Competishun

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

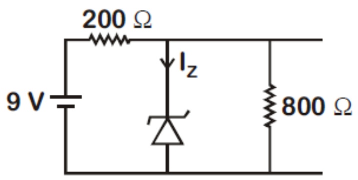
Date: 04/12/2023
Time: 3 hours **Max. Marks:** 300

MFST-1 (23-24)

Physics

Single Choice Question

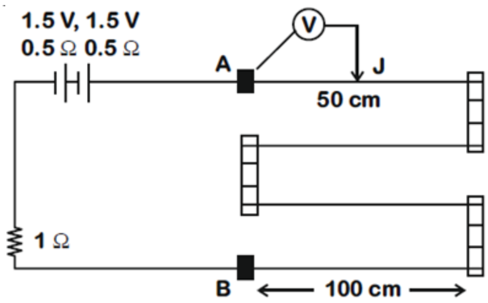
Q1 The reverse breakdown voltage of a Zener diode is 5.6 V in the given circuit.



The current IZ through the Zener is

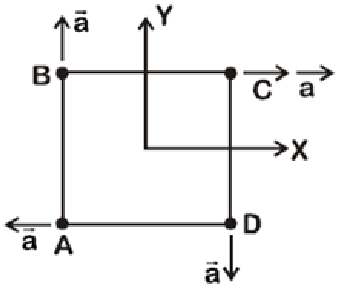
a) 15 mA **b)** 7 mA **c)** 10 mA **d)** 17 mA

Q2 In the circuit shown, a four wire potentiometer is made of a 400 cm long wire, which extends between A and B. The resistance per unit length of the potentiometer wire is r = 0.01 Ω/cm. If an ideal voltmeter is connected as shown with jockey J at 50 cm from end A, the expected reading of the voltmeter will be:



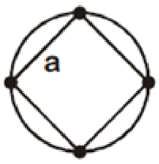
a) 0.75 V **b)** 0.50 V **c)** 0.20 V **d)** 0.25 V

Q3 Four particles A, B, C and D with masses $m_A = m$, $m_B = 2m$, $m_C = 3m$ and $m_D = 4m$ are at the corners of a square. They have accelerations of equal magnitude with directions as shown. The acceleration of the centre of mass of the particles is :



a) Zero b) $a(\hat{i} + \hat{j})$ c) $\frac{a}{5}(\hat{i} + \hat{j})$ d) $\frac{a}{5}(\hat{i} - \hat{j})$

Q4 Four identical particles of mass M are located at the corners of a square of side 'a'. What should be their speed if each of them revolves under the influence of others' gravitational field in a circular orbit circumscribing the square?



a) $1.41\sqrt{\frac{GM}{a}}$ b) $1.16\sqrt{\frac{GM}{a}}$ c) $1.21\sqrt{\frac{GM}{a}}$ d) $1.35\sqrt{\frac{GM}{a}}$

Q5 50 W/m^2 energy density of sunlight is normally incident on the surface of a solar panel. Some part of incident energy (25%) is reflected from the surface and the rest is absorbed. The force exerted on 1 m^2 surface area will be close to ($c = 3 \times 10^8$ m/s) :

a) 20×10^{-8} N b) 35×10^{-8} N c) 15×10^{-8} N d) 10×10^{-8} N

Q6 Two cars A and B are moving away from each other in opposite directions. Both the cars are moving with a speed of 20 ms^{-1} with respect to the ground. If an observer in car A detects a frequency 2000 Hz of the sound coming from car B, what is the natural frequency of the sound source in car B?

(speed of sound in air = 340 ms^{-1})

a) 2150 Hz b) 2300 Hz c) 2060 Hz d) 2250 Hz

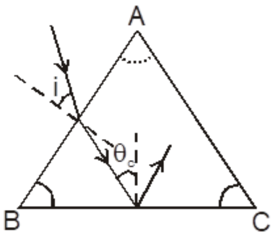
Q7 The velocity of a particle moving on the x-axis is given by $v = x^2 + x$ where v is in m/s and x is in m. Find its acceleration in m/s^2 when passing through the point x = 2m

a) 0 b) 5 c) 11 d) 30

Q8 A particle is projected from a point P (2, 0, 0)m with a velocity 10 m/s making an angle 45° with the horizontal. The plane of projectile motion passes through a horizontal line PQ which makes an angle of 37° with positive x-axis, xy plane is horizontal. The coordinates of the point where the particle will strike the line PQ is: (Take g = 10 m/s^2)

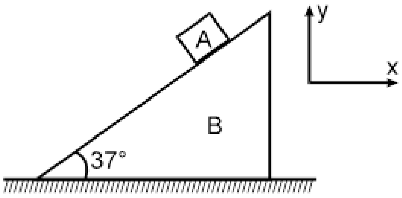
a) (10, 6, 0)m b) (8, 6, 0)m c) (10, 8, 0)m d) (6, 10, 0)m

Q9 A light is incident on face AB of an equilateral glass prism ABC. After refraction at AB, the ray is incident on face BC at the angle slightly greater than critical angle so that it gets reflected from face BC and finally emerges out from face AC. Net deviation angle of the ray is 112° anticlockwise. The angle of incidence 'i' has value :



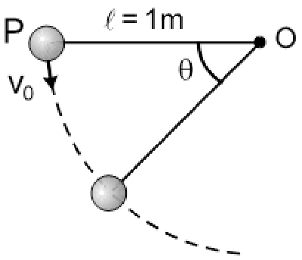
a) 22° b) 24° c) 26° d) 28°

Q10 In the figure shown the acceleration of A is, $\vec{a_A} = 15\hat{i} + 15\hat{j}$ then the acceleration of B is: (A remains in contact with B)



a) $6\hat{i}$ b) $-15\hat{i}$ c) $-10\hat{i}$ d) $-5\hat{i}$

Q11 The sphere at P is given a downward velocity v_0 and swings in a vertical plane at the end of a rope of ℓ = 1m attached to a support at O. The rope breaks at angle 30° from horizontal, knowing that it can withstand a maximum tension equal to three times the weight of the sphere. Then the value of v_0 will be : (g = π^2 m/s^2)



a) $\frac{g}{2}ms$ b) $\frac{2g}{3}ms$ c) $\sqrt{\frac{3g}{2}}ms$ d) $\frac{g}{3}ms$

Q12 A uniform smooth rod is placed on a smooth horizontal floor is hit by a particle moving on the floor, at a distance $\frac{\ell}{4}$ from one end. Then the distance travelled by the centre of the rod after the collision when it has completed three revolution will be: [e $\neq$ 0 & 'ℓ' is the length of the rod]

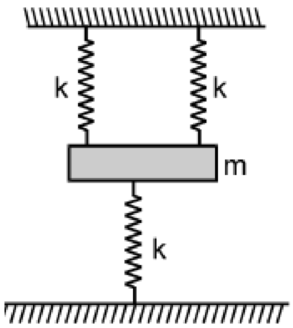
a) $2\pi\ell$

b) can't be determined

c) $\pi\ell$

d) none of these

Q13 In the figure all springs are identical having spring constant k and mass m each. The block also has mass m. The frequency of oscillation of the block is :



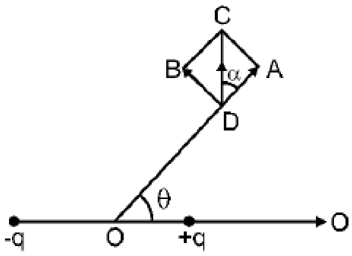
a) $\frac{1}{2\pi}\sqrt{\frac{3k}{m}}$

b) $\frac{1}{2\pi}\sqrt{\frac{3k}{2m}}$

c) $2\pi\sqrt{\frac{3m}{3k}}$

d) none of these

Q14 An electric dipole of moment is placed at the origin along the x-axis. The electric field at a point P, whose position vector makes an angle θ with the x-axis, will make an angle :



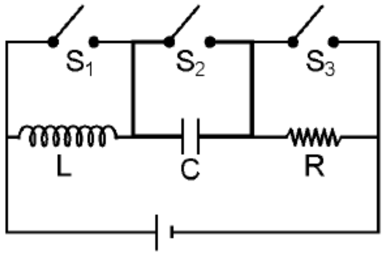
a) α

b) θ

c) $\theta + \alpha$

d) $2\theta + \alpha$

Q15 Consider the circuit shown in figure. With switch S_1 closed and the other two switches open, the circuit has a time constant 0.05 sec. With switch S_2 closed and the other two switches open, the circuit has a time constant 2 sec. With switch S_3 closed and the other two switches open, the circuit oscillates with a period T. Find T (in sec). (Take $\pi^2 = 10$)

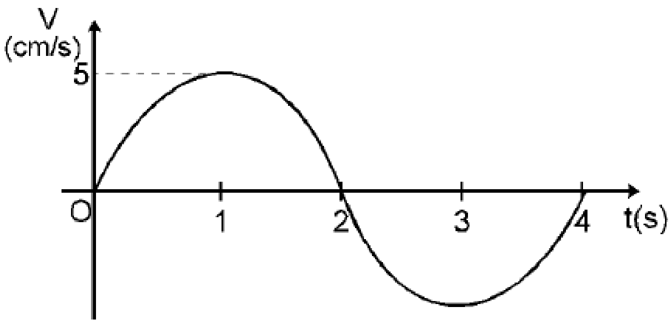


a) 2 b) 3 c) 4 d) 6

Q16 The primary winding of the transformer to power the radio receiver has 1200 turns with input voltage of 120 V. What should be the number of turns of the transformer in secondary winding to power the lamp filament, if it requires 3.6 V voltage and current of 1A? Secondary has a resistance of 0.4 ohms. The loss in the primary winding may be neglected.

a) 40 b) 36 c) 48 d) 18

Q17 A certain transverse sinusoidal wave of wavelength 20 cm is moving in the positive x direction. The transverse velocity of the particle at x = 0 as a function of time is shown. The amplitude of the motion is:

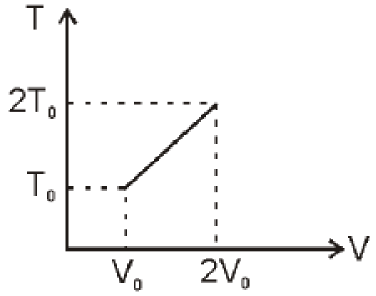


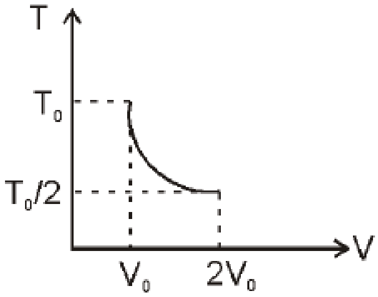
a) $\frac{5}{\pi} cm$ b) $\frac{\pi}{2} cm$ c) $\frac{10}{\pi} cm$ d) $2\pi cm$

Q18 In Young's double slit experiment, we get 60 fringes in the field of view of monochromatic light of wavelength 4000 A^0. If we use monochromatic light of wavelength 6000 A^0, then the number of fringes that would be obtained in the same field of view is :

a) 60 b) 90 c) 40 d) 1.5

Q19 For two thermodynamic process temperature and volume diagram are given. In first process, it is a straight line having initial and final coordinates as (V_0, T_0) and ($2V_0$, $2T_0$), where as in second process it is a rectangular hyperbola having initial and final coordinates (V_0, T_0) and ($2V_0$, $T_0/2$). Then ratio of work done in the two processes must be





a) 1 : 2 b) 2 : 1 c) 1 : 1 d) None of these

Q20 Two spheres of radii r_1 and r_2 have densities ρ_1 and ρ_2 and specific heats s_1 and s_2 respectively. If they are heated to the same temperature, then the ratio of their rates of cooling initially in the same surrounding will be: (assume that both surface has same emissivity)

a) $\frac{r_2\rho_2 S_2}{r_1\rho_1 S_1}$ b) $\frac{r_2\rho_2 S_1}{r_1\rho_1 S_2}$ c) $\frac{r_1\rho_1 S_1}{r_2\rho_2 S_2}$ d) $\frac{r_2\rho_1 S_1}{r_1\rho_2 S_1}$

Numerical

Q21 An unknown quantity x is measured using an experiment by measuring a length ℓ(in cm) from scale having least count of 1cm. Formula used is x = R $\frac{\ell}{100-\ell}$. R is known accurately. Find the percentage error in measurement of 'x' for ℓ = 50 cm.

Q22 When equal volumes of two substance are mixed, the specific gravity of the mixture is 8, when equal weights of the same substance are mixed, the specific gravity of the mixture is 6. Find the ratio of specific gravity of denser substance to lighter substance.

Q23 A particle is displaced from point A(0,0,0) to D(2,0,2) via point B(3,4,6) and C (6,9,4). If two constant forces $\overrightarrow{F_1} = (\hat{i} + \hat{j})n$ and $\overrightarrow{F_2} = (3\hat{i} + \hat{4}k)N$ apart from other forces were acting on the particle during the whole journey then find the total work (in Joule) done by these two forces on the particle.

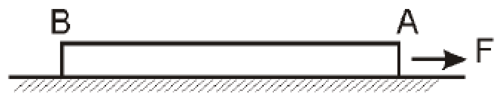
Q24 Two opposite forces $F_1 = 120N$ and $F_2 = 80N$ act on an heavy elastic plank of modulus of elasticity
$y = 2\times10^{11}\ N/m^2$ and length $L = 1m$ placed over a smooth horizontal surface. The cross-sectional area of plank is $A = 0.5m^2$. If the change in the length of plank is $x \times 10^{-9}$ m, then find x ?

Q25 When an air bubble rises from the bottom to the surface of a lake, its radius becomes double. The depth of the lake is d and the atmospheric pressure is equal to the pressure due to column of water 10m high. Assume constant temperature and neglect the effect of surface tension and viscosity. Find the value of $\frac{d}{10}$.

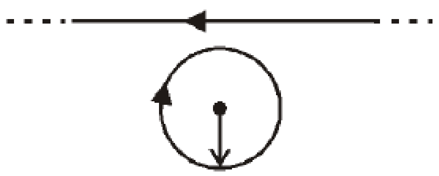
Q26 The density of a material is SI units is 128 kg m^{-3}. In certain units in which the unit of length is 25 cm and the unit of mass is 50 g, the numerical value of density of the material is

Q27 A plane is flying with an air speed 10 m/s toward north but suddenly encounters a wind of 10 m/s at 30° north of east. If angle made by new direction of velocity of plane with respect to ground from north direction is $\frac{\pi}{n}$ then value of n is :

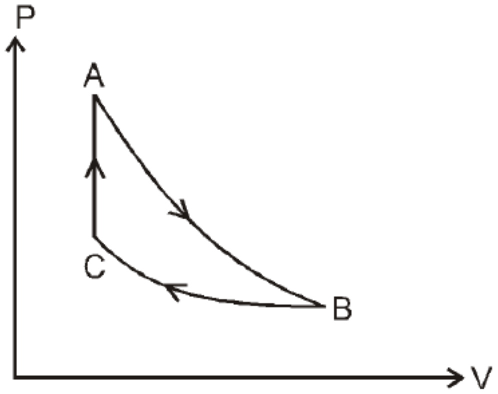
Q28 A uniform rod is kept at smooth horizontal surface, a constant force is applied on the rod in horizontal direction at end 'A'. Find the ratio of energy stored per unit volume at end A to the energy stored per unit volume in the middle of rod.



Q29 The radius of a coil of wire with N turns is 0.22 m, and 3.5 A current flows clockwise in the coil as shown. A long straight wire carrying a current 54A toward the left is located 0.05 m from the edge of the coil. The magnetic field at the centre of the coil is zero tesla. The number of turns N in the coil are:



Q30 A ideal gas undergoes a cyclic process, in which one process is isochoric, one process is isothermal and one process is adiabatic. During the isothermal process, 40 J heat is released by the gas, and during the isochoric process, 80 J heat is absorbed by the gas. If work done by the gas during adiabatic process is W_1 and during isothermal process is W_2 then $\frac{|W_1|}{|W_2|}$ will be equal to :



Chemistry

Single Choice Question

Q31 A compound 'X' on treatment with Br_2/NaOH, provided C_3H_9N, which gives positive carbylamine test. Compound 'X' is :

a) $CH_3CH_2CH_2CONH_2$

b) $CH_3COCH_2NHCH_3$

c) $CH_3CH_2COCH_2NH_2$

d) $CH_3CON(CH_3)_2$

Q32 The standard reaction Gibbs energy for a chemical reaction at an absolute temperature T is given by $\Delta G^{o} = A - BT$

Where A and B are non-zero constants. Which of the following is true about this reaction?

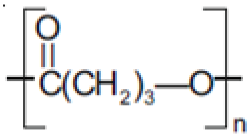
a) Exothermic if B < 0

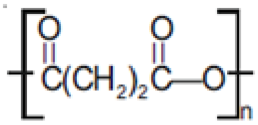
b) Endothermic if A > 0

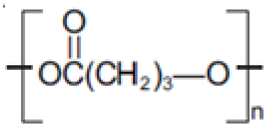
c) Endothermic if A < 0 and B > 0

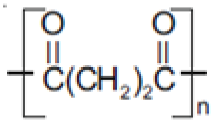
d) Exothermic if A > 0 and B < 0

Q33 The homopolymer formed from 4-hydroxy-butanoic acids is :

a) 

b) 

c) 

d) 

Q34 The correct match between item (I) and item (II) is:

Item –I	Item - II
(A) Norethindrone	(P) Anti-biotic
(B) Ofloxacin	(Q) Anti-fertility
(C) Equanil	(R) Hypertension
	(S) Analgesics

a) (A) →(R) ; (B) → (P) ; (C) →(R)

b) (A) → (R) ; (B) → (P) ; (C) → (S)

c) (A) → (Q) ; (B) → (P) ; (C) → (R)

d) (A) → (Q) ; (B) → (R) ; (C) → (S)

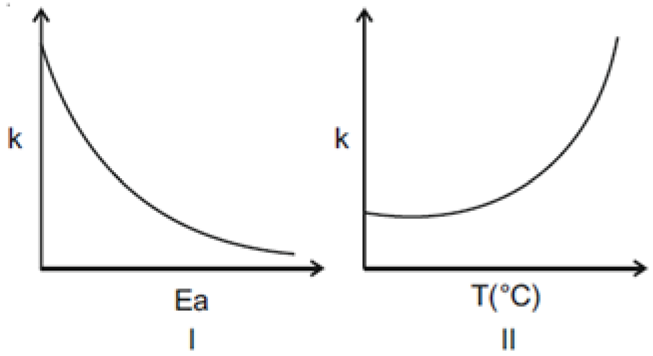
Q35 In the cell

Pt(s)|H_2(g,1bar)|HCl(aq)|AgCl(s)|Ag(s)|Pt(s)the cell potential is 0.92 V when a 10^{-6} molal HCl solution is used. The standard electrode potential of (AgCl/Ag,Cl...) electrode is:

$$\left\{Given, \frac{2.303RT}{F} = 0.06V\ at\ 298K\right\}$$

a) 0.20 V
b) 0.40 V
c) 0.76 V
d) 0.94 V

Q36 Consider the given plots for a reaction obeying Arrhenius equation (0°C < T < 300°C) : (k and E_a are rate constant and activation energy, respectively)



Choose the correct option:

a) I is wrong but II is right
b) Both I and II are correct
c) Both I and II are wrong
d) I is right but II is wrong

Q37 Wilkinson catalyst is (Et = C_2H_5)

a) $[(Ph_3P)_3IrCl]$
b) $[(Ph_3P)_3RhCl]$
c) $[(Et_3P)_3IrCl]$
d) $[(Et_3P)_3RhCl]$

Q38 For a first order reaction, the value of rate constant for the reaction

$A_{(gas)} \longrightarrow 2B_{(gas)} + C_{(solid)}$

(If P_o is initial pressure and P_t is pressure of mixture at time t)

a) $\frac{1}{t}ln\left(\frac{P_0}{P_0-P_t}\right)$
b) $\frac{1}{t}ln\left(\frac{P_0}{2P_0-P_t}\right)$
c) $\frac{1}{t}ln\left(\frac{2P_0}{3P_0-P_t}\right)$
d) $\frac{1}{t}ln\left(\frac{2P_0}{2P_0-P_t}\right)$

Q39 Correct name is written against which of the following chemical formulae ?

a) Mg_3N_2 Magnesium nitrite
b) $Ni(HSO_3)_2$ Nickel (II) sulphite
c) $Sr(PO_3)_2$ Stronsium phosphate
d) CsOBr Cesium hypobromite

Q40 A brown ring is formed in the ring test for NO_3^- ion. It is due to the formation of

a) $[Fe(H_2O)_5(NO)]^{2+}$
b) $FeSO_4 \cdot NO_2$
c) $[Fe(H_2O)_4(NO)_2]^{2+}$
d) $FeSO_4 \cdot HNO_3$

Q41 White phosphorus when boiled with strong solution of caustic soda produces.

a) Phosphine
b) Phosphoric acid
c) Phosphorus Acid
d) No reaction

Q42 S^{2-} and SO_3^{2-} ions can be distinguished by using–

a) $(CH_3COO)_2$ Pb

b) Na_2 [Fe $(CN)_5$ NO]

c) Both (1) and (2)

d) none of these

Q43 $XeF_6 + H_2O \longrightarrow A + B$

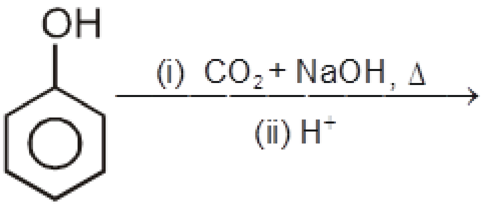
Compound A & B are respectively ;

a) XeO_4, HF

b) Xe, F_2

c) XeF_2, Xe

d) XeO_3, HF

Q44 

(P > Q) % yield

Select the correct option :

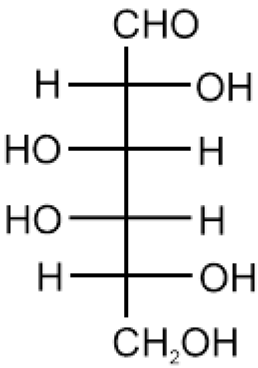
a) Boiling point : (P > Q)

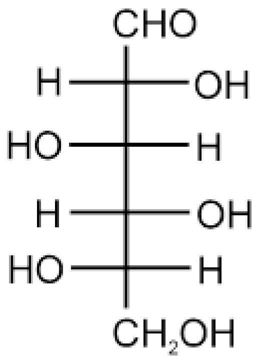
b) Melting point : (Q > P)

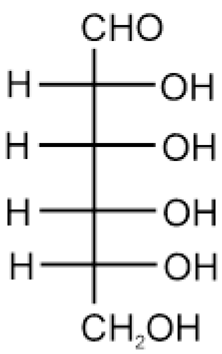
c) Water solubility : (P > Q)

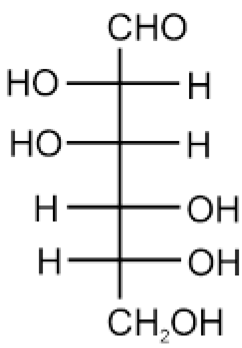
d) Acid Strength : (Q > P)

Q45 Which of the following is a C-4 epimer of D-glucose.

a) 

b) 

c) 

d) 

Q46 D-glucose and D-fructose can be differentiate by :

a) Fehling's solution

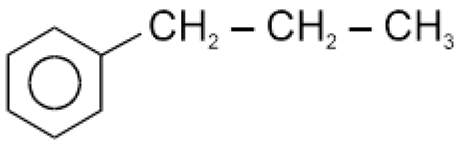
b) Tollen's reagent

c) Ph – NH – NH_2

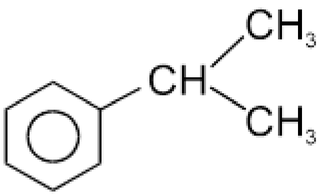
d) Br_2/H_2O

Q47


What is Q ?

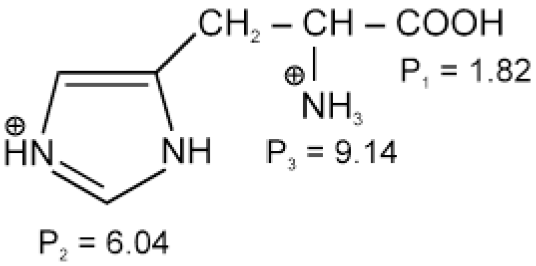
a) 

b) $CH_3-CH_2-\overset{O}{\overset{||}{C}}-H$

c) 

d) $CH_3-\overset{O}{\overset{||}{C}}-CH_3$

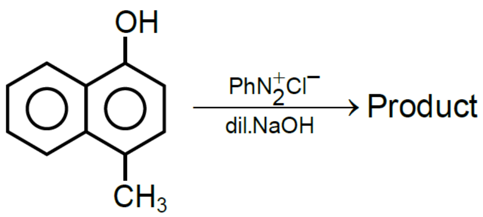
Q48 Observe the pKa values (P_1-P_3) of the given amino acid.

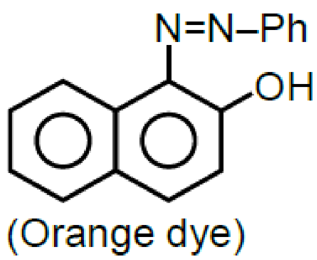


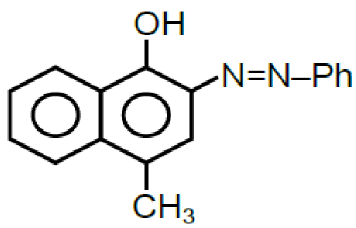
Which form of this amino acid will exist in aqueous solution at pH = 8 ?

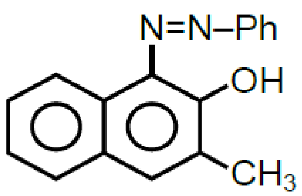
a) as dication b) as monocation c) as zwitter ion d) as monoanion

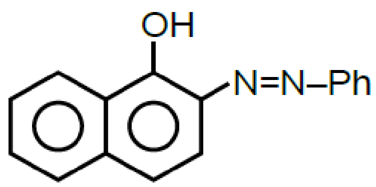
Q49 What is the product in the following reaction?



a) 

b) 

c) 

d) 

Q50 In the reaction,

$$C_6H_5NH_2 \xrightarrow[273\ K]{NaNO_2/HBF_4} (A) \xrightarrow{\Delta} C_6H_5F:$$

The compound (A) is known as :

a) m-nitro fluorobenzene
b) a mixture of fluoroanilines
c) benzene diazonium fluoride
d) benzene diazonium tetrafluoroborate

Numerical

Q51 In the reaction of oxalate with permanganate in acidic medium, the number of electrons involved in producing one molecule of CO_2 is

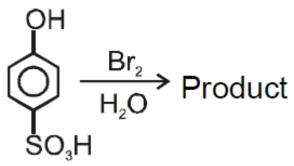
Q52 In the ionic equation

$2KBrO_3 + 12H^+ + 10e^- \longrightarrow Br_2 + 6H_2O + 2K^+$,

the equivalent weight of $KBrO_3$ will be :

(Atomic weight : Br = 80, O = 16, K = 39)

Q53



Number of bromine molecules is required for one molecule of reactant in this reaction ?

Q54 How many of the following natural α-amino acids are essential α-amino acids?
Glycine, Valine, Leucine, Methionine, Serine, Cysteine, Proline, Phenylalanine, Histidine, Aspartic acid

Q55 The pH of $\frac{M}{100}$ aqueous of solution of monobasic organic acid is 4 at 300K. Find pKb of corresponding conjugated base of organic acid at 300K.

Q56 The coordination number of Th in $K_4[Th(C_2O_4)_4(OH_2)_2]$ is

$\left(C_2O_4^{2-} = Oxalato\right)$

Q57 How many of the following are paramagnetic:

C_2, B_2, O_2^{-2} , BN, Cl_2^+ & NO^+.

Q58 At 20°C, two balloons both have equal volume and porosity are filled to a pressure of 2 atm. One with 14kg N_2 and other with 1kg of H_2. The N_2 balloon leaks to a pressure of 0.5 atm in 1 hr. How long (in minute) (...........) will it take for H_2 balloon to reach a pressure of 0.5 atm.

Q59 One mole of benzene liquid is converted into vapour at its boiling point (80°C). Find out change in internal energy ΔU for this process (in KJ).
(given $\rightarrow \Delta Hv = 3.0$ KJ/mol, report your answer in the form of nearest integer)

Q60 In a given solution Zn^{2+} is present at the concentration of 10^{-2} (M). The given solution is saturated H_2S. To obtain the precipitation of ZnS, what should be the minimum pH required $\times$ 10 in nearest possible integers?
Given: In aqueous solution ionic product of H_2S is 10^{-22} and Ksp of ZnS = 10^{-21}.

Mathematics

Single Choice Question

Q61 Let f :(–1, 1) → R be a function defined by f (x) = max $\left\{-|x|, -\sqrt{1-x^2}\right\}$. If K be the set of all points at which f is not differentiable, then K has exactly

a) Three elements **b)** Two elements **c)** One element **d)** Five elements

Q62 If $\frac{dy}{dx} + \frac{3}{cos^2 x} y = \frac{1}{\cos^2 x}, x \in \left\{\frac{-\pi}{3}, \frac{\pi}{3}\right\}$ and y $\left(\frac{\pi}{4}\right) = \frac{4}{3}$, they $\left(-\frac{\pi}{4}\right)$ equals

a) $\frac{1}{3} + e^6$ **b)** $\frac{1}{3} + e^3$ **c)** $\frac{1}{3}$ **d)** $\frac{3}{2}\sqrt{21}$

Q63 Let f(x) = $x^2 + \frac{1}{x^2}$ and g(x) = $x - \frac{1}{x}$, x ∈ R – {–1, 0, 1}. If h(x) = $\frac{f(x)}{g(x)}$, then the local minimum value of h(x) is :

a) $-2\sqrt{2}$ **b)** $2\sqrt{2}$ **c)** 3 **d)** –3

Q64 If $\int \frac{x+1}{\sqrt{2x-1}} dx = f(x)\sqrt{2x-1} + C$, where C is a constant of integration, then f(x) is equal to :

a) $\frac{1}{3}(x+1)$ **b)** $\frac{1}{3}(x+4)$ **c)** $\frac{2}{3}(x-4)$ **d)** $\frac{2}{3}(x+2)$

Q65 Let z be a complex number such that |z| + z = 3 + i $\left(where\ i = \sqrt{-1}\right)$. Then |z| is equal to :

a) $\frac{\sqrt{41}}{4}$ **b)** $\frac{5}{4}$ **c)** $\frac{5}{3}$ **d)** $\frac{\sqrt{34}}{3}$

Q66 If $\sum_{i=1}^{9}(x_i - 5) = 9$ and $\sum_{i=1}^{9}(x_i - 5)^2 = 45$, then the standard deviation of the 9 items x_1, x_2, ….., x_9 is :

a) 2 **b)** 3 **c)** 9 **d)** 4

Q67 If $(\cot^{-1} x)^2 - 3(\cot^{-1} x) + 2 > 0$, then x lies in

a) (cot 2, cot 1) **b)** $(-\infty, cot\ 2) \cup (cot\ 1, \infty)$

c) $(cot\ 1, \infty)$ **d)** $(-\infty, cot\ 1) \cup (cot\ 2, \infty)$

Q68 Let a_1, a_2, a_3, …… be terms of an A.P. If $\frac{a_1+a_2+....+a_p}{a_1+a_2+....+a_q} = \frac{p^2}{q^2}, p \neq q$, then $\frac{a^6}{a^{21}}$ equals-

a) $\frac{41}{11}$ **b)** $\frac{7}{2}$ **c)** $\frac{2}{7}$ **d)** $\frac{11}{41}$

Q69 Let S be the set of all triangles in the xy-plane, each having one vertex at the origin and the other two vertices lie on coordinate axes with integral coordinates. If each triangle in S has area 50 sq. units, then the number of elements in the set S is:

a) 9 b) 32 c) 36 d) 18

Q70 If $\begin{vmatrix} x-4 & 2x & 2x \\ 2x & x-4 & 2x \\ 2x & 2x & x-4 \end{vmatrix} = (A + Bx)(x - A)^2$ then the ordered pair (A, B) is equal to :

a) (–4, 5) b) (4, 5) c) (–4, –5) d) (–4, 3)

Q71 The direction cosines of two lines are related by $\ell + m + n = 0$ and $a\ell^2 + bm^2 + cn^2 = 0$. The lines are parallel if -

a) $a + b + c = 0$

b) $a^{-1} + b^{-1} + c^{-1} = 0$

c) $a = b = c$

d) None of these

Q72 In a triangle ABC if BC =1 and AC = 2. Then the maximum possible value of angle A is-

a) $\frac{\pi}{6}$ b) $\frac{\pi}{4}$ c) $\frac{\pi}{3}$ d) $\frac{\pi}{2}$

Q73 Probability that a randomly drawn card from a pack of playing cards is either a spade or a queen is $\frac{|a-3|}{13}$. Then -

a) a = 0 b) a = 7 c) a = 4 d) a = 5

Q74 Maximum distance of any point on the circle $(x-7)^2 + (y - 2\sqrt{30})^2 = 16$ from the centre of the ellipse $25x^2 + 16y^2 = 400$ is

a) $\frac{1-\sqrt{3}}{2}$ b) $\frac{3}{2}$ c) 3 d) None of these

Q75 If $xy = m^2 - 9$ be a rectangular hyperbola whose branches lie only in the second and fourth quadrant, then -

a) $|m| \geq 3$ b) $|m| < 3$ c) $m \in R - \{|m|\}$ d) None of these

Q76 Two vertical poles of heights, 20 m and 80 m stand apart on a horizontal plane. The height (in meters) of the point of intersection of the lines joining the top of each pole to the foot of the other, from this horizontal plane is :

a) 16 b) 18 c) 15 d) 12

Q77 If θ is the angle (semi-vertical) of a cone of maximum volume and given slant height, then tan θ is given by

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

Q78 The equation $2\cos^2\left(\frac{x}{2}\right)\ \sin^2 x = x^2 + x^{-2}$, $x \le \frac{\pi}{9}$ has

a) no real solution
b) one real solution
c) more than one real solution
d) None of the above

Q79 The maximum value of $3\cos\theta + 5\sin\left(\theta - \frac{\pi}{6}\right)$ for any real value of θ is

a) $\sqrt{34}$
b) $\sqrt{19}$
c) $\frac{\sqrt{79}}{2}$
d) $\sqrt{31}$

Q80 For all $x \in R$, if $mx^2 - 9mx + 5m + 1 > 0$, then m lies in the interval -

a) (–4/61, 0)
b) (0, 4/61)
c) (4/61, 61/4)
d) (–61/4,0]

Numerical

Q81 If the area of the triangle whose one vertex is at the vertex of the parabola, $y^2 + 4(x - a^2) = 0$ and the other two vertices are the points of intersection of the parabola and y-axis, is 250 sq. units, then a value of 'a' is :

Q82 If $a + b + c = 0$, $a^2 + b^2 + c^2 = 4$,
then $a^4 + b^4 + c^4$ is

Q83 $\int_0^{\pi/4} = (cos2\theta)^{3/2}\ cos\theta d\theta = \frac{a\pi}{b\sqrt{2}}$, where a & b are co-prime then find sum of digits of 3a + b.

Q84 If the area bounded by the curves $y = \cos^{-1}x$; $y = \sin^{-1}x$ and $y = -\pi x^3$; where $-1 \le x \le 1$, is A sq. units, then [1] is ....
Where [1] represents integral value of A.

Q85 Let x.y.z = 315 where $x, y, z \in N$. Then find number of ordered triplets (x, y, z) satisfying the given equation.

Q86 If the area of an equilateral triangle inscribed in the circle, $x^2 + y^2 + 10x + 12y + c = 0$ is $27\sqrt{3}$ sq. units

Q87 The positive value of λ for which the co-efficient of x^2 in the expression $x^2\left(\sqrt{x} + \frac{\lambda}{x^2}\right)^{10}$ is 720, is

Q88 The number of solution of $\log_{\sin x} 2^{\tan x} > 0$ in the interval $\left(0, \frac{\pi}{2}\right)$ is -

Q89 Two circles with equal radii are intersecting at the points (0, 1) and (0, –1). The tangent at the point (0, 1) to one of the circles passes through the centre of the other circle. Then the distance between the centres of these circles is:

Q90 The number of solution of equation $\pi \cot^{-1}(x-1) + (\pi - 1)\cot^{-1} x = 2\pi - 1$

Answer Key

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	**C**	**D**	**D**	**B**	**A**	**D**	**D**	**A**	**C**	**D**
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	**C**	**A**	**B**	**C**	**A**	**A**	**C**	**C**	**B**	**A**
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	**4**	**3**	**16**	**1**	**7**	**40**	**6**	**4**	**4**	**2**
Que.	31	32	33	34	35	36	37	38	39	40
Ans.	**A**	**B**	**A**	**C**	**A**	**B**	**B**	**B**	**D**	**A**
Que.	41	42	43	44	45	46	47	48	49	50
Ans.	**A**	**C**	**D**	**B**	**A**	**D**	**D**	**C**	**B**	**D**
Que.	51	52	53	54	55	56	57	58	59	60
Ans.	**1**	**33**	**3**	**5**	**8**	**10**	**2**	**16**	**0**	**15**
Que.	61	62	63	64	65	66	67	68	69	70
Ans.	**A**	**A**	**B**	**B**	**C**	**A**	**B**	**D**	**C**	**A**
Que.	71	72	73	74	75	76	77	78	79	80
Ans.	**B**	**A**	**B**	**D**	**B**	**A**	**C**	**A**	**B**	**B**
Que.	81	82	83	84	85	86	87	88	89	90
Ans.	**5**	**8**	**7**	**1**	**54**	**25**	**4**	**0**	**2**	**1**