JEE(Main)-2024 | 08 April 2024 (Shift-2 Evening) | Question Paper | Memory Based

MATHEMATICS

1. $\int \frac{1}{\sqrt{1-e^x}}dx$

2. $\text{Re}\left(\frac{1+i\cos\theta}{1-i\cos\theta}\right)=0 \quad \theta \in [-\pi, 2\pi]$

Find sum of value of θ.

3. "MATHEMATICS" number of different words that can be formed?

4. Solve the Differential Equation

$\sec y \frac{dy}{dx} + 2\sin y = \cos y$ and $y(\sqrt{3}) = 1$. It pass through $\left(0, \frac{\pi}{4}\right)$.

5. Area bounded by $x^2 + y^2 = 8$ and $y^2 = 2x$ in 1st quadrant.

6. $\left(2\sqrt{a}x^2 + \frac{1}{2x^3}\right)^{10}$ has constant terms 105. The value of a^2 is

7. $\alpha = \lim_{x\to 0} \frac{e^{\sqrt{\tan x}} - e^{\sqrt{x}}}{\sqrt{\tan x} - \sqrt{x}}$, and $\beta = \lim_{x\to 0}(1+\sin x)^{1/2\,\text{cosec}\,x}$. Find $\alpha + \beta$.

8. Let $\vec{a} = \hat{i} + 2\hat{j} + 3\hat{k}$, $\vec{b} = 3\hat{i} - \hat{j} + \lambda\hat{k}$, $\vec{c} = 2\hat{i} + 3\hat{j} - 5\hat{k}$ here $\vec{r}$ is parallel to $\vec{b} + \vec{c}$ is an unit vector and satisfy $\vec{r}\cdot\vec{a} = 3$ find λ

9.

2

5 8

11 14 17

20 23 26 29

⋮ ⋮ ⋮ ⋮

Find the sum of all elments in 10th row.

10. $|x+1||x+3| - 4|x+2| + 5 = 0$, find number of solutions.

11. If $\alpha \neq a, \beta \neq b, \gamma \neq c$ and $\begin{vmatrix} \alpha & b & c \\ a & \beta & c \\ a & b & \gamma \end{vmatrix} = 0$, then the value of $\frac{a}{\alpha - a} + \frac{b}{\beta - b} + \frac{c}{\gamma - c}$ is

12. Find value of $\frac{5\cos 18^\circ + 3\sin 36^\circ}{3\cos 18^\circ - 5\sin 36^\circ}$

13. In a G.P. $a_3 a_5 = 49$ & $a_2 + a_4 = \frac{70}{3}$ then find the value of $a_4 + a_6 + a_8$

14. Let $A(5,2)$ & $B(2,a)$ here $\angle AOB = \frac{\pi}{4}$ (0 is origin), find sum of all absolute values of a

15. Mirror Image of point $A(-4,5)$ about line $x + 2y = 2$ lies on circle $(x+4)^2 + (y-3)^2 = r^2$, find r.

16. There are 3 bags x, y, z

x contains $\rightarrow$ 5 one rupee coin
4 five rupee coin

y contains $\rightarrow$ 4 one rupee coin
5 five rupee coin

z contains $\rightarrow$ 3 one rupee coin
6 five rupee coin

A bag is selected randomly and a coin is taken out and found to be a one rupee coin. Find the probability that this coin is from bag y.

17. $f : [-a, a] \rightarrow [0, 4a] \quad \forall\ a > 0$

$$f(x) = \begin{cases} -a & x \in [-a, 0] \\ x + a & x \in (0, a] \end{cases}$$

$g(x) = f(|x|) + |f(x)|$

Check whether g(x) is one-one, onto

neither one-one nor onto

18. If the system of Equations $x + y - z = \lambda$, $7x + 9y + \mu z = -3$, $5x + y + 2z = -1$ has infinitely many solutions then value of $2\mu + 3\lambda$ is.

19. Let S be the region between $y^2 = 2x$ and $x = 2y$. Maximum possible area of a rectangle inscribed in region S is.

20. Let $A = \{2, 3, 5, 8, 9\}$ and $B = \{1, 4, 6, 10, 11\}$. A relation R is defined from $A \times B \rightarrow A \times B$ such that $(a,b)R(c,d)$ if $3ad - 7bc$ is an even integer. then relation R is

(1) Reflexive & symmetric
(2) Reflexive & not symmetric
(3) Symmetric & not transitive
(4) Equivalence.

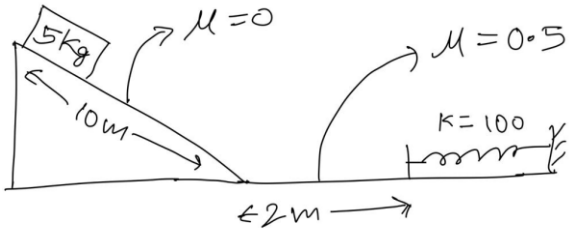
21. If mean, mean deviation about mean and variance of 5 observation 9, 25, a, b, c are 18, 4 and $\frac{136}{5}$ respectively and a < b < c, find the value of 2a + b – c.

PHYSICS

1. A particle is projected at such an angle that its maximum height and range are same then find the angle of projection.

2. If wavelength of electron and proton are same then find the ratio of their kinetic energies.

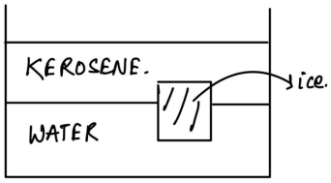
3. In the given diagram calculate the maximum compression in the spring.
(The angle of wedge is 30°)



4. A disc of mass m and radius R is rotating with angular speed ω. If another similar disc is placed gently on the rotating disc, then find out new angular speed of the discs.

5. Dimension formula of $\varepsilon_0 E^2$. (Where E is electric field)

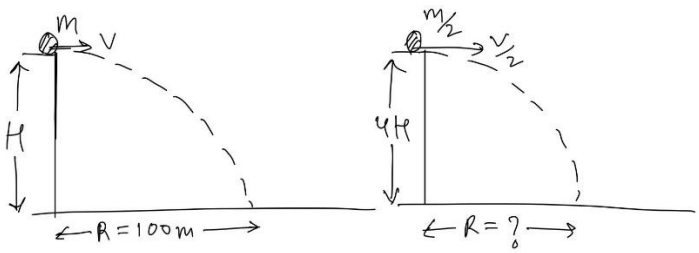
6. Find the ratio of volume of ice in kerosene and water. (Specific gravity of kerosene = 0.8 and specific gravity of ice = 0.9)



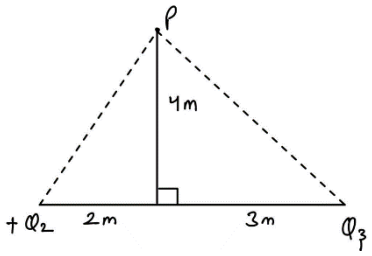
7. The work done by a diatomic gas during an isobaric process is 100J. Calculate the heat supplied.

8. An infinitely long current carrying wire of radius 'a' carries uniform current (i) find out the ratio of magnetic field at distance a/2 and 2a.

9. Two particles are projected from two different towers of heights H and 4H with velocity V and V/2 respectively. If horizontal range for first particle is 100m then find horizontal range for other.



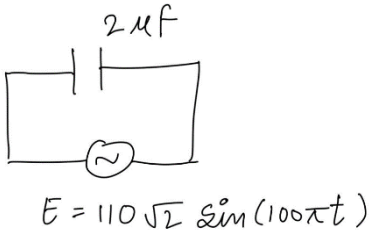
10. If electric field at point P due to Q_2 and Q_3 is zero in y direction, then find out the ratio of $\frac{Q_2}{Q_3}$



11. Two satellites are revolving around a planet at radius R and 4R respectively. If the speed of first satellite is 6v, Then find the speed of second satellite.

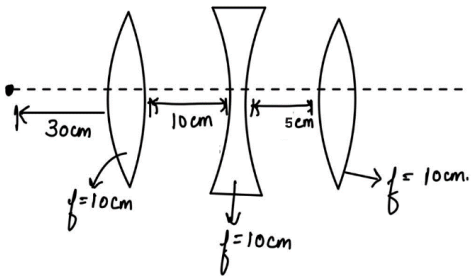
12. A wave equation is given as $y = 2\cos(2\pi\{360t - x\})$ Find frequency.

13. An ac source is connected across a capacitor having capacitance 2μF. Find the rms current in the given circuit.



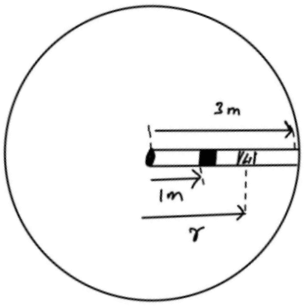
14. Some amount of water is heated using a constant supply source for 20 minutes. Now if we change the length of heating element then same amount of water gets heated using same source in 15 minutes calculate the change in length.

15. Find distance between final image and object.



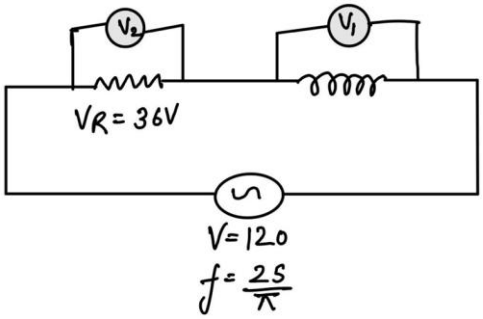
16. In the above two cases, if the time taken in case-I is t and time taken in case-II is (nt) to reach at the bottom of the wedge. Find the value of μ in terms of n. (μ = Coefficient of friction)

17. A disc having radius 3 m have a smooth groove a shown in figure. Disc is rotating with some constant angular velocity if particle have some mass (m) as disc is put gently at distance of 1m from centre. Then velocity of particle wrt disc when it leave the disc is $(2\omega\sqrt{x})$ find x.



18. A water drop falls from sky and attends the terminal velocity of 6cm/s. What will be the terminal velocity if 8 similar drop condenses and falls from the sky ?

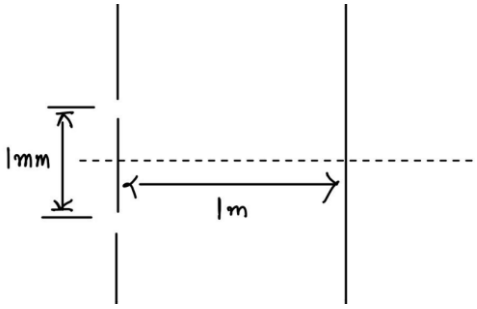
19. In the given AC circuit having resistance and inductance are connected in series. If voltage across resistance is 36 V and resistance of resistor is 90Ω. Then find the self inductance of coil of inductor.



20. A particle is performing SHM, at a particular position x = 0.4m, potential energy is 0.4 J and kinetic energy is 0.5 J, then find amplitude of SHM.

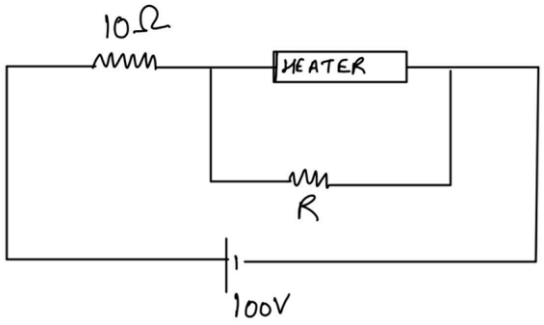
21. An isotope $^{12}B_5$ of mass m having proton (m_p) and neutron (m_n) then what will be the binding energy in terms of m_p, m_n and m :

22. In a YDSE shown, a monochromatic light of wavelength 500 nm is incident, at point P 10^{th} maxima is formed. Now the two slits are replaced with a single slit of width w placed at the centre the first diffraction minima is observed at P. Find w

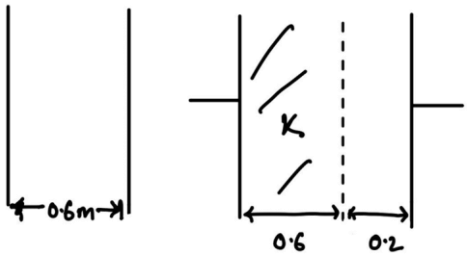


23. If least count of vernier calliper is $\frac{1}{20N}$ cm. If main scale division is 1 mm. How many N division of vernier scale coincide with main scale.

24. If the power drop across heater is 62.5 watts and power rating of heater is 1000 watts. What will be the value of R in the following circuit.



25. A parallel plate capacitor have plate area A and plate separation is 0.6 m as shown in figure. Now a dielectric of dielectric constant (K) is filled between the plates to same capacitance and the separation is increased by 0.2 m. Find the value of K.



26. If pitch of screw gauge is 1mm and there is no any instrument between it's jaw then zero is 5 division below the measurement line. Now we put wire then 4 is reading of MSD and 60 division of circular scale. Find the diameter of wire if total division on circular scale is 100.

CHEMISTRY

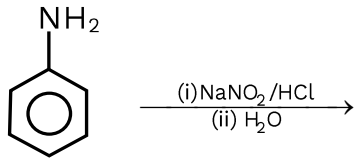
1. What is the structure of carbocation

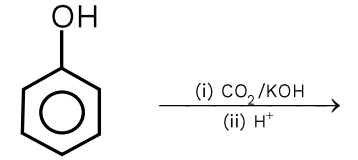
(1) Tetrahedral (2) Triagonal planar

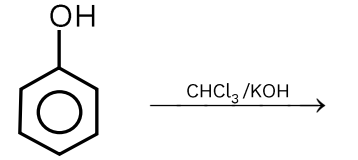
(3) Diagonal (4) Diagonal planar

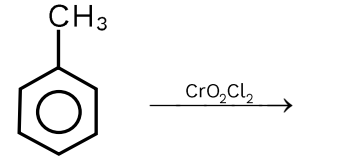
2.

List-I

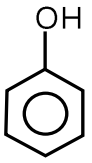
(P) 

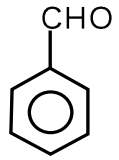
(Q) 

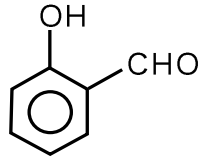
(R) 

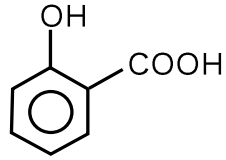
(S) 

List-II

(1) 

(2) 

(3) 

(4) 

(1) P→1; Q→4; R→3; S→2 (2) P→2; Q→4; R→3; S→1

(3) P→1; Q→3; R→4; S→2 (4) P→3; Q→4; R→1; S→2

3. Which of the following have bond order=2

(1) O_2 (2) C_2H_6 (3) H_2 (4) Ne_2

4. Given $A \longrightarrow B$: k_1

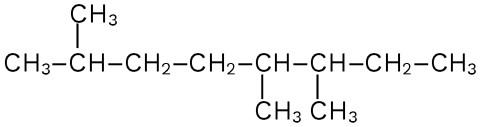
$B \longrightarrow C$: k_2

Rate of formation of B = O

What is concentration of B in terms of A

(1) $\frac{k_1}{k_2}[A]$ (2) $\frac{k_2}{k_1}[A]$ (3) $k_1 k_2 [A]$ (4) $k_1 k_1 [A]$

5. Write IUPAC name of given compound



(1) 2,5,6 trimethyloctane (2) 3,4,7 trimethyloctane

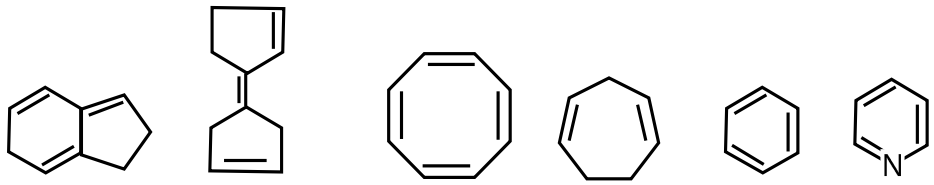
(3) 2,4-dimethyl-6-ethylheptane (4) 3,6-dimethyl-2-ethylheptane

6. What will be the wave function of σ^* (destructive)

(1) $\psi_A - \psi_B$ (2) $\psi_A + \psi_B$

(3) $\psi_A + 2\psi_B$ (4) $\psi_A - 2\psi_B$

7. Count number of aromatic compound



8. Match the correct magnetic moment of the given compound

	List-I		List-II
(P)	$[CoF_6]^{3-}$	(1)	5
(Q)	$[Ni(CN)_4]^{2-}$	(2)	0
(R)	$[Ni(NH_3)_6]^{2+}$	(3)	3
(S)	$[Fe(H_2O)_6]^{3+}$	(4)	6

(1) P→1; Q→2; R→3; S→4 (2) P→2; Q→1; R→3; S→4

(3) P→1; Q→3; R→4; S→2 (4) P→4; Q→3; R→2; S→1

9. If de-Broglie wavelength of electron is equal to de-broglie wavelength of proton, then what is the relation between their kinetic energy

(1) $KE_e > KE_p$ (2) $KE_e < KE_p$ (3) $KE_e = KE_p$ (4) $2KE_e = KE_p$

10. Consider the given reaction $Cr_2O_7^{2-} \rightleftharpoons CrO_4^{2-}$

Above rection shifts in forward direction in which medium

(1) Acidic (2) Basic (3) Neutral (4) Slightly acidic

11. **Statement-I :** Benzene sulphonyl chloride reacts with 1°, 2° and 3° amines.

Statement-II : All products of the above reaction are soluble in NaOH.

Select the correct option.

(1) Both statements are correct

(2) Both statements are incorrect

(3) Statement-I is correct, Statement-II is incorrect

(4) Statement-I is incorrect, Statement-II is correct

12. Total number of carbon in tyrosine

13. Find the total number of correct statements

(1) N_2 behaves as inert gas at room temperature

(2) Oxides of metals are basic generally

(3) Oxides of non-metals are acidic generally

(4) As we move down the group in group 15 then stability of +5 oxidation state decrease

(5) General oxidation state of group 15 are +3,+5,-3

14. **Statement-I :** In S_N2, stereospecific product is formed.

Statement-II : In S_N1, racemic product is formed.

Select the correct option.

(1) Both Statement-I and Statement-II are correct

(2) Both Statement-I and Statement-II are incorrect

(3) Statement-I is correct, Statement-II is incorrect

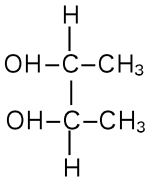
(4) Statement-I is incorrect, Statement-II is correct

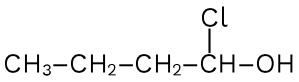
15. What is the formula of canary yellow ppt.

(1) $(NH_4)_3[P(Mo_3O_{10})_4]$ (2) $(NH_4)_2[P(Mo_3O_{10})_2]$

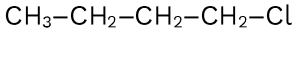
(3) (NH_4) $[P(Mo_3O_{10})_3]$ (4) $(NH_4)_4[P(Mo_3O_{10})_3]$

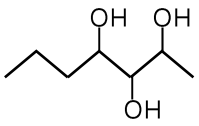
16. Count total number of optically active compounds





$CH_3-CH_2-CH_2-OH$





17. For the reaction $Tl^+_{(0.001M)} + Cu_{(s)} \rightleftharpoons Tl_{(s)} + Cu^{2+}_{(0.01\ M)}$ E= 056. E_{cell} can be increased by

(1) By increasing $[Cu^{2+}]$ (2) By decreasing $[Cu^{2+}]$

(3) By increasing [Tl] (4) By decreasing [Tl]

18. The mole of H_2O and C_2H_5OH are g and I mole respectively the mass percent of C_2H_5OH will be

(1) 22.11 % (2) 11.22 % (3) 12 % (4) 10 %

19.

List-I (Test)	**List-II (Group)**
(P) Bayer's reagent	(1) Aldehyde
(Q) CAN test	(2) –OH group
(R) Pthaliene dye test	(3) Unsaturation
(S) Schiff test	(4) Phenol

(1) P→3; Q→2; R→4; S→1 (2) P→1; Q→2; R→4; S→3

(3) P→3; Q→4; R→2; S→1 (4) P→2; Q→3; R→1; S→4

20. Given wavelength of wave is 15800 Å find its wave number = X × 10^{-1} cm^{-1}. Find x

21. **Statement-I :** Kjeldhal's method is not used for pyridine.

Statement-II : Kjeldhal's method easily convert pyridine into N_2.

Select the correct option.

(1) Both Statement-I and Statement-II are correct

(2) Both Statement-I and Statement-II are incorrect

(3) Statement-I is correct, Statement-II is incorrect

(4) Statement-I is incorrect, Statement-II is correct

22. Given $\Delta H_{vap} = 40\ kJ/mol$ for $H_2O(l)$

T = 273K and P = 1 bar. Find ΔU_{vap} (in kJ/mol) for $H_2O(l)$

23. Correct order of acidic strength will be

(I) HCOOH (II) CH_3COOH (III) C_2H_5COOH (IV) C_3H_7COOH

(1) (I) > (II) > (III) > (IV)

(2) (II) > (I) > (III) > (IV)

(3) (IV) > (II) > (III) > (I)

(4) (IV) > (III) > (II) > (I)