JEE(Main)-2024 | 09 April 2024 (Shift-2 Evening) | Question Paper | Memory Based

MATHEMATICS

1. If $\frac{z-2i}{z+2i}$ is purely imaginary then find the maximum value of $|z + 8 + 6i|$.

2. $\lim\limits_{x\to 0}\frac{e-(1+2x)^{1/2x}}{x}$

3. In the expansion of $\left(x^{2/3}+\frac{1}{2}x^{-2/5}\right)^9$ find the sum of coefficients of $x^{2/3}$ and $x^{-2/5}$

4. If

x	c	2c	3c	4c	5c	6c
f	2	1	1	1	1	1

variance is 160, then find the value of c.

5. $\lim\limits_{x\to\frac{\pi}{2}}\frac{\int_{x^3}^{\left(\frac{\pi}{2}\right)^3}(\sin(2x)+\cos x)}{\left(x-\frac{\pi}{2}\right)}dx$

6. $2\sin^{-1}(x)+3\cos^{-1}(x)=\frac{7\pi}{5}$, find number of real solution of equation

7. $I=\int_{-1}^{2}\ln\left(x+\sqrt{1+x^2}\right)dx$

8. If $\ln(y)=\sin^{-1}(x)$ then find the value of $\left(1-x^2\right)\frac{d^2y}{dx^2}-x\frac{dy}{dx}=$? at $x=\frac{1}{2}$

9. $f(x)=\frac{1}{2+\sin 3x+\cos 3x}$ if Range of $f(x)$ is [a, b] then Ratio of AM of a,b & GM of a,b is

10. Number of integers between 100 to 1000 whose sum of digits is 14.

11. Given $f'(x)=3f(x)+\alpha$
If $f(0)=7$ and $\lim\limits_{x\to-\infty}f(x)=0$
Find $f\left(\frac{1}{3}\right)$

12. $\int_{\frac{1}{4}}^{\frac{3}{4}} \cos\left(2\cot^{-1}\sqrt{\frac{1+x}{1-x}}\right)dx$

13. Ellipse $\frac{(x-1)^2}{100}+\frac{y^2}{75}=1$ and A Hyperbola of same focus as ellipse whose major axis is α and minor axis is β & $ee'=1$ (where e' is eccentricity of hyperbola and e is eccentricity of ellipse)

find $3\alpha^2 + 2\beta^2$

14. A dice is thrown three times such that the outcomes are x_1, x_2, x_3 respectively. Find the probability of getting the outcomes such that $x_1 < x_2 < x_3$.

15. Find the area bounded by $y = x$, $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ and x-axis in first quadrant $(a = 3\sqrt{2}, b = \sqrt{6})$.

16. Let $\frac{1}{\alpha+1}+\frac{1}{\alpha+2}+\cdots+\frac{1}{\alpha+1012}=\frac{1}{1\cdot 2}+\frac{1}{3\cdot 4}+\frac{1}{5\cdot 6}+\cdots+\frac{1}{2023\cdot 2024}$ find α

17. Given G.P. a, ar, ar^2, ...

$\sum_{n=0}^{\infty} ar^n = 57 \quad \sum_{n=0}^{\infty} a^3r^{3n} = 9747$

Find a + 18r

18. If $\int_0^x \sqrt{1-(y')^2}\,dx = \int_0^x y(x)\,dx$

$y(0) = 0$. Find $|y'' + y + 1|$ at $x = 1$

19. Let α & β be roots of the equation

$x^2 - \sqrt{2}x - \sqrt{3} = 0.$

Further $P_n = \alpha^n + \beta^n, n \in N.$

If $11P_{12} + (10 - 11\sqrt{2})P_{11} - (11\sqrt{3} + 10\sqrt{2})P_{10} - \lambda = 0$

Then λ is

(1) $\sqrt{3}P_9$ (2) $5\sqrt{3}P_9$ (3) P_9 (4) $10\sqrt{3}P_9$

PHYSICS

1. Find work done to bring a particle from x = 2 m to x = 4 m if force acting on it is given by $F = x^2 + 2x - 3$.

2. Find the dimensional formula of plank's constant.

3. Find the Kinetic energy of electron emitted from metal surface if energy incident is 4.31 eV and the work function is 3.31eV.

4. Find the time period of the block of mass m = 0.5 kg when force acting on it is given as F = – 50x.

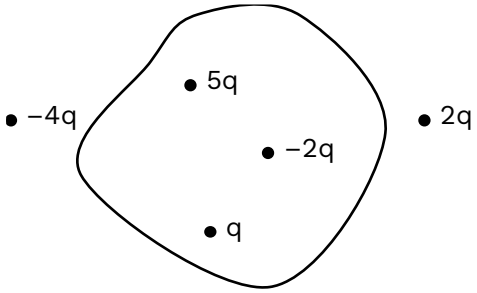
5. Magnitude of resultant of two vectors A and B is $\frac{|B|}{2}$, then find the angle between resultant and A vector. (given: $(\vec{A}+\vec{B})\cdot\vec{B}=0$)

6. When the position of particle varies with the time as $x = 3t^2 - 2t + 4$. find the displacement from t = 2s to t = 4s ?

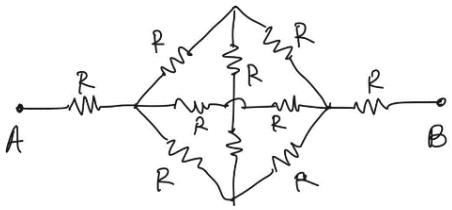
7. To particles separated by 300m are moving with speed 20m/s each in opposite directions. Acceleration of both the particles is $-2m/s^2$. Find their separation when they both stop.

8. A particle of mass m breaks into two parts of masses 2m/3 and m/3. Find ratio of their speeds after explosion.

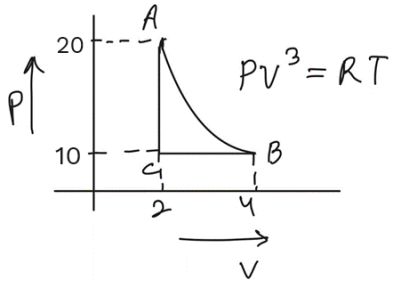
9. Find out the electric flux passing through the given surface.



10. Find R_{eq} about A and B in the given circuit



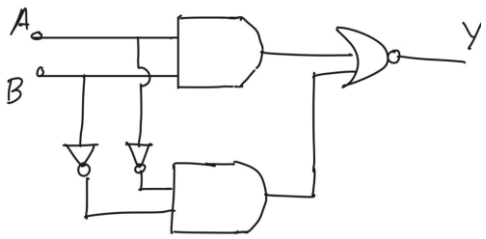
11. Find work done by the gas in the given cyclic process.



12. Kinetic energy of a gas sample is K at −78°C, find the temperature at which its kinetic energy is 2K.

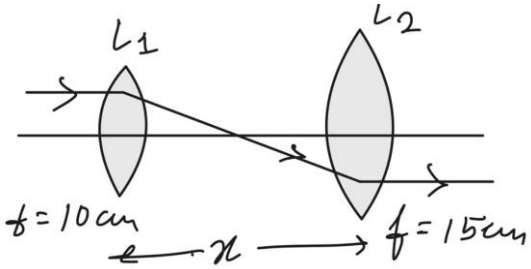
13. When a disc slips on an incline, it takes time t to reach the bottom. If it rolls then it takes time $\left(\frac{\alpha}{\beta}\right)^{\frac{1}{2}}$ t. Find the value of $\alpha + \beta$.

14. Find the output (Y) in terms of input (A & B).

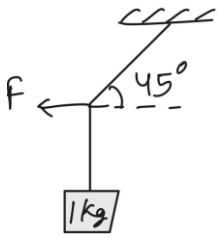


15. Resistance of a wire is 50Ω at 60°C. Find temperature at which resistance is 62Ω. Thermal coefficient of resistance (α) is 2.4×10^{-4} °C^{-1}.

16. If incident and refracted rays are parallel to principle axis in the given figure, then find the value of x.

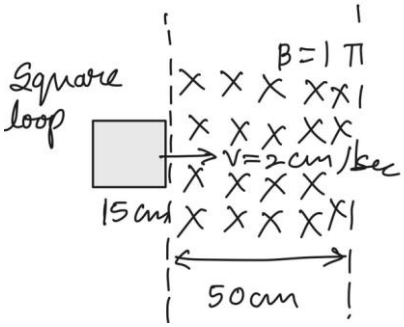


17. Find the value of force required to keep the system (as shown) in equilibrium.



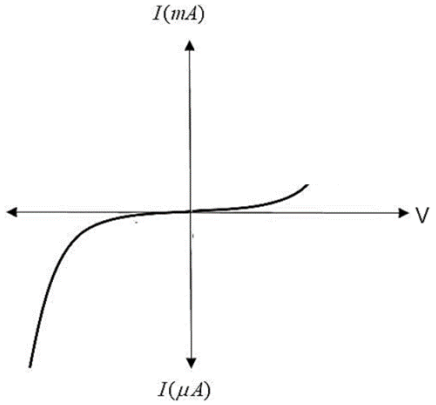
18. Two particles of mass m and 2m have same kinetic energy. Find ratio of their velocities.

19. A metallic square of sides 15 cm is moving with speed 2cm/s as shown in the figure. Find EMF induced in the square 10 sec. after it enters the magnetic field region.



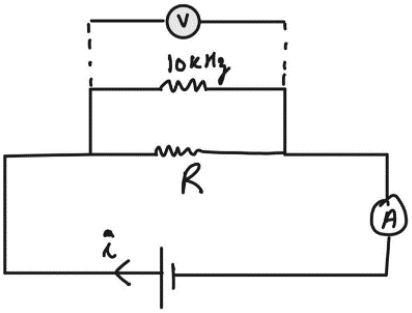
20. If kinetic energy of deuteron and proton particles are same. They both enter in a magnetic field region perpendicular to the magnetic field. Then find the ratio of their radius of circular path.

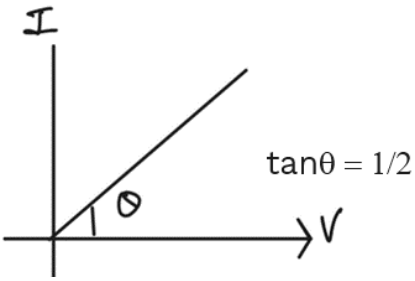
21. Which of the following represents the graph to the best.



(1) zener diode
(2) solar cell
(3) rectifier
(4) Transistor

22. In the given circuit, find the value of the resistance?





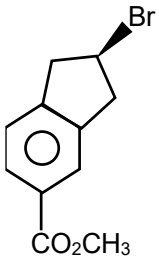
CHEMISTRY

1. Write the increasing order of adjacent bond angle among below given species

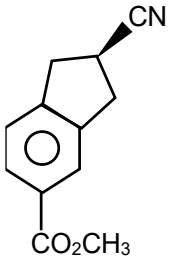
PF_3, BF_3, ClF_3

(1) $ClF_3 < BF_3 < PF_3$ (2) $ClF_3 < PF_3 < BF_3$ (3) $PF_3 < BF_3 < ClF_3$ (4) $PF_3 < ClF_3 < BF_3$

2.



$\xrightarrow[DMSO]{KCN}$ Major product is

(1)


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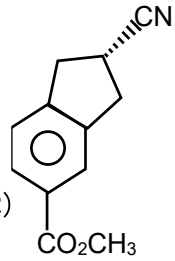

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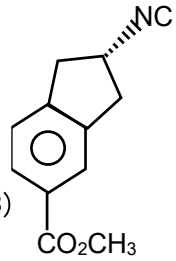

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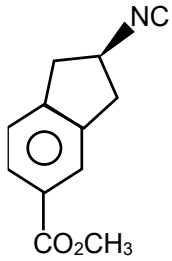


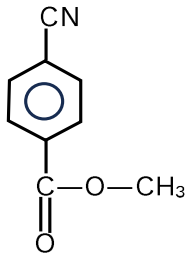
3. Find the total number of electrons in π^* of the following species

O_2^+, O_2, O_2^-

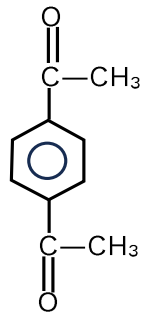
4. Correct electronic configuration for (z = 99) will be

(1) [Rn] $5f^{10}$ $7S^2$ (2) [Rn] $5f^{11}$ $7S^2$ (3) [Rn] $5f^{12}$ $7S^1$ (4) [Rn] $5f^{12}$ $7S^2$

5.



$\xrightarrow[(ii)\ H_3O^+]{(i)\ Me\ Mg\ Br\ (excess)}$ major product is:

(1)


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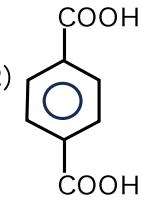

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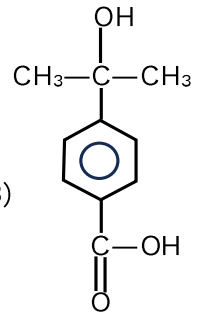

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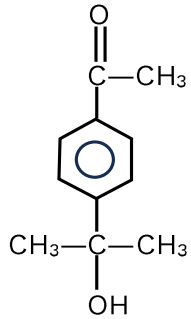
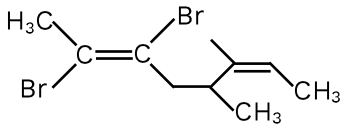
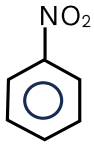
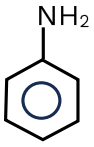
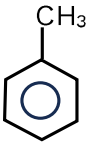


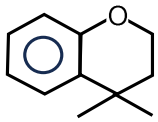
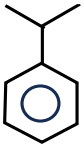
6. 

Total number of stereo isomers of given compound is -

(1) 6 (2) 8 (3) 10 (4) 4

7. Fridel craft reaction is not given by how many of the following compounds

(a)  (b)  (c)  (d) 

(e)  (f) 

8.

List-I **Complex**	**List-II** **Hybridisation**
(P) $[Ni(CO_4)]$	(1) dsp^2
(Q) $[Co(NH_3)_6]Cl_3$	(2) sp^3
(R) $K_2[Ni(CN)_4]$	(3) d^2sp^3
(S) $[CoF_6]^{3-}$	(4) sp^3d^2

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

9.

List-I **Element**	**List-II** **Electronic configuration**
(P) S	(1) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$
(Q) N	(2) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^6$
(R) Kr	(3) $1s^2\ 2s^2\ 2p^3$
(S) Ar	(4) $1s^2\ 2s^2\ 2p^6\ 3s^2$ 3p6

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

10. Stability order of given resonating structure

(I) $CH_3-CH=CH-\overset{\overset{O}{\|}}{C}-CH_3$ (II) $CH_3-\overset{\oplus}{C}H-CH=\overset{\overset{O^{\ominus}}{|}}{C}-CH_3$ (III) $CH_3-\overset{\ominus}{C}H-CH=\overset{\overset{O^{\oplus}}{|}}{C}-CH_3$

(1) I > II > III (2) III > II > I (3) I > III > II (4) I > II = III

11. Sc, Ti, V, Cr, Mn

Find magnetic moment of M^+ whase element having maximum second Ionisation energy

12. Ca^{2+} makes which type of complex with EDTA

(1) Trigonal bipyramidal (2) Square planar (3) Tetrahedral (4) octahedral

13. Which option is incorrect ?

(1) Glucose is Aldohexose

(2) Glucose have many isomeric form in aq. medium

(3) Glucose is soluble in H_2O due to presence of aldehyde functional group

(4) Glucose is a reducing sugar

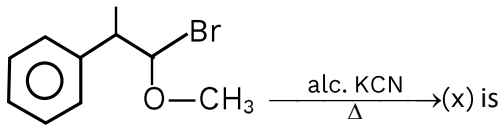
14. Fuming sulphuric acid has how many oxygen atoms ?

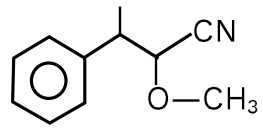
15. Positive Tollen's Test is given by

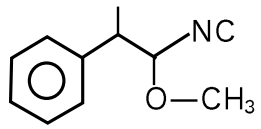
(I) Acetone (II) Formaldehyde (III) Formic acid (IV) Acetic acid

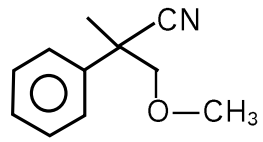
(V) Benzaldehyde

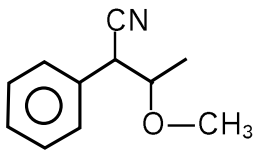
(1) All of the above (2) II, III & V (3) I, II & III (4) II, III & IV

16. 

(1) 

(2) 

(3) 

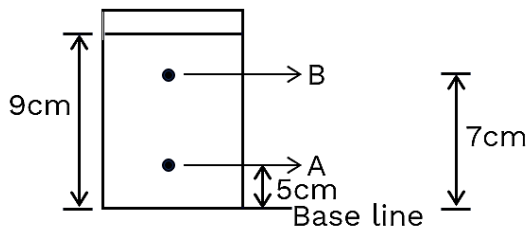
(4) 

17.

List-I	**List-II**
Group 13 properties	**Order**
(P) Size	(1) Tl > In > Al > Ga > B
(Q) Ionization enthalpy	(2) Tl > In > Ga > Al > B
(R) Melting Point	(3) B > Tl > Ga > Al > In
(S) Ionic radius	(4) B > Al > Tl > In > Ga

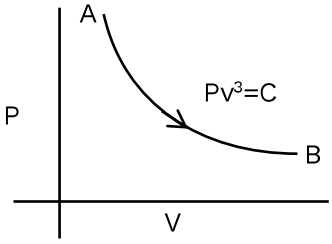
(1) P→1; Q→2; R→3; S→4 (2) P→4; Q→3; R→2; S→1

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

18. 

If R_f (B) = n R_f (A). Find the value of (X) in n = (X) × 10^{-1}.

19. Find the work done by I mol of monoatomic ideal gas given by process $pv^3 = C$. If Temperature changes from 300 k to $330\,K$ in given process AB ?



(1) 125 J (2) 250 J (3) 500 J (4) 6250 J

20. Find equilibrium temperature in a chemical reaction at constant pressure of 1 atm given $\Delta H = x$, $\Delta S = y$

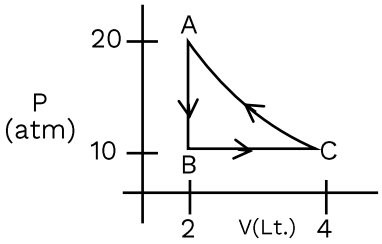
(1) $x - y$ (2) $\frac{x}{y}$ (3) $\frac{y}{x}$ (4) $x + y$

21. Which of the following is correct for strong electrolyte (A > O)

(1) $\lambda_m - \lambda_m^0 - A\sqrt{C} = 0$ (2) $\lambda_m + \lambda_m^0 - A\sqrt{C} = 0$

(3) $\lambda_m - \lambda_m^0 + A\sqrt{C} = 0$ (4) $\lambda_m + \lambda_m^0 + A\sqrt{C} = 0$

22. What is work done in cyclic process ABCA ?



Given ln 2=0.7

23. Match the list and choose correct option.

List-I	**List-II**
(P) Ni-Cd cell.	(1) Rechargable.
(Q) Fuel cell.	(2) Anode is made up of Zn
(R) mercury cell.	(3) used in hearing aid
(S) Leclanché cell	(4) Combustion energy into electrical energy.

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

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