FINAL JEE-MAIN EXAM, 2026

Held On 21 January, Wednesday 2026 | **TIME : 9 : 00 AM to 12 : 00 PM**

MATHEMATICS

SECTION -A

1. If the domain of the function $f(x)=\cos^{-1}\left(\frac{2x-5}{11-3x}\right)+\sin^{-1}\left(2x^2-3x+1\right)$ is the interval $[\alpha,\beta]$, then $\alpha+2\beta$ is equal to :

(1) 1 (2) 3 (3) 5 (4) 2

2. The area of the region, inside the ellipse $x^2+4y^2=4$ and outside the region bounded by the curves $y=|x|-1$ and $y=1-|x|$, is :

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

3. The number of relations, defined on the set $\{a,b,c,d\}$, which are both reflexive and symmetric, is equal to:

(1) 256 (2) 16 (3) 1024 (4) 64

4. Let a point A lie between the parallel lines L_1 and L_2 such that its distances from L_1 and L_2 are 6 and 3 units, respectively. Then the area (in sq. units) of the equilateral triangle ABC, where the points B and C lie on the lines L_1 and L_2, respectively, is :

(1) $15\sqrt{6}$ (2) 27 (3) $21\sqrt{3}$ (4) $12\sqrt{2}$

5. Let $\vec{a}=-\hat{i}+2\hat{j}+2\hat{k}, \vec{b}=8\hat{i}+7\hat{j}-3\hat{k}$ and $\vec{c}$ be a vector such that $\vec{a}\times\vec{c}=\vec{b}$. If $\vec{c}\cdot(\hat{i}+\hat{j}+\hat{k})=4$, then $|\vec{a}+\vec{c}|^2$ is equal to :

(1) 33 (2) 30 (3) 35 (4) 27

6. Let $a_1,a_2,a_3,\ldots$ be a G.P. of increasing positive terms such that $a_2\cdot a_3\cdot a_4=64$ and $a_1+a_3+a_5=\frac{813}{7}$.

Then $a_3+a_5+a_7$ is equal to:

(1) 3256 (2) 3252 (3) 3244 (4) 3248

7. Let $\vec{c}$ and $\vec{d}$ be vectors such that $|\vec{c}+\vec{d}|=\sqrt{29}$ and $\vec{c}\times(2\hat{i}+3\hat{j}+4\hat{k})=(2\hat{i}+3\hat{j}+4\hat{k})\times\vec{d}$. If $\lambda_1,\lambda_2\,(\lambda_1>\lambda_2)$ are the possible values of $(\vec{c}+\vec{d})\cdot(-7\hat{i}+2\hat{j}+3\hat{k})$, then the equation $K^2x^2+\left(K^2-5K+\lambda_1\right)xy+\left(3K+\frac{\lambda_2}{2}\right)y^2-8x+12y+\lambda_2=0$ represents a circle, for K equal to:

(1) 4 (2) 1 (3) -1 (4) 2

8. Let $y = y(x)$ be the solution curve of the differential equation $\left(1+x^2\right)dy+\left(y-\tan^{-1}x\right)dx=0, y(0)=1$.

Then the value of $y(1)$ is :

(1) $\frac{2}{e^{\pi/4}}+\frac{\pi}{4}-1$ (2) $\frac{2}{e^{\pi/4}}-\frac{\pi}{4}-1$ (3) $\frac{4}{e^{\pi/4}}+\frac{\pi}{2}-1$ (4) $\frac{4}{e^{\pi/4}}-\frac{\pi}{2}-1$

9. The number of strictly increasing functions f from the set $\{1,2,3,4,5,6\}$ to the set $\{1,2,3,....,9\}$ such that $f(i)\neq i$ for $1\le i\le 6$, is equal to :

(1) 21 (2) 27 (3) 22 (4) 28

10. Let $f:\mathbf{R}\to(0,\infty)$ be a twice differentiable function such that $f(3)=18, f'(3)=0$ and $f''(3)=4$.

Then $\lim\limits_{x\to1}\left(\log_e\left(\frac{f(2+x)}{f(3)}\right)^{\frac{18}{(x-1)^2}}\right)$ is equal to :

(1) 1 (2) 9 (3) 2 (4) 18

11. Let the foci of a hyperbola coincide with the foci of the ellipse $\frac{x^2}{36}+\frac{y^2}{16}=1$. If the eccentricity of the hyperbola is 5 , then the length of its latus rectum is :

(1) 12 (2) 16 (3) $\frac{96}{\sqrt{5}}$ (4) $24\sqrt{5}$

12. The value of $\int_{-\pi/6}^{\pi/6}\left(\frac{\pi+4x^{11}}{1-\sin(|x|+\pi/6)}\right)dx$ is equal to:

(1) 2π (2) 4π (3) 8π (4) 6π

13. Let the mean and variance of 7 observations $2,4,10,x,12,14,y, x>y$, be 8 and 16 respectively. Two numbers are chosen from $\{1,2,3,x-4,y,5\}$ one after another without replacement, then the probability, that the smaller number among the two chosen numbers is less than 4 , is :

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

14. Let (α,β,γ) be the co-ordinates of the foot of the perpendicular drawn from the point $(5,4,2)$ on the line $\vec{r}=(-\hat{i}+3\hat{j}+\hat{k})+\lambda(2\hat{i}+3\hat{j}-\hat{k})$.

Then the length of the projection of the vector $\alpha\hat{i}+\beta\hat{j}+\gamma\hat{k}$ on the vector $6\hat{i}+2\hat{j}+3\hat{k}$ is :

(1) $\frac{15}{7}$ (2) 4 (3) $\frac{18}{7}$ (4) 3

15. Let PQ and MN be two straight lines touching the circle $x^2+y^2-4x-6y-3=0$ at the points A and B respectively. Let O be the centre of the circle and $\angle AOB=\pi/3$. Then the locus of the point of intersection of the lines PQ and MN is :

(1) $3\left(x^2+y^2\right)-18x-12y+25=0$ (2) $x^2+y^2-12x-18y-25=0$

(3) $x^2+y^2-18x-12y-25=0$ (4) $3\left(x^2+y^2\right)-12x-18y-25=0$

16. If the coefficient of x in the expansion of $\left(ax^2+bx+c\right)(1-2x)^{26}$ is -56 and the coefficients of x^2 and x^3 are both zero, then $a+b+c$ is equal to:

(1) 1300 (2) 1500 (3) 1403 (4) 1483

17. If $x^2+x+1=0$, then the value of $\left(x+\frac{1}{x}\right)^4+\left(x^2+\frac{1}{x^2}\right)^4+\left(x^3+\frac{1}{x^3}\right)^4+....+\left(x^{25}+\frac{1}{x^{25}}\right)^4$ is:

(1) 128 (2) 162 (3) 175 (4) 145

18. The value of $\text{cosec}10^o-\sqrt{3}\sec 10^o$ is equal to :

(1) 4 (2) 2 (3) 8 (4) 6

19. The sum of all the roots of the equation $(x-1)^2-5|x-1|+6=0$, is :

(1) 4 (2) 3 (3) 1 (4) 5

20. Let O be the vertex of the parabola $x^2=4y$ and Q be any point on it. Let the locus of the point P, which divides the line segment OQ internally in the ratio 2 : 3 be the conic C. Then the equation of the chord of C, which is bisected at the point $(1,2)$, is :

(1) $5x-y-3=0$ (2) $4x-5y+6=0$

(3) $x-2y+3=0$ (4) $5x-4y+3=0$

SECTION -B

21. Let $f:\mathbf{R}\to\mathbf{R}$ be a twice differentiable function such that the quadratic equation $f(x)m^2-2f'(x)m+f''(x)=0$ in m, has two equal roots for every $x\in\mathbf{R}$. If $f(0)=1, f'(0)=2$, and (α,β) is the largest interval in which the function $f\left(\log_e x-x\right)$ is increasing, then $\alpha+\beta$ is equal to _____ .

22. Let $a_1=1$ and for $n\geq 1, a_{n+1}=\frac{1}{2}a_n+\frac{n^2-2n-1}{n^2(n+1)^2}$. Then $\left|\sum_{n=1}^{\infty}\left(a_n-\frac{2}{n^2}\right)\right|$ is equal to

23. Let $S=\{(m,n):m,n\in\{1,2,3,.....,50\}\}$. If the number of elements (m, n) in S such that 6^m+9^n is a multiple of 5 is p and the number of elements (m,n) in S such that $m+n$ is a square of a prime number is q, then $p+q$ is equal to _____.

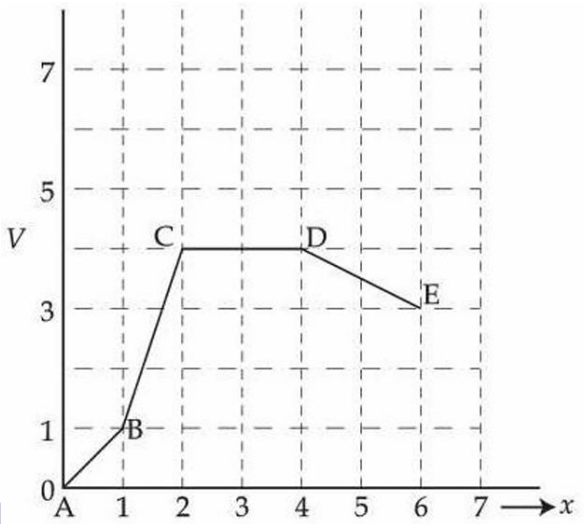
24. For some $\alpha,\beta\in\mathbf{R}$, let $A=\begin{bmatrix}\alpha & 2\\ 1 & 2\end{bmatrix}$ and $B=\begin{bmatrix}1 & 1\\ 1 & \beta\end{bmatrix}$ be such that $A^2-4A+2I=B^2-3B+I=O$. Then $\left(\det(\text{adj})\left(A^3-B^3\right)\right)^2$ is equal to _____ .

25. $6\int_0^{\pi}|(\sin 3x+\sin 2x+\sin x)|\,dx$ is equal to ____.

PHYSICS

SECTION -A

26. Potential energy (V) versus distance (x) is given by the graph. Rank various regions as per the magnitudes of the force (F) acting on a particle from high to low.



(1) $F_{BC} > F_{CD} > F_{DE} > F_{AB}$ (2) $F_{CD} > F_{AB} > F_{BC} > F_{DE}$

(3) $F_{CD} > F_{DE} > F_{AB} > F_{BC}$ (4) $F_{BC} > F_{AB} > F_{DE} > F_{CD}$

27. A gas based geyser heats water flowing at the rate of 5.0 litres per minute from 27ºC to 87ºC. The rate of consumption of the gas is_____ g/s.

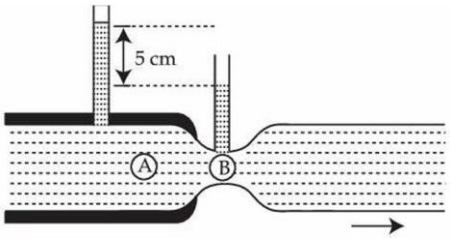
(Take heat of combustion of gas = 5.0×10^4 J/g) specific heat capacity of water = 4200J/kg.ºC

(1) 2.1 (2) 4.2 (3) 0.42 (4) 0.21

28. A conducting circular loop of area 1.0m^2 is placed perpendicular to a magnetic field which varies as B = sin(100t) Tesla. If the resistance of the loop is 100Ω, then the average thermal energy dissipated in the loop in one period is____J.

(1) $\frac{\pi}{2}$ (2) 2π (3) π (4) π^2

29. Water flows through a horizontal tube as shown in the figure. The difference in height between the water columns in vertical tubes is 5 cm and the area of cross-sections at A and B are 6cm^2 and 3cm^2 respectively. The rate of flow will be_____ cm^3/s. (take $g = 10\,\text{m/s}^2$)



(1) $\frac{200}{\sqrt{3}}$ (2) $200\sqrt{6}$ (3) $200\sqrt{3}$ (4) $100\sqrt{3}$

30. In an experiment the values of two spring constants were measured as $k_1 = (10 \pm 0.2)\text{N/m}$ and $k_2 = (20 \pm 0.3)\text{N/m}$. If these springs are connected in parallel, then the percentage error in equivalent spring constant is :

(1) 2.67% (2) 2.33% (3) 1.33% (4) 1.67%

31. A 4 kg mass moves under the influence of a force $\vec{F} = \left(4t^3\hat{i} - 3t\hat{j}\right)\text{N}$ where t is the time in second. If mass starts from origin at t = 0, the velocity and position after t = 2s will be:

(1) $\vec{v} = 3\hat{i} + \frac{3}{2}\hat{j}, \quad \vec{r} = \frac{6}{5}\hat{i} + \hat{j}$

(2) $\vec{v} = 4\hat{i} - \frac{3}{2}\hat{j}, \quad \vec{r} = \frac{8}{5}\hat{i} - \hat{j}$

(3) $\vec{v} = 4\hat{i} + \frac{5}{2}\hat{j}, \quad \vec{r} = \frac{8}{5}\hat{i} + 2\hat{j}$

(4) $\vec{v} = 4\hat{i} - \frac{3}{2}\hat{j}, \quad \vec{r} = \frac{6}{5}\hat{i} - \hat{j}$

32. Consider a modified Bernoulli equation.

$$\left(P + \frac{A}{Bt^2}\right) + \rho g(h + Bt) + \frac{1}{2}\rho V^2 = \text{ constant}$$

If t has the dimension of time then the dimensions of A and B are_____respectively.

(1) $\left[\text{ML}^0\text{T}^{-1}\right]$ and $\left[\text{M}^0\text{LT}\right]$

(2) $\left[\text{ML}^0\text{T}^{-1}\right]$ and $\left[\text{M}^0\text{LT}^{-1}\right]$

(3) $\left[\text{ML}^0\text{T}^{-2}\right]$ and $\left[\text{M}^0\text{LT}^{-2}\right]$

(4) $\left[\text{ML}^0\text{T}^{-2}\right]$ and $\left[\text{M}^0\text{LT}^{-1}\right]$

33. A current carrying solenoid is placed vertically and a particle of mass m with charge Q is released from rest. The particle moves along the axis of solenoid. If g is acceleration due to gravity then the acceleration (a) of the charged particle will satisfy :

(1) a = g (2) a > g (3) a = 0 (4) 0 < a < g

34. A parallel plate capacitor has capacitance C, when there is vacuum within the parallel plates. A sheet having thickness $\left(\frac{1}{3}\right)^{\text{rd}}$ of the separation between the plates and relative permittivity K is introduced between the plates. The new capacitance of the system is :

(1) $\frac{3KC}{2K+1}$ (2) $\frac{CK}{2+K}$ (3) $\frac{3CK^2}{(2K+1)^2}$ (4) $\frac{4KC}{3K-1}$

35. The electric field in a plane electromagnetic wave is given by :

$$E_y = 69\sin\left[0.6\times10^3 x - 1.8\times10^{11}t\right]\text{V/m}.$$

The expression for magnetic field associated with this electromagnetic wave is _____ T.

(1) $B_z = 2.3\times10^{-7}\sin\left[0.6\times10^3 x - 1.8\times10^{11}t\right]$

(2) $B_z = 2.3\times10^{-7}\sin\left[0.6\times10^3 x + 1.8\times10^{11}t\right]$

(3) $B_y = 69\sin\left[0.6\times10^3 x + 1.8\times10^{11}t\right]$

(4) $B_y = 2.3\times10^{-7}\sin\left[0.6\times10^3 x - 1.8\times10^{11}t\right]$

36. In a double slit experiment the distance between the slits is 0.1 cm and the screen is placed at 50 cm from the slits plane. When one slit is covered with a transparent sheet having thickness t and refractive index n(= 1.5), the central fringe shifts by 0.2 cm . The value of t is _____ cm.

(1) 8×10^{-4} (2) 6.0×10^{-3} (3) 5.6×10^{-4} (4) 5.0×10^{-3}

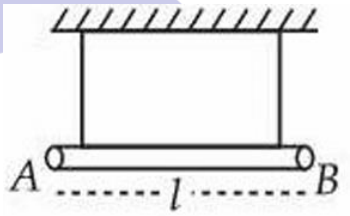
37. A light wave described by $E=60\left[\sin\left(3\times10^{15}\right)t+\sin\left(12\times10^{15}\right)t\right]$ (in SI units) falls on a metal surface of work function 2.8 eV . The maximum kinetic energy of ejected photoelectron is (approximately) _____ eV. $\left(h=6.6\times10^{-34}\text{ J.s. and }e=1.6\times10^{-19}\text{C}\right)$

(1) 5.1 (2) 3.8 (3) 6.0 (4) 7.8

38. If an alpha particle with energy 7.7 MeV is bombarded on a thin gold foil, the closest distance from nucleus it can reach is _____ m. (Atomic number of gold = 79 and $\frac{1}{4\pi\in_o}=9\times10^9$ in SI units)

(1) 2.95×10^{-14} (2) 2.95×10^{-16} (3) 3.85×10^{-16} (4) 3.85×10^{-14}

39. A uniform rod of mass m and length l suspended by means of two identical inextensible light strings as shown in figure. Tension in one string immediately after the other string is cut, is ____. (g acceleration due to gravity)

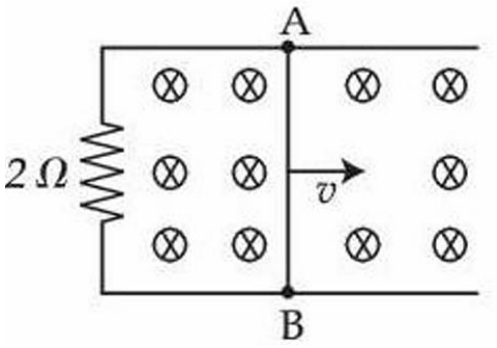


(1) mg/2 (2) mg/4 (3) mg/3 (4) mg

40. An aluminium and steel rods having same lengths and cross-sections are joined to make total length of 120 cm at 30ºC. The coefficient of linear expansion of aluminium and steel are $24\times10^{-6}/^{\circ}\text{C}$ and $1.2\times10^{-5}/^{\circ}\text{C}$, respectively. The length of this composite rod when its temperature is raised to 100ºC, is _____ cm.

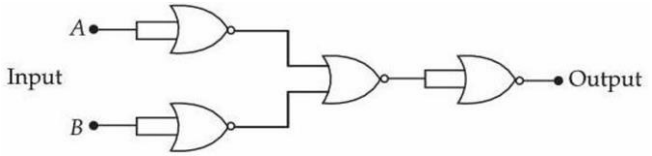
(1) 120.20 (2) 120.15 (3) 120.03 (4) 120.06

41. A 1 m long metal rod AB completes the circuit as shown in figure. The area of circuit is perpendicular to the magnetic field of 0.10 T. If the resistance of the total circuit is 2Ω then the force needed to move the rod towards right with constant speed (v) of 1.5 m/s is _____ N.



(1) 7.5×10^{-2} (2) 5.7×10^{-3} (3) 5.7×10^{-2} (4) 7.5×10^{-3}

42. The given circuit works as :



(1) AND gate (2) NOR gate (3) NAND gate (4) OR gate

43. Two strings (A,B) having linear densities $\mu_A = 2\times10^{-4}\,\text{kg/m}$ and, $\mu_B = 4\times10^{-4}\,\text{kg/m}$ and lengths $L_A = 2.5\text{m}$ and $L_B = 1.5\text{m}$ respectively are joined. Free ends of A and B are tied to two rigid supports C and D, respectively creating a tension of 500 N in the wire. Two identical pulses, sent from C and D ends, take time t_1 and t_2, respectively, to reach the joint. The ratio t_1/t_2 is :

(1) 1.08 (2) 1.90 (3) 1.67 (4) 1.18

44. Initially a satellite of 100 kg is in a circular orbit of radius $1.5R_E$. This satellite can be moved to a circular orbit of radius $3R_E$ by supplying $\alpha\times10^6\,\text{J}$ of energy The value of α is____ .

(Take Radius of Earth $R_E = 6\times10^6\,\text{m}$ and $g = 10\,\text{m/s}^2$)

(1) 150 (2) 500 (3) 100 (4) 1000

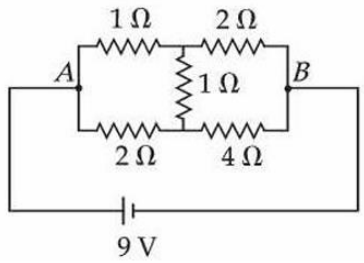
45. A point charge of 10^{-8}C is placed at origin. The work done in moving a point charge $2\mu\text{C}$ from point $A(4,4,2)\text{m}$ to $B(2,2,1)\text{m}$ is _____ J. ($\frac{1}{4\pi\in_0} = 9\times10^9$ in SI units)

(1) 45×10^{-6} (2) 0 (3) 30×10^{-6} (4) 15×10^{-6}

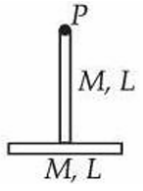
SECTION - B

46. A collimated beam of light of diameter 2 mm is propagating along x-axis. The beam is required to be expanded in a collimated beam of diameter 14 mm using a system of two convex lenses. If first lens has focal length 40 mm, then the focal length of second lens is____mm.

47. The heat generated in 1 minute between points A and B in the given circuit, when a battery of 9 V with internal resistance of 1Ω is connected across these points is____ J.



48. Two identical thin rods of mass M kg and length L m are connected as shown in figure. Moment of inertia of the combined rod system about an axis passing through point P and perpendicular to the plane of the rods is $\left(\frac{x}{12}\text{ML}^2\right)\text{kg m}^2$. The value of x is _____.



49. 10 mole of oxygen is heated at constant volume from 30ºC to 40ºC. The change in the internal energy of the gas is____ cal. (The molecular specific heat of oxygen at constant pressure, $C_P = 7\text{cal}/\text{mol.}^\circ\text{C}$ and $R = 2\text{cal.}/\text{mol.}^\circ\text{C}$.)

50. In a microscope the objective is having focal length f_0 = 2cm and eye-piece is having focal length f_e = 4cm. The tube length is 32 cm. The magnification produced by this microscope for normal adjustment is _____ .

CHEMISTRY

SECTION -A

51. Consider the following reactions.

$$PbCl_2 + K_2CrO_4 \rightarrow A + 2KCl \ (\text{Hot solution})$$

$$A + NaOH \rightleftharpoons B + Na_2CrO_4$$

$$PbSO_4 + 4CH_3COONH_4 \rightarrow (NH_4)_2SO_4 + X$$

In the above reactions, A, B and X are respectively.

(1) $Na_2[Pb(OH)_2], PbCrO_4$ and $(NH_4)_2[Pb(CH_3COO)_4]$

(2) $PbCrO_4, Na_2[Pb(OH)_4]$ and $[Pb(NH_3)_4]SO_4$

(3) $Na_2[Pb(OH)_2], PbCrO_4$ and $[Pb(NH_3)_4]SO_4$

(4) $PbCrO_4, Na_2[Pb(OH)_4]$ and $(NH_4)_2[Pb(CH_3COO)_4]$

52. Which of the following represents the correct trend for the mentioned property ?

A. $F > P > S > B$ - First Ionization Energy

B. $Cl > F > S > P$ - Electron Affinity

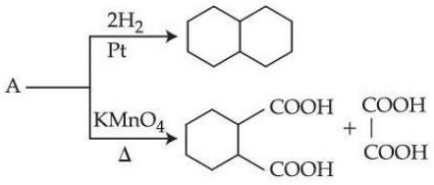
C. $K > Al > Mg > B$ - Metallic character

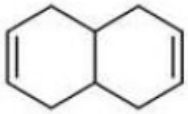
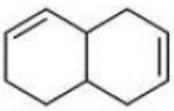
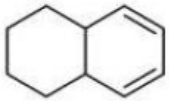
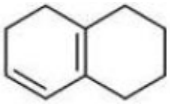
D. $K_2O > Na_2O > MgO > Al_2O_3$ - Basic character

Choose the correct answer from the options given below :

(1) A, B and D only (2) A, B, C and D (3) A and B only (4) B and C only

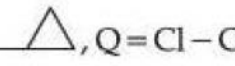
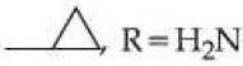
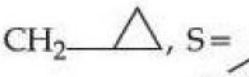
53. Identify A in the following reaction.



(1)  (2)  (3)  (4) 

54. A hydrocarbon ' P'$\left(C_4H_8\right)$ on reaction with HCl gives an optically active compound 'Q' $\left(C_4H_9Cl\right)$ which on reaction with one mole of ammonia gives compound ' R ' $\left(C_4H_{11}N\right)$. ' R' on diazotization followed by hydrolysis gives ' S '. Identify P, Q, R and S .

(1) $P=CH_3-CH_2-CH=CH_2$, $Q=CH_3-CH_2-CH_2-\underset{Cl}{CH_2}$, $R=CH_3-CH_2-CH_2-\underset{CH_3}{NH}$, $S=CH_3-CH_2-\underset{CH_3}{\overset{OH}{CH}}$

(2) $P=CH_3$ , $Q=Cl-CH_2$ , $R=H_2N-CH_2$ , $S=$ 

(3) $P=CH_3-CH=CH-CH_3$, $Q=CH_3-CH_2-\underset{Cl}{CH}-CH_3$, $R=CH_3-CH_2-\underset{NH_2}{CH}-CH_3$, $S=CH_3-CH_2-\underset{OH}{CH}-CH_3$

(4) $P=CH_3-CH=CH-CH_3$, $Q=CH_3-CH_2-CH_2-CH_2-Cl$, $R=CH_3-CH_2-CH_2-\underset{NH_2}{CH_2}$, $S=CH_3-CH_2-\underset{OH}{\overset{CH_2}{CH_2}}$

55. Given below are two statements :

Statement I: The number of pairs among $\left[SiO_2, CO_2\right],\left[SnO, SnO_2\right],\left[PbO, PbO_2\right]$ and $\left[GeO, GeO_2\right]$, which contain oxides that are both amphoteric is 2 .

Statement II: BF_3 is an electron deficient molecule, can act as a Lewis acid, forms adduct with NH_3 and has a trigonal planar geometry.

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

(1) Both Statement I and Statement II are true

(2) Both Statement I and Statement II are false

(3) Statement I is true but Statement II is false

(4) Statement I is false but Statement II is true

56. 80 mL of a hydrocarbon on mixing with 264 mL of oxygen in a closed U-tube undergoes complete combustion. The residual gases after cooling to 273 K occupy 224 mL . When the system is treated with KOH solution, the volume decreases to 64 mL . The formula of the hydrocarbon is :

(1) C_2H_4 (2) C_4H_{10} (3) C_2H_2 (4) C_2H_6

57. 14.0 g of calcium metal is allowed to react with excess HCl at 1.0 atm pressure and 273 K . Which of the following statements is incorrect ?

[Given : Molar mass in $gmol^{-1}$ of $Ca-40, Cl-35.5, H-1$]

(1) 0.35 mol of H_2 gas is evolved. (2) $7.84 L$ of H_2 gas is evolved.

(3) 33.3 g of $CaCl_2$ is produced. (4) The limiting reagent is calcium metal.

58. In Carius method, 0.75 g of an organic compound gave 1.2 g of barium sulphate, find percentage of sulphur (molar mass $32 g\,mol^{-1}$). Molar mass of barium sulphate is $233 g\,mol^{-1}$.

(1) 4.55 % (2) 10.30% (3) 21.97% (4) 16.48%

59. Elements P and Q form two types of non-volatile, non-ionizable compounds PQ and PQ_2. When 1 g of PQ is dissolved in 50 g of solvent ' $A', \Delta T_b$ was 1.176 K while when 1 g of PQ_2 is dissolved in 50 g of solvent ' $A', \Delta T_b$ was $0.689\,K$, $(K_b$ of ' $A' = 5\,K\,kg\,mol^{-1})$. The molar masses of elements P and Q (in $gmol^{-1}$) respectively, are :

(1) 70,110 (2) 65,145 (3) 60,25 (4) 25,60

60. An organic compound (P) on treatment with aqueous ammonia under hot condition forms compound (Q) which on heating with Br_2 and KOH forms compound (R) having molecular formula C_6H_7N. Names of P, Q and R respectively are.

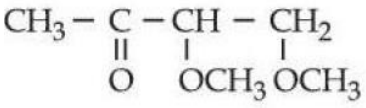
(1) Benzoic acid, benzamide, aniline

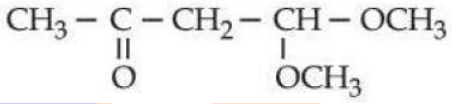
(2) Toluic acid, methylbenzamide, 2-methylaniline

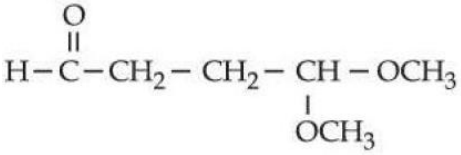
(3) Benzoic acid, 4-methylbenzamide, 4-methylaniline

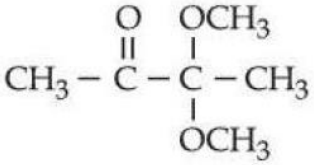
(4) Phenylethanoic acid, phenylethanamide, benzamine

61. An organic compound "P" of molecular formula $C_6H_{12}O_3$ gives positive lodoform test but negative Tollen's test. When "P" is treated with dilute acid, it produces "Q". "Q" gives positive Tollen's test and also iodoform test. The structure of "P" is :

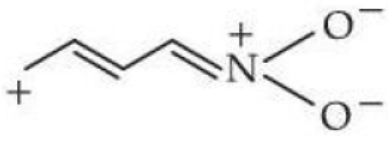
(1) 

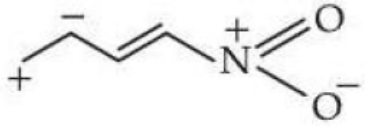
(2) 

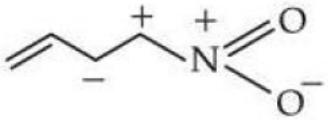
(3) 

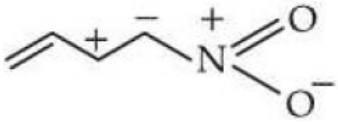
(4) 

62. From the following, the least stable structure is :

(1) 

(2) 

(3) 

(4) 

63. MnO_4^{2-}, in acidic medium, disproportionates to :

(1) Mn_2O_7 and MnO_2

(2) MnO_4^- and MnO

(3) MnO_4^- and MnO_2

(4) Mn_2O_7 and MnO

64. Given below are two statements :

Statement I : The number of species among $SF_4, NH_4^+, [NiCl_4]^{2-}, XeF_4, [PtCl_4]^{2-}, SeF_4$ and $[NiCN)_4]^{2-}$, that have tetrahedral geometry is 3 .

Statement II: In the set $[NO_2, BeH_2, BF_3, AlCl_3]$, all the molecules have incomplete octet around central atom. In the light of the above statements, choose the correct answer from the options given below :

(1) Statement I is true but Statement II is false

(2) Both Statement I and Statement II are false

(3) Statement I is false but Statement II is true

(4) Both Statement I and Statement II are true

65. Given below are two statements :

Statement I: Among $[Cu(NH_3)_4]^{2+}, [Ni(en)_3)]^{2+}, [Ni(NH_3)_6]^{2+}$ and $[Mn(H_2O)_6]^{2+}$, $[Mn(H_2O)_6]^{2+}$ has the maximum number of unpaired electrons.

Statement II : The number of pairs among $\{[NiCl_4]^{2-}, [Ni(CO)_4]\}, \{[NiCl_4]^{2-}, [Ni(CN)_4]^{2-}\}$ and $\{[Ni(CO)_4], [Ni(CN)_4]^{2-}\}$ that contain only diamagnetic species is two.

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

(1) Statement I is false but Statement II is true

(2) Both Statement I and Statement II are true

(3) Both Statement I and Statement II are false

(4) Statement I is true but Statement II is false

66. Identify correct statements from the following :

A. Propanal and propanone are functional isomers.

B. Ethoxyethane and methoxypropane are metamers.

C. But-2-ene shows optical isomerism.

D. But-1-ene and but-2-ene are functional isomers.

E. Pentane and 2,2-dimethyl propane are chain isomers.

Choose the correct answer from the options given below :

(1) B, C and D only (2) A, B and C only (3) A, B and E only (4) C, D and E only

67. Identify the correct statements.

A. Arginine and Tryptophan are essential amino acids.

B. Histidine does not contain heterocyclic ring in its structure.

C. Proline is a six membered cyclic ring amino acid.

D. Glycine does not have chiral centre.

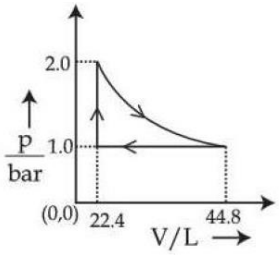
E. Cysteine has characteristic feature of side chain as $MeS-CH_2-CH_2-$.

Choose the correct answer from the options given below:

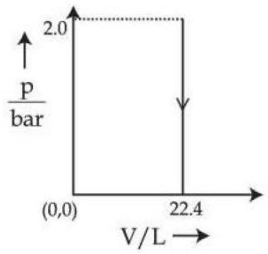
(1) C and E Only (2) B and E Only (3) C and D Only (4) A and D Only

68. Which of the following graphs between pressure 'p' versus volume 'V' represents the maximum work done?

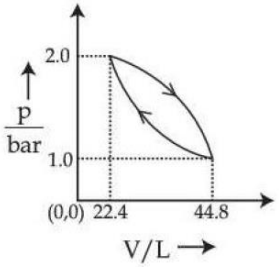
(1)



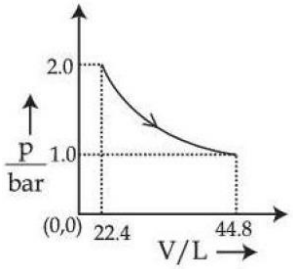
(2)



(3)



(4)



69. For the reaction, $N_2O_4 \rightleftharpoons 2NO_2$, graph is plotted as shown below. Identify correct statements.

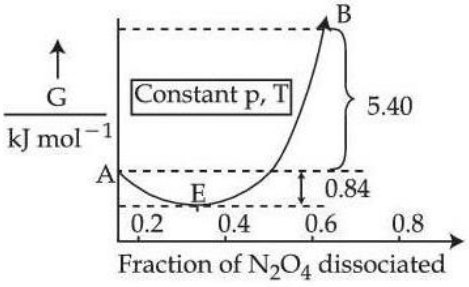
A. Standard free energy change for the reaction is $-5.40\,kJ\,mol^{-1}$.

B. As $\Delta G^{\ominus}$ in graph is positive, N_2O_4 will not dissociate into NO_2 at all.

C. Reverse reaction will go to completion.

D. When 1 mole of N_2O_4 changes into equilibrium mixture, value of $\Delta G^{\ominus} = -0.84\,kJ\,mol^{-1}$

E. When 2 mole of NO_2 changes into equilibrium mixture, $\Delta G^{\ominus}$ for equilibrium mixture is $-6.24\,kJ\,mol^{-1}$.



Choose the correct answer from the options given below :

(1) D and E only (2) C and E only (3) A and D only (4) B and C only

70. Given below are two statements :

Statement I: When an electric discharge is passed through gaseous hydrogen, the hydrogen molecules dissociate and the energetically excited hydrogen atoms produce electromagnetic radiation of discrete frequencies.

Statement II : The frequency of second line of Balmer series obtained from He^+ is equal to that of first line of Lyman series obtained from hydrogen atom.

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

(1) Both Statement I and Statement II are true (2) Both Statement I and Statement II are false

(3) Statement I is false but Statement II is true (4) Statement I is true but Statement II is false

SECTION - B

71. Pre-exponential factors of two different reactions of same order are identical. Let activation energy of first reaction exceeds the activation energy of second reaction by $20\,kJ\,mol^{-1}$. If k_1 and k_2 are the rate constants of first and second reaction respectively at 300 K , then $\ln\frac{k_2}{k_1}$ will be ____ (nearest integer) $\left[R = 8.3\,J\,K^{-1}\,mol^{-1}\right]$

72. The pH and conductance of a weak acid (HX) was found to be 5 and $4\times10^{-5}\,S$, respectively. The conductance was measured under standard condition using a cell where the electrode plates having a surface area of $1cm^2$ were at a distance of 15 cm apart. The value of the limiting molar conductivity is ____ $Sm^2\,mol^{-1}$. (nearest integer)

(Given : degree of dissociation of the weak acid $(\alpha) << 1$)

73. Use the following data :

Substance	$\frac{\Delta_f H^{\ominus}(500K)}{kJ\,mol^{-1}}$	$\frac{S^{\ominus}(500K)}{J\,K^{-1}\,mol^{-1}}$
$AB(g)$	32	222
$A_2(g)$	6	146
$B_2(g)$	x	280

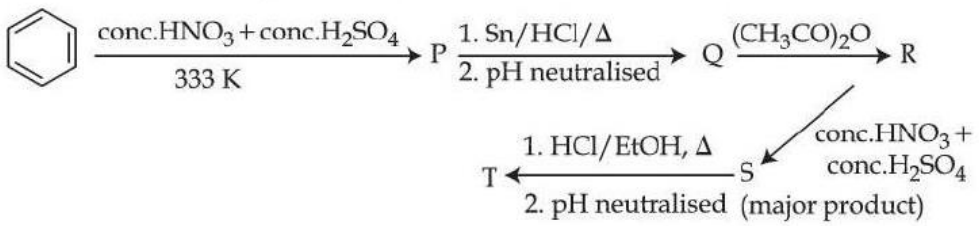
One mole each of $A_2(g)$ and $B_2(g)$ are taken in a 1 L closed flask and allowed to establish the equilibrium at 500 K .

$$A_2(g) + B_2(g) \rightleftharpoons 2AB(g)$$

The value of $x\left(inkJmol^{-1}\right)$ is ____ . (Nearest integer)

(Given : $\log K = 2.2 \quad R = 8.3\,J\,K^{-1}\,mol^{-1}$)

74. Consider the following reaction sequence



The percentage of nitrogen in product 'T' formed is ____%. (Nearest integer)

(Given molar mass in $gmol^{-1}$ $H:1, C:12, N:14, O:16$)

75. Consider the following reactions :

$$NaCl + K_2Cr_2O_7 + H_2SO_4 \rightarrow A + KHSO_4 + NaHSO_4 + H_2O$$

$$A + NaOH \rightarrow B + NaCl + H_2O$$

$$B + H_2SO_4 + H_2O_2 \rightarrow C + Na_2SO_4 + H_2O$$

In the product 'C', 'X' is the number of O_2^{2-} units, 'Y' is the total number oxygen atoms present and 'Z' is the oxidation state of Cr. The value of X + Y + Z is _____.

ANSWER KEY

1.	**(2)**	**2.**	**(1)**	**3.**	**(4)**	**4.**	**(3)**	**5.**	**(4)**	**6.**	**(2)**	**7.**	**(2)**
8.	**(1)**	**9.**	**(4)**	**10.**	**(3)**	**11.**	**(3)**	**12.**	**(2)**	**13.**	**(2)**	**14.**	**(3)**
15.	**(4)**	**16.**	**(3)**	**17.**	**(4)**	**18.**	**(1)**	**19.**	**(1)**	**20.**	**(4)**	**21.**	**1**
22.	**2**	**23.**	**1333**	**24.**	**225**	**25.**	**17**	**26.**	**(4)**	**27.**	**(3)**	**28.**	**(3)**
29.	**(3)**	**30.**	**(4)**	**31.**	**(2)**	**32.**	**(2)**	**33.**	**(1)**	**34.**	**(1)**	**35.**	**(1)**
36.	**(1)**	**37.**	**(1)**	**38.**	**(1)**	**39.**	**(2)**	**40.**	**(2)**	**41.**	**(4)**	**42.**	**(3)**
43.	**(4)**	**44.**	**(4)**	**45.**	**(3)**	**46.**	**280**	**47.**	**1080**	**48.**	**17**	**49.**	**500**
50.	**100**	**51.**	**(4)**	**52.**	**(1)**	**53.**	**(3)**	**54.**	**(3)**	**55.**	**(1)**	**56.**	**(3)**
57.	**(3)**	**58.**	**(3)**	**59.**	**(4)**	**60.**	**(1)**	**61.**	**(2)**	**62.**	**(3)**	**63.**	**(3)**
64.	**(3)**	**65.**	**(4)**	**66.**	**(3)**	**67.**	**(4)**	**68.**	**(4)**	**69.**	**(1)**	**70.**	**(1)**
71.	**8**	**72.**	**6**	**73.**	**70**	**74.**	**20**	**75.**	**13**				