength in given metal carbonyl is : -

a) $[Fe(CO)4]^{2-} > [Co(CO)_4]^- > [Ni(CO)_4]$

b) $[Ni(CO)_4] > [Co(CO)_4]^- > [Fe(CO)_4]^{2-}$

c) $[Fe(CO)_4]^{2-} > [Ni(CO)_4] > [Co(CO)_4]^-$

d) $[Ni(CO)_4] > [Co(CO)_4]^- = [Fe(CO)_4]^{2-}$

Q50 A particular state of system is arrived at starting from a given state in two different ways (1) following reversible path and (2) irreversible path. Which of the following relations would be correct if the processes are isothermal ?

a) $\Delta S_{rev} \neq \Delta S_{irrev}$ b) $\Delta q_{rev} = \Delta q_{irrev}$

c) $\Delta S_{rev} = \Delta S_{irrev} = \frac{\Delta q_{rev}}{T}$ d) $\Delta S_{irrev} = \frac{\Delta q_{irrev}}{T} \neq \Delta S_{rev}$

Q51 The values of observed and calculated molecular weights of calcium nitrate are respectively 65.6 and 164. The degree of dissociation (in %) of calcium nitrate will be

Numerical

Q52 How many isomers are possible for the complex ion, $[Cr(NH_3)(OH)_2Cl_3]^{2-}$?

Ans. 3

Q53 The number of P-P bonds in P_4S_3 is -

Ans. 3

Q54 Find change in internal energy, when 0.5 mole of Ar having a specific heat at constant pressure of 20.814 J g^{-1} deg^{-1} is heated from 27°C to 31°C at constant volume. (Atomic mass of Ar = 40) (give your answer in terms of nearest integer in KJ)

Ans. 1

Q55 The pH of a saturated aqueous solution of CO_2 is 5; For H_2CO_3 , Ka1 = 10^{-7} and Ka_2 = 10^{-11}. At the given pressure the solubility of CO_2 in water is 10^{-2} (M). What is the value of –log $[CO_2{}^{2-}]$ in the nearest possible integers?

Ans. 10

Q56 In which of the following all bond length are not equal ?
PCl_5, SF_4, ClF_3, XeF_2, $[SF_5]^+$, $[ClF_4]^+$, $[XeF_3]^+$, O_3, P_4 (white)

Ans. 6

Q57 The work function (ϕ) of some metals is listed below. The number of metals which will show photoelectric effect when light of 300 nm wavelength falls on the metal is

Metal	Li	Na	K	Mg	Cu	Ag	Fe	Pt	W
(ϕeV)	2.4	2.3	2.2	3.7	4.8	4.3	4.7	6.3	4.75

Ans. 4

Q58 The atomic masses of He and Ne are 4 and 20 a.m.u., respectively. The value of the de Broglie wavelength of He gas at –73°C is "M" times that of the de Broglie wavelength of Ne at 727°C. M is :

Ans. 5

Q59 Consider the cell
Pt(s) | H_2 (g)(1 atm) | H^+ (aq, $[H^+]$ = 1M) || Fe^{3+} (aq), Fe^{2+} (aq) | Pt(s)
Given : $E^\circ_{Fe^{3+}/Fe^{2+}} = 0.771V$ and $E^\circ_{H^+/\frac{1}{2}H_2} = 0V$, T = 298K
If the potential of the cell is 0.712 V the ratio of concentration of Fe^{2+} to Fe^{3+} is________
(Nearest integer)

Ans. 10

Q60 Formation of polyethene from calcium carbide takes place as follows :
$CaC_2 + H_2O \rightarrow Ca(OH)_2 + C_2H_2$;
$C_2H_2 + H \rightarrow C_2H_4$
$n(C_2H_4) \rightarrow (–CH_2–CH_2–)$ n.
The amount of polyethylene (in kg) possibly obtainable from 64.0 kg CaC_2 can be

Ans. 28

Mathematics

Single Choice Question

Q61 sin [2 $\cos^{-1}(-3/5)$] is equal to

a) $\frac{6}{25}$ b) $\frac{24}{25}$ c) $\frac{4}{5}$ d) $\frac{-24}{25}$

Q62 The length of the perpendicular from the point (2, –1, 4) on the straight line, $\frac{x+3}{10}=\frac{y-2}{-7}=\frac{z}{1}$ is

a) Greater than 3 but less than 4 b) Greater than 2 but less than 3

c) Greater than 4 d) Less than 2

Q63 α, β are roots of the equation $\lambda(x^2 - x) + x + 5 = 0$. If λ_1 and λ_2 are the two values of λ for which the roots α, β are connected by the relation $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = 4$, then the value of $\frac{\lambda_1}{\lambda_2} + \frac{\lambda_2}{\lambda_1}$ is -

a) 150 b) 254 c) 180 d) 1022

Q64 The mean of five observations is 5 and their variance is 9.20. If three of the given five observations are 1, 3 and 8, then a ratio of other two observations is

a) 4 : 9 b) 6 : 7 c) 10 : 3 d) 5 : 8

Q65 The number of real solutions of $x^7 + 5x^3 + 3x + 1 = 0$ is equal to ________.

a) 0 b) 1 c) 3 d) 5

Q66 The number of four-digit numbers strictly greater than 4321 that can be formed using the digits 0, 1, 2, 3, 4, 5 (repetition of digits is allowed) is :

a) 360 b) 306 c) 288 d) 310

Q67 If lines x + 2y – 1 = 0, ax + y + 3 = 0 and bx – y + 2 = 0 are concurrent and let S be the curve denoting locus of (a, b). Then the least distance of S from the origin is.

a) $\frac{5}{\sqrt{57}}$ b) $\frac{5}{\sqrt{51}}$ c) $\frac{5}{\sqrt{58}}$ d) $\frac{5}{\sqrt{59}}$

Q68 For the two positive numbers a, b, if a, b and $\frac{1}{18}$ are in a geometric progression, while $\frac{1}{a}$, 10 and $\frac{1}{b}$ are in an arithmetic progression, then, 16a + 12b is equal to _____.

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

Q69 Axis of a parabola lies along x-axis. If its vertex and focus are at distances 2 and 4 respectively from the origin, on the positive x-axis then which of the following points does not lie on it?

a) (4, –4) b) $(5, 2\sqrt{6})$ c) $(6, 4\sqrt{2})$ d) (8, 6)

Q70 The sum of the co-efficients of all even degree terms in x in the expansion of $\left(x+\sqrt{x^3-1}\right)^6+\left(x-\sqrt{x^3-1}\right)^6$, $(x > 1)$ is equal to :

a) 24 b) 32 c) 26 d) 29

Q71 The pair of lines joining origin to the intersection of the curve $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ by the line $\ell x + my + n = 0$ are coincident if -

a) $a^2\ell^2+b^2m^2=n^2$

b) $\frac{a^2}{\ell^2}+\frac{b^2}{m^2}=\frac{1}{n^2}$

c) $\frac{\ell^2}{a^2}+\frac{m^2}{b^2}=n^2$

d) None of these

Q72 If S_1 and S_2 are respectively the sets of local minimum and local maximum points of the function, $f(x) = 9x^4 + 12x^3 - 36x^2 + 25$, $x \in R$, then :

a) $S_1 = \{-2\}; S_2 = \{0, 1\}$

b) $S_1 = \{-2, 1\}; S_2 = \{0\}$

c) $S_1 = \{-1\}; S_2 = \{0, 2\}$

d) $S_1 = \{-2, 0\}; S_2 = \{1\}$

Q73 For some $\theta \in \left(0, \frac{\pi}{2}\right)$, if the eccentricity of the hyperbola, $x^2 - y^2\sec^2\theta = 10$ is $\sqrt{5}$ times the eccentricity of the ellipse, $x^2\sec^2\theta + y^2 = 5$, then the length of the latus rectum of the ellipse, is :

a) $2\sqrt{6}$ b) $\frac{2\sqrt{5}}{3}$ c) $\frac{4\sqrt{5}}{3}$ d) $\sqrt{30}$

Q74 Function f(x) = $f(x)=\begin{cases} x\sin x; & 0 \le x < \frac{\pi}{2} \\ \frac{\pi}{2}\sin(\pi+x); & \frac{\pi}{2} \le x < \pi \end{cases}$ then-

a) $\lim_{x\to\frac{\pi}{2}}$ f(x) does not exist

b) $\lim_{x\to\frac{\pi}{4}}$ f(x) does not exist

c) Discontinuous at $x = \frac{\pi}{2}$

d) Both (1) & (3)

Q75 If $I = \int\left(\sqrt{\tan x}+\sqrt{\cot x}\right)dx$, then I equals:

a) $\sqrt{2}\sin^{-1}(\sin x + \cos x) + C$

b) $\sqrt{2}\cos^{-1}(\sin x - \cos x) + C$

c) $\sqrt{2}\sin^{-1}(\sin x - \cos x) + C$

d) $\sqrt{2}\cos^{-1}(\sin x + \cos x) + C$

Q76 Area of the region bounded by the curves $y = x^2 + 2$, $y = -x$, $x = 0$ and $x = 1$ is -

a) $\frac{17}{6}$ b) $\frac{5}{16}$ c) $\frac{3}{16}$ d) None of these

Q77 The curve amongst the family of curves represented by the differential equation, $(x^2 - y^2)\,dx + 2xydy = 0$ which passes through (1, 1) is

a) A hyperbola with transverse axis along the x-axis.

b) A circle with centre on the y-axis.

c) An ellipse with major axis along the y-axis.

d) A circle with centre on the x-axis.

Q78 If $|z^2 - 1| = |z|^2 + 1$ then z lies on a -

a) circle **b)** parabola **c)** ellipse **d)** None of these

Q79 If for two events A, B ; $P(A \cup B) = \frac{6}{7}$, $P(\bar{A}) = \frac{5}{7}$, $P(B) = \frac{4}{7}$, then A, B are

a) independent events **b)** mutually exclusive

c) equally likely **d)** forming an exhaustive system

Q80 If A satisfies the equation $x^3 - 5x^2 + 4x + k = 0$, then A^{-1} exists if -

a) $k \neq 1$ **b)** $k \neq 3$ **c)** $k \neq -1$ **d)** None

Numerical

Q81 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 :

Ans. 84

Q82 Two newspapers A and B are published in a city. It is known that 25% of the city population reads A and 20% reads B while 8% reads both A and B. Further, 30% of those who read A but not B look into advertisements and 40% of those who read B but not A also look into advertisements, while 50% of those who read both A and B look into advertisements. Then the percentage of the population who look into advertisements is :

Ans. 13.9

Q83 Let two points be A(1, –1) and B(0, 2). If a point P(x′, y′) be such that the area of ΔPAB = 5 sq. units and it lies on the line, 3x + y – 4λ = 0, then a value of λ is

Ans. 3

Q84 If f : R → R satisfying f(0) = 1, f(1) = 2 and f(x + 2) = 2 f(x) + f(x + 1) then f(6) is

Ans. 64

Q85 $\int_{-\pi/2}^{\pi/2} \sqrt{\frac{1-cos2x}{2}}$ dx equals :

Ans. 2

Q86 Let the unit vectors $\vec{a}, \vec{b}, \vec{c}$ be the position vectors of the vertices of a triangle ABC. If $\vec{F}$ is the position vector of the mid point of the line segment joining its orthocentre and centroid then $(\vec{a} - \vec{F})^2 + (\vec{b} - \vec{F}) + (\vec{c} - \vec{F})^2 =$

Ans. 3

Q87 If $\left|\frac{z_1-3z_2}{3-z_1\bar{z}_2}\right| = 1$ and $|z_2| \neq 1$, then $|z_1|$ is equal to

Ans. 3

Q88 $\lim_{\theta \to 0} \frac{1-cos\theta}{sin^2 2\theta} = \frac{1}{k}$ then k is

Ans. 8

Q89 If $a^2 + b = 2$ then maximum value of term independent of x in expression of $(ax^{1/6} + bx^{-1/3})^9$ $(a > 0, b > 0)$ is $9^k + k + 1$, then value of k is

Ans. 2

Q90 Value of $y = (0.36)^{log_{0.25}\left(\frac{1}{3}+\frac{1}{3^2}+\frac{1}{3^3}+.....upto\ \infty\right)}$ is-

Ans. 0.6

Answer Key

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	**A**	**D**	**B**	**C**	**C**	**C**	**A**	**C**	**C**	**C**
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	**A**	**A**	**C**	**B**	**C**	**C**	**C**	**A**	**B**	**D**
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	**6**	**2**	**23**	**2**	**3**	**4**	**50**	**5**	**3**	**9**
Que.	31	32	33	34	35	36	37	38	39	40
Ans.	**C**	**D**	**D**	**A**	**A**	**D**	**D**	**A**	**D**	**D**
Que.	41	42	43	44	45	46	47	48	49	50
Ans.	**D**	**A**	**D**	**B**	**A**	**A**	**D**	**A**	**A**	**C**
Que.	51	52	53	54	55	56	57	58	59	60
Ans.	**75**	**3**	**3**	**1**	**10**	**6**	**4**	**5**	**10**	**28**
Que.	61	62	63	64	65	66	67	68	69	70
Ans.	**D**	**A**	**D**	**A**	**B**	**D**	**C**	**B**	**D**	**A**
Que.	71	72	73	74	75	76	77	78	79	80
Ans.	**A**	**B**	**C**	**D**	**C**	**A**	**D**	**D**	**B**	**D**
Que.	81	82	83	84	85	86	87	88	89	90
Ans.	**84**	**13.9**	**3**	**64**	**2**	**3**	**3**	**8**	**2**	**0.6**