VMC Vidyamandir Classes SINCE 1986
IIT JEE | MEDICAL | FOUNDATION

CODE A

JEE Main Home Practice Test - 1 | JEE - 2024

Date: 31/12/2023 **Maximum Marks: 300**

Timing: 10:00 AM to 1:00 PM **Duration : 3.0 Hours**

General Instructions

1. The test is of **3 hours** duration and the maximum marks is **300.**
2. The question paper consists of **3 Parts** (Part I: **Physics**, Part II: **Chemistry**, Part III: **Mathematics**). Each Part has **two** sections (Section 1 & Section 2).
3. **Section 1** contains **20 Multiple Choice Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE CHOICE** is correct.
4. **Section 2 contains 10 Numerical Value Type Questions Out of which ONLY 5 (any) questions have to be attempted. You will NOT be allowed to attempt the sixth question. If you wish to attempt any other question apart from the five already attempted, then you will have to delete any one response from the five previously answered and then proceed to answer the new one.**
   The answer to each question should be **rounded off to the nearest integer**.
5. No candidate is allowed to carry any textual material, printed or written, bits of papers, pager, mobile phone, any electronic device, etc. inside the examination room/hall.
6. On completion of the test, the candidate must hand over the Answer Sheet to the **Invigilator** on duty in the Room/Hall. **However, the candidates are allowed to take away this Test Booklet with them**.

Marking Scheme

1. **Section – 1:** +4 for correct answer, –1 (negative marking) for incorrect answer, 0 for all other cases.
2. **Section – 2:** +4 for correct answer, –1 (negative marking) for incorrect answer, 0 for all other cases.

Syllabus:

Physics: Full Syllabus
Chemistry: Full Syllabus
Mathematics: Full Syllabus

Name of the Candidate (In CAPITALS) : _____

Roll Number : _____

OMR Bar Code Number : _____

Candidate's Signature : _____ **Invigilator's Signature** _____

PART - I : PHYSICS 100 MARKS

SECTION-1

This section contains 20 Multiple Choice Questions. Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE CHOICE is correct.

1. A moving proton and electron have same momentum. If k and λ denote kinetic energy and de-broglie wavelength respectively. Then choose the correct option :

(A) $\lambda_p = \lambda_e \,\&\, k_p = k_e$ **(B)** $\lambda_p = \lambda_e \,\&\, k_p < k_e$

(C) $\lambda_p > \lambda_e \,\&\, k_p > k_e$ **(D)** $\lambda_p < \lambda_e \,\&\, k_p = k_e$

2. From a tower of height H, a particle is thrown vertically upward with a speed u. The time taken by the particle to hit the ground is n times that taken by it to reach the maximum height. The relation between H, u and n is:

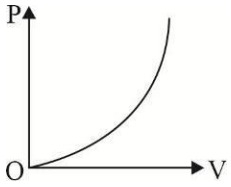
(A) $2gH = nu^2(n-2)$ **(B)** n^2u^2

(C) $gH = (n-2)^2u^2$ **(D)** $gH = (n-2)u^2$

3. Which of the following equations is dimensionally correct where t = time, h = height, S = surface tension, θ = angle, ρ = density, r = radius, g = acceleration due to gravity, V = volume, p = pressure, L = length, η = coefficient of viscosity, f = frequency, I = moment of inertia.

(A) $h = \dfrac{2S\cos\theta}{\rho g}$ **(B)** $f = \dfrac{1}{2\pi}\sqrt{\dfrac{I}{mgL}}$ **(C)** $V = \dfrac{\pi\rho r^2 t}{8\eta L}$ **(D)** None of these

4. The variation of pressure P with volume V for an ideal diatomic gas is parabolic as shown in the figure. The molar specific heat of the gas during this process is:



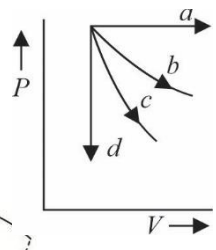
(A) $\dfrac{9R}{5}$ **(B)** $\dfrac{17R}{6}$ **(C)** $\dfrac{3R}{4}$ **(D)** $\dfrac{8R}{5}$

Space for Rought Work

5. The near point of a person is 75 cm. In order that he may be able to read book at a distance 30 cm, the power of spectacles lenses should be:

(A) -2 D **(B)** +3.75 D **(C)** +2 D **(D)** +3 D

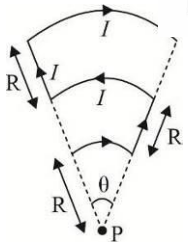
6. The given diagram shows four processes i.e., isochoric, isobaric, isothermal and adiabatic. The correct assignment of the processes, in the same order is given by :



(A) *d a c b* **(B)** *a d c b*

(C) *a d b c* **(D)** *d a b c*

7. Magnetic field at P due to given structure is:



(A) $\left(\frac{\mu_0}{4\pi}\right)\frac{I\theta}{2R}$ **(B)** $\frac{\mu_0}{4\pi}\frac{6I\theta}{5R}$

(C) $\left(\frac{\mu_0}{4\pi}\right)\frac{5I\theta}{6R}$ **(D)** $\left(\frac{\mu_0}{4\pi}\right)\frac{2I\theta}{R}$

8. The angular momentum of a particle performing uniform circular motion is L. If the kinetic energy of partical is doubled and frequency is halved, then angular momentum becomes:

(A) L/2 **(B)** 2L **(C)** L/4 **(D)** 4L

9. Two balls of equal masses *m* each undergo oblique collision. If collision is perfectly elastic, then angle between their velocities after collision is:

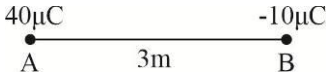
(A) $\frac{\pi}{4}$ **(B)** $\frac{\pi}{3}$ **(C)** $\frac{\pi}{6}$ **(D)** $\frac{\pi}{2}$

10. Two coplanar and concentric loops of radii *R* and *r* ($r<<R$). A current is passed through the outer loop. Both loops have one turn. Find the coefficient of mutual inductance between two loops.

(A) $\frac{\mu_0\pi R^2}{2r}$ **(B)** $\frac{\mu_0\pi r^2}{2R}$ **(C)** $\frac{\mu_0\pi R}{2r}$ **(D)** $\frac{\mu_0 r}{2R}$

Space for Rought Work

11. Two particles A and B having charges $40\mu C$ & $-10\mu C$ respectively are held fixed with a separation of 3m. At what position a third charged particle should be placed so that it does not experience a net electric force?



(A) At midpoint between two charges

(B) At 3m from $-10\mu C$ on the right side

(C) At 2m from $-10\mu C$ between two charges

(D) At 3m from $40\mu C$ on the left side of system

12. Match the quantities given in Column I with their dimensions given in Column II

Column I		**Column II**	
I.	Moment of inertia	**P.**	$[M\,L^{-2}T^{-2}]$
II.	Planck's constant h	**Q.**	$[M\,L^{2}T^{0}]$
III.	Pressure gradient	**R.**	$[M\,L^{2}T^{-1}]$
IV.	Coefficient of elasticity	**S.**	$[M\,L^{-1}T^{-2}]$

Choose the most appropriate answer from the option given below:

(A) I – Q ; II – R ; III – P ; IV – S **(B)** I – P ; II – Q ; III – R ; IV – S

(C) I – Q ; II – R ; III – S ; IV – P **(D)** I – P ; II – R ; III – S ; IV – Q

13. A galvanometer having a resistance of $8\,\Omega$ is shunted by a wire of resistance $2\,\Omega$. If the total current is 1 A, the part of it passing through the shunt is:

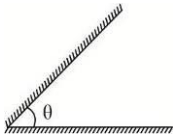
(A) 0.5 A **(B)** 0.2 A **(C)** 0.8 A **(D)** 0.25 A

14. A body is thrown with a velocity equal to *n* times the escape velocity (v_e). Velocity of the body at a large distance away will be:

(A) $v_e\sqrt{n^2-1}$ **(B)** $v_e\sqrt{n^2+1}$ **(C)** $v_e\sqrt{1-n^2}$ **(D)** None of these

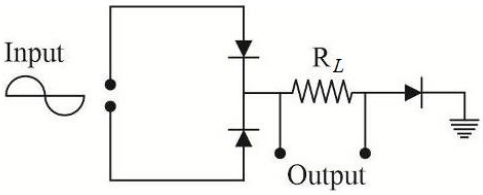
Space for Rought Work

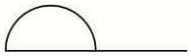
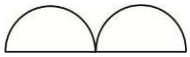
15. Two mirrors are inclined at an angle θ as shown in the figure. Light ray is incident parallel to one of the mirrors. The ray will start retracting its path after third reflection if,

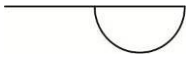
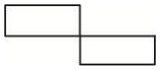


(A) $\theta = 45°$ **(B)** $\theta = 30°$ **(C)** $\theta = 60°$ **(D)** All of these

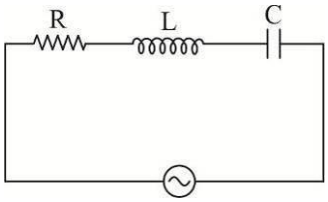
16. In the circuit shown, the input waveform is given. Which of the following correctly gives the output waveform across R_L ?



(A)  **(B)** 

(C)  **(D)** 

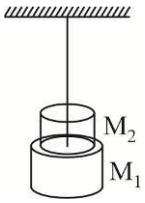
17. In the following circuit, the emf of source is $E_0 = 200$ volt, R = 20 Ω, L = 0.1 henry, C = 10.6 farad and frequency is variable. The current at frequency f = 0 and $f = \infty$ is:



(A) Zero, 10 A **(B)** 10 A, zero **(C)** 10 A, 10 A **(D)** Zero, zero

Space for Rought Work

18. The length of wire, when M_1 is hung from it, is l_1 and is l_2 with both M_1 and M_2 hanging. The natural length of wire is:



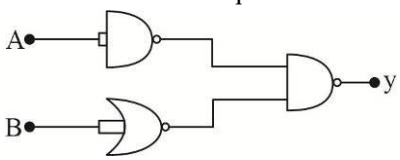
(A) $\frac{M_1}{M_2}(l_1-l_2)+l_1$ **(B)** $\frac{M_2l_1-M_1l_2}{M_1+M_2}$

(C) $\frac{l_1+l_2}{2}$ **(D)** $\sqrt{l_1l_2}$

19. A nucleus *A*, with a finite de-broglie wavelength λ_A, undergoes spontaneous fission in to two nuclei *B* and *C* of equal mass. *B* flies in the same direction as that of *A*, while *C* flies in the opposite direction with a velocity equal to half of that of *B*. The de-Broglie wavelengths λ_B and λ_C of *B* and *C* are respectively:

(A) $\frac{\lambda_A}{2},\lambda_A$ **(B)** $\lambda_A, 2\lambda_A$ **(C)** $2\lambda_A,\lambda_A$ **(D)** $\lambda_A,\frac{\lambda_A}{2}$

20. The combination of gates shown in the circuit is equivalent to:



(A) OR **(B)** AND **(C)** NAND **(D)** NOR

Space for Rought Work

SECTION-2

Section 2 contains 10 Numerical Value Type Questions Out of which ONLY 5 (any) questions have to be attempted. The answer to each question should be **rounded off to the nearest integer**.

1. When a rubber ball is taken to a depth of 200 *m* in deep sea, its volume decreases by 0.2%. The bulk modulus of rubber is _____$\times 10^9 N/m^2$. Density of sea water $=1\times 10^3 kg/m^3$ and $g=10\ m/\sec^2$.

2. A circle shaped uniform wire is bent to form a square. The equivalent resistance between two diametrically opposite points of the circle was 6Ω. The resistance of each side of the square of will be _____. (in Ω)

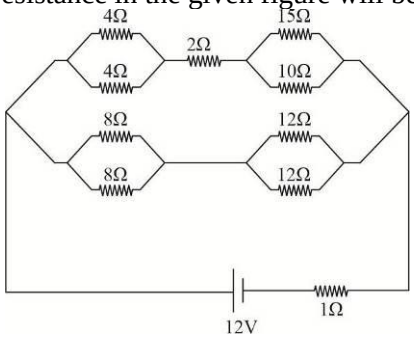
3. A bus is moving on a plane inclined at 60° to the vertical with an acceleration of $9.8 ms^{-2}$ parallel to the plane downward. A bob is suspended by a string from the roof of the bus. The angle in degrees which the string makes with the vertical is _____. (Take $g=9.8 ms^{-2}$)

4. A parallel plate capacitor has $1\mu F$ capacitance. One of its two plates in given $+2\mu C$ charge and the other plate, $+4\mu C$ charge. The potential difference developed across the capacitor is _____.

5. A pipe of length 170 cm is closed from one end. Number of possible natural oscillation of air column in pipe whose frequency lie below 1000 Hz is _____. Velocity of sound in air is 340 m/sec.

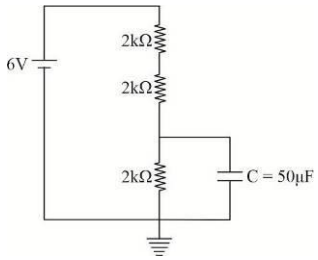
Space for Rought Work

6. The voltage drop across 1Ω resistance in the given figure will be _____V.



7. A block moving horizontally on a smooth surface with a speed of $40\,ms^{-1}$ splits into two equal parts. If one of the parts moves at $60\,ms^{-1}$ in the same direction then the ratio of final kinetic energy to initial kinetic energy will be $x:4$ where x = _____.

8. A capacitor of $50\mu F$ is connected in a circuit as shown in figure. The energy stored in capacitor is _____ μJ.



9. A particle of mass 1 kg is hanging from a spring of force constant $100\,Nm^{-1}$. The mass is pulled slightly downward and released so that it executes free simple harmonic motion with time period T. The time when kinetic energy is 1/3 of potential energy is T/x. The value of x is _____.

10. The electric field in an electromagnetic wave is given by $E = (50\,NC^{-1})\sin\omega(t - x/c)$

The energy contained in a volume V is $5.5\times10^{-12}\,J$. The value of V is _____ cm^3.

(Given $\in_0 = 8.8\times10^{-12}C^2N^{-1}m^{-2}$)

Space for Rought Work

PART - II : CHEMISTRY 100 MARKS

SECTION-1

This section contains 20 Multiple Choice Questions. Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE CHOICE is correct.

1. The metal d-orbitals that are directly facing the ligands in $K_3[Co(CN)_6]$ are:

(A) d_{xz}, d_{yz} and d_{z^2} **(B)** d_{xy}, d_{xz} and d_{yz}

(C) $d_{x^2-y^2}$ and d_{z^2} **(D)** d_{xy} and $d_{x^2-y^2}$

2. In the actual structure of permanganate ion :

(A) Average bond order of Mn-O bonds is 1.5

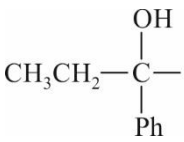
(B) Average bond order of Mn-O bonds is 2

(C) Hybridisation of Mn is sp^3

(D) Average bond order of Mn-O bonds is 1.75

3. Which one of the following equimolar aqueous solutions will have highest boiling point?

(A) Na_2SO_4 aq **(B)** KCl aq **(C)** Urea aq **(D)** $K_3[Fe(CN)_6]$ aq

4.  cannot be prepared by:

(A) $HCHO + PhCH(CH_3)CH_2MgX$ **(B)** $CH_3CH_2COCH_3 + PhMgX$

(C) $PhCOCH_2CH_3 + CH_3MgX$ **(D)** $PhCOCH_3 + CH_3CH_2MgX$

Space for Rought Work

5. Given below are two statements : one is labeled as Assertion (A) and the other is labeled as Reason (R).

Assertion (A) : The modern periodic law states that physical and chemical properties of elements are periodic functions of their atomic numbers.

Reason (R) : Moseley observed that a plot of $\sqrt{\nu}$ vs atomic number (Z) is a straight line thereby leading to the modern periodic law. (ν: characteristic frequency of any element with atomic number Z)

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

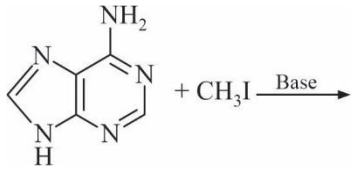
(A) Both (A) and (R) are correct and (R) is the correct explanation of (A)

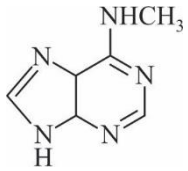
(B) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

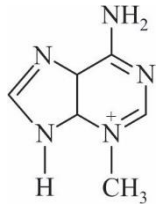
(C) (A) is true but (R) is false

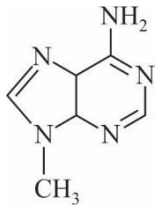
(D) (A) is false but (R) is true

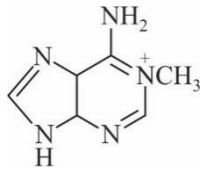
6. The major product in the following reaction is:



(A)


(B)


(C)


(D)


7. Among the following molecules/ions, $C_2^{2-}, N_2^{2-}, O_2^{2-}, O_2$

Which one is diamagnetic and has the shortest bond length?

(A) C_2^{2-} **(B)** O_2^{2-} **(C)** O_2 **(D)** N_2^{2-}

Space for Rought Work

8. For a reaction scheme $A \xrightarrow{k_1} B \xrightarrow{k_2} C$, if the rate of formation of B is set to be zero then the concentration of B is given by:

(A) $(k_1 + k_2)[A]$ **(B)** $(k_1 - k_2)[A]$ **(C)** $k_1 k_2 [A]$ **(D)** $\left(\frac{k_1}{k_2}\right)[A]$

9. Most common oxidation states of Ce(Cerium) are :

(A) +3, +4 **(B)** +2, +3 **(C)** +2, +4 **(D)** +3, +5

10. The maximum denticity of an organic ligand, $EDTA^{3-}$ (Ethylene diamine triacetate) is :

(A) 3 **(B)** 4 **(C)** 5 **(D)** 6

11. A solution of $Ni(NO_3)_2$ is electrolysed between platinum electrodes using 0.1 Faraday electricity. How many mole of Ni will be deposited at the cathode?

(A) 0.15 **(B)** 0.05 **(C)** 0.20 **(D)** 0.10

12. Given below are two statements : one is labeled as Assertion (A) and the other is labeled as Reason (R).

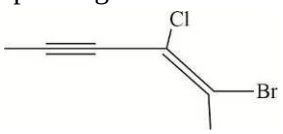
Assertion (A) : Glycerol is separated from spent-lye in soap industry using distillation under reduced pressure (vacuum distillation)

Reason (R) : Liquids purified using vacuum distillation are made to boil below their normal boiling points, so that they don't decompose due to having very high normal boiling points.

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

(A) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(B) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(C) (A) is true but (R) is false
(D) (A) is false but (R) is true

13. Choose the correct name for the compound given below :



(A) (2Z)-2-Bromo-3-chlorohex-4-yn-2-ene
(B) (2E)-2-Bromo-3-chlorohex-4-yn-2-ene
(C) (2Z)-2-Bromo-3-chlorohex-2-en-4-yne
(D) (2E)-2-Bromo-3-chlorohex-2-en-4-yne

Space for Rought Work

14. Given below are two statements : one is labeled as Assertion (A) and the other is labeled as Reason (R).

Assertion (A) : Treatment of hydrogen bromide with propene yields 1-bromopropane as the major product in the presence of benzoyl peroxide.

Reason (R) : Benzoyl peroxide helps to drive the reaction through free radical mechanism to form the final product.

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

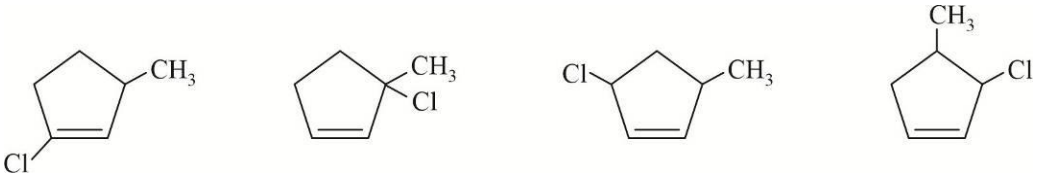
(A) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(B) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

(C) (A) is true but (R) is false

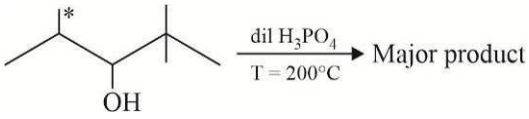
(D) (A) is false but (R) is true

15. Out of the given compound, which is most reactive towards solvolysis in the presence of formic acid?

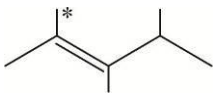


(A) **(B)** **(C)** **(D)**

16. The major product formed in the following reaction is :



(A)



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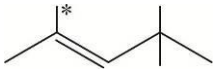
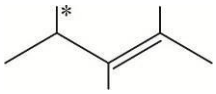


(C)



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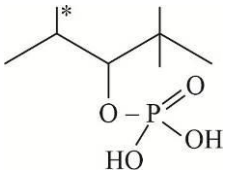

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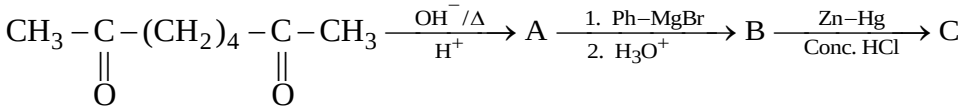
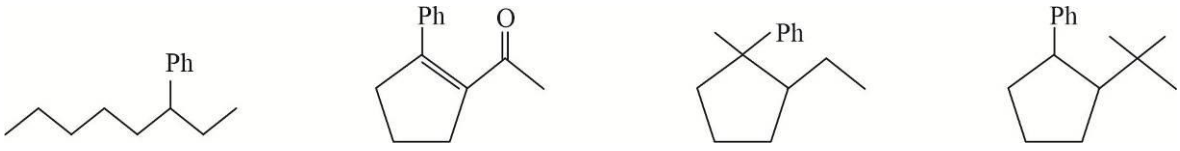


The product 'C' can be :



(A) **(B)** **(C)** **(D)**

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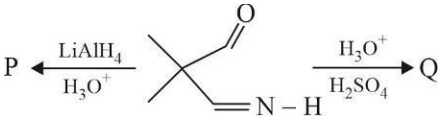
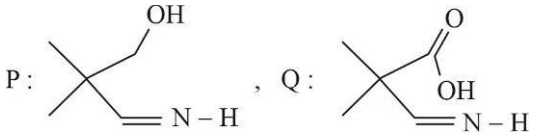
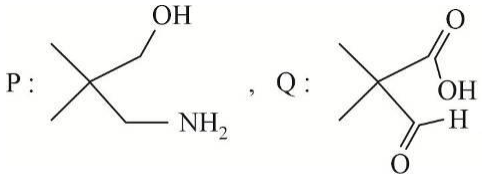
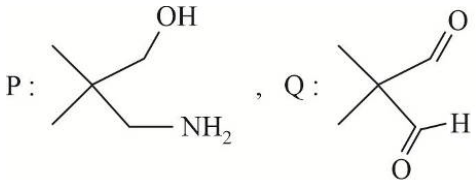
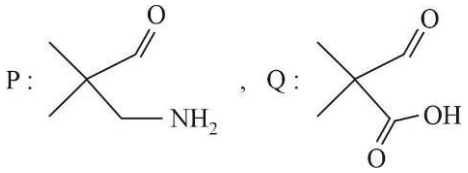
18. The major products P and Q in the following set of reactions are :



(A) 

(B) 

(C) 

(D) 

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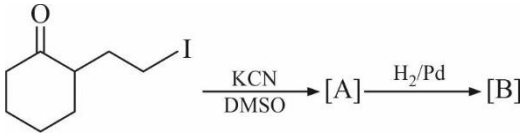
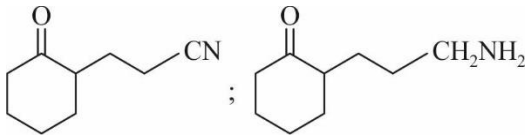
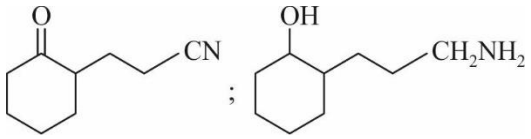
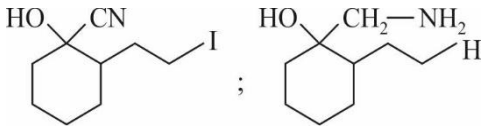
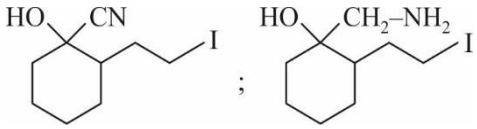
19. The major products A and B for the following reactions are, respectively:



(A) 

(B) 

(C) 

(D) 

20. Lactose is formed by glycosidic linkage of (i) of (ii) glucose and (iii) of (iv) galactose. Choose the correct option :

(A) (i) - C4 ; (ii) - β -D ; (iii) - C1 ; (iv) - β -D

(B) (i) - C1 ; (ii) - β -D ; (iii) - C4 ; (iv) - β -D

(C) (i) - C4 ; (ii) - α -D ; (iii) - C1 ; (iv) - β -D

(D) (i) - C2 ; (ii) - β -D ; (iii) - C4 ; (iv) - α -D

Space for Rought Work

SECTION-2

Section 2 contains 10 Numerical Value Type Questions Out of which ONLY 5 (any) questions have to be attempted. The answer to each question should be **rounded off to the nearest integer**.

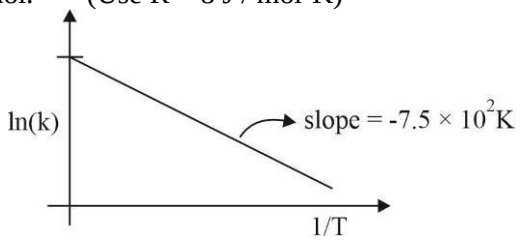
1. The molality of a solution prepared by dissolving 57.2 gm of washing soda in 1.25 L of water is $y \times 10^{-2}\,\text{mol/kg}$. The value of $\sqrt{y}$ is : (Atomic masses : $\text{Na} = 23,\ \text{C} = 12,\ \text{O} = 16,\ \text{H} = 1$)

2. Halogens (except fluorine) have (n-1) number of empty orbitals having *l* = 2 in their nth excited state. The value of 'n' is _____.

3. According to the following figure, the magnitude of activation energy of the given reaction

Reactants $\xrightarrow{k}$ Products

is equal to _____kJ/mol. (Use R = 8 J / mol-K)



4. A_4B_3 is a sparingly soluble salt of molar mass $M_0(\text{gm/mol})$ and its solubility is 's' gm/L. The solubility product satisfies $K_{sp} = 4^x \cdot 3^y \left(\frac{s}{M_0}\right)^z$ where $x, y \,\&\, z$ are integers. The value of $(x+y)/z$ is :

Space for Rought Work

5. For certain electrochemical reaction, value of cell potential at 25ºC and 27ºC are 0.52V and 0.51 volt respectively. If temperature coefficient of the cell potential is –x, then value of 1000x is ____.

6. A first order reaction gets 99.9% completed in 'n' half-lives. Find the value of n/2.
(Use $\log_{10} 2 = 0.3$). (Integer answer)

7. The number of halogen(s) forming halic (III) acid(s) is _____.

8. The number of hydrogen bonds associated with the compound Nickel bis(dimethylglyoximate) is _____.

9. The total number of reagents from those given below, that can convert Benzene diazonium chloride back to Benzene is _____.

(I) H_2O (II) H_3PO_2 (III) $NaNO_2, Cu/\Delta$

(IV) $H_2O, Zn\,dust$ (V) KI (VI) EtOH

10. In the ionic equation:

$BiO_3^- + 6H^+ + xe^- \longrightarrow Bi^{+3} + 3H_2O$, The value of x is:

Space for Rought Work

PART - III : MATHEMATICS 100 MARKS

SECTION-1

This section contains 20 Multiple Choice Questions. Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE CHOICE is correct.

1. For real numbers x and y, we write $_xR_y \rightarrow x-y+\sqrt{2}$ is an irrational number. Then the relation R is:

(A) Reflexive **(B)** Symmetric **(C)** Transitive **(D)** Equivalence

2. The number of distinct real roots of the equation $e^{4x}+e^{3x}-4e^{2x}+e^{x}+1=0$ is :

(A) 4 **(B)** 2 **(C)** 3 **(D)** 1

3. If $a_r=(\cos 2\pi r+i\sin 2\pi r)^{1/20}$, then $\begin{vmatrix} a_1 & a_3 & a_5 \\ a_7 & a_9 & a_{11} \\ a_{13} & a_{15} & a_{17} \end{vmatrix}$ is equal to:

(A) 0 **(B)** a_1 **(C)** a_3 **(D)** a_5

4. If the system of linear equations

$x+ky+3z=0$

$3x+ky-2z=0$

$2x+4y-3z=0$

has a non-zero solution (x,y,z) then $\frac{xz}{y^2}$ is equal to:

(A) -30 **(B)** 30 **(C)** –10 **(D)** 10

5. If the numbers a,b,c,d,e from an A.P., then the value of $a-4b+6c-4d+e$ is:

(A) 1 **(B)** 2 **(C)** 0 **(D)** 3

Space for Rought Work

6. If three distinct numbers a,b,c are G.P. and the equations $ax^2+2bx+c=0$ and $dx^2+2ex+f=0$ have a common root, then which one of the following statements is correct?

(A) $\frac{d}{a},\frac{e}{b},\frac{f}{c}$ are in G.P. **(B)** d,e,f are in G.P.

(C) d,e,f are in A.P. **(D)** $\frac{d}{a},\frac{e}{b},\frac{f}{c}$ are in A.P.

7. $\lim\limits_{x\to 0}\frac{\sin(2+x)-\sin(2-x)}{x}=$

(A) cos 1 **(B)** cos 2 **(C)** 2 cos 2 **(D)** 0

8. If the function $f(x)=\begin{cases}1, & x\le 2\\ ax+b, & 2<x<4\\ 7, & x\ge 4\end{cases}$ is continuous at $x=2$ and at $x=4$, then the values of a and b are :

(A) 3,5 **(B)** 3,-5 **(C)** 0,3 **(D)** 0,5

9. Function $y=\sin^{-1}(2x/(1+x^2))$ is not differentiable for :

(A) $|x|<1$ **(B)** $x=1,-1$ **(C)** $|x|>1$ **(D)** $x=\{0\}$

10. The value of $\int\frac{a^{\sqrt{x}}}{\sqrt{x}}dx$ is: (where λ is integration constant)

(A) $a^{\sqrt{x}}\log_e a+\lambda$ **(B)** $2a^{\sqrt{x}}\log_e a+\lambda$

(C) $2a^{\sqrt{x}}\log_{10} a+\lambda$ **(D)** $2a^{\sqrt{x}}\log_a e+\lambda$

Space for Rought Work

11. If $\frac{dy}{dx} = e^{-2y}$, and $y = 0$ when $x = 5$, then value of x when $y = 3$ is:

(A) e^5 **(B)** $e^6 + 1$ **(C)** $\frac{e^6 + 9}{2}$ **(D)** $\log_e 6$

12. Let f be a non-negative function defined on the interval [0,1]. If $\int_0^x \sqrt{1-(f'(t))^2}\,dt = \int_0^x f(t)dt$, $0 \le x \le 1$ and $f(0) = 0$, then:

(A) $f\left(\frac{1}{2}\right) < \frac{1}{2}$ & $f\left(\frac{1}{3}\right) > \frac{1}{3}$ **(B)** $f\left(\frac{1}{2}\right) > \frac{1}{2}$ & $f\left(\frac{1}{3}\right) > \frac{1}{3}$

(C) $f\left(\frac{1}{2}\right) < \frac{1}{2}$ & $f\left(\frac{1}{3}\right) < \frac{1}{3}$ **(D)** $f\left(\frac{1}{2}\right) > \frac{1}{2}$ & $f\left(\frac{1}{3}\right) < \frac{1}{3}$

13. Find the equation of the line where length of the perpendicular segment from the origin to the line is 4 and the inclination of the perpendicular segment with the positive direction of x-axis is 30°.

(A) $y + \sqrt{3}x = 8$ **(B)** $y - \sqrt{3}x = 8$ **(C)** $y + \sqrt{2}x = 4\sqrt{3}$ **(D)** $y - \sqrt{2}x = 4\sqrt{3}$

14. The length of the latus rectum of the parabola $169[(x-1)^2 + (y-3)^2] = (5x - 12y + 17)^2$ is :

(A) $\frac{14}{13}$ **(B)** $\frac{12}{13}$ **(C)** $\frac{28}{13}$ **(D)** $\frac{42}{13}$

15. In an ellipse, with centre at the origin, if the difference of the lengths of major axis and minor axis is 10 and one of the foci is at $\left(0, 5\sqrt{3}\right)$, then the length of its latus rectum is:

(A) 6 **(B)** 8 **(C)** 5 **(D)** 10

Space for Rought Work

16. The equations of the straight line through the origin and parallel to the line $(b + c)x + (c + a)y + (a + b)z = k = (b - c)x + (c - a)y + (a - b)z$ is:

(A) $\frac{x}{b^2-c^2}=\frac{y}{c^2-a^2}=\frac{z}{a^2-b^2}$ **(B)** $\frac{x}{b}=\frac{y}{c}=\frac{z}{a}$

(C) $\frac{x}{a^2-bc}=\frac{y}{b^2-ca}=\frac{z}{c^2-ab}$ **(D)** $\frac{x}{b^2+c^2}=\frac{y}{c^2+a^2}=\frac{z}{a^2+b^2}$

17. The number of real roots of the quadratic equation $\sum_{k=1}^{n}(x-k)^2=0,\ (n>1)$ is:

(A) 1 **(B)** 2 **(C)** n **(D)** 0

18. Let $\bar{a}\equiv 2\hat{i}-\hat{j}+\hat{k}$, $\bar{b}\equiv \hat{i}+2\hat{j}-\hat{k}$ and $\bar{c}\equiv \hat{i}+\hat{j}-2\hat{k}$ be three vectors. A vector in the plane of $\bar{b}$ and $\bar{c}$ whose projection on $\bar{a}$ is of magnitude $\sqrt{\frac{2}{3}}$, is:

(A) $2\hat{i}+3\hat{j}-3\hat{k}$ or $-2\hat{i}-\hat{j}+5\hat{k}$ **(B)** $2\hat{i}+3\hat{j}+3\hat{k}$ or $2\hat{i}-\hat{j}+5\hat{k}$

(C) $-2\hat{i}-\hat{j}+5\hat{k}$ or $2\hat{i}-3\hat{j}-3\hat{k}$ **(D)** $2\hat{i}+\hat{j}+5\hat{k}$ or $2\hat{i}-3\hat{j}-3\hat{k}$

19. The value of sin10° sin30° sin50° sin70° is:

(A) $\frac{1}{32}$ **(B)** $\frac{1}{18}$ **(C)** $\frac{1}{36}$ **(D)** $\frac{1}{16}$

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

(A) 12.8 **(B)** 13.5 **(C)** 13.9 **(D)** 13

Space for Rought Work

SECTION-2

Section 2 contains 10 Numerical Value Type Questions Out of which ONLY 5 (any) questions have to be attempted. The answer to each question should be **rounded off to the nearest integer**.

1. The sum of the rational terms in the expansion of $\left(\sqrt{2}+3^{1/5}\right)^{10}$ is_____.

2. The radius of circle $z\bar{z}+z+\bar{z}-iz+i\bar{z}-7=0$, is_____ (Units).

3. The least natural number '*a*' for which $x+ax^{-2}>2$ for all $x\in R^{+}$, is_____.

4. For an integer *n*, the integral $\int_0^{\pi} e^{\cos^2 x}\cos^3(2n+1)x\,dx$ has the value_____.

5. Let $f(x)=x^2+\int_0^x e^{-t}f(x-t)dt$ and $f(0)=0$. Then $[f(3)]$ where [.] represent greatest integer function, equals to_____.

Space for Rought Work

6. The number of points P on circle $(x-3)(x-4)+(y-1)(y-2)=0$ such that area of ΔPAB is 1/2 sq. units where $A(3, 2)$ and $B(4, 1)$ is_____.

7. If a point $R(4, y, z)$ lies on the line segment joining the points $P(2,-3,4)$ and $Q(8,0,10)$, then the distance of R from the origin is $\sqrt{t}$ then t is equal to:

8. Six boys and six girls sit in a row at random, then the probability that six girls sit together is $1/k$, then the value of k is_____.

9. The number of ways in which the letters of the word ARTICLE can be rearranged so that even places are always occupied by consonants, is_____.

10. Co-efficient of variance of two series are 75% and 90% and their standard deviations 15 and 18. Then the sum of their mean is_____.

Space for Rought Work

••• End of JEE Main Home Practice Test - 1 [JEE - 2024] •••